GUIDING DESIGN DIRECTIONS IN INDUSTRY-COLLABORATIVE GRADUATION PROJECTS THROUGH A UNIFYING THEME

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ABSTRACT
Each year, the Graduation Projects of our fourth-year students address a wide range of real-world challenges, demonstrating the role of industrial design in shaping innovative products, services, and systems. These are individual student projects, supported by external advisors from sectors such as electronics, healthcare, transportation, and defence, reflecting the multidisciplinary nature of design education. For three consecutive years, a unifying semester theme was introduced to stimulate, guide, and connect student work across these varied sectors. This paper examines the benefits and practical implementation of setting a semester theme, using the example of 'Design for Connection'. The theme was carefully embedded within the studio teaching and learning, including structured activities that supported exploration of the theme within students' individually chosen project sectors. An inductive analysis of final project documentation was used to understand how students interpreted and expressed the theme through their design processes and outcomes. Ideation was found to be tied to five categories of connectivity (digital and technological; social and human interaction; environmental and physical; experiential; emotional), demonstrating the divergence benefits of a unifying theme for students, instructors, and external collaborators. Furthermore, the study shows how a unifying theme can help provide not only pedagogical structure within large and varied studio settings but also initiate positively diverse and unusual design ideation and innovation strategies, to the benefit of students and external advisors.

1   INTRODUCTION
As the culmination of the four-year undergraduate industrial design curriculum at Middle East Technical University, the Graduation Project guides final-year students in addressing a wide range of design problems and opportunities. Through creativity and analytical skills, students demonstrate the potential of industrial design to contribute to innovative or improved products, services, and systems. Projects are based on commercially relevant problem areas, set on an individual student basis, which engage with current markets or make future projections.

A defining quality of the Graduation Project is its collaboration between course instructors, students, and external advisors from diverse sectors. These advisors include industry professionals, design consultancies, NGOs, public-sector bodies, and individual experts who bring both design and sector-specific expertise. Such collaborations expose students to authentic project conditions and dynamic field knowledge, bridging theory and practice [1]. Partnerships have spanned sectors including electronics, household appliances, transportation, healthcare, and defence, highlighting the multidisciplinary nature of design challenges. While instructors provide structure through workshops, assessments, and juries, students are responsible for managing their own project brief, expectations, and development process. Throughout the course, students are expected to critically investigate real-life design problems and use their findings to inform their design decisions with a professional approach. Accordingly, jury assessments consider both the quality of design proposals and how they are justified through research. For three consecutive years, we introduced a semester theme to influence each students' ideation as well as set a contemporary design direction for the studio as a community. The shared starting point brought about by the theme aimed to encourage creative exploration while prompting engagement with broader

societal concerns that cut across sectors. Although design propositions were expected to connect to the theme, students retained flexibility in how they interpreted it in relation to the sector or problem area they would address through their projects. Setting a common thematic frame has been discussed in education literature as a way to elevate relevance, interdisciplinary thinking, and engagement in complex problem spaces [2] [3]. While a few studies discuss thematic exploration in design education, such as van Leeuwen et al. [4] in the context of social design, these typically involve emergent themes defined individually by students. The deliberate use of a shared, overarching theme to guide a collection of independent projects in a product design studio remains largely undocumented in the published literature. By framing the projects in this way, we aimed to create conditions for shared student understanding around a contemporary topic, as well as stimulation of design directions and outcomes that might otherwise not have emerged or been foreseen by students and external advisors.

This paper examines how the semester theme *Design for Connection* was integrated into the graduation project process, and how students interpreted and responded to it through their design work. The work had three aims: (i) to understand how a conceptual prompt (as a theme) can be deployed within studio projects spanning diverse sectors, (ii) to examine the practical influence of the theme on ideation (based on the variety of forms of connectivity that emerged), and (iii) to reveal the place of thematic framing in studio-based design education. While the study does not evaluate the theme impact in an experimental sense, it provides insight into how a shared conceptual direction can support diversity in interpretation and design outcomes, while offering a common point of learning amongst a studio community of students, instructors, and external advisors. The paper concludes with the insight that themes, when applied to projects across different sectors, can prompt fresh perspectives and innovative approaches, encouraging students and potentially companies to tackle problem areas from new angles.

2 SETTING AND COMMUNICATING THE THEME

As the final design studio course for industrial design students, the Graduation Project gives hands-on experience in managing large-scale projects and working with external professionals. Students strengthen their ability to communicate ideas, think critically, collaborate with stakeholders, and document their design process in a portfolio that addresses real-world challenges. The final proposal is presented in both digital and physical formats, ready for exhibition. Running for nearly 20 years, the Graduation Project has built a network of collaborating companies, NGOs, and other organisations. At the end of each academic year, instructors reach out to these external partners for feedback on their experiences, areas for improvement, and interest in future collaboration. A similar reflection process is conducted with students to understand their experiences with external advisors. Before the semester begins, the course leader confirms the availability of external advisors and compiles a list of participating organisations. Students indicate their preferred sectors and rank their choices among the available external advisors. Once matches are made, external advisors and students are introduced to each other at the start of the semester. While smaller companies may supervise only one student, larger organisations often accommodate multiple students. Around 100 students take the Graduation Project, with each student working individually on a sector-specific, contemporary design problem through critiques, workshops, group discussions, and self-study. The course includes 12 weekly studio hours (10 ECTS) and is led by four to five full-time instructors, along with several part-time instructors from industry. Instructors provide structured feedback and facilitate discussions to support students in their projects. However, managing this diversity presents challenges, as instructors must navigate multiple design briefs, understand each project's context, and provide meaningful critiques within the available time. To create a shared framework while maintaining sector diversity, we introduced a semester theme for three consecutive years. This approach aimed to bring cohesion to the design proposals across the class and support the educational process, while still allowing students to engage with different industries. Additionally, we explored whether this thematic approach could also benefit external advisors by providing a clearer collaboration structure and opening new opportunities for design differentiation and innovation.

2.1 Theme Selection: Design for Connection

Prior to the semester start, studio instructors proposed potential themes, providing explanations of their contemporary relevance, supported by research and professional experience. Instructors also outlined how the theme could be interpreted across different sectors, arguing for its potential and applicability.

After all proposals were presented, the studio team took a vote, with the most supported theme becoming the focus for that year's projects. One of the themes introduced was 'Design for Connection'.

This theme was selected for its broad relevance across societal, technological, and emotional dimensions. In a period shaped by digital transformation, social fragmentation, and changing modes of interaction, the theme encouraged students to explore how design can support, question, or reimagine different forms of connectedness. While digital connectivity often dominates current discourse, the theme invited reflection on a broader set of bonds, including emotional, psychological, social, cognitive, physical, environmental, and technological. It was framed around key concepts such as 'connect,' 'connectedness,' 'to be connected,' and 'to remain connected,' encouraging students to interpret these in diverse ways. This included social ties, relationships with and between devices, digital experiences, and our connection with nature, as well as intersections between online and offline life.

The theme's open-ended scope was compatible with sectors such as healthcare, household products, and mobility, focusing on how design might support emotionally, socially, and technologically relevant connections in everyday life. Physical or digital products, services, and systems were seen as means to facilitate and strengthen such connections. To introduce the theme, each studio instructor contributed slides illustrating their owns interpretations, compiled and presented to students as inspiration rather than limitation. The theme explanation was also shared with external advisors to help them better understand the context and guide students in exploring it within their sectors.

2.2 Integrating the Theme into Individual Projects

The Graduation Project is structured into three distinct phases, each concluding with a formal jury assessment: i) Foundations & Ideation (ending with the Initial Ideas Jury), ii) Concept Development (ending with the Preliminary Jury), and iii) Finalisation & Detailing (ending with the Final Jury). Across these phases, students are guided through in-class and out-of-class activities. During the Foundations & Ideation phase, specific activities were introduced to help students engage more directly with the semester theme. One such activity directed students through three distinct directions to support early design exploration, with outcomes presented at the Initial Ideas Jury. The first, *'Connect'*, invited students to reflect on their project statement in relation to different types of connectivity. A worksheet (Figure 1) helped them consider eight connective dimensions: electronic, social, environmental, emotional, value-based, design-related, and two student-defined categories. The second direction, *'Take a User Journey'*, prompted students to map key steps in user interaction with their proposed product or service, from short encounters (e.g., using a coffee machine) to extended processes (e.g., taking a bus). A separate worksheet guided this process and aligned with structured redesign methodologies that combine iterative development with research-based approaches to improve product and UX/UI outcomes [5]. The third, *'Radicalise'*, encouraged students to generate unconventional ideas that challenged assumptions in form, function, ergonomics, interface, or technology, even if not fully developed.

Figure 1. Directed ideation 'connect' worksheet

3   ANALYSES OF DESIGN FOR CONNECTEDNESS PROJECT OUTCOMES

A total of 70 students completed the Graduation Project [6], working across various sectors: Home & Kitchen Appliances (18), Retail & E-commerce (15), Public & Social Spaces (13), Healthcare & Well-being (10), Sustainability & Environment (8), and Mobility & Transportation (6). As part of the final documentation, students submitted a project process portfolio that included sketches, conceptual developments, storyboards, mock-ups, and 3D models of their final proposals. Each student was also asked to provide a brief one-line statement and a short paragraph summarising how their design addressed the theme of connectivity. This made the connection to the theme explicit and highlighted both how the theme guided their thinking and the diverse ways they interpreted it. The analysis presented here focuses on how connectivity was embedded in students' work across different sectors. An inductive thematic analysis [7] was applied to their students' documentation, including written statements and project materials, to identify patterns in how connectivity was interpreted and integrated.

3.1   Key Categories of Connectivity

The analysis initially revealed three broad categories of connectivity that were frequently addressed across student projects. The first, *Digital and Technological Connectivity*, appeared in projects where IoT, AI, automation, or smart systems played a central role. The second, *Social and Human Interaction Connectivity*, was reflected in designs that promoted collaboration or strengthened interpersonal relationships. The third, *Environmental and Physical Connectivity*, was characterised by modularity, adaptability, or solutions driven by sustainability goals. As the analysis progressed, it became clear that several projects did not fit neatly into these categories, prompting the addition of two further categories. *Experiential Connectivity* captured projects centred on immersive experiences, shared activities, or ritualistic interactions, emphasising sensory engagement and user experience. *Emotional Connectivity* described designs that prioritised well-being, relaxation, and emotional support, often aiming to reduce stress or build emotional attachment. To refine the categories, all projects were re-examined across sectors to confirm consistency. This process highlighted that connectivity in design extends beyond digital systems and physical linkages to also include the following. *Meaningful interactions.* A key aspect of Social and Human Interaction Connectivity, where engagement between users and products or systems was central. *Immersive experiences.* A defining element of Experiential Connectivity, where deep sensory or participatory involvement shaped the user experience. *Emotional connections.* Strongly linked to Emotional Connectivity, where designs aimed to evoke comfort, support well-being, or create emotional attachment. The heatmap (Figure 2) visualises the distribution of connectivity types across sectors, with darker shades indicating a higher concentration of projects. Project examples for each connectivity type are provided in Figure 3.

	Digital & Technological	Social & Human Interaction	Environmental & Physical	Experiential	Emotional
Home & Kitchen Appliances	10	2	4	1	1
Retail & E-commerce	7	3	1	2	2
Healthcare & Well-being	5	2	1	1	1
Mobility & Transportation	3	1	1	1	0
Sustainability & Environment	3	2	3	0	0
Public & Social Spaces	2	4	2	2	3

Figure 2. Distribution of connectivity types across sectors

3.2   Sector-Based Connectivity as an Additional Layer

While reviewing the projects, discussions with the studio team revealed an additional dimension of connectivity that had not been initially considered. Some design solutions extended beyond direct user-product interactions, instead establishing connections between multiple stakeholders within a broader system. These solutions required coordination across different sectors, involving healthcare professionals, manufacturers, service providers, or public infrastructure, making connectivity more layered and systemic. Of the 70 projects, 16 demonstrated this 'sector-based connectivity', where connectivity was not limited to individual users but instead integrated wider institutional, infrastructural, or multi-sectoral relationships. While most projects focused on user-driven interactions, these examples highlighted how connectivity in design can facilitate collaboration between multiple entities, shaping

larger service and product ecosystems. To illustrate this, some design solutions extended beyond individual users, facilitating collaboration among multiple stakeholders in diverse contexts. A few examples in Figure 4 highlight how sector-based connectivity appeared in different contexts.

Project Name	Visual	Connectivity Type	Sector	Brief Description
'Glica'		Digital & Technological Connectivity	Healthcare & Well-being	A smart glucose monitoring system that shares real-time data between patients and medical staff, demonstrating digital connectivity through IoT and AI.
'Topraktan'		Social & Human Interaction Connectivity	Retail & E-commerce	A direct-to-consumer platform connecting rural farmers and urban buyers, strengthening human interaction and community-driven commerce.
'Soul'		Environmental & Physical Connectivity	Home & Kitchen Appliances	A compact personal coffee machine and thermos with portion-controlled servings and a reusable design, ensuring convenience while reducing waste.
'Wanderlust'		Experiential Connectivity	Public & Social Spaces	A tour bus experience with interactive digital guides, creating immersive and participatory interactions for travellers.
'Orca'		Emotional Connectivity	Healthcare & Well-being	A wearable anxiety relief device using haptic, auditory, and visual stimuli, fostering emotional connection through sensory engagement.

Figure 3. Project examples for each connectivity type

Project Name	Sector	Stakeholders Involved
DiaBuddy	Healthcare & Well-being	Patients, health support networks, caregivers
Vestel Xp	Retail & E-commerce	Retail customers, digital commerce platforms, store employees
Travo	Mobility & Transportation	Bus passengers, drivers, public transport authorities
Wanderlust	Public & Social Spaces	Tourists, digital guide systems, local tourism services

Figure 4. Examples of sector-based connectivity appeared in different contexts

4   DISCUSSION AND CONCLUSIONS

The studio team initially questioned whether some sectors might struggle to apply the 'design for connection' theme, as connectivity is often associated with digital products and technology. There were also concerns about how well students collaborating with certain sectors, such as glassware, would interpret the theme in their work. To address this, the theme was introduced to external partners through a mini poster and explained in online or in-person meetings at the start of the project. These efforts helped establish a shared understanding among students and industry partners. Overall, adopting a thematic approach provided structure to the projects, strengthening collaboration among students, instructors, and external advisors. Industry experts also noted that the theme encouraged discussions beyond their initial expectations, leading them to explore new directions in their field.

Through observations and feedback from students, instructors, and external advisors, three key benefits of the theme-driven approach were identified:

- *Guiding students' creative processes.* The theme provided a clear direction, helping students narrow their ideas and focus on a specific challenge. This resulted in well-structured projects and strong research and design outcomes.
- *Supporting instructors in guiding student projects.* Graduation Projects span multiple sectors, making it challenging for instructors to shift between industries, product types, and user needs during studio critiques. The theme provided a focal point, helping instructors frame discussions around a shared dimension of design while still accommodating project diversity.
- *Offering direction to industry partners.* The theme encouraged companies to rethink their market perspectives and explore new product development directions, making collaboration with students more focused. One industry partner reflected: *"At first, it was challenging to think about connectivity, as it wasn't a topic we discussed in the design team. But we realised our work in*

diabetes monitoring fit the idea of connection, particularly in connecting with family and healthcare through continuous monitoring."

This feedback highlights how connectivity would not have been an obvious design consideration but, through engagement with the theme, industry partners found meaningful ways to help integrate it into students' projects. Instructors also reflected that the theme helped them navigate the complexity of guiding diverse projects. Given that each student worked with a different sector and design brief, the shared theme provided a conceptual thread to frame feedback and structure critique sessions. Without it, conversations risked becoming fragmented across product types, industries, and user contexts. The theme allowed instructors to maintain focus on a common design dimension, even while supporting highly varied directions. Although we, the instructors who initially introduced this approach, are no longer teaching the course, the practice has been sustained by the current studio team, suggesting its sustained relevance as an approach to studio education.

The use of a broad design theme, as presented in this paper, aligns with research on thematic design projects but also presents some distinctions. Tollestrup, Eriksen, and Ovesen [8] discuss the principles of thematic projects in industrial design education, where a project is structured around specific challenges and integrated with theoretical study and experimental case work in collaboration with industry. Berglund [9] highlights how themes can shape students' learning processes, particularly when focusing on specific design dimensions, such as anthropometry, biomechanics, and cognitive science.

While these studies emphasise narrowly defined themes, the Graduation Project took a different approach, introducing a *unifying* or *umbrella theme* spanning multiple sectors. Instead of guiding students toward a single challenge or dimension, this broader framing allowed for diverse interpretations of connectivity across industries. It encouraged flexible exploration and cross-sector discussions, enabling students to engage with the theme in ways relevant to their respective fields. We may say it was a driver for creativity. The umbrella approach provided a shared focus across sectors, helping students structure their projects while supporting instructors in navigating diverse topics. It also encouraged companies to reconsider their assumptions and explore new directions. This model could be valuable for a variety of design studio settings, offering a balance between structured guidance and open-ended exploration, which is an important consideration in preparing students for increasingly complex design challenges.

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