



Innovation Pilot (summer edition) 62990

2024

“Reflection & Learning “

Group 3

ECO Innovators



Innovation Pilot (summer edition) 62990

2024

“Reflection & Learning “

Group 3

ECO Innovators

Ahsunalla Wahidi
Software Technology
S184858



Battal Kaya
Building & infrastructure
S181665



Lucas Barkov Bruun Lassen
Building & infrastructure
S210796



Mhd Sabah Hadad
Electrical energy technology
S225903



Diyar Deveci
Building & infrastructure
S215379



Mahdi Ibrahimi
Software Technology
S210077



Content

Innovation process and outcome	4
Double diamond Model	5
Project work	8
Communication.....	10
Team collaboration	11
Interdisciplinary collaboration	12
Facilitators collaboration	12
Company collaboration.....	13
Feedback from company and facilitators.....	14
Loop 1 - Dairy without borders	14
First presentation.....	14
Pre pitch.....	14
Last pitch	14
Loop 2 – Ballerup bowling.....	14
First presentation.....	14
Pre pitch.....	15
Demo Day/video pitch.....	15
Learning and reflection.....	15
Individual part.....	17
Ahsunalla Wahidi	17
Battal Kaya.....	20
Diyar Deveci.....	23
Mhd Sabah Hadad	26
Lucas Barkov Bruun Lassen	29
Mahdi Ibrahimi	31

Innovation process and outcome

As we embarked on our second iteration of the project, our focus shifted toward gaining a deeper and more nuanced understanding of the root problem. It became evident that achieving this greater level of insight would require a methodical approach, one that would allow us to dissect the issue from multiple angles. To this end, we employed the well-established technique of the Five Whys, a useful tool for drilling down into the underlying causes of a problem.

The application of the Five Whys not only enabled us to gain a more comprehensive understanding of the challenges we were facing but also helped us to uncover the various contributing factors that were at play. By repeatedly asking "why" and digging deeper with each question, we were able to move beyond superficial symptoms and identify the core issues that needed to be addressed. This process of inquiry allowed us to reveal interrelated causes that might have otherwise been overlooked, providing us with a solid foundation for developing effective solutions.

However, recognizing the complexity of the situation, we did not rely solely on the Five Whys. To ensure a holistic approach, we also integrated the SWOT framework into our analysis. The importance of having a comprehensive overview of the project cannot be overstated, as a clear understanding of the strengths, weaknesses, opportunities, and threats associated with our potential solutions is crucial for achieving successful outcomes. The SWOT analysis allowed us to systematically assess the internal and external factors that could influence the project's success, ensuring that our approach was both strategic and well-rounded.

By identifying and evaluating these factors, we were able to pinpoint areas of strength that we could leverage, acknowledge weaknesses that required attention, uncover opportunities for innovation, and anticipate potential threats that might undermine our efforts. This thorough examination helped us to formulate a solution that was not only feasible but also sustainable in the long term.

As we approached this new phase of the project, the combination of the Five Whys and the SWOT framework proved to be instrumental in shaping our strategic direction. These tools guided us to think beyond conventional solutions, such as simply creating more parking spaces or reconfiguring existing ones. Instead, we were inspired to explore innovative approaches that would revolutionize the infrastructure of Ballerup Bowling and its surrounding area.

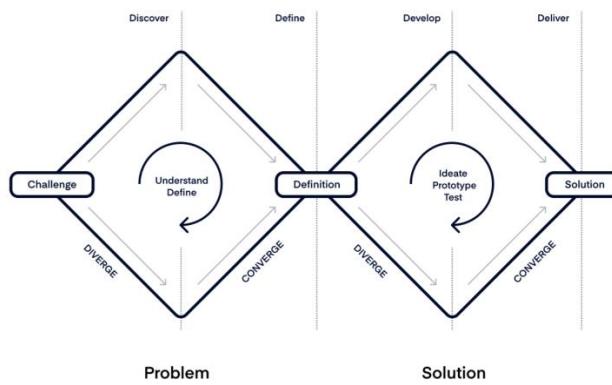
Our analysis led us to consider the broader context of the problem, recognizing that addressing the underlying issues required a more creative and comprehensive solution. By mapping out the entire infrastructure, we were able to envision a transformative approach that would not only meet immediate needs but also enhance the overall experience for visitors to Ballerup Bowling. This forward-thinking strategy allowed us to propose solutions that were not just about solving the problem at hand but also about creating a positive impact on the community and the environment.

In conclusion, our second loop of the project was marked by a rigorous and thoughtful approach to problem-solving. By combining the analytical power of the Five Whys with the strategic insights

provided by the SWOT framework, we were able to develop a solution that was both innovative and impactful. This experience underscored the importance of taking a holistic view of the problem, considering all relevant factors, and thinking creatively about the possibilities for change. As a result, we are confident that our proposed solution will not only address the current challenges but also contribute to the long-term success and sustainability of Ballerup Bowling and its surroundings.

Double diamond Model

Below is a visual representation of the various innovation phases we've been through. Our entire process has been guided by the four key phases: Discover, Define, Develop, and Deliver.



We were introduced to a project by Ditte Storm Kronil, a representative from Ballerup Bowling. The main objective was to transform a designated area, adjacent to an indoor children's playground called Hermans Hule, into a relaxing seating space where guests could enjoy food and drinks. This space was also to include a smaller section specifically for the parents of children playing in Hermans Hule.

During our visit, Ditte herself guided us through the area we were supposed to work on. Although the focus of the tour was the designated relaxation area, Ditte also shared concerns about the existing parking lot. She mentioned the need for additional parking spaces and suggested reshaping the current layout, which might involve removing some plants and flowers to create more room.

Taking all of Ditte's comments into consideration, we realized that we needed a clearer understanding of the project's scope. At this stage, we were uncertain about the exact direction we wanted to take. Ditte's remarks about the parking lot threw us off a bit, leading us to question whether we should focus solely on the relaxation area or explore a different approach that could address the parking lot issues.

We made sure to carefully assess the area during Ditte's tour, giving us a solid grasp of what we were dealing with. With this insight, we decided to develop two separate proposals. Each proposal

would address a different problem statement. On the day of our presentation to the company, we planned to ask for permission to work on the parking lot issue. If they agreed, we would proceed in that direction; if not, we would revert to our original plan for the relaxation area. This way, no time would be wasted, and we would be prepared to tackle whichever problem Ballerup Bowling deemed most pressing.

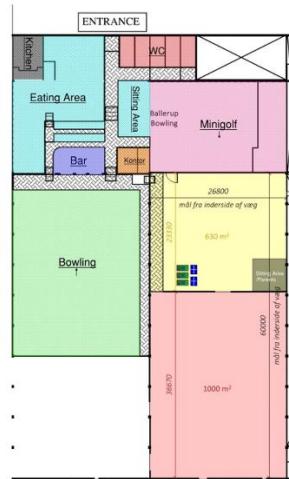
Problem statement presented for relaxation area:

“How can we sustainably renovate a 630 m² area adjacent to a children's indoor playground at Ballerup Bowling into a desirable lounge that is suitable for relaxation and socializing while addressing safety and accessibility concerns?”

Problem statement presented for parking lot:

“How can we sustainably convert the grassy area of Ballerup bowling into a parking lot to resolve parking shortages and improve accessibility by establishing a visible entrance that resolves the current issue and focusing on eco-friendly materials?”

Idea presented of relaxation area:



Idea presented of parking lot:



On presentation day, Ditte was genuinely excited about our proposal to focus on the parking lot rather than the relaxation area. We made it clear that our intention wasn't to modify the existing parking lot but to create an entirely new one behind the Ballerup Bowling building. This plan involved constructing a new entrance on the opposite side of the building, as well as designing a turning path for guests arriving by car or bike. Ditte was thrilled with our ideas and gave us the green light to proceed. With her approval, any uncertainties that had been holding us back before the presentation were resolved, allowing us to move forward confidently to the next step: determining how we would tackle the issue.

This marked the beginning of the Discover phase of the double diamond framework, where the goal is to identify and thoroughly understand the problem. At this stage, we employed a divergent approach, which is all about exploring a wide range of possible solutions.

We utilized the method of elimination, a strategy we had found effective during our first loop and decided to implement it again for this project. We discarded unrealistic ideas or those that would be impossible to execute within the timeframe of our second loop. For instance, proposals that involved redesigning both the current and new parking lots were ruled out during this phase. During the Discover phase, we also benefited greatly from Ditte's input, which provided us with a clearer understanding of the company's needs and their vision for a solution. With her help, we were able to refine our focus and get closer to finalizing a problem statement that would guide us toward an effective solution.

Armed with the insights we gained through our research and collaboration with the company, we were ready to move on to the Define phase of the double diamond. Thanks to a strong start and early acceptance of our problem statement by the company, we were already well into the Define phase. We revisited and refined our problem statement, and both our team and Ditte were pleased with the outcome.

Problem statement we ended with:

"How can we sustainably convert the grassy area of Ballerup bowling into a parking lot to resolve parking shortages and improve accessibility by establishing a visible entrance that resolves the current issue and focusing on eco-friendly materials?"

This problem statement encapsulates everything the company asked us to address. It highlights the shortage of parking spaces, incorporates the sustainability criteria that Ballerup Bowling is eager to implement, and acknowledges their challenge of attracting visibility. These aspects are all included in our problem statement, making it a crucial issue worth solving.

It's important to note that during this phase, we shifted to a convergent approach. Unlike the divergent approach, which explores a wide range of possibilities, the convergent approach involves narrowing down the problem to a specific focus.

With this refined problem statement, we were ready to proceed to the third phase of the double diamond: the Develop phase. Fortunately, our team included three structural engineers, whose expertise quickly guided us toward a feasible solution. During a group brainstorming session, we decided to create a detailed map or drawing of the proposed new parking lot, complete with the new entrance, turning path, and bike lane. This design would serve as a practical and realistic plan that Ballerup Bowling could use when implementing our ideas. Additionally, we planned to build a prototype using wood and paint to provide a visual representation for those who might find it difficult to interpret the technical drawings.

In the Deliver phase, we brought our plan to life by creating the map or drawing using MicroStation software. Alongside this, we constructed the prototype from wood, paint, and other materials to help visualize the design. This combination of a precise technical drawing and a tangible prototype ensured that our solution was both practical and easy to understand.



Above is a brief overview of our work through each of the four stages of the double diamond framework. Showing the steps we went through to get to where we are today, every step was crucial and meaningful to our project, and are all key elements for our success.

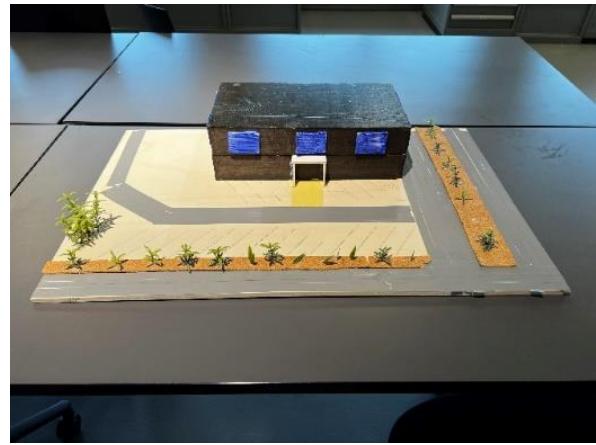
Project work

Our project turned out to be a success, though not without challenges and unexpected twists. As a group of six members with diverse personalities and academic backgrounds, we initially wondered how our varied experiences would come together. Combining insights from architecture, sustainability, engineering, business, and design, we tackled the complex task of creating a sustainable parking lot for Ballerup Bowling. The result was something we were proud of, especially when the company not only appreciated our work but also took our final prototype for potential implementation.

From the outset, our motivation was strong. Solving a real world problem with tangible outcomes was exciting, and the freedom to think creatively only added to our enthusiasm. We felt a deep sense of ownership, knowing our contributions could directly impact Ballerup Bowling's future. This sense of purpose kept us driven, even when faced with the inevitable hurdles of a complex project. We worked tirelessly, regularly meeting to discuss progress, troubleshoot issues, and refine our ideas. Each member played to their strengths, ensuring we stayed on track and maintained momentum.

Interestingly, the project took an unexpected turn that proved to be pivotal. Initially focused on developing a relaxation area, as outlined in our first problem statement, we spent considerable time conceptualizing a functional and inviting space. However, during a site visit with Ditte, it

became clear that the parking situation was a more pressing issue. With new attractions increasing visitor numbers, the existing parking lot struggled to accommodate demand. This revelation led us to shift our focus to the parking lot, understanding that this would have a more immediate impact. This shift wasn't easy, it required rethinking our approach and starting over in some respects. Our first prototype of the parking lot didn't go as smoothly as hoped. The initial design lacked the clarity and detail needed to effectively convey our ideas. Rather than being discouraged, we took this as a learning experience. We analyzed what went wrong and committed to improving our design. Our renewed focus led to a final prototype that was well-received by the company, validating our efforts and reinforcing the importance of persistence and iteration in the creative process.



Reflecting on the project, there are a few things we would do differently in the future. We learned the importance of thorough planning and prototyping, rushing the initial design phase led to later issues. Allocating more time to conceptual development in future projects will help us fully explore ideas and ensure detailed, accurate prototypes. We also recognized the value of regular, open communication within the team. While collaboration was strong, moments of miscommunication led to confusion. In future projects, we plan to implement more structured check-ins to ensure everyone is aligned. Additionally, we realized the importance of incorporating user feedback into the project process. While we relied on our expertise, gathering input from potential users earlier could have provided valuable insights. In the future, we intend to include methods like surveys or interviews to better understand user needs. Lastly, we aim to push the boundaries of sustainability further. Although we incorporated eco-friendly elements, there is always room for more innovation. We hope to explore new materials and technologies in future projects to enhance sustainability.

Overall, this project was a tremendous learning experience. We're proud of what we accomplished as a team, and the lessons learned will undoubtedly inform how we approach future projects, both in terms of process and collaboration.

Communication

Our project journey was as much about effective communication as it was about technical innovation.

Pitch day was a blend of excitement and nerves, and our video was our chance to make a lasting impression. We began filming at Ballerup Bowling, using the current parking as a backdrop to highlight the need for our solution. The transition from the parking lot to the serene green space where our new parking area would be developed was more than just a visual aid, it was a narrative device that showcased our vision.

The final segment, filmed in our lab, was where we introduced our prototype. We used the N-A-B-C method, Needs, Approach, Benefits, and Competition to structure our pitch. This approach ensured we addressed the target audience's needs, presented our solution effectively, outlined the benefits, and highlighted our competitive edge. Distilling all this into a concise three-minute video was challenging but crucial. It taught us how to present complex ideas clearly and persuasively, a skill that will be invaluable in future pitches.

Writing our innovation report was an exercise in clarity and detail. It wasn't just about documenting what we did but also about framing our work in a way that highlighted its impact and significance. We had to articulate our innovation process clearly, showcasing how our approach was novel and how it addressed specific problems.

Our reflection reports, on the other hand, were a chance to look back and analyze our journey. Reflecting on our experiences, challenges, and successes required honesty and introspection. It was about understanding what worked, what didn't, and why. These reports were not just academic exercises, they were tools for personal growth and improvement. We aimed to make our findings accessible and engaging, ensuring in both reports, that our readers could grasp the essence of our work.

Working with external partners like Ballerup Bowling emphasized the importance of relationship building. Our communication with them needed to be collaborative and responsive. We had to align our solution with their needs and constraints, which required us to listen carefully and adjust our approach based on their feedback.

Interacting with engineers from various disciplines was like learning a new language. Each field had its own technical jargon and approach, and finding common ground was essential. Regular meetings became crucial for aligning our diverse perspectives and integrating our solutions into a cohesive project. The key was to approach these interactions with respect and openness. Understanding and valuing each discipline's contributions helped us overcome challenges and innovate effectively. This experience taught us that interdisciplinary collaboration is built on mutual respect and a willingness to understand different viewpoints.

Reflecting on our project, it's clear that communication was at the heart of our success. From pitching our ideas and writing detailed reports to collaborating with partners and engineers, every aspect required careful and effective communication.

Team collaboration

From the outset, our group of five members had high expectations to perform well, both for the course and for our personal development. As we got to know each other and recognized our individual strengths, we continuously worked towards improving our collaboration.

We decided to distribute tasks based on each member's skills, interests, and what they were passionate about. This approach ensured that everyone was motivated and allowed us to make the most of our individual contributions to the project. Regular feedback was key to our success. By consistently asking for and providing feedback, we achieved better outcomes in both Loop 1 and Loop 2, which helped us find effective solutions to our case problem.

In the beginning, our levels of ambition varied, but as we became more familiar with each other, our ambitions aligned. We were all committed to delivering our best work and supported one another in reaching high standards. Although we encountered communication challenges, we addressed these by holding a group meeting, where we found a solution that improved our ability to meet deadlines and fulfill project requirements.

We also created a group contract that everyone agreed upon and signed. This contract played an important role in keeping all members engaged and active throughout the project. While we made some verbal adjustments along the way, the original contract remained effective, as we all adhered to the agreed terms.

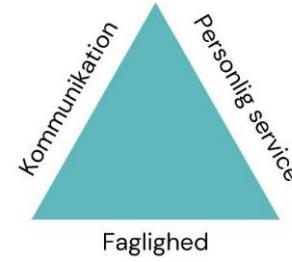
Looking ahead, we recognize the importance of communication in future group work. Effective communication allows us to solve problems together, preventing anyone from feeling isolated when challenges arise.

In the end, our collaboration met the expectations of all group members. We were all satisfied with the solution and the final product we delivered, and both the company and our instructors were pleased with the outcome. Working as a group with members from different educational backgrounds and perspectives was a unique and enriching experience. Our collective creativity and high ambition made our group dynamic and successful.

Interdisciplinary collaboration

As a group, we have learned to work interdisciplinarily in almost all areas throughout the course. This interdisciplinary approach has allowed us, as a group, to achieve success that would be difficult to reach individually. Our interdisciplinary work involved everyone showing up where the work began, and if someone couldn't attend in person, they connected via Teams. We mostly worked interdisciplinarily because the tasks were large and complex, requiring multiple areas of expertise. Our group included three students from Construction, two from Software, and one from Electrical Engineering. Each member brought their own experience, which we combined to achieve our goals.

Collaborating as a group has also strengthened our ability to tackle complex tasks together. By merging different areas of expertise, we were able to simplify and solve these tasks more effectively. Working with peers from other disciplines has broadened our perspectives and sometimes led us to think and listen like others, which is different from what we're used to, as we usually work within the same field of study. Some group members brought innovative thinking, creating physical models to demonstrate ideas to other students. Others approached tasks mathematically, calculating how to manage quantities in relation to the ongoing innovation. Some members excelled at programming, focusing on design and implementation. Others contributed national perspectives, ensuring compliance with Danish regulations, particularly in matters involving municipal authorities. All the points mentioned can be effectively explained using the Competency Triangle, which illustrates how our group has collaborated across disciplines. Communication, which has been the most crucial factor for us, is at the core, while expertise and personal effort have followed. These three elements have significantly developed our group, enabling us to successfully complete tasks and achieve substantial progress. The previous points also indirectly refer to the Competency Triangle, even if not explicitly stated.



As a group, we have strived to leverage our collective knowledge and expertise, ensuring that our products, the thinking behind them, and the innovation process were realized in the best possible way.

Facilitators collaboration

Our collaboration with the facilitators was truly fantastic. They were not only incredibly skilled but also genuinely nice and approachable. Every time we had a question or hit a roadblock, they were quick to respond with helpful and insightful answers. This support made a huge difference in the success of our project. We were able to address issues more effectively and refine our approach thanks to their guidance.

For our next project, this experience underscores how crucial it is to build a strong working relationship with facilitators from the beginning. Their expertise was invaluable and involving them early on will help us tackle challenges more proactively and enhance our project's overall success.

We leaned heavily on the facilitators for their expert advice and support. Whenever we faced uncertainties or needed clarification, we reached out to them, and their insights were always spot on. By keeping open lines of communication and being upfront about our difficulties, we made the most of their expertise.

Looking back, there were times when we could have reached out more frequently or earlier in the process. We sometimes tried to solve problems on our own when we could have benefited from their advice sooner. Engaging them more proactively could have made our work even smoother and more efficient.

To get even more out of the facilitators, we could have set up more regular check-ins to keep everything on track. Instead of waiting for issues to arise, having scheduled updates could have helped us stay aligned and get ahead of potential problems. Also, being clearer about our goals and expectations from the start would have helped the facilitators tailor their advice even more effectively.

One major takeaway from this project is the value of ongoing collaboration. We learned that it's not just about reaching out when we're stuck but about building a partnership that evolves over time. For our next project, we plan to involve our facilitators right from the beginning and maintain a more structured schedule for consultations. This way, we can leverage their expertise throughout the project, not just when challenges arise. This approach will help us work more efficiently and achieve better outcomes.

Company collaboration

Throughout the course of Innovation pilot, we've had the opportunity to work closely with the operational manager at Ballerup bowling. Her optimistic thinking made it possible to work within new ranges of the given project. We were given a specific task of making a lounge and relaxation area and ended up with Ballerup bowling giving us the opportunity to take our own direction within their own wishes of making a parking lot. Ditte fulfilled the role as an operational manager thinking ahead of her new decor. With an expected extra capacity of 32000 visitors a year, 40 parking spaces wouldn't fulfill the customers' needs of expected transportation.

Since the company has its entrance placed in an industrial quarter, it isn't as noticeable and is not as noticeable as it could be, having the site being enlarged with 1600 square meters with the back facing one of the most trafficked roads in Ballerup. This opened a whole new conversation and dialogue with the firm. Meeting new demands and reframing our innovative process. Discovering and defining a new case we found more interesting and therefore got more invested in. Throughout the whole course we knew how to get a hold of the company and there wasn't any miscommunication

or misguidance of any kind. In conclusion collaborating with Ballerup bowling has been straightforward and easy. It's been motivating to move on a different path than expected and still see the ambition of the idea throughout the course. Having a positive view on the process from the stakeholders keeps your ideas flowing and the questions solved.

Feedback from company and facilitators

Loop 1 - Dairy without borders

During Loop 1, we conducted three feedback sessions. Two sessions were held with the facilitators, and one session included both the facilitators and company representatives.

First presentation

The initial presentation primarily focused on our concepts and the primary challenge we identified. The feedback received was a blend of positive and constructive comments. The facilitators appreciated our approach, particularly the criteria we developed for the further advancement of the product.

Pre pitch

During this presentation, we introduced a new version of The Hard Nut and showcased the product we have been developing. The feedback we received was both positive and constructive. The facilitators appreciated our concept for cheese packaging and the visualizations we provided. However, they suggested that we improve the opening of our presentation to better capture attention and provide a clearer rationale for the necessity of our product.

Last pitch

During our pitch to Dairy without Borders, attended by two company representatives, we presented our product concept along with a physical prototype developed in our lab. The feedback we received was primarily focused on concerns regarding the durability of beeswax in hot weather. However, they also expressed appreciation for the prototype and the visualizations we provided.

Loop 2 – Ballerup bowling

During Loop 2, we conducted three feedback sessions. Two sessions included both facilitators and one or more company representatives, while one session was held exclusively with the facilitators.

First presentation

During our presentation, we really dug into the problem and the main challenges we noticed. We identified two big issues: one with the lounge area and another with the lack of parking. The parking problem was something we discovered ourselves. Ditte, the owner of Ballerup Bowling, pointed out that we should definitely focus on the parking issue since it's something they've also been thinking about.

Pre pitch

During the pre-pitch, we presented our drawings of the parking lot and the physical prototype. However, we did not have a video pitch prepared for the presentation. The feedback we received was less positive compared to our previous session. It was noted that we appeared less prepared, our comparison slide was not particularly relevant, and we did not adhere to the allotted time frame.

Demo Day/video pitch

At Demo Day, we presented our project to three representatives from Ballerup Bowling. We created two posters featuring visuals, informative text, and calculations. During the poster showcase, the representatives provided feedback on the project. They appreciated the concept and found the design intriguing, particularly the idea of a one-way road to increase parking spaces. When we presented the video pitch, they expressed interest in the sustainable parking lot concept and were unfamiliar with permeable asphalt. Towards the end of the day, Ballerup Bowling requested to take the prototype back to their office, to which we agreed.

Learning and reflection

Creating a parking lot involves multiple engineering disciplines and practical considerations, including planning, design, material selection, environmental concerns, and regulatory compliance. A significant part of the learning experience involves understanding how to optimize the space to meet user needs and adhere to the required standards. We as a group had three categories in mind before jumping into the design phase.

- **Efficient Space Utilization:** Maximizing the number of parking spaces within the given area. Here we chose the solution to make it a one-way street enabling angled parking spaces. By adding this we changed the needed maneuver width of 19m to 15,4m
- **Material Selection and Construction:** Understanding how different materials and methods impact both costs and durability. Here we chose to use a different asphalt on the bike lane making it more sustainable and customer friendly since it's permeable and therefore can't be flooded.
- **Environmental Considerations:** Integrating sustainable solutions, such as permeable surfaces for water management or using environmentally friendly materials. In the solution we cooperated water management in form of LAR, but also by making the road lighting solar powered and the bike lane permeable.

These elements were not something we knew by default but were something we progressed to get to know by staying in the “Research” phase rather than swifiting into problem solving and designing.

Our intention was to gather as much information from our interdisciplinary viewpoints and collect knowledge from written compliances and guidelines.

Most of our information was gathered from engaging in brainstorming and progressing into the “5 why’s” to get deeper into the problem solving. This led to some changes in the later stages of the course. We went about two phases on our prototypes, and made it so as speak a visual principle for the finished drawings. We restructured some parking spaces to bicycle parking placing them close to the new entrance, while further modifications such as MC parking was moved, and a stairwell was made from Ballerup boulevard making the entrance even more noticeable and modern from the street.

Contribution table

Tasks/members	Ahsunulla	Battal	Diyar	Mahdi	Lucas	Sabah
Innovation Report Loop 1	20%	20%	20%	20%	0	20%
Reflection report Loop 1	20%	20%	20%	20%	0	20%
Innovation Report Loop 2	16,67%	16,67%	16,67%	16,67%	16,67%	16,67%
Reflection report Loop 2	16,67%	16,67%	16,67%	16,67%	16,67%	16,67%
Presentations	16,67%	16,67%	16,67%	16,67%	16,67%	16,67%
Brainstorming/ideas	16,67%	16,67%	16,67%	16,67%	16,67%	16,67%
Video pitch	23,3%	10%	10%	10%	23,3%	23,3%
Design/Drawings	10%	30%	10%	10%	30%	10%
Prototype	23,3%	10%	23,3%	23,3%	10%	10%
Research	16,67%	16,67%	16,67%	16,67%	16,67%	16,67%
Poster	10%	10%	30%	30%	10%	10%

Individual part

Ahsunalla Wahidi

Throughout this course, I gained significant insights both personally and professionally. As a software engineering student, I had the opportunity to step out of my usual domain and contribute to a project focused on structural engineering. This experience broadened my understanding of how general engineering principles can be applied in different contexts. Personally, I learned the importance of flexibility and adaptability when working on multidisciplinary teams. These skills are crucial for effective collaboration and problem-solving in any professional setting.

Working on this project allowed me to apply my experience in project management and team-based work, which are core aspects of my study program. These skills were particularly useful in planning and coordinating our efforts, ensuring that we met deadlines and maintained a clear vision for our project.

Innovation is essential in any engineering field, including structural engineering. The major innovations in this area currently include the integration of sustainable materials, smart construction techniques, and improved urban planning practices. However, there remains a strong need for innovation in creating more efficient and user-friendly urban spaces, which is precisely what we aimed to address in our project.

During the course, I was introduced to the Double Diamond framework, which significantly shaped our approach to problem-solving and design. The Double Diamond process, with its distinct phases of discovering, defining, developing, and delivering, provided a structured approach that I found incredibly valuable. From this experience, I learned the importance of thoroughly exploring a problem space before narrowing down on specific solutions. This method helped ensure that our design was well-considered and aligned with the needs of the stakeholders. Moving forward, I plan to incorporate the Double Diamond framework into future projects as it offers a comprehensive way to tackle

complex problems, ensuring that all potential solutions are explored before finalizing the best approach.

Adopting an innovation mindset was key to our success in this course. We approached every aspect of the project with creativity and a willingness to explore new solutions. This mindset was evident throughout our work, particularly in how we tackled the challenges presented to us. By remaining open to new ideas and methods, we were able to deliver a project that was both innovative and practical.

One of the most valuable aspects of this course was the teamwork and understanding of team dynamics that it fostered. Our group worked exceptionally well together, with each member contributing across various tasks. This collaborative approach allowed us to leverage the diverse skills within our team, from planning and coordination to the hands-on creation of the physical prototype.

We did encounter challenges, particularly when one team member faced personal issues that affected their availability. This situation tested our ability to manage team dynamics and support one another. By communicating openly and offering the necessary support, we were able to overcome this challenge, demonstrating the importance of flexibility and understanding within a team.

The guidance from our teachers and teaching assistants was invaluable. Their feedback was instrumental in helping us refine our ideas and improve our project. The energy and enthusiasm they brought to the course were contagious, motivating us to give our best effort. Their constructive criticism allowed us to make significant improvements, leading to a final product that met and even exceeded the expectations of our client.

In terms of my contributions, I was involved in almost every aspect of the project except for using MicroStation. I played a key role in helping to create the physical prototype, applying my hands-on skills to bring our design to life. I also participated as one of the actors in our video pitch, using this platform to effectively communicate our ideas and solutions to stakeholders. Additionally, I applied my experience in project management and teamwork,

which helped in organizing our efforts, setting timelines, and ensuring that all tasks were completed efficiently. One of my significant contributions was maintaining close contact with the company, particularly with our client representative, Ditte Kronil from Ballerup Bowling. This role involved frequent communication to ensure that our project aligned with the company's needs and expectations. By staying in regular contact, I was able to relay important feedback to the team, which helped us make necessary adjustments and ultimately deliver a solution that was well-received by the company.

My experience from my study line, where teamwork is a central component, was particularly useful in this project. I contributed to planning sessions, helping to align our goals and ensuring that we worked cohesively as a team. This background also helped me in facilitating discussions, making sure that every team member's ideas were heard and considered.

Looking back, the most important lessons I learned revolve around collaboration, planning, and adaptability. Effective teamwork was crucial to our success, and this experience reinforced the importance of clear communication and mutual support within a group. The ability to adapt to challenges, such as managing team dynamics or responding to feedback, was another key takeaway. Working closely with a company like Ballerup Bowling and their representative, Ditte Kronil, provided a valuable opportunity to understand the importance of tailoring solutions to meet specific client needs. The experience of creating a project that was well-received by the company and receiving their positive feedback was incredibly rewarding and a testament to the effectiveness of our approach.

In conclusion, this course has been a transformative experience, providing me with skills and insights that I will carry forward into my future projects and professional life. The opportunity to work on a real-world problem, guided by excellent instructors and in collaboration with a supportive company, has been invaluable. I leave this course with a deeper understanding of innovation, teamwork, and the practical application of engineering principles, all of which will be essential in my future career.

Battal Kaya

This course has been highly educational for me. I had the privilege of taking the leadership role within my group and the opportunity to impart knowledge, which proved to be more challenging than I initially anticipated.

Initially, we established clear and transparent rules for the group. We dedicated an hour to discussing each member's expectations. One of my key proposals was to limit discussions on disagreements to no more than 30 minutes during group work, as it is crucial to me that we do not remain stuck on a problem for too long. To address this, we agreed that the group leader would decide on how to proceed. Although we had not yet appointed a leader, we planned to do so later in the week. It was reassuring to know that we had solutions in place from the outset. Additionally, we made a contract outlining our group collaboration, including how to manage absences and the expected work effort from all members. This contract proved to be a valuable tool, as it provided a reference point if any member failed to adhere to our agreements.

During the first two weeks of the course, known as Loop 1, we collaborated with Dairy Without Borders. This phase was particularly challenging for me as I struggled to grasp what was expected of us. There were numerous new terms and tools that I had not encountered before, requiring a period of self-study to train myself with them for effective group work. Additionally, identifying each group member's strengths was initially difficult, despite having taken two personality tests. We had to experiment to understand how to best utilize our assigned roles. Early on, I realized the need to take a leadership role, primarily to initiate our tasks, as we often stalled after brainstorming sessions. Everyone believed their idea was the best, so I had to facilitate progress through collective dialogue and voting.

In Loop 2, we shifted our focus to the Ballerup Bowling case, where they sought assistance in designing a lounge area for an expansion project. Following a visit to Ballerup Bowling, our group discussed the next steps. We began brainstorming designs for the lounge area and sketching our ideas. During this process, I suggested we also consider the parking situation, as Ditte from Ballerup Bowling had mentioned issues, particularly when Crystal Garden, the

wedding hall, hosted events. We brainstormed several good ideas for parking and decided to include this in our presentation to Ditte. She appreciated the suggestion, and we proceeded to develop a parking solution.

The collaboration during Loop 2 was highly successful. I assumed the leadership role to ensure we did not stall during our work, as the others seemed reluctant to take on this responsibility. I was never appointed by the team to be leader, but I took it upon me without officially announcing it. Following the approach from Loop 1, I delegated tasks to group members. By this time, I had also begun to understand the roles assigned to us during the personality tests, allowing me to distribute tasks accordingly. The prototype task was assigned to the creative members, the “quick tasks” to those who excel at rapid execution, and the drawing and video tasks to those with the greatest interest in these areas. In addition to delegating tasks, the group members were proactive in taking initiative. My primary responsibility as the leader was to initiate our activities and arrange status meetings.

However, not everything was perfect in our group work. We encountered an issue with a group member who was frequently absent, causing frustration among the other members. We consulted the facilitators for guidance on addressing this problem. The facilitators reminded us of our work contract and advised us to refer to it and have a conversation with the absent member. We discussed the issue with the absent member, listened to his perspective, and agreed that he would remain in the group but needed to be more active in the group work. He adhered to this agreement, and the group work has been progressing smoothly since then.

I was absent for two days due to illness, which caused me to miss the initial presentation on the parking concept. Nevertheless, I actively engaged in the group chat, consistently requesting updates.

The most challenging and crucial task I undertook was drawing the parking layout. Unfortunately, our initial drawing was not usable because Ballerup Municipality prohibits construction within 2 meters of the property line. Consequently, we had to create a new plan. The revised drawing featured angled parking spaces instead of straight ones and a one-way

road encircling the entire building on the plot. This concept of angled parking was a collaborative effort, incorporating input from all group members. The new drawing took significantly longer than expected, resulting in delays and increased pressure towards the end.

Three of us in the group are studying Construction and Infrastructure, which facilitated our understanding of how to manage the project and initiate a construction project, including its essential components. However, it was crucial to convey this knowledge to the other three group members who were unfamiliar with construction projects. This proved to be more challenging than anticipated. I realized the importance of clear and simple communication to ensure everyone understood the processes, tools, and terms used in projects like this.

In conclusion, this course has been exceptionally meaningful for me. The interdisciplinary group composition and the instructor's teaching method have greatly enhanced my interest in innovation and development. I initially intended to use this course to learn about development, but I feel I have gained much more. I have developed a new analytical approach to group projects, leadership, and development, which I hope to apply in my future career as a contractor on construction sites.

Diyar Devci

As a civil engineering student, I've been looking forward to all the work completed by our group. To describe how well I've contributed to the group's efforts, I was identified as a PLANT, which means I'm good at thinking innovatively and coming up with new ideas, allowing me to think deeply and creatively. However, I'm also seen as a Resource Investigator, meaning I'm adept at bringing external resources to the team, thanks to my extensive network. Since it's an Innovation course, it's good to be seen as a PLANT & Resource Investigator.

I've chosen to leverage my innovative thinking, which was highlighted in the course, to create knowledge and develop projects that other students can learn from. For example, I worked independently on a prototype for Loop 1, which consists of a cheese package made from cardboard. The package is shaped like a round box and uses brown colors to indicate that it's made from bamboo—an eco-friendly material beneficial for Nepal, where bamboo is abundantly produced and could help save costs for the country. We developed the bamboo cheese package as a group effort to eliminate plastic.

After two weeks, my focus shifted to BALLERUP BOWLING! They needed more parking for their customers. On the other side of a major road, there's a large grassy area perfect for converting into a parking lot. Ballerup Bowling was very eager to find a solution for the parking issue. I immediately began thinking innovatively and used a professional program to design and plan how the space should look in the future. We decided to use rain gardens to naturally manage stormwater, avoiding additional costs for drainage. Following Danish national regulations, we had to ensure a minimum of 2 meters from the bike path to the rain gardens. This made the parking lot smaller and tighter, so we had to design it with angled spaces and a one-way road from Hollanvej to the back of the bowling center, allowing for traffic flow from all directions. So how many parkings is really needed? Let me give one example out of many others innovative thinking methods: 960 guests in the area of 3 hours & 5 persons each car à $\frac{960 \text{ guests}}{5} = 192 \text{ parking needed} \geq 110 \text{ parking now } \frown\text{:}$ If we establish 200 parking more à $(200 + 110) = 310 \text{ parking in future} \geq$

192 parking needed 😊😊. Because of the new idea that is established, then why not to end the parking with a smart necessity, by adding electricity stations to the electrical cars.

Additionally, considering Copenhagen's strong biking culture, we connected the bike path along the edge of the building to the bike path on Hollanvej.

Not only did I create a design and plan with detailed programming, but I also developed a prototype to illustrate all these ideas. We made two prototypes for Ballerup Bowling: the first was a test of ideas and craftsmanship, and the second was the final prototype. The goal with the second prototype was to ensure it was both aesthetically pleasing and functional. Since I was involved in the design process, I made sure the prototype reflected the ideas and concepts from the programming.

All these efforts address a problem that I, along with the group, worked to solve. This exercise helps me in the future by improving my ability to tackle and resolve issues. Identifying a problem is one thing, but articulating it and finding a solution is what truly matters. Success depends on how effectively one thinks through the problem, which in this case involves innovation. The one who identifies the most critical problem and provides the best solution is always the winner, and that's what motivates me.

In group work, it's also crucial to bring energy, life, and collaboration. Creating a positive environment requires individual effort. I've done my best to make my teammates laugh and enjoy themselves while maintaining a serious approach to developing solutions and gaining knowledge. I showed up every day because of the motivation I have in the course, but also to show the group the seriousness of meeting up every day, so we don't waste time. Social activities, like playing football together with the possibility of a playful penalty for the losing team, have also been part of our routine, to get away from the screen sometimes and throw the stress away by that method. The group and I have shared meals both internally and externally. I even suggested that we should go bowling together on one of the last days of the course to wrap things up nicely.

Things like writing reports, delivering presentations, and creating PowerPoints are also tasks I have been involved with throughout the course. The fact that my contributions are included is significant not only for my own overall impact and that of the group but also for other students who could learn from our ideas, knowledge, and innovations.

As a conclusion, I really enjoyed the course because it stands out significantly from other courses at the school. I appreciated the group work, which fostered motivation and built friendships, making the weeks pass more quickly. The social activities also added to the experience, but what I liked most was that, as a group, we had a lot of freedom to decide how our products should be and were not constantly restricted in how we approached and tackled tasks. I am very satisfied with both my own and the group's final product, as we dedicated a lot of time to considering how best to execute our ideas and whether the way we approached things was necessary or not. Both loop1 and loop2 were fun, and I personally participated in everything, which has given me a complete understanding of the subject, something that was my goal from the start.

Mhd Sabah Hadad

As an Electrical Energy Technology student, the Innovation Pilot course has been a real game-changer for me, both professionally and personally. My personal test results showed that I'm intuitive, evaluative, and responsible, and my role as a completer finisher has really shaped how I approached this project. This course has been more than just a learning experience, it's deepened my understanding of how to take a project from just an idea all the way to completion, ensuring every detail is thought through and the final result is of high quality.

Through this course, I've significantly boosted my skills in project management and sustainable design. Working on the Ballerup Bowling parking lot project was a fantastic chance to apply what I've learned to create something practical and eco-friendly. The importance of integrating sustainability into every aspect of design became clear, as did the value of managing a project from start to finish. I used the Double Diamond approach, which really helped me get the best ideas and systematically solve problems, ensuring that no aspect of the project was overlooked. The goal was to create an eco-friendly parking lot that would serve Ballerup Bowling and its visitors well. My role involved ensuring that our final design met both functional and environmental standards. Collaborating with a multidisciplinary team was a great learning experience, it broadened my perspective and helped me become better at explaining complex technical concepts to people from different backgrounds. This has made me more confident in communicating ideas clearly and effectively.

On a personal level, I've grown more confident in leading and managing projects. Being the completer finisher meant I was responsible for making sure every detail was covered. This role taught me the importance of attention to detail and delivering high-quality work. It also helped me improve my ability to work under pressure, ensuring that deadlines were met without compromising on the quality of our work.

One of the most significant contributions I made to the project was integrating Electric Vehicle (EV) Charging Stations. Denmark is rapidly moving towards green energy, and with

the increasing number of electric vehicles on the road, it was crucial to include infrastructure that would not only meet current needs but also be scalable for future growth. I applied my knowledge of electrical systems to figure out the best placement and power requirements for the EV chargers. We made sure to use energy-efficient charging solutions and even explored renewable energy sources to power these stations, aligning the project with Denmark's sustainability goals.

To calculate the energy consumption for the EV chargers, a formula can be used:

Energy Consumption (kWh)=Power Rating (kW)×Usage Time (hours)

For annual consumption, the formula is:

Annual Consumption (kWh)=Daily Consumption (kWh/day)×Number of Days

Another significant area where I contributed was in the selection and placement of LED lighting fixtures. In Denmark, energy efficiency is a big deal, and LEDs were the perfect choice for this project. They offer significant energy savings compared to traditional lighting, which was important not just for reducing costs but also for minimizing the environmental impact. We strategically placed these LED lights throughout the parking lot, which not only reduced overall energy consumption but also improved safety and aesthetics. I also proposed using solar-powered LEDs, which are becoming increasingly popular in Denmark, to further reduce reliance on non-renewable energy sources.

For calculating the energy savings from switching to LED lighting, the following formula can be used:

Energy Savings (kWh)=(Power of old fixtures (W)–Power of LED fixtures (W))×Number of fixtures×Operating Hours

For annual savings, the formula is:

Annual Savings (kWh)=Daily Savings (kWh)×Number of Days

Finally, I played a key role in redesigning the parking lot layout to increase the number of spaces while improving overall functionality. This involved careful planning to maximize

space without sacrificing the green areas that are so important to Ballerup Bowling's aesthetic and environmental values. By incorporating eco-friendly materials and adding green elements like trees and shrubs, we created a more pleasant and sustainable environment for visitors. Sustainability is a core value, making these green choices wasn't just about aesthetics, it was about aligning with the broader cultural emphasis on protecting the environment.

Looking ahead, I'm excited to apply the skills and insights from this course to future projects in electrical energy technology. I will continue focusing on sustainability in my designs and using my project management skills to drive successful outcomes. This course has strengthened my commitment to creating innovative, eco-friendly solutions and prepared me to tackle future challenges with a strategic and responsible mindset. This experience has reinforced my belief in the value of working across disciplines and taking a thorough, methodical approach to innovation. I'm eager to bring these lessons into my career and continue striving for excellence and sustainability in every project I take on. By addressing the parking lot challenge, we ensured that Ballerup Bowling can continue to meet the needs of its visitors, providing a seamless and enjoyable experience that aligns with the centers long term goals. This dual focus approach not only solves immediate problems but also positions Ballerup Bowling for future growth, ensuring its continued success as a beloved local institution.

Lucas Barkov Bruun Lassen

In this report, I will reflect on my experiences and insights gained from an innovative course, where I took on the role of the "driver" in a team. The primary objective of the course was to equip us with the skills to tackle any complex challenge regarding businesses optimization and innovative ideas. Using our engineering knowledge throughout the course, we learned how to plan and execute interdisciplinary innovation processes, utilizing relevant innovation models, methods, and technological knowledge.

Methods such as the double diamond were a foreign model for me but will certainly be a tool used in the future. It keeps you focused on the innovative process rather than going straight to the problem solving. This is something I do have a challenge with since I'm very problem solving by trait. This also has its advantages such as being the driver, I was responsible for maintaining momentum, motivating team members, and ensuring that we met our goals within the given timeframe. This role was pivotal in understanding the activities and processes involved in an innovation journey and how to apply and adapt innovation models to practical problem-solving scenarios.

This is something that comes natural for me although it wasn't the case throughout the whole course. I missed some days in the course during loop 2 for work reasons, not giving out the right communication to the group, therefore I created some bad energy around the group. We managed to talk it through, and I was of course understanding of their perspective. We managed to push through the problem, since my priority when being there was on the same page as the groups. So therefore, I also learned the importance of being clear and precise in my communication. Although I kept my promises when assigned a task, I ensured that every team member knew exactly what was expected of me and did the honor of doing the task within the timeframe of the given deadlines.

Taking this aside, I got to show where my qualities lie within. My background in civil engineering was instrumental in ensuring that our solutions were not only innovative but also technically viable and aligned with industry standards. I could bring experience into the

team, sharing ideas from former projects and corporate the stakeholders need into the ideas. This being calculating a rain management solution to handle the water for a period of 10 years and drawing the cut sections of the road profiles to ensure direction and flow of the water.

The experiences I've gained throughout this course will be invaluable in future construction projects. I plan to apply the techniques I learned to better manage projects while ensuring that all team members contribute and feel valued. I will also pay more attention to the "Discover and define" phase in future innovation projects, particularly in the construction industry, where innovative solutions can lead to significant improvements in efficiency, sustainability, and safety. This I'm already trying to implement in the design phase at my firm, where time management and flow is key to success for a construction site.

Furthermore, I have realized how important it is to develop strong communication and leadership skills to effectively lead a team, especially in complex projects where interdisciplinary collaboration is essential. I intend to continue working on these skills, as they are essential for excelling in a role as a team member or leader, particularly when managing large-scale infrastructure projects as we did by making the proposal of doing a parking lot for Ballerup bowling.

By the end of the course, I felt that our team had achieved our goals, despite the challenges we faced. We succeeded in developing an innovative solution that we were all proud of, and I believe working as a team and keeping a good tone was a key factor in our success. The course provided me with valuable insights into how to integrate business understanding with the innovation process and solve challenges in a professional engineering manner.

Mahdi Ibrahimi

During this course, I have grown both professionally and personally. As an introverted person, I often find it challenging to engage in group settings, but this experience has taught me the value of being a good team player. I have learned how to effectively collaborate with others and how to think innovatively, not just in my studies but also in my personal life. This course has helped me discover the importance of creativity and how it can be applied in everyday situations. I realized that I have a lot of creative potential, which I plan to utilize more in the future.

As a software development student, I'm used to focusing on technical tasks like coding. However, this course encouraged me to step outside of my comfort zone. I contributed to the group by suggesting the idea of creating a 3D prototype for Loop 2. Although I initiated the idea, it was the teamwork and combined effort of the group that made it a success. The prototype was well-received, and even Ballerup Bowling was impressed, deciding to keep it. On demo day, we received positive feedback from various people about our idea and the prototype, which reinforced our belief in the project.

In addition to working on the prototype, I also helped design our poster for demo day. This task allowed me to explore my creative side, which I didn't previously associate with my field of study. I realized that creativity is not just for design but is also important in software development. Whether it's coding or designing user interfaces, creativity is essential. Moving forward, I plan to apply this creative thinking more in my work, blending it with my technical skills to develop innovative solutions.

When I look at the broader field of software development, I see that innovation is key. Major developments like artificial intelligence, machine learning, and cloud computing are transforming the industry, but there is still a need for more innovation, particularly in how we approach the integration of creativity into technical work. I believe that by fostering an

innovative mindset, we can address this gap. For me, this means continuing to learn, staying open to new ideas, and collaborating with others to drive innovation in the software industry.

Throughout the course, I also learned important lessons about teamwork, team dynamics, and the roles we play in a group. Working with a diverse team with different backgrounds taught me the importance of communication and collaboration. Although we faced some communication challenges, we were able to resolve them through group meetings and discussions. This experience showed me how crucial it is to communicate openly and work together to overcome obstacles.

My contribution to the group work involved helping out as much as I could. I made sure to support my teammates by participating actively in discussions, sharing ideas, and working on tasks that needed attention. I also tried to create a positive atmosphere where everyone felt comfortable sharing their thoughts. By doing this, I aimed to keep the group on track and ensure that we could all work together smoothly to reach our goals. My focus was on being a helpful and cooperative team member, making sure that I was always available to assist wherever needed. Since my background as a software engineer wasn't as useful for this exact project as I had hoped, I had to think of different ways to contribute to the project. I was involved in every aspect of the project and helped in every possible way, the only part I wasn't involved in as much as the structural engineers was the drawing of the parking lot itself using MicroStation, which is a software used in the structural engineer study line only and not something the rest of the group was familiar with. Along with all other aspects of the project I was also a key player when it came to the physical prototype, since our vision was as spectacular as it was, the prototype had to be as well, and I managed to guide us to a prototype, which the representative for the company Ballerup Bowling was so satisfied with, she took it with her and told us that the prototype was absolutely beautiful and perfect.

In conclusion, this course has been a valuable learning experience. I have gained new insights into the importance of creativity, innovation, and teamwork in my field of study. The

skills and knowledge I have acquired will be incredibly useful in my future projects. I now see the value of integrating creativity with technical expertise, and I am confident that this approach will lead to more innovative and effective solutions in my career as a software developer.

