Designing the IDEA Factory: A Study on Innovation Spaces for Academic and Industry Collaboration

Inclusive Collaboration in Innovation Spaces: A Study of Design's Social Impact in the IDEA Factory

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Duy Tran

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Technical Team Members:

Mike Rogerson, Logan Holsapple, Faythe Way, Katy Dominguez, Zubaidah Al Jumaili

On my honor as a University of Virginia student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

ADVISORS

Prof. Kent A. Wayland, Department of Engineering and Society

Prof. Diana Duran, Department of Civil Engineering

Introduction

How can innovation spaces foster inclusive, interdisciplinary collaboration between academia and industry?

Modern academic institutions are increasingly building innovation spaces to bridge the gap between academia and industry, supporting collaborations that advance technology and entrepreneurship. These spaces often provide modern facilities and equipment, such as advanced laboratories and digital tools. However, these physical resources alone do not ensure the success of collaboration. Instead, what truly fosters effective innovation are accessible and human-centered designs that prioritize interaction, such as flexible workspaces, communal areas, and tools that accommodate diverse user needs. These elements are important to create an inclusive environment where individuals with different backgrounds and experiences can connect with each other.

The IDEA Factory at the University of Maryland is a prime example of this trend. This 61,000-square-foot building, housing advanced laboratories for quantum technology, robotics, and entrepreneurship hubs, seeks to promote academic-industry collaboration. However, the facility's success depends on whether its design truly enables inclusive collaboration, bringing together students, faculty, and industry professionals. This prospectus outlines two interrelated projects focused on this goal: a technical project to design the IDEA Factory itself, and an STS research project examining how design elements influence inclusivity and collaboration. Together, these projects address the broader question of how physical spaces can shape social interactions in innovative and inclusive ways.

Technical Project: Designing an Inclusive and Collaborative Innovation Space at the University of Maryland

How can the IDEA Factory's design effectively balance specialized research needs with flexible, inclusive spaces to enhance interdisciplinary collaboration?

The technical research project centers on responding to the University of Maryland's Request for Proposal (RFP) for the IDEA Factory. Advanced research labs like the Robotics Realization Laboratory, Quantum Technology Labs, and Rotorcraft Laboratory will be housed in

this 61,000-square-foot structure. The project also includes collaborative spaces like the Startup Shell and ALEx Garage, designed to encourage entrepreneurship and industry-academia partnerships. The goal is to create a state-of-the-art building that supports creativity and interdisciplinary collaboration while also incorporating a pedestrian bridge for easy access to the Jeong H. Kim Engineering Building.

Defining the problem and background

Innovation spaces are increasingly needed to bridge academic research with practical industrial applications, fostering an ecosystem where students, researchers, and industry professionals can interact in flexible, inclusive environments. The IDEA Factory aims to incorporate a layout that accommodates specialized research requirements while offering adaptable spaces for group work, presentations, and informal networking. This dual functionality is particularly important in environments dedicated to significant fields like robotics and quantum technology, which demand both advanced technical infrastructure and the flexibility to support a range of collaborative activities. Moreover, the pedestrian bridge emphasizes the importance of physical accessibility in creating interaction between different engineering departments. By addressing these challenges, the goal of this project is to create an environment that not only supports scientific research but also enhances collaboration across different fields in the university.

Design Process and Methods

The technical design of the IDEA Factory will be carried out through several key stages to ensure that the space is functional, sustainable, and conducive to inclusivity:

1. Spatial and Structural Design: The layout will balance specialized labs and communal areas, allowing for both dedicated research work and shared collaborative spaces. Drawing on adaptable designs, we aim to create open, reconfigurable layouts that support different modes of collaboration. The structural design will also include a pedestrian bridge, enhancing accessibility to the neighboring Jeong H. Kim Engineering Building, and fostering interaction across departments.
2. Systems Integration: Essential systems—such as groundwater management, bracing, and foundation stabilization—will be incorporated to support the building's technical

demands. These systems are crucial for ensuring that the IDEA Factory is both safe and resilient to future technological advancements.

3. Sustainability and Accessibility: The building design will incorporate sustainable materials and systems to minimize its environmental impact. Furthermore, universal design principles will be applied to ensure accessibility for all users. Features like clear signage, ramps, and adaptable furniture will create an inclusive environment, enabling individuals of all abilities to participate equally in collaborative activities.

Anticipated Outcomes and Future Impact

The end goal of this project is a functional, inclusive, and adaptable innovation space that goes with the University of Maryland's vision of bridging academia and industry. The IDEA Factory will serve as an example for how university research spaces can be designed to accommodate both specialized technical work and interdisciplinary collaboration. By successfully implementing these design elements, the project will lay the groundwork for future developments in academic innovation spaces, where inclusivity and flexibility are as valued as technical capability. This project's design approach could serve as a template for similar initiatives, supporting diverse, collaborative environments that encourage research and entrepreneurship.

STS research project: Inclusive Collaboration in Innovation Spaces: A Study of Design's Social Impact in the IDEA Factory

How do design features in innovation spaces influence social interactions and inclusivity among diverse groups?

This STS research project aims to examine the social effects of innovation hubs like the IDEA Factory at the University of Maryland, with a specific focus on how architectural design and spatial layout influence collaboration and inclusivity among students, faculty, and industry professionals. Innovation spaces often intend to foster cross-disciplinary cooperation, yet without careful design considerations, these spaces may inadvertently exclude certain groups, reinforcing social and professional boundaries. This research explores how the IDEA Factory's design might

overcome such challenges by facilitating inclusive, interdisciplinary interactions and lowering barriers between diverse participants.

Background

The IDEA Factory is a good example of a sociotechnical system where the design of physical space influences the interactions between different groups of people. Students, instructors, academics, and business professionals are among the stakeholders who will use the facility for a variety of activities, such as product testing, startup incubation, and research and development. Therefore, values such as innovation, inclusivity and collaboration must be carefully considered as well as other aspects like safety, adaptability and accessibility.

It is also important to consider how similar spaces have been designed to promote inclusivity. For instance, universal design principles, which advocate for spaces that accommodate a wide range of users regardless of physical ability, offer valuable insights into how the IDEA Factory can ensure equitable participation for all.

Literature Review and Theoretical Framework

The design of inclusive and collaborative spaces, especially within academic and innovation settings, often draws upon principles of Universal Design. As explained in the article, universal design aims to create environments that accommodate all users, regardless of physical or cognitive abilities, fostering accessibility for diverse groups. This principle is fundamental to the IDEA Factory's layout, as features like ramps, adaptable furniture, and clear signage ensure that people of all abilities can navigate and use the space. By prioritizing accessibility, universal design principles support an inclusive environment, making it easier for individuals with various needs to participate fully in academic and professional activities within the IDEA Factory.

Inclusivity in design goes beyond physical accessibility to social factors, as highlighted by Umaña-Barrios and Gil (2017) in their research on spatial inclusivity and gender equality. Their study underscores the importance of designing environments that consider safety, visibility, and gender-sensitive elements, ensuring that all users, regardless of gender or background, feel comfortable and safe. Applied to the IDEA Factory, these principles can better the inclusivity of the space, promoting broader participation across diverse groups. By integrating gender-sensitive and inclusive design principles, the IDEA Factory creates a welcoming environment where users can collaborate comfortably and equitably.

Another essential factor in designing sustainable, adaptable spaces is the concept of Infrastructure Time, developed by Karasti, Baker, and Millerand (2010). This concept emphasizes that infrastructure should be designed with both short-term functionality and long-term adaptability in mind. Facilities like the IDEA Factory, which support research and innovation in rapidly evolving fields, must be able to accommodate future advancements and changing academic needs. By incorporating adaptable features, the IDEA Factory can remain relevant and functional over time, positioning itself as a sustainable resource that supports evolving interdisciplinary work.

In addition to accessibility and adaptability, effective collaboration also relies on well-structured environments that enhance teamwork performance. Fan, Li, and Zhao (2017) propose the Collaboration Process Pattern (CPP) approach, which uses data to analyze how spatial design impacts team efficiency. By examining recurring patterns in teamwork, the CPP approach identifies spatial layouts and interaction structures that support efficient collaboration. For the IDEA Factory, such insights can guide design improvements that improve workflows and enhance communication. Structured environments, as demonstrated through the CPP approach, encourage smoother interactions, enabling diverse teams to work together effectively and making the space not only accessible but also functional for interdisciplinary teamwork.

Inclusivity and collaboration are further supported by Oldenburg's Third Place Theory (1989), which highlights the social benefits of spaces that encourage informal gatherings and interactions. Third places—environments outside of work and home where people can connect socially—foster spontaneous exchanges that build social cohesion. The IDEA Factory's open areas and communal spaces embody this concept by creating opportunities for unplanned interactions among students, faculty, and industry professionals. This design element is important in promoting a collaborative atmosphere, breaking down professional and academic barriers, and encouraging interdisciplinary relationships.

Symbolic Interactionism, particularly Erving Goffman's (1959) work, provides a view on understanding how environments influence social dynamics. While Goffman focused primarily on face-to-face interactions and the presentation of self, his opinion on social roles and behavior in different settings can be applied here. Open, transparent spaces in the IDEA Factory might encourage equality and accessibility by reducing isolated or restricted areas. However, this claim

needs further support from other literature that explicitly links spatial openness to minimizing social boundaries.

To form a comprehensive framework, these theories must be integrated to address the specific challenges and opportunities of the IDEA Factory. Universal Design ensures the space is accessible to all, while the CPP approach shows efficient spatial layouts that promote collaboration. Infrastructure Time provides a view on long-term adaptability, ensuring sustainability. Social inclusivity principles and Third Place Theory guide the creation of environments that support diverse, informal interactions. Finally, Symbolic Interactionism underscores the importance of designing spaces that facilitate equitable perceptions and interactions. Together, these perspectives combine to form an evaluation of how the IDEA Factory's physical layout can promote inclusive, interdisciplinary collaboration between academia and industry.

Methodology: Data Collection and Analysis

To investigate the impact of the IDEA Factory's design on inclusivity and collaboration, the study will utilize the following methods:

1. Spatial Analysis: A spatial analysis will evaluate the IDEA Factory's design features, including open layouts, accessibility adaptations, and collaborative areas, alongside those of established innovation hubs. This method will involve reviewing floor plans, planning usage zones, and applying frameworks like the Collaboration Process Pattern (CPP) to evaluate how spatial layouts influence teamwork and interaction. Comparing these design elements across facilities will help identify which features best support inclusive collaboration and efficient workflows.
2. Case Studies: Case studies of comparable facilities, such as Cornell Tech and MIT's Media Lab, will provide additional insights. Evidence for these case studies will include viewing architectural plans, mission statements, user feedback or interviews with designers or administrators. By comparing design intentions with observed outcomes, the study will identify best characteristics relevant to the IDEA Factory's goals of inclusivity and interdisciplinary collaboration.

Conclusion

The combined outcomes of the technical and STS research projects aim to address the overarching question of how the design of academic innovation spaces can foster inclusivity and interdisciplinary collaboration across diverse social and professional boundaries. The technical project will create a functional and inclusive design for the IDEA Factory, setting a precedent for future university spaces that balance technical improvement with accessibility. Meanwhile, the STS research will provide valuable insights into how design influences social dynamics within collaborative environments, potentially establishing guidelines for fostering inclusivity and interaction in innovation spaces. Together, these projects not only contribute to architectural design but also advance our understanding of how physical spaces shape social engagement, offering a comprehensive model for creating academic hubs that are both innovative and socially inclusive.

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