27TH INTERNATIONAL CONFERENCE ON ENGINEERING AND PRODUCT DESIGN EDUCATION
11-12 SEPTEMBER 2025, UNIVERSITY OF MALTA, MALTA

THE D+ FRAMEWORK. AN EDUCATIONAL MODEL PROPOSAL TO ADDRESS CONTEMPORARY CHALLENGES IN STRATEGIC DESIGN COURSES

David SANCHEZ RUANO[1] **and Valentina DE MATTEO**[2]
[1]Tecnologico de Monterrey, Mexico
[2]Universitá di Bologna, Italy

ABSTRACT
Strategic design education faces significant challenges in adapting to the complexities of an increasingly dynamic world. Key among these is the integration of systems thinking, entrepreneurial skills, and innovative practices to prepare students for diverse career paths and enable them to engage with real-world projects introduced by enterprises. This aligns with educational trends emphasising a problem-finding mindset and project-based learning models that empower students to navigate uncertainty, address global challenges, and co-create solutions with diverse stakeholders. By bridging creative, scientific, and humanistic disciplines, design education can train a new generation of designers to become transformational partners for organisations and social systems working in a "fourth order design" environment. This paper examines the "D+" Strategic Design undergraduate course at Tecnologico de Monterrey as an educational experiment. The course was based on the "Design Plus" (D+) framework, where strategic design was paired with four key concepts: Value, Innovation, Foresight, and Humanity. Students explored models, theories, and practical tools at the intersection of design, management, systems thinking, and humanistic culture. A key component involved a real-world challenge presented by a multinational manufacturing enterprise. This task emphasised intangible assets, such as organisational culture and brand equity, steering students from product-oriented solutions to systemic approaches to value creation. This circular exploration—from value to humanity and back—encouraged students to adopt transformative perspectives, equipping them to work within and strategically on organisations, addressing contemporary challenges with innovative contributions.

Keywords: Strategic design, systems thinking, innovation, foresight, value creation

1 INTRODUCTION: THE ROLE OF STRATEGIC DESIGN IN EDUCATION
Strategic design now integrates design thinking with management, social sciences, and systemic foresight. This multidisciplinary approach responds to the growing complexity of contemporary challenges, prompting designers to engage in problem-finding rather than just problem-solving [1]. Design education is thus essential, equipping future designers with skills to navigate technological shifts, socio-environmental complexities, and ethical dilemmas [2]. The "new designer" [3] blends insights from psychology, sociology, anthropology, and environmental studies. This evolution marks a shift from traditional craft-based training to a systemic, research-driven discipline where design helps shape collective futures [4]. Increasing complexity in design practice has led to four key educational shifts: systems thinking, participatory co-design, futures-oriented approaches, and entrepreneurial adaptability [5]. These changes align with the fourth-order design framework [6], transforming design discourse by influencing organisations' structures, policies, and interventions. Overall, these shifts underline design education's role in preparing designers for complex challenges.

2 EMERGING TRENDS IN STRATEGIC DESIGN EDUCATION
Design discourse is not static but constantly renegotiated within educational and professional domains [7]. Historically, design education followed a craft-based model, focusing on material production and technical expertise. However, with the rise of strategic design, education has transitioned toward critical engagement with social, economic, and political issues.

This transformation mirrors what the author calls “Trajectory of Artificiality”, where design has expanded from products and appearances to multi-user systems and societal discourse. As such, design education must prepare students not just to design objects but to engage in ethical, systemic, and participatory problem-solving [8].
Moreover, the concept of “hyperobjects” [9] offers a valuable framework for understanding the scale and complexity of contemporary design challenges. Hyperobjects—such as climate change, global digital infrastructures, and planetary urbanisation—are so vast and interconnected that they transcend human comprehension. Design itself can be considered a hyperobject, as its effects are nonlinear, distributed, and extend beyond any singular moment or actor, shaping “our every interface with the material world”. The integration of hyperobjects into design education compels students to adopt systemic and long-term perspectives, recognising how design interventions ripple through social, technological, and ecological networks [10].

3 STRATEGIC DESIGNS AS A FRAMEWORK FOR FUTURE EDUCATION

Strategic design operates as a bridge between theory and practice, allowing designers to navigate complexity, uncertainty, and interdisciplinary collaboration [11]. The literature identifies three primary roles of strategic design in education:

- Strategic Design as a Discipline: institutionalising design as a research-based field, integrating scientific methodologies with creative thinking [12].
- Strategic Design as an Attitude: cultivating designers' adaptability, ambiguity tolerance, and collaborative mindset [13].
- Strategic Design as a Process: Encouraging iterative problem-solving, prototyping, and co-creation [14].

A key theoretical foundation in strategic design is Actor-Network Theory (ANT), which emphasises design as an agentive force within networks of human and non-human actors [15]. Additionally, the DARN framework (Devices, Actors, Representations, Networks) extends ANT by providing a structured approach to understanding how design shapes and is shaped by organisations and societal systems [16].
With the transition from industrial to post-industrial design, the role of education must also evolve. Traditional industrial design focused on mass production and market efficiency, whereas post-industrial design emphasises knowledge creation, sustainability, and participatory governance [17]. In this shift students must become facilitators rather than passive problem-solvers; curricula must integrate systems thinking, social innovation, and policy engagement; designers must work within open-source, collaborative models rather than proprietary, hierarchical systems. These changes demand a redefinition of design pedagogy, ensuring that future designers understand their role as transformational partners within organisations, institutions, and global networks [18].

4 DESIGN PLUS (D+) FRAMEWORK: VALUE, INNOVATION, FORESIGHT, AND HUMANITY

As strategic design expands beyond traditional disciplinary boundaries, educational institutions must adopt models that integrate design methodologies, managerial strategies, systemic thinking, and humanistic perspectives. The D+ Strategic Design Framework, developed at *university name*, exemplifies an innovative pedagogical approach that positions design as an agent of organisational transformation.
This framework pairs strategic design with four foundational concepts: Value, Innovation, Foresight, and Humanity. By integrating these dimensions, D+ fosters a holistic, multidisciplinary approach that moves students beyond conventional product-centric solutions toward systemic, strategic, and human-centred interventions. A defining feature of the program is its emphasis on intangible assets, including organisational culture, brand equity, and stakeholder experience, preparing students to engage with complex real-world challenges.
The D+ Framework is anchored in four interdependent pillars:

Value: Defining and Creating Systemic Impact. Strategic design is fundamentally concerned with the creation of value, not only in economic terms but also in social, cultural, and organisational contexts. The D+ approach reframes design from a problem-solving tool to a value-generation mechanism, ensuring that students consider multiple dimensions of impact.

Innovation: Expanding the Boundaries of Strategic Design. Innovation in D+ is positioned as a dynamic, exploratory process that transcends traditional product development. Instead, students engage with organisational transformation, service ecosystems, and strategic foresight to rethink innovation's role in contemporary enterprises.

Foresight: Anticipating and Navigating Complexity. Foresight in D+ is not merely about predicting future trends but about actively shaping future scenarios through design methodologies. D+ curriculum emphasises anticipatory governance, enabling students to design resilient strategies for complex, uncertain environments.

Humanity: Re-centring Ethics and Cultural Dimensions in Strategic Design. Humanity, the fourth pillar of the D+ framework, ensures that strategic design remains ethically grounded, culturally attuned, and socially responsible. Design is an agent of social Change that incorporates humanistic disciplines such as philosophy, anthropology, and ethics, so ensuring that design remains a force for positive social transformation.

The D+ framework is structured around experiential learning methodologies, ensuring that students engage with real-world challenges while mastering theoretical frameworks. The curriculum follows an iterative, project-based learning model, integrating Industry collaboration as a key component aimed to reinforce strategic problem-solving and the management of intangible assets and to allow for iterative experimentation and reflective learning.

D+ model is explicitly interdisciplinary, drawing from business, engineering, humanities, and social sciences to prepare students for complex, transdisciplinary challenges. Based on these fundamental attributes, it employs and integrates a wide array of diverse tools, orchestrated within a structured and articulated process, as described below.

5 PROCESS AND TOOLS

The framework was developed in an educational context at the Strategic Design undergraduate course, part of the third year of the Bachelor in Design at the School of Architecture, Art and Design at Tecnologico de Monterrey. All courses in the institution focus on acquiring competences and sub competences, as part of its education model [19]. Specifically, this course emphasises two competences. The first is 'Development of Design Strategies,' where students develop design strategies for organisations facing business, institutional, and community challenges globally. It includes two sub competences: a) 'Definition of value,' where students define the value design generates within an organisation by considering its impact on product, process, and strategy; and b) 'Innovation detonation,' where students lead projects, programs, policies, and design strategies in both public and private organisations. The second competence is 'Self-knowledge and management,' whereby students build a lifelong personal and professional well-being project through responsible reflection and integration of emotional and intellectual resources. This competence includes one sub competence 'Self-knowledge' enabling students to establish a self-concept based on an ethical frame of reference, self-diagnosis, and continuous reflection. Over one semester, students must solve a challenge given by teachers and a company (details in section 5). In this case, the D+ framework and a set of tools were introduced. These tools, widely used by design professionals, marketing agents, and business managers, integrate the following sequence and aims:

1. Challenge Assigned: The project begins with a challenge from teachers and a partnering company.
2. Company History: Students gather initial insights about the company.
3. Business Context: Understanding the industry sector.
4. SWOT Analysis: Assessing internal and external factors.
5. Product-Service System (PSS): Shifting to a holistic approach.
6. PESTEL Analysis: Evaluating macro-environmental influences.
7. Competitor Analysis: Benchmarking against competitors.
8. Audit Results/Interviews Insights: Gathering operational insights.
9. Brief/Wow Opportunities: Identifying unique user experiences.
10. Value Proposition Canvas: Aligning products/services with customer needs.
11. ABCD Tool: Prioritising strategic actions.
12. Future Narrative: Planning for future changes.
13. Top 5 Opportunities: Focusing on critical strategic areas.
14. Strategic Business Canvas: Visualising the business model.
15. Innovation Strategy/Idea Proposition: Evaluating new ideas.

16. Diagram Business Plan: Outlining key components of the business strategy.
17. Finance: Ensuring financial viability.
18. Gigamap: Understanding the strategic landscape.
19. Final Strategic Report: The culmination of the project, integrating all findings.

By completing this sequence, students can interweave the outcomes of the analytical tools and the D+ Framework into a comprehensive strategic report for the company. This process not only demonstrates their mastery of the required sub competences but also provides them with a robust, practical qualification.

6 CASE STUDY: DESIGNING STRATEGIES FOR A MULTINATIONAL COMPANY

A multinational company in Tire and Interactive Vehicle Systems challenged thirty students, organised into four teams, to develop innovative design strategies. The company provided open access to data and facilitated several interviews with its engineering and marketing departments. Over the semester, each team applied the D+ Framework's analytical tools to create distinct strategic approaches without being confined to any specific focus area.

Ultimately, four unique projects were developed, and one team emerged as the winner, earning an invitation to engage further with the company. The winning team presented a comprehensive diagnostic and proposed a solution that involved establishing two new departments: an "Strategic Vision Hub" and "Impact Operations" (See Figure 1). Their proposal addressed issues found in the diagnostic: insufficient interdepartmental collaboration, a lack of design expertise, and disorganised internal information.

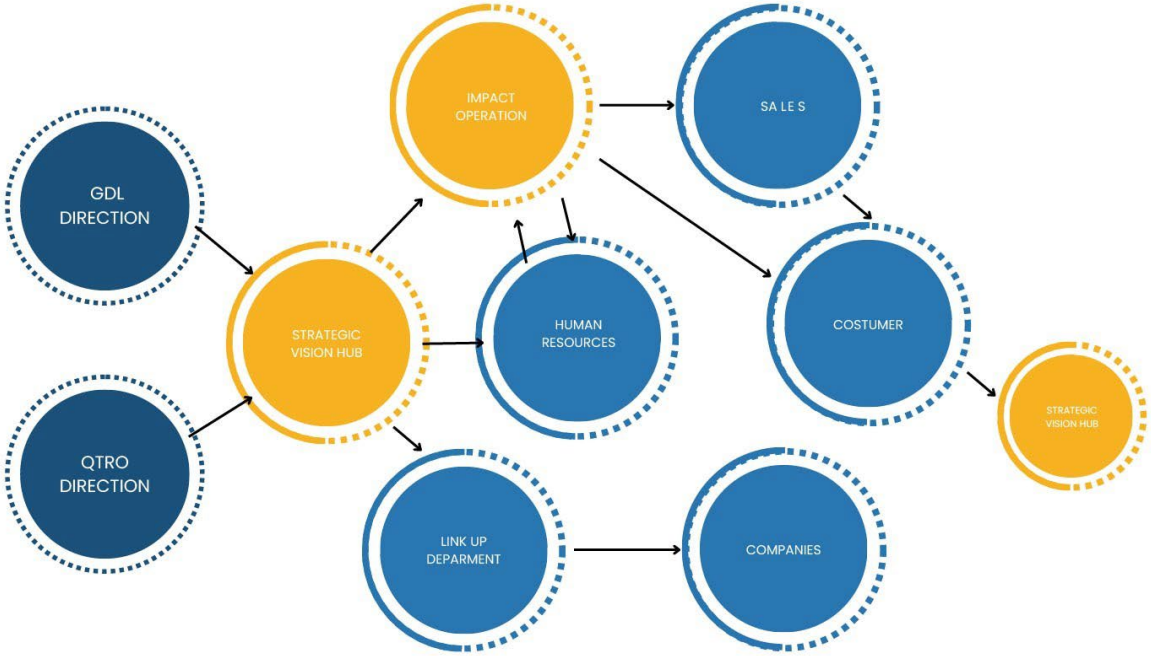

Figure 1. Diagram of the design strategy for the company. Authors: Jimena, Miranda and Estefania

The D+ framework helped the students to propose a solution addressing the complexities of the automotive industry while fostering innovation and systemic transformation. The automotive company, as a leader in sustainable and connected mobility, faces challenges such as integrating cutting-edge technologies, managing complex supply chains, and navigating the shift toward software-driven vehicles. In these, and the other project proposals, the dynamics of the D+Framework equipped with a strong transformative approach to strategic design education. The tools enable students to create impactful solutions that resonate across the organisational philosophy. The key tools used on this project were SWOT analysis, value proposition canvas, and gigamapping guiding the company with an iterative process culture of analysis, design, and strategic planning. These tools not only emphasise the

importance of aligning design with organisational goals but also encourage anticipatory thinking and ethical considerations.
By emphasising systemic value creation, the D+ framework enables the company to optimise its organisational culture, enhance interdepartmental collaboration, strengthen its brand equity, driving innovation and creating systemic value across its global operations. This approach ensures students are not only adept at navigating complexity but also positioned as transformative partners capable of driving innovation, fostering collaboration, and generating systemic value in professional design and consultancy contexts.

7 CONCLUSIONS

The D+ framework represents a significant evolution in strategic design education, bridging theory and practice. By integrating four foundational concepts: Value, Innovation, Foresight, and Humanity, the framework equips students with the skills to develop systemic, human-centred, and innovation-driven solutions. The framework's emphasis on interdisciplinary collaboration, systems thinking, and real-world applications fosters a holistic learning experience, preparing students to play transformative roles in organisations and society. Through the structured use of the series of analytical tools, students cultivate critical competences such as defining value, fostering innovation, and self-management. These competences align with the fourth-order design paradigm, enabling future designers to navigate complexity, drive organisational transformation, and co-create solutions with diverse stakeholders. The case study involving the multinational company exemplifies the practical impact of the D+ framework, demonstrating how students can diagnose organisational gaps and propose strategic solutions. This approach blends strategic thinking with hands-on experience, ensuring students not only understand the theoretical foundations of strategic design but also apply them effectively in professional contexts. The D+ framework provides a robust educational model that prepares students to address real world challenges, making design a vital force for innovation, collaboration, and systemic change.

REFERENCES

[1] Krippendorff K. (2006). *The Semantic Turn: A New Foundation for Design.* CRC Press.
[2] Manzini E. (2015). *Design, When Everybody Designs.* MIT Press.
[3] Lima M. (2023). *The New Designer. Rejecting Miths, Embracing Change*. MIT Press.
[4] Buchanan R. (1992). *Wicked Problems in Design Thinking.* Design Issues, 8(2), 5-21.
[5] Muratovski G. (2022). *Design in the Age of Change.* Intellect.
[6] Golsby-Smith T. (1996). *Fourth Order Design: A Practical Perspective.* Design Issues, 12(1), 5–25. https://doi.org/10.2307/1511742
[7] Krippendorff K. (2006). *The Semantic Turn: A New Foundation for Design.* CRC Press
[8] Krippendorff K. (2021) 'Design Discourse', in T. Schwer and K. Vöckler (eds) Der Offenbacher Ansatz: Zur Theorie der Produktsprache. Bielefeld, Germany: transcript Verlag. Available at: https://doi.org/10.1515/9783839455692-024.
[9] Morton T. (2013). *Hyperobjects: Philosophy and Ecology After the End of the World.* University of Minnesota Press.
[10] Escobar A. (2018). *Designs for the Pluriverse: Radical Interdependence, Autonomy, and the Making of Worlds.* Duke University Press.
[11] Caliskan K. and Wade M. (2022). *DARN: What Is Strategic Design? Social Theory and Intangible Design in Perspective.* She Ji: The Journal of Design, Economics, and Innovation.
[12] Simon H. (1996). *The Sciences of the Artificial.* MIT Press.
[13] Brown T. "Design Thinking." *Harvard Business Review* 86, no. 6 (2008): 84–92. https://hbr.org/2008/06/design-thinking.
[14] Buchanan R. "Wicked Problems in Design Thinking." Design Issues 8, no. 2 (1992): 5–21. https://doi.org/10.2307/1511637
[15] Latour B. (1999). *On Recalling ANT.* Sociological Review, 47(1), 15–25.
[16] Caliskan K. and Wade M. (2022). *DARN: What Is Strategic Design? Social Theory and Intangible Design in Perspective.* She Ji: The Journal of Design, Economics, and Innovation.
[17] Manzini E. *Design, When Everybody Designs: An Introduction to Design for Social Innovation*. Cambridge, MA: MIT Press, 2015
[18] Muratovski G. (2022). *Research for Designers: A Guide to Methods and Practice.* Sage Publications.

[19] Olivares, S. L. O., Islas, J. R. L., Garín, M. J. P., Chapa, J. A. R., Hernández, C. H. A., & Ortega, L. O. P. (2021). *Tec21 Educational Model: Challenges for a Transformative Experience.* Editorial Digital del Tecnológico de Monterrey.