Developing a Design Project Center

An Interactive Qualifying Project Report
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Abstract

The goal of this project was to determine the feasibility of a global design-themed Interactive Qualifying Project (IQP) center for WPI project teams by exploring opportunities in Japan as a pilot program. This was achieved by investigating interest in design at WPI, analyzing the current IQP system, and identifying project opportunities in Japan. We determined that a global design-themed IQP center was feasible due to the student and faculty interest in a design program within WPI, and that Japan is a suitable pilot location because of the unique design philosophies and project opportunities that exist in Kyoto. Therefore, we recommend that our sponsors follow our plan to create the Design Center, which will provide design projects at IQP centers around the globe, beginning with Japan.

Executive Summary

Introduction

At Worcester Polytechnic Institute (WPI), many students and faculty work on a wide variety of projects that require design, but there is not a formal design major for undergraduates or easily accessible design coursework at WPI that guides undergraduate students through the full design process. Therefore, this project investigates a way of integrating design education into the undergraduate experience by creating a global, design-themed Interactive Qualifying Project (IQP) center. To do this, we determined the interest in design at WPI, the adaptability of the IQP system, and also if Japan is a suitable location for the initial implementation of this design-focused project center.

Validation of Design Interest

In order to validate the need for a new design education experience at WPI, we investigated student and faculty interest in design, and analyzed WPI's current design coursework.

To investigate student and faculty involvement in design at WPI, we used three main methods: semi-structured interviews, a short survey, and an analysis of WPI's 2020-2021 course catalog. By interviewing two alumni and two faculty, we found that WPI lacks the design coursework necessary for students to learn the design thinking that their future employers will often expect them to have. We also found that over 30 faculty are interested in a design-focused project center at WPI.

To investigate student interest in design at WPI, we sent out a short, six question survey asking students for their majors and their experience with design at WPI. From the 29 students who responded, we set up a total of five student interviews to further investigate interest in a new design-focused project center and interest in design overall. From the student survey and interviews, we found that most students believe that their major is involved with some sort of design and that they want a new design themed project center.

We analyzed WPI's course catalog to find all available courses in every course catalog code that could be associated with the interdisciplinary definition of design: the process of planning, optimizing, and producing an effective solution to a known problem. This result complimented the student interview finding, which is that WPI's design coursework does not prepare students for design-related jobs post-graduation.

Based on these results, creating a design-themed IQP center will be beneficial to WPI as it will further the necessary design education of interested students.

Implementation

To properly implement a new design themed project center, it needs to be integrated into WPI's current IQP system. Therefore, we performed an investigation of the administration of the IQP program by setting up semi-structured interviews with project center directors and members of the Interdisciplinary and Global Studies Division at WPI. From them, we determined how the IQP program works internally and what some of the limitations are inside the IQP system.

The recommendation of this project is to establish the Design Center: a new, global, design-themed IQP center. This new project center will offer six projects in its single project

term, with the term being chosen by the Design Center director and each of the projects having a specific focus on design. These projects will be completed at six different IQP sites around the globe where the team of Design Center students will function as a 7th team of students at the center they travel to. The Design Center students will have their own advisors who have experience with design and will remotely advise the teams from WPI. This project center configuration was the easiest way to include student design projects at multiple, global locations without causing major disturbances to the IQP system, because it limits faculty workload by making advising remote. Additionally, the advisors for the Design Center should be familiar with design concepts, since inexperienced advisors were cited as a problem for themed projects. In preparation for this new, design-themed project center, there will be a pre-PQP course that will be taught the term before ID2050 as a means of educating students about design. We recommend this because design experience is inconsistent among WPI students, and we think it is unreasonable for the majority of WPI students to attempt to complete a design focused project without any academic experience with design. There will also be a standard ID2050 class for the students at this project center, taught by a qualified instructor.

While the end goal of this project is to create the Design Center at WPI, it is not possible to build a new project center overnight and properly implement it. Therefore, a phased approach to slowly integrate design projects into the IQP system is advised and it will eventually accumulate enough resources to fully install the Design Center. This phased approach has three phases: the first is single project replacement in Kyoto, the second is to replace one project at multiple centers, and the third is to finally implement the Design Center.

The first phase is the replacement of one of the six projects at the Kyoto project center with a design project. The replacement design project will run like a normal project. By replacing a single project at one IQP center, it will function as a test case for design projects in addition to beginning to establish relations with design sponsors.

In the second phase of the implementation process, the process undertaken in step one is replicated in more project centers. The reasoning for expanding the number of project replacements is to more adequately prepare the IQP system for integrating with the design center at multiple locations. The person serving as the Design Center director must also be determined in this phase in order to begin the expansion of project replacements.

The third and final phase in this process is the full installation of the Design Center. Before this can happen, there should be at least six project centers that have had design projects completed at their center that offer projects in the same term and there are at least two faculty members at WPI with experience in design willing to participate in the Design Center as advisors.

In Japan

Throughout the phased process of implementing this new design IQP center, the project center directors will need to organize design projects for students. Since this center is starting in Kyoto, Japan, we identified the unique design philosophies that exist there so that students can get the most of their time working on design projects in Kyoto.

In order to identify the unique design philosophies in Japan, we performed a literature review, where we explored a broad scope of design philosophies in Japan. Additionally, we conducted interviews with design experts in Japan about their opinions on design in Japan, projects they were actively working on or had worked on in the past, as well as any examples of uniquely Japanese design principles/fields they could identify. Additionally, we asked the

interviewees if and where they saw opportunities for design projects in Japan that future WPI students could work on.

Unlike other major Japanese cities, Kyoto has remained largely untouched through World War II, and recent natural disasters. The preservation of the city has allowed its unique history and dedication to traditional design concepts to remain intact. Along with this, there is a societal impact of concepts like "Pocket Design," where products are designed to be convenient and functional, as well as kawaii, where products/media are designed to be cute with bright colors. Furthermore, the way many Japanese people treat the world around them is inherently spiritual: for example, deciding the placement of a building or garden based on the spirituality of a tree. This extends to ideas of imperfections in objects, minimalism, and egalitarianism, which are all notable aspects of Japanese society that permeate into the fields of design.

There are also a number of potential projects and sponsors associated with these unique design philosophies. This includes universities, businesses, temples, and individuals who work within the various fields of design, and either have worked with, or are willing to work with students from WPI. Some of our interviewees told us directly that they, or the organization they worked for, is willing to work with WPI students on design projects, while other interviewees indicated external organizations and individuals to contact for project opportunities.

Storing and Cataloging Design Project Data

An important aspect of the design center is the potential for projects to be stackable, meaning that future teams can take the work already done on a project and build upon it to reach the formulation of a long term goal. We assessed the types of data that will need to be collected and the appropriate methods of storage via interviews and research. In the end, storage of research materials and field data is desired, because having an open data pool allows future projects to utilize bigger populations and data pools, thus leading to the formulation of grander community impacts and findings. These data would then be collected and, if appropriate, made accessible to sponsors and project teams through the project center. This accessibility would be done through one of our recommendations for hosting these data: CSV's (comma separated value sheets), spreadsheets, or a proper dedicated database.

Conclusion

The plan we created for the Design Center provides a roadmap that the center director or directing team can use to bring the center from one replacement project into a full center. The Design Center will be a step toward providing design thinking and design experience to WPI students, increasing their employability and providing them a more complete education, through global, interdisciplinary project education.

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1 Introduction

Design is all around us, and people everywhere interact with design elements on a daily basis. At Worcester Polytechnic Institute (WPI), many students and faculty work on a wide variety of projects that require design, but there is not a formal design major for undergraduates or easily accessible design coursework that specifically guides students through the design process. Therefore, WPI is investigating the potential of integrating design education into the undergraduate experience by creating a design-themed Interactive Qualifying Project (IQP) center and establishing a test case in Kyoto, Japan.

The IQP is a required undergraduate project that brings together an interdisciplinary team of students with different backgrounds to find a solution to a sponsor's problem. By incorporating a design-themed project center into the IQP system, we allow for all IQP eligible students to undertake projects that require design thinking. Additionally, IQPs are often global, and there are many design philosophies internationally that students can gain valuable experience from. Notably, Japan's history, unique design philosophies, and urban planning methods present a good background and a unique perspective to approach design projects from.

Our task was to investigate the potential for design learning to be blended with the IQP program as a means to advance design education at WPI, and also to conclude why Japan is a suitable location for a test case. To achieve this, we identified five key research objectives, which were identifying unique design philosophies in Japan, identifying opportunities and potential sponsors for design projects in Japan, investigating student and faculty interest in design at WPI, evaluating the IQP system to determine its ability to integrate a new global project center, and finally evaluating the best options for a center-wide data pool.

This report first starts by introducing key background information about the history of design in Japan, before moving into the methodology of our research. It then moves into the results of our research, before finally detailing our recommendations of the project for our sponsors.

2 Background

This chapter details some of the notable aspects of design in Japan, starting with the history of how modern design principles in Japan developed. Next, it outlines the concepts of kansei design and universal design, and how they highlight the social and spiritual philosophies of Japanese people, before finally exploring the Japanese city planning methods of machizukuri and toshikeikaku and their impact on urban and architectural design.

2.1 Japanese Design History

Though Japan has a rich and thorough history, when considering design and the impact of Japanese design on the world, the place to start is after 1868 when the final in a set of treaties imposed by Western trading powers was signed by Japan. These treaties almost fully opened up the nation to outsiders, trade, as well as new diplomatic relations, and as a result Japan lost a lot of its own autonomy (Clark 2020). This was, however, the first time in centuries that people were able to leave Japan, and foreign designers or reformers were able to come into Japan (Gordon, 2003). On one hand, Japanese designers and artists were finally able to travel and broaden their palette, as well as integrate aspects of art and design from other cultures into their own. On the other hand, it also meant that foreigners were able to take aspects of Japanese design and integrate them into their own cultures (Adriasola et al., 2016). The exposure of Japanese design and art to new cultures is what initially cemented the idea of "Japanese design," in concepts like minimalism, meticulousness in planning or execution of steps, and Zen or personal balance in work.

Both the exposure to the outside world, and the outside world's exposure to Japan, laid the necessary foundation for design in Japan to be what it is today. It is on top of this foundation that the next pillars were built which define the most notable aspects of Japanese design. The rest of Japanese design history can be broken into three major time periods of the expansion, foundation, and advancement of Japanese design concepts: Pre World War I, Post World War II, and Post 2011.

2.1.1 Early 1900s Japan: Urban and Industrial Booms

The early 1900s (Pre World War I) saw the first real urban boom of Japan's history, with urbanization exploding at a rate almost entirely unmanageable. Technical school systems were established, and commercial production was reformed under the ideal of "Industrial Design". After the outbreak of WWI, Japan joined the Entente allies, and as a result, needed to radically redesign its industrial output. Japan saw one of the largest expansions in industrial production and manufacturing of civilian goods, which were exported all over the Western world (Nakamura, 2003). Despite this higher demand, Japanese officials and scholars pushed for design principles to not be ignored. This led to a unique aesthetic in the goods produced in Japan, and a well defined method of incorporating good industrial and aesthetic design into mass manufacturing (Adriasola et al., 2016).

2.1.2 Post-WWII Recovery and Reform

Immediately following World War II, a resurgence of culture, life, and economy in the war torn country led to a very crucial recovery. Bombed and destroyed cities were swiftly rebuilt and repopulated, allowing for urban design to be reimagined, and for the first time gave an

opportunity to factor in new design principles to Japanese architecture, something previously untouched as an old world art form (Adriasola et al., 2016). The new urban design focused on both technology and small businesses, the design of which allowed for new growth into a thriving commercial economy. Though this new economy saw a rise in social and economic inequality, it saw one of the biggest expansions of industrial and graphic design the country had ever seen (Fiell & Fiell, 2013). Companies that produced televisions, media and music devices, and game systems became the front runners, followed by producers of graphic design and other art forms as they took the stage in international markets. These technology companies became the leaders of innovation in Japan, but also overseas, in North America and Europe, due to their meticulous and well structured industrial design practices (Fiell & Fiell, 2013).

Companies like Sony, Nissan, and Toyota took the international stage as some of the most popular and successful exporters of modern goods, and their design focused approach to manufacturing led them to be household and trusted names. Their success brought pride to Japanese manufacturers, and "also stimulated a buoyant economy with which to build the infrastructure of a new, democratic and far more outward-looking society" (Fiell & Fiell, 2013). Rapid growth in the economy only lasted for so long, however, and eventually the growth stagnated into a stable and very slowly declining economy (Mosk, 2001). The stagnating economy carried Japan down a very gentle economic slope from the late 1980s until 2011 when the next big reform in design would occur (Hayami, 2003).

2.1.3 Radical Changes in Social Design Following Disaster

When the Tōhoku earthquake, tsunami, and Fukushima Nuclear Disaster struck Japan in March of 2011, Japan saw its newest debates and shifts in design paradigms. Instead of industry, architecture, or graphic design, it became clear that social design reform was necessary to recuperate from the disaster, not only to get the economy back on track, but to also ensure that the welfare of the Japanese people was treated as a priority in the process (Adriasola et al., 2016). While the government focused on traditional reconstruction techniques, scholars and designers saw the immediate need for "human centered design solutions" (Adriasola et al., 2016). Such changes, however, did not come from scholars and designers alone, but also from larger groups of people who were fighting to set up a societal structure that would assist all people, and build societal resistance. They started programs that could build this resilience through societal engagement and involve the community in recovery efforts, thus making the process of recovery a personal and community led change for many towns and cities (Adriasola et al., 2016).

It is also in the shift towards community focused change that one sees a shift in paradigms towards ideals like Japanese universal design, and other social justice focused design. The idea of ensuring that these communities are continually connected and accessible in the years following the disaster became a primary goal of the newest phase of Japanese design.

2.2 Kansei Design: Designing for Humans

As Japan transitioned from a focus on industrial design to a focus on social design, one of the strong design principles that emerged was the concept of kansei design, or kansei engineering. Kansei is a Japanese word that describes a complex psychological process that people go through when experiencing the world, combining sensation, perception, and cognition into a cooperating system (Figure 1). In terms of design, it refers to the "psychological feeling or

image that a consumer will have in mind when purchasing a product" (Nagamachi, 1999). The original theory of kansei was developed in Japan, but it is generally based on a very Eastern approach to seeing the world, specifically because it emphasizes the relationships between objects, people, and the environment, whereas the Western approach focuses on these three concepts as separate categories. Kansei was first mentioned in Japanese literature as early as 1878, but did not gain popularity until around 1984, when new authors started revising the theory, and large companies such as Mazda and Dentsu started adopting kansei design principles to create products (Lévy, 2007). This was in direct response to the changing cultural ideas about manufacturing in Japan, which saw a shift from products being made based on industrial standards, to more human-centric standards based on consumer opinion (Nagamachi, 1999). Kansei design and engineering seek to directly connect the more abstract aspects of consumer opinion to the product design process.

Figure 1 *Kansei design etymology*
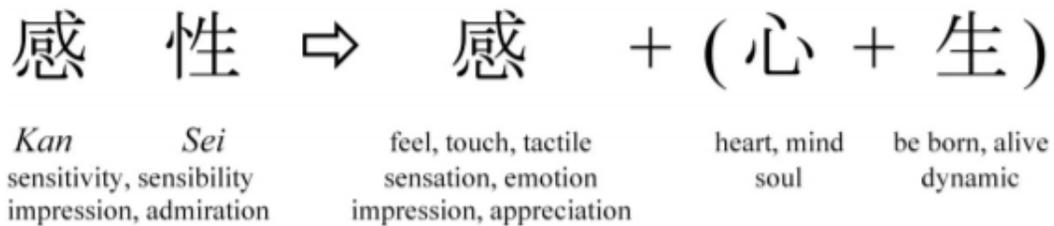
Note. Taken from (Lévy, 2007) to show the etymology of the kanji characters for kansei.

2.2.1 Influence of Kansei in Japanese Engineering

Even though kansei design has had a long academic history, it only became popular when it was applied specifically to engineering. Kansei engineering, sometimes associated with affective engineering, aims to connect the physical aspects of a product with the psychological needs and desires of a customer in a concrete way (Lévy, 2013). The first well known product to apply a kansei perspective to the engineering process was the first generation Mazda Miata, which bore a soft, sleek, and bubbly shape that was inviting and friendly to consumers, as well as a "tight, direct, and speedy" feeling associated with driving it (Nagamachi, 1999). In order to achieve this, Mazda engineers followed a very rigid, scientific approach to kansei principles which involved strict methodology guidelines laid out by the more prominent authors on kansei design (Nagamachi, 1999). This precedent has caused kansei engineering to have a deeply scientific design methodology, with a relatively consistent and replicable process for measuring the kansei feelings of people and applying/exploiting that information in the design process. This concrete and reliable way to measure and apply abstract kansei experience greatly contributed to the rise in popularity of kansei engineering in the late 20th century (Lévy, 2007), with multiple other car companies following Mazda's example, like Nissan, Ford, and Volvo (Lévy, 2013).

2.2.2 A New Approach to Kansei Design

The historical context of kansei implies that it was meant to describe much more than just a rigid, scientific understanding of design. The success of the sciences in creating a generally reliable method of measuring kansei has highlighted the validity of kansei design principles, but in recent years there has been a push to use this knowledge in areas outside of strictly

engineering fields. As design companies gain a new understanding of kansei design, they are starting to return to and re-explore the cultural and philosophical elements of kansei to describe the way that people react to both the physical elements of designed products, and the interactive elements of designed services. Putting more emphasis on cultural philosophies then encourages a more universal knowledge of the impacts of design in Japanese society, and from this, companies can begin to explore how to include a larger number of people and markets into kansei perspectives (Lévy, 2013).

2.3 Universal Design History in Japan

In contrast to how kansei design focuses on the consumer, Universal design seeks to provide a community-focused design approach, and responds to Japan's aging demographic. In 1997, local Japanese governments and designers discovered that the way they had designed products and services was less accessible to the elderly or handicapped (Kose, 2001). The government needed to rethink housing, product design, information technology, health care, and other services, to determine if they were truly inclusive. To address the issue, they developed the seven principles of Universal Design (Story, 2001):

1. Equitable Use
2. Flexibility in Use
3. Simple and Intuitive Use
4. Perceptible Information
5. Tolerance for Error
6. Low Physical Effort
7. Size and Space for Approach and Use

The Center for Universal Design developed these seven principles with help from a group of experts in the United States and the principles were then translated and assimilated into Japan's design culture. Experts believed these principles to embody all basic universal design principles, including environmental design (i.e., housing), products, and communications (i.e., Information Technology/IT) (Story, 2001).

To further assist with the creation and implementation of universal design in Japan, the International Conference on Universal Design was held in 2002 in Yokohama, Japan where experts formed an organization known as the International Association of Universal Design (Ostroff, 2011). The goal of this conference was to popularize the idea of universal design not only in Japan, but everywhere. The IAUD now meets regularly and at the 2006 International Conference in Kyoto, they announced that participants from over 29 different countries were engaged in some sort of universal design (Ostroff, 2011).

2.3.1 Universal Design in Information Technology

Since Japanese society is heavily reliant on Information Technology (IT), such as websites, equipment, information services, etcetera, local and national governments had to find a specific way to optimize IT frameworks with the seven universal design principles in mind, including the friendliness and usability of Information Technologies. Due to Japan's growing elderly population and the universal goal of inclusion, Japan's enterprises sought to tap into this promising market. They now readily work with the local and national governments in order to

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establish user-friendly IT products on a national scale following their universal design guidelines (Ikeda, 2005).

2.3.2 Universal Design with Housing/Urban Planning

Although IT design is important to the technologically advancing Japanese society, there is a more basic need to incorporate universal design within housing. According to a statistical analysis done of Japanese communities and industries in 2018, almost 51 percent of housing was equipped with some form of accessibility equipment including wheelchair accessible ramps, handrails, and step-free bathtubs (Figure 2) (Reports, 2018).

Figure 14.4
Ratio of Housing with Universal Design Features

Equipment for the elderly, etc.
Handrail-equipped
Step-free interior ◄ 2008 ◄ 2013
Bath tub, easy-to-step-in
Wheelchair-accessible hallway
Street-to-door wheelchair access

Source: Statistics Bureau, MIC.
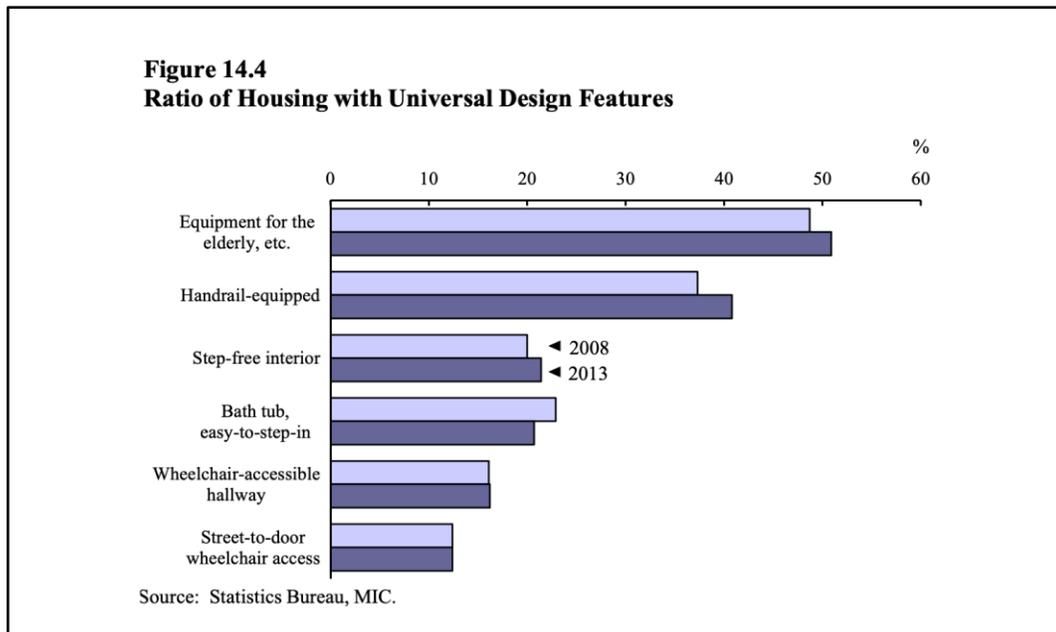
Figure 2. The ratio of housing with universal design features (Reports, 2018).

These communities achieved a 2.2% increase in just 10 years, highlighting the importance of the role of universal design in Japanese society, which was exceptional given Japan's traditionalist views and the need for community-based permissions. Since universal design is being integrated into every aspect of life in Japan, including housing, it is also heavily integrated with another important aspect of design in Japan: urban planning.

2.4 Urban Planning in Japan

The concept of Universal Design has various manifestations inside Japanese culture. One such manifestation is in the field of urban planning, where two unique concepts have been developed: *toshikeikaku* and *machizukuri*.

2.4.1 Toshikeikaku

The first concept, *toshikeikaku*, roughly translates to "urban planning" and is a relatively new term in the Japanese language since "[t]he city as a unique overall structure has never had the same importance in Japan as in Europe " (Hein, 2002, p.225). Breaking the word down,

"Toshi was created using the kanji of capital city (*miyako*) and marketplace (*ichi*)" (Hein, 2002, p.226) and the second part of the word, *keikaku,* means planning. *Toshikeikaku* represents the idea of treating a city as a singular social unit (Watanabe 2007). This means that this form of urban design is specifically confined to types of development that pertain to an entire city or town. Examples of *toshikeikaku* are the creation of train lines, expanding forms of public transportation, new hospitals, and anything else that would provide a city-wide public function (Watanabe 2007). This supports the idea of Universal Design as *toshikeikaku* focuses on ensuring every citizen in a city has easy access to public services and that all the demands of the citizens are met. Some obvious crossovers between the two would be the installation of power and internet lines to every home and equal access to all public buildings.

2.4.2 Machizukuri

Machizukuri is the other form of urban planning which is the polar opposite of *toshikeikaku* as it instead focuses its efforts into localized sections of cities. M*achizukuri,* which translates to "making a neighborhood", is much older than its counterpart, as Japanese culture has historically emphasized the development and autonomy of independent sections of a city, known as *machi*. *Machi* are typically defined around a key geographic area of a city like a hill or valley and were normally centered around a single key street (Watanabe 2007). However, their borders are loosely defined and regularly refer to an area where a certain social community is predominant. Inside these *machi*, there are formal neighborhood organizations called *chônaikai*. These organizations are, "responsible both for organizing neighborhood events such as festivals, as well as activities and duties such as rules for waste disposal" (Hein, 2002, p.227). C*hônaikai* even have a say in the local government before any major changes occur in their *machi*. City officials tend to consult the *chônaikai* of any *machi* where a new construction project is being planned and allow for them to give input into how the proposed project develops. Overall, the people living in urban *machi* tend to have a large amount of say in what happens in their own area (Sorensen et al. 2008), resulting in cities being more of a collection of various *machi,* and less like a single cohesive place. Universal Design is applicable here as this system of governance ensures that every citizen has a voice in what they want to see in their own *machi*. In the end, the idea of *toshikeikaku* is still a necessary part of cities, however, *machizukuri* fits in better with the ideas of Universal Design because it places emphasis on the needs of individuals and therefore has a much more profound effect on urban planning.

3 Methodology

The goal of this project was to determine the feasibility of a global design themed project center for WPI by exploring opportunities in Japan. This center will assist in the development of interdisciplinary and international design projects for WPI students, with a focus on Japanese design as a test case. To achieve this goal, the five objectives we focused on were:

1. Identify unique design philosophies in Japan.
2. Identify opportunities and potential sponsors for design projects in Japan.
3. Investigate student and faculty interest in design at WPI.
4. Evaluate the IQP system to determine its ability to integrate a new global project center.
5. Evaluate the best options for a center-wide data pool

Below is the discussion of the methods by which the project achieved its overarching goal and objectives.

3.1 Objective 1: Identify unique design philosophies in Japan

The first objective of this project was to identify the unique characteristics of Japanese design and how these characteristics are shaped by different design philosophies in Japan. The information gathered answered the mission-critical question, "What makes Japan a suitable place for the pilot of this design center?" and gave us a framework of unique Japanese design concepts to reference when exploring project opportunities. There were two primary ways to collect this information: literature reviews, and semi-structured interviews with our sponsors and other professionals in various fields of design.

The literature review allowed us to get a broad perspective of the academic and theoretical aspects of design in Japan. The interdisciplinary scope of this project also meant that the review needed to cover a wide swath of topics and disciplines in order to ensure that the information obtained was reliable, varied, and was not too focused on specific disciplines.

Our next approach was to reach out to our sponsors, in particular our sponsor Professor Benoît Jacquet who, given his residence and employment in Kyoto, was able to give us a necessary connection to Japanese design. Specifically, Professor Jacquet works as a professor of architecture at Kyoto University, and gave us a better insight into architectural and urban design in Kyoto. Professor Jacquet was also uniquely capable of getting us in touch with other professors and design experts in Japan thanks to his history of working with other professionals in the field of design. Professor Jacquet was able to give us his perspective on design in Japan and where to focus, but the experts he connected us with gave us a wider breadth of perspectives and opinions to consider. These experts and their differing values and opinions allowed us to move forward with an understanding of the many notable design characteristics in Japan. By interviewing Professor Jacquet and a variety of other diverse contacts, we ensured that the projects discovered came from a broad range of disciplines.

Of these contacts, we interviewed Professors Andrea Flores Urushima and Kiwamu Yanagisawa of Kyoto University, as well as Professor Sushi Suzuki of Kyoto Institute of Technology. Beyond our contacts at these institutions, we interviewed Lucinda Cowing, the director of the Kyoto Journal, to get a non-academic perspective on design, and to get us in touch with more organizations in the Kyoto area.

3.2 Objective 2: Identify opportunities and potential sponsors for design projects in Japan

The project teams who go to the design center will need valuable and worthwhile projects to work on. This means that we had to find potential sponsors who had interest in design in Japan and who might be willing to work with WPI students. We needed to know which companies, organizations, and individuals were the best candidates to be sponsors and why so we could provide a useful recommendation of potential projects for project directors to look into.

To determine which candidates will make the best sponsors, we gathered information on the companies, organizations, and individuals that exist in Japan who have connections to design practices. We did this through research on products and services in Japan that seemed to have a strong connection to design thinking, taking note of the companies who produced such products. Professor Jacquet, who has local knowledge about organizations who work with design, helped make connections to new avenues of information. He connected us to three professors with design experience in Japan: Professors Flores Urushima and Yanagisawa who both work with architectural design and city planning, and Professor Suzuki who works with engineering design. To find project opportunities in Kyoto, we asked them questions 4, 5, and 6 from appendix A, and after the interview, we sent them follow up emails asking for any additional information they had on companies, organizations, or individuals who might be willing to work with WPI students on design projects.

We kept in mind that Professor Jacquet has a background in architecture and therefore gave us more connections to architectural design opportunities, so we investigated other potential contacts to expand our scope of information gathering beyond just him to get a more well-rounded list of project opportunities and sponsors that did not have a heavy leaning towards architectural design. We also contacted project sponsors from this year and previous years who had any connection to design, with hopes to hear perspectives of design outside of academia. Specifically, we interviewed Lucinda Cowing from the Kyoto Journal, using modified questions from appendix A, and also reached out to Atticus Sims from Kyoto VR.

As we compiled a list of potential sponsors, we found it useful to take note of certain aspects of each project opportunity (Appendix B), so that whoever receives our recommendation will have an easier time prioritizing which organizations to contact. We noted the contact information for each organization, if they have English capabilities, their location, and details about what kind of project opportunities are potentially available there. We wanted to ensure that the sponsors recommended are ones who will provide WPI students with the opportunity to learn about design in a uniquely Japanese environment where the students will have a comfortable cultural experience. Additionally, the sponsors should be able to provide opportunities for students to experience a project that has important social implications.

3.3 Objective 3: Investigate Design at WPI

In order to ensure a design-themed project center is valuable for students and faculty, we investigated interest in design at WPI. By doing so, we further built the case for not only creating a design-themed project center in Japan, but in many other WPI project center locations.

To investigate faculty interest at WPI, we scheduled semi-structured interviews with the professors, advisors, and other faculty associated with the implementation of this IQP project. We assumed that this group of people have most likely seen or experienced interest in design from students and other faculty at WPI, which is why they created this project. By interviewing them, we hoped to find exactly what about design in Japan or design in general interested them

and whether it is from their personal interest or student interest. To accomplish this, the interviews began with Jennifer deWinter, the IQP project coordinator, and we asked her for the names of faculty most involved with this project, such as Professors Yunus Telliel and Steven Van Dessel, so interviews could be set up with them. While interviewing these faculty, we determined which departments at WPI have the most interest in design and established the need for more design related coursework (J. deWinter, Y. Telliel, and B. Sanders, personal communications, November 2020).

To investigate student interest in design at WPI, we distributed a short, six question survey on Sona systems and the WPI subreddit asking each student their major, graduation year, whether or not they thought fellow students in their major will find a design-focused project center useful, and finally whether or not they would be willing to complete an interview with us. Then, for some students who agreed to from the survey, we set up interviews to ask them the separate student interest questions (Appendix C). These student interviews helped us discover WPI's already existing design courses or programs and establish a need for more interdisciplinary design coursework.

We made the choice to use a semi-structured interview because it allowed us to gently guide the interviewee towards the desired subject (the amount of interest they have seen and experienced for design at WPI) and then have them lead the conversation around their personal experience (Berg & Lune, 2007). By only guiding them with questions (Appendix D), the dialogue is left open for our interviewee's response to be unrestricted. For example, leaving the interview less restricted allowed the interviewees to ask us questions, and for us to ask questions based on the answers they gave in order to further investigate interest in design in a more vigorous way.

Along with our other methods, we also analyzed every course available to undergraduates at WPI to investigate the amount of design education available per course catalog code. To determine whether or not a course involved interdisciplinary design or design thinking, we used a definition of design we formulated to avoid close minded thinking of design. The definition being: design is the process of planning, optimizing, and producing an effective solution to a known problem. This allowed us to identify the amount of design coursework available for students, as well as identify design on an interdisciplinary scale.

3.4 Objective 4: Evaluate the IQP system to determine its ability to integrate a new global project center

For our fourth objective, our goal was to analyze WPI's current IQP program to determine the ability of the system to integrate a new project center. Our sponsors expressed interest in the creation of a brand new project center that will act as a central location for global, design based project work. Therefore, we investigated the foundations of the IQP program by setting up semi-structured interviews with project center directors and members of the Interdisciplinary and Global Studies Department (IGSD) at WPI. The goal was to learn from them how the IQP program works internally and what some limitations were inside the IQP system. We did this to allow the team to work with both WPI and our sponsors to discover an effective and achievable end goal for this project in addition to increasing the plausibility of the recommended course of action made at the end of the project.

Our first interview was with Professor Ingrid Shockey, the project center director of the Mandi, India project center and author of the Climate Changes Stories project (Interview questions in Appendix E). We interviewed her to learn more about running IQP projects at a

global scale. Professor Shockey has experience with sponsoring IQP projects at multiple project centers around the globe concurrently to have students collect climate change stories for her project. Therefore, the information about the logistical aspects of running projects across various IQP centers remotely was the primary interest.

We also interviewed Professor Fabio Carrera, the director of the Venice project center, about the process of 'stacking' IQP projects from year to year (Interview questions in Appendix F). Professor Carrera has been the director of the Venice project center for close to 30 years and he pioneered the idea of having projects built on top of each other year after year to tackle problems that could normally not be solved in a seven week term. For this reason, it was necessary to learn more about this process of 'stacking' as some core components of design projects are revision and constant optimization.

Our third interview was with Professor Kent Rissmiller, the dean of WPI's IGSD (Interview questions in Appendix G). We interviewed him because he is the primary overseer of the IQP system and therefore, he is the utmost authority in evaluating whether the IQP system could integrate a new design themed project center. We hoped to glean from him the ability of the IQP system to operate a global project center and some of the potential challenges that will need to be solved in order to successfully integrate a global project center.

3.5 Objective 5: Evaluate the best options for a center-wide data pool

The goal for this objective is for the projects at this proposed design project center to be both stackable (maintaining a continuity of projects through the years) and comparable to other projects worldwide. Project teams will need to know the details of projects that came before them in order to contextualize their own design projects in a way that supports and expands upon past projects. A system needs to be created to collect data from the center that will allow students and faculty to work on design projects in the future while being able to build off of past work, both at the Kyoto center and at other centers globally. Therefore, it is important to determine what kinds of data project teams could possibly collect and to identify effective options to store, represent, and utilize these data.

In order to determine the best method for long term data collection of projects, we investigated pre-existing methods utilized by other project centers for similar types of data collection . One such case was the global project program already in place at WPI. Professor Ingrid Shockey, the creator of the Climate Change Stories project, has performed the same level of global data collection that is fit for the design project center. Consequently, one of our main methods was to interview her and learn about the logistics and difficulties of data collection on this scale. Professor Shockey has gathered data and stories from student project teams that performed interviews across the world and has gained experience in handling the many problems that arise from this system of global data collection. We interviewed her in order to understand the insights she had gained from running projects over many years and how she recommended global data collection for design projects be handled.

Also, we determined the need to ascertain the best method of stacking IQPs and other global projects. One aspect of the proposed design program is that the projects will be able to build on top of each other, in a way that a project run one year further develops the ideas and work of a project run in a previous year. We investigated the process of stacking IQPs by interviewing Fabio Carrera, the project center director for the Venice IQP site. The possibility of project stacking was a key idea behind the design projects because projects on the normal 7 week time-scale may not have an immediate impact and may be too small in scale to address larger

issues in a community (deWinter, Personal Communication, November 2, 2020). Therefore, we conducted important research to understand the practice of stacking IQPs so the prospect could be considered for the final recommendation.

4 Results and Findings

In this section, we share the findings from our research on the five objectives. First, we express the need for more design coursework at WPI based on feedback from students as well as faculty, and we use this knowledge as a basis for the idea that a design focused IQP center will be a good place to add more design thinking into WPI. Next, the various logistical possibilities and considerations associated with the execution of this new design center idea are addressed, before finally giving our recommendation for the implementation of this center. Finally, the unique design philosophies of Japan are laid out, considering culture, history, and other unique Japanese approaches to design. Alongside this, opportunities and potential sponsors for future design projects are described.

4.1 Interest in Design at WPI

With a building at WPI known as Foisie Innovation Studio and with WPI's President Laurie Leshin often encouraging students to "innovate", the definition of which follows our design definiton's "optimization" aspect, there should be no shortage of design available to WPI students of all majors. To investigate the design courses or programs that WPI has to offer, we analyzed design courses taken by students via a student survey, student interviews, and an in-depth analysis of the available WPI course catalog to find the courses associated with interdisciplinary design (Appendices C & I).

Figure 3. *Bar chart depicting the number of available undergraduate design courses per department.*

Number of Design Courses Per Course Code
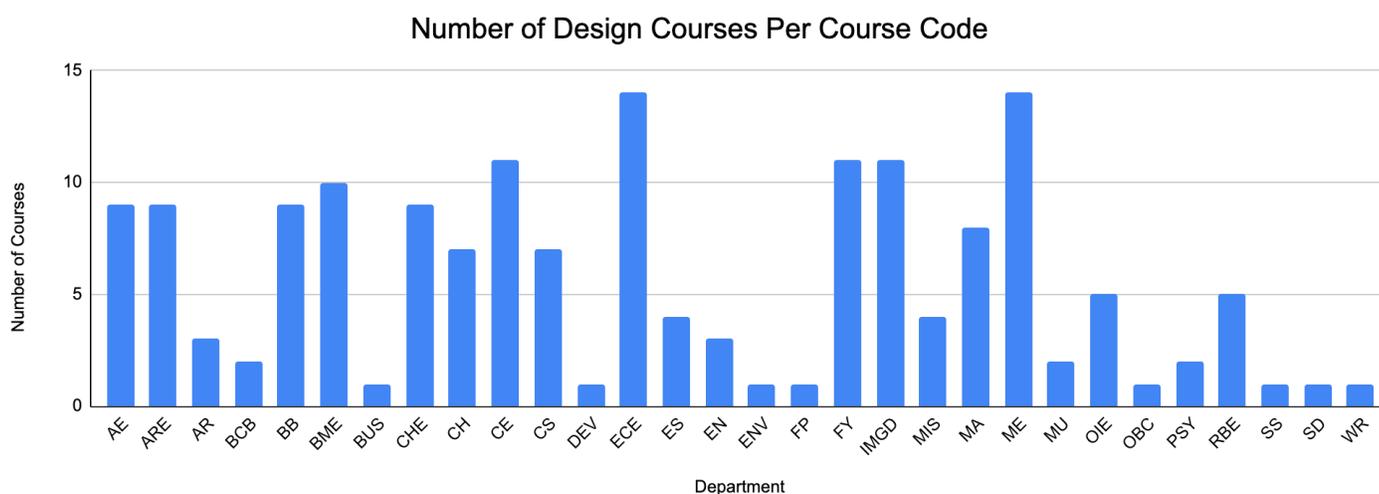
Note: To see unabbreviated department titles, see Appendix H.

According to students and faculty such as Professor Telliel, certain departments such as Mechanical Engineering, Interactive Media & Game Design, and Electrical & Computer Engineering have the most undergraduate design courses available (Figure 6). According to an analysis of all available undergraduate courses at WPI, 54.7% of all catalog course codes at WPI have some sort of design related courses. In the departments carrying the most design courses,

such as Mechanical Engineering or Electrical and Computer Engineering, design courses make up 62.5% and 51.9% of the department's course loads respectively. However, unreported in Figure 6 were 23 course codes that had no design courses available at all when evaluated with our broad interdisciplinary definition of design.

Along with analyzing the courses taken by students, interviews with Professors Shockey, deWinter, and Telliel showed that although there are design-focused courses available at WPI (Figure 6), there is not enough to meet the design needs of every department or for students to be able to thrive in design associated careers post-graduation. To complement the conclusion from the interviews from Professors Shockey, deWinter, and Telliel, alumnus Brandon Sanders also emphasized the point that WPI lacks the design coursework necessary for students to learn the design thinking that their future employers will often expect them to have. From Sanders and another alumnus Matt Munyon, we found that many undergraduate classes at WPI lack critical design thinking education, and the seven-week long terms might stunt student's abilities to fully experience the design process from planning to production to final result. Along with these interviews, an analysis of the roughly 1000 courses available to WPI undergraduates showed that 24% of the available undergraduate courses at WPI had any association with design as defined in the methods chapter.

Out of 29 student survey responses, 65.5% of those students believe that students in their major will benefit from the addition of a Design Center (Figure 7).

Figure 4. *Graph depicting student survey responses to the question "Do you think students in your major would find a project center focused on design useful"*

Student Interest in a Design Project Center
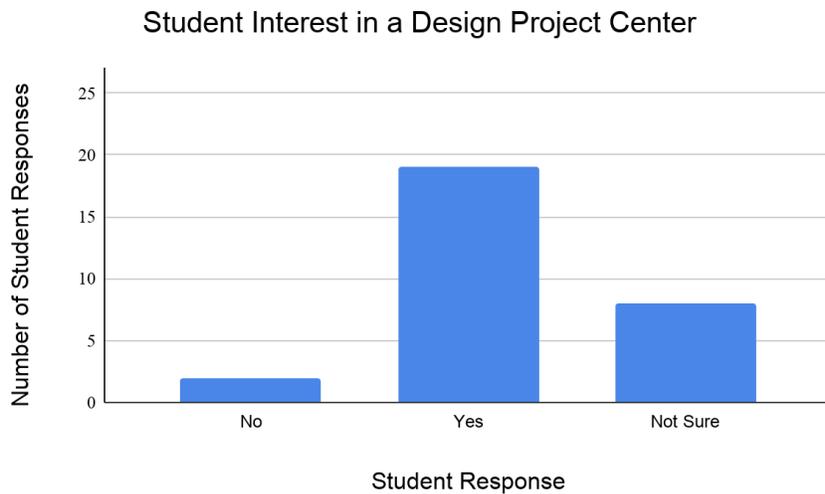
We found that when students were told that design is the process of planning, optimizing, and producing an effective solution to a known problem, they often described themselves as having experienced only a singular part of the design process. For example, most WPI students believed they were experienced with the "producing an effective solution" aspect of the design process while not learning about planning or optimizing.

Overall, with more than 30 faculty interested in a design-themed IQP center (deWinter, personal communication, November 2020), 65.5% of surveyed students interested in design, as well as a lack of interdisciplinary design courses, WPI will greatly benefit from the implementation of a design-themed IQP center.

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4.2 Implementation Considerations

When investigating the ability of the IQP system to integrate a new, multinational project center, many different parts of a project center that are necessary for its operation were identified. The important aspects of a project center identified were faculty, students, the discovery of projects, project management, and project preparations. In this section, we will refer to the proposed global design center as the Design Center.

As part of the research, we interviewed multiple project center directors and other faculty inside the Interdisciplinary and Global Studies Division (IGSD) at WPI to investigate the plausibility of the Design Center. Overall, there are numerous roadblocks that our sponsors must overcome to find plausible solutions.

4.2.1 Finding More Advisors

One of the main challenges with any project center is the task of finding faculty advisors. This is a concern because the majority of professors at WPI are expected to handle many responsibilities on campus, including teaching classes, advising student project teams, and performing research. Within the current system, the IQP relies on professors being able to give up their responsibilities and leave campus for a term to travel with student teams to IQP centers. Many departments at WPI, however, cannot easily give up a professor to advise an IQP because these professors would normally teach classes and advise other student projects. From our interview with Professor Rissmiller, Dean of IGSD at WPI, one existing solution to this is that academic departments, like the Mechanical Engineering department, will receive money from IGSD to pay for adjunct professors to fill the spot of the professor on IQP. Unfortunately, this solution does not work for all departments. Across WPI, some of the academic departments are unable to find affordable or qualified adjunct professors. Even without the ability to find an adjunct professor, some departments send professors anyways to show support for the IQP program. This results in a smaller pool of possible advisors and some departments having to cut certain classes every year and otherwise decreasing the amount of resources available to the students (K. Rissmiller, Personal Communication, November 20, 2020).

Taking all of this into consideration, the best way to add a new IQP center without increasing faculty workload is to allow for the advisors for the Design Center to advise remotely. By implementing remote advising, it effectively removes the largest obstacle when creating a new IQP center. An IQP center with remote advising avoids the travel requirement for IQP which subsequently allows a professor to both advise an IQP and also maintain some of their responsibilities at home like being with their families in addition to allowing faculty who are unable to travel the opportunity to advise an IQP center.

4.2.2 Finding Qualified Advisors

The second question with the proposed Design Center is who the advisors will be. From our interview with Professor Shockey, the director of the Mandi, India project center and creator of the Climate Change Stories project, one of the major hindrances with her Climate Change Stories project is that the advisors who assist the student teams in documenting the stories have no prior experience in the proper methods of collecting stories. She told us that since many of the advisors she receives at the Mandi, India project center are not knowledgeable in the ways of story collection and therefore are unable to advise students in the correct way to document

climate change. Professor Shockey said that this makes some of the data collected from projects unusable. For this reason, it will be necessary for advisors working with the Design Center to be previously knowledgeable about design. If the advisors at the Design Center are already familiar with design concepts, it will allow them to successfully guide design student teams through the design process and ensure that the project is graded fairly.

Addressing the process of advisors picking which project center they wish to advise for, the Design Center will be another option among the other project centers for potential advisors to choose from. The faculty will be able to voice preference for the Design Center or not, but advisors with a background in design will have a better chance of receiving the position at the Design Center. This system will hopefully allow advisors with experience in design to receive preference at the Design Center and achieve the goal of having experienced advisors.

4.2.3 Finding Students

The third consideration with creating a new project center is how to find students for the new project center. In the current system, the IQP program is carefully balanced between how many project terms are offered each year and how many students are able to attend a project term so that there are the least amount of empty spots at project centers (K. Rissmiller, personal communication, November 20, 2020). This means that a new project center will increase the number of openings in the IQP program, upsetting the previously established balance by creating more project openings than eligible students. While this may seem like a large problem, Professor Rissmiller assured us that it was not. The IGSD at WPI monitors the number of students eligible for IQP in any given year and shifts around the number of project center openings to match that number. He explained that at the time of our interview, multiple project sites had gained additional project terms in order to add more openings for students. Therefore, by removing a second or third project term from project centers with more than one, the Design Center could be added to the yearly offerings while keeping the balance of needed student projects.

4.2.4 Preparation in ID2050 and PQP

The fourth issue to address is how the Design Center will operate ID2050 and PQP for its students. When students prepare to travel to a global IQP center, they must enroll in and complete ID2050 and PQP in the term before their term abroad. The ID2050 class is a project preparation class that teaches students about how to write project reports and perform interviews and research. The class can be taught by any professor with a background in social science and the final product of the class is a project proposal produced by each of the student teams. The PQP is a 1/6th credit and is taken alongside ID2050. PQP is attended by the student's project advisors and consists of student team meetings with advisors which focus on the team's individual work developing the project proposal. It is in these two classes that students learn about the process of conducting a social science project and the culture of their chosen destination. Logically, this means that students attending the Design Center IQP will do the same since these classes are required of every IQP student who is accepted into a global project center. However, these classes do not feature a significant amount of design education.Through our interviews with faculty and student alumni, one commonality was that WPI students do not receive significant exposure to design and design thinking (B. Sanders, J. DeWinter, I. Shockey, Personal Communication, November 2020). For this reason, it is unreasonable for students to

attempt to complete a design focused project without any prior experience with design. Therefore, it is proposed that students attending the Design Center should be required to complete a pre-PQP to learn about design in the term before they take ID2050.

A pre-PQP is a type of class that is normally reserved for IQP centers with significant cultural differences so that the students may learn about and become acclimated before traveling to that location. Instead of teaching about the culture and history, it is proposed that the pre-PQP can be used to teach students about design. Any sort of introduction to design will give students required exposure to design thinking and design related work so that they may succeed in their IQP.

We considered how design will be taught and what the contents of the pre-PQP will be, but this question was outside the scope of the project and research was not conducted into this idea. Instead, those decisions will be left to the professor who will teach this class. However, this report will compile a list of all the reading material used in the research process and any other resources that were found so that the future professor teaching the pre-PQP course may have some material on design with which to start the class with.

As for who will teach pre-PQP, the Design Center director will take this responsibility, because directors have classically taught pre-PQPs for their own project centers. One concern with this approach is that the director may not have the time to teach this course because they may still be searching for projects. In preparation for this problem, the Design Center director will seek out a professor at WPI who has experience in design and will be willing to run the class or collaborate on it. The pre-PQP will have minimal time commitment and the workload could be entirely determined by the professor running the class. This level of freedom should make it possible for many professors to undertake this extra responsibility. Over time, the professor teaching this class could change or stay on and develop this class further. Having the director of the Design Center teach this pre-PQP is the ideal case and this should be the end goal to achieve.

4.2.5 Global Project Management

The fifth difficulty with creating a new project center is how to manage finding and completing design projects around the globe. One of the original requirements for the Design Center was that it will be able to offer design projects at multiple locations around the globe. This presented many challenges because the Design Center has to consider how to find design related projects at multiple IQP project sites and also how to accommodate students at their individual locations.

Distributing Teams

To answer the question of how to send students away to complete projects, the best method is to split the student teams up and send each of the teams to a different IQP center. While the advisors for the Design Center will not be required to travel, this design-themed project center will send its student teams to other IQP centers around the globe. These design teams are an additional team travelling with the other project teams to their project location. This way is the easiest way to include design projects at multiple, global locations without causing major disturbances to the IQP system. The reasoning for splitting up the teams is twofold. The first reason is that most global project centers will likely be able to produce one or two design projects, but it is unlikely that there will be a global project center that has six design projects. Plus, design is a broad, all-encompassing field that is omnipresent in the globe so finding design

work at any location should not prove difficult. The second reason is that design work and design philosophies will differ between locations. For example, the main methods of transportation in Kyoto, cars and trains, are not the same in Venice, which utilizes boats, because these two cities were designed by two different groups of people with different values and culture. By having each student design team at different locations, the design knowledge gained by each team will be diverse and that will aid these students in future projects because they will learn new ways to solve common issues.

For deciding which project centers to send students to, the only criteria will be the ability of the center to accommodate the students. This project did not conduct research to determine which project centers Design Center students will attend. This facet of the Design Center will be decided by the future director of the Design Center. The director, in their search for design projects, will determine locations and terms where there are design projects available by communicating with global project center directors. This will determine where students will be sent and which terms they will travel in. Overall, the idea of splitting the student teams leads to some interesting logistical implications as to how advising and housing the student design teams will function.

Remote Advising

In terms of advising, it is impossible for any advisor(s) to advise all of the design teams on site because the teams will be dispersed to multiple locations. Therefore, all advising for the design teams will be remote. Remote advising implies that all of the normal responsibilities of an IQP advisor will be completed remotely, over services like Zoom and WhatsApp. This includes responsibilities like attending sponsor and team meetings. For most project sites, remote advising will present a challenge because the time difference between the different project sites and WPI will create scheduling difficulties for all parties. However, there is reason to believe that this problem is not insurmountable because all IQP teams in the 2020-2021 school year have completed or will complete their IQPs doing just that. One of the sponsors for this project was in Japan for the duration of the project while our team was at WPI and yet it was possible to effectively communicate with him. By instituting remote advising, advisors will be able to stay at WPI because it will allow faculty to advise the project teams while producing minimal disruptions to their life at WPI.

Housing and Safety

The responsibility of housing logistics for the design teams will fall on the project center director. Luckily, finding housing at most project centers should not be a problem at all. After interviewing Professors Rissmiller and Carrera, both of them agree that it will be trivial to increase the number of students at the majority of project centers. Professor Rissmiller stated that many of the current project centers take advantage of mass housing facilities like hotels and apartment complexes, so accommodating an additional team of students will be simple. However, some project sites may be unable to cope with an additional team of students. In this scenario, it will then disqualify that project site from hosting a team of design students until the proper accommodations could be secured.

The safety of the students will fall under the on-site advisor's responsibility. The student design team will join the larger group of project center IQP students and their safety will be the

responsibility of the two advisors that traveled with the group. To clarify, the on-site advisors will only be responsible for the safety and behavior of the Design Center team and not the actual work of the team. On-site advisors will not be expected to attend sponsor or advisors meetings with the design team or meet with them in any academic capacity; they will simply be resources for the design team in terms of securing transportation and locating local resources. Once again, this idea was met with agreement from both Professors Rissmiller Carrera, in addition to receiving support from our own advisors when this was brought up in an advisor meeting.

4.2.6 Procuring New Projects

To address the problem of finding projects, the project center director of the Design Center will communicate and work with other global, residential project center directors to find design projects. In an interview with Professor Carrera, he said that, as a project center director, he is able to find design projects in Venice, but he will not want to because this will be a project that he will get nothing out of since the project will not be run by the Venice project center. Further, one of our advisors for this project, Professor Belz, agrees with Professor Carrera. She is the director of the Costa Rica project center. She said that she is reluctant about finding design projects by herself because it is already difficult to find six regular projects. Therefore, Professor Belz suggested that this responsibility should be delegated to the Design Center director who could work alongside local directors to find and meet potential design sponsors in the area. This idea is logical because normally it is the project center director that must produce projects so it is only natural that the Design Center does the same. However, this may prove to be an arduous task for the Design Center director because the projects they will need to find will be at six different global locations. Meaning, the director of the Design Center might have to travel to each location and be in contact with the project center director and the local project coordinators to find a project. The project center directors may still end up being largely responsible for finding design projects in their locale, but the added assistance of the Design Center director will hopefully be enough to gain their cooperation.

4.3 Options for a Center Wide Data Pool

The next objective was to identify the best options for a site-wide data pool, and to give a recommendation for which to use for this center. The research on this subject resulted in a wide swath of opportunities for what kind of data to retain from design projects, as well as how this data will be stored. The data pool will serve as groundwork for projects further into the future than those which collected the initial data. It will do so by storing valuable data which will take time and effort to compile, but will then be freely accessible to future teams, preventing wasted time from periodically repeating the same data collection methods. It also means that projects could be 'stackable,' allowing future project teams to build upon past projects, and use the data from the previous teams as a springboard.

Data collected during the projects, or on the ground in Japan, also needs a storage/organization system for future teams to take advantage of. This type of data collection, in concept, is very similar to what is already implemented by the Venice Project Center, where teams on the ground collect information, pictures, and notes about structures, architecture, or features in the city. These data are, if appropriate, then hosted on the site to be utilized by both local companies, as well as any future teams that need to access it. The data falls into categories such as its GPS coordinates, a unique identifier for each entry, the site or structure's name, the

name of the associated image, and the year it was built and/or founded. The data collected will ideally be similar, where data collected is relevant to the fields projects are completed within.

The first option for our data collection is to follow the footsteps of the Venice center, and use CSV files to store the data. This has the benefit of being easily accessible from any computer, as CSV files can be opened by text editors, Microsoft Excel, Google Sheets, and LibreOffice calc. It also has the added benefit of being very easy to import into a proper SQL database, or be searched by a program. On their own, however, CSV files can be challenging to read through, or identify relevant data. This challenge is exacerbated the longer the file is. Additional challenge comes when data needs to be cross referenced, or connected to another table in some way. In searching, we concluded that CSVs are best used alongside another system.

The next options are very similar. One option is storing dedicated spreadsheets (.xls, .xlsx files). Spreadsheets have the same benefits as CSV files on the whole, but opening, sorting, and modifying the data can be done in a more user friendly way, as the standard spreadsheet editing software programs all allow for the saving of formulas, graphs, and formatting in spreadsheets.. Spreadsheets also have the benefit of being easy to share, well understood across businesses and professionals, and having built in tools to display graphs based on the data. Much like CSVs, the downside of spreadsheets is that file-size increases quickly, and a too high-quantity of data can lead to a hard to read, or hard to search data set. Sharing is also of concern, as sharing through a platform like Google Drive, or One Drive can lead to people having edit access when they should not, if handled poorly.

The final option to store the data is to host a proper embedded database. The biggest benefit of a proper database, over a CSV or spreadsheet, is that databases (especially SQL, or any queried language setup) are massively more efficient at partial queries than the alternatives listed. This is especially true if the data sets are large enough that reading through the whole sheet is no longer a realistic task. They also handle adjoining or connecting tables far better than the alternatives. The main downside of a hosted database is its complexity on the backend. In order to implement, send queries to, or add data to the database, one either needs to have experience with querying languages, or alternatively, the team or person that implements the database sets up an efficient and useful graphical interface for users to use in the future. Systems like this also come with the detriment of maintenance being required in the long term, and thus not conducive to a program without an active software team.

No matter which approach is taken, the question of where these data is accessible is the final and most foundational question. The data could just as easily be hosted in a private server as it could be a public, Internet facing site. Fabio Carerra spoke briefly about how beneficial it was to have a well designed and openly accessible website to store the data, and how it has been useful to both the teams at Venice, and the sponsors and organizations they work with. This also ties into the field of open source information, and can ensure that the data stays in the hands of the public, rather than locked away. Private data storage, or that which requires WPI login to access, means sponsors, community members, or community businesses will not have access to the information collected from or for them.

4.4 Design Philosophies and Opportunities in Japan

A critical aspect of this project was to determine the unique design philosophies of Japan, and the project opportunities that accompany them. These unique aspects generally fell into one or more other categories of culture, history, or spiritual connection.

4.4.1 Japanese Culture and Design

Japanese people interact with the world around them quite differently than many other cultures in the world. One such example that Professor Jacquet pointed out is that Japanese people have a unique regard of inanimate objects as part of a greater spiritual world. This means that household objects, especially those that are useful or artful, need to be treated with respect. On top of this, craftsmen in Japan also take another level of care than their counterparts in other cultures, in that craftsmanship tends to be more meticulous, focused, and can take more work to truly perfect skills of the craft. Professor Jacquet also claimed that the Japanese people often enjoy convenient and useful things, which he labelled "Pocket Design". He explained that Pocket Design is a common trend in Japanese product design in which objects are produced to be small, practical, and appealing to use in some way.

The final aspect of Japanese object design he referred to is the concept of 'kawaii', which merely translates to 'cute.' Both Professor Jacquet and Professor Andrea Flores Urushima, a professor of Urban Studies at Kyoto University, explained that Japanese people have a marked taste for cute and lovable things, and that this is something that plays a critical role in the way products, graphics and advertisements are produced (Figures 3 & 4). Professor Flores Urushima and Professor Jacquet both also pointed to video game and anime design as good examples of unique Japanese media. These categories of Japanese, they explained, pull greatly from this concept of kawaii, or cuteness, as it is very easy to see the exaggerated cuteness, as well as the facial, and body design of characters in these mediums.

Figure 5: Examples of character design using kawaii art styling (kawaii characters, 2014) [2]

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[2] Kawaii characters. (2014). [Illustration].
https://cdn.mos.cms.futurecdn.net/85f8e61c82d1ef232b9e7a448e4cb2b4-970-80.jpg

Figure 6: Example of kawaii character design used in on-product marketing. (Hirasaka, 2013) *3*

These examples of connections between the Japanese people's feelings and the products and media that are designed for them, tie right into kansei design, a concept explored in the background literature review. Because of this connection between kansei design principles and the arguments made about the interaction between the Japanese people and design, it was noted that studying the details of kansei design could give a good background on design thinking in Japan.

4.4.2 Project and Sponsor Opportunities in the Field of Culture

Game design is a major industry in Japan, and there are several opportunities for game design projects in Kyoto. Most notably, Nintendo is based in Kyoto, and Professor Jacquet knows a game designer at Nintendo, Jordan Amaro. This could prove to be a vital contact in introducing WPI students to game design projects in Japan, but with Nintendo being such a large and well-known company, they may not be willing to work with student groups, due to logistical problems like security or legal concerns. Additionally, Professor Jacquet has a contact named Raj Joshi at 17-BIT Inc., a game design company based in both Seattle and Kyoto. Joshi is not a designer himself, but he works with designers, and with the company having a base in Seattle, it is more accessible to English-speaking clients/collaborators such as WPI IQP teams. At 17-BIT Inc, the game designers are heavily influenced by classic Japanese video games while also incorporating modern technology for sleek but retro game design. This will provide useful experience in more traditional Japanese video game design as well as the use of new technology in the design process.

Lucinda Cowing has indicated that she has a small design team for the Kyoto Journal, and that she is willing to take on a student team to work on the design aspects of Kyoto Journal. This will include the graphic design/layout of the physical edition of the journal, as well as the website and virtual editions. She told us that the Kyoto Journal is meant for non-Japanese

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3 Hirasaka, H. (2013). Kokeshi matches [Photograph]. https://static.designboom.com/wp-content/uploads/2013/05/matches12.jpg

individuals to experience and read about Japanese culture, so even though the audience is not Japanese, they have a very Japan focused design style with emphasis on minimalism, simplicity, and elegance.

Professor Suzuki, through a follow up email, provided a number of potential sponsor opportunities in fields of technology design. Most notably, he mentioned companies like Atmoph, Hacarus, and Nota, which all work on highly technological products relating to many design fields, like software design, user interface design, mechanical design, and more. Additionally, he pointed us to Kyoto Makers Garage, a public makerspace much like the Foisie makerspace at WPI, which will be a useful asset for students trying to prototype their design projects.

4.4.3 Historical Impact on Urban Design

Machizukuri and Toshikeikaku, two concepts discussed in the background section, continue to have relevance as contrasting design styles for urban planning and the reconstruction of cities, most recently in the rebuilding of cities damaged by earthquakes and tsunamis in 2011. These concepts, along with Universal Design, contribute to Japanese cities running efficiently, while still treating the needs and lives of the people who live there as a priority, as Professor Sushi Suzuki of the Kyoto Institute of Technology pointed out. These three philosophies have permeated Japanese design culture and it is crucial that they are considered and understood as unique reasons to study design in Japan.

These concepts can be studied in practice through places that are rebuilding, and should certainly be taken into account, however they are not as directly prevalent as in Kyoto. Lucinda Cowing, the director of the Kyoto Journal, and Professor Flores Urushima, both acknowledged Kyoto's fortunate position of surviving both the war and recent natural disasters relatively untouched. Both Cowing and Professor Flores Urushima pointed out that this puts Kyoto in a unique position of having interesting design project opportunities that are unique when compared to other locations even within Japan. They, along with Professor Kiwamu Yanagisawa, all additionally noted that Kyoto's history lends itself to study very uniquely Japanese, and notably historical design aspects.

For specific examples, Professor Yanagisawa first brought up his work on the revitalization of Kyoto townhouses, known in Japanese as 'Machiya' (Figure 5), which are the traditional housing structures found all over the city. He explained to us that they have a uniquely Japanese design, with their structure, architecture, and design layout coming from imperial Japanese design practices. By studying these townhouses, and working on revitalizing them, one could actively research and work with historical Japanese design. Furthermore, both he and Professor Flores Urushima brought up the markets and businesses of Kyoto, some of which are hundreds of years old at this point. Both the numerous traditional businesses, and communities of traditional architecture open up the door to study product and business design that is rooted and/or founded in imperial Japan.

Figure 7: Front of a typical Kyoto townhouse, or 'Machiya' (Horikoshi, 2020). [4]

Townhouses and traditional business, however, barely scratch the surface of the potential ways to learn about and work with historical design fields in Kyoto. In our interviews with Lucinda Cowing, Professor Flores Urushima, and Professor Yanagisawa, they consistently referred to the numerous temples, universities, old imperial buildings, and gardens that exist in Kyoto. The existence of such structures and organizations is unique to Kyoto, compared to cities that have been damaged by war, disaster, or been modernized. Professor Flores Urushima, Professor Yanagisawa, and Professor Jacquet spoke of this to explain their work in studying and revitalizing these structures and buildings in Kyoto.

4.1.4 Project Opportunities in Historical or Traditional Fields.

At Kyoto Seika University, Professor Flores Urushima and her colleagues are leading a new initiative in Human Environmental design. The year 2021 is the first year for this new program, and Japanese students will initially be staying more on campus to complete projects. External activities might not begin until 2022. Still, there will probably be opportunities for collaboration on campus (A. Urushima, personal communication, November 11, 2020). With current Covid-19 concerns, there is still uncertainty going forward, but Professor Flores Urushima also mentioned potential future project opportunities in the revitalization of rural areas or depopulating neighborhoods. She says this might be done through an intermediary or by collaboration with the Kyoto Prefectural Government or other local governments. Projects related to raising environmental awareness among citizens on water and in forest landscapes might also be possible, according to Professor Flores Urushima, but it will be more focused on research rather than design. Additionally, Professor Yanagisawa has expressed interest in working with WPI students on projects that he has planned for the future, such as designing a

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[4] Horikoshi, K. (2020). Close up view of the facade [Photograph]. World Architecture. https://cdnimd.worldarchitecture.org/extuploadc/closeupviewofthefacade.jpg

shop in Kyoto, or helping him with his work revitalizing traditional Japanese architecture. Professor Jacquet, who has already worked with WPI student teams in the past, has also stated that he is willing to help find design projects in his field of architectural design for WPI project teams to work on.

From our research and interviews, we found that universities in Kyoto have a lot of potential to be great sources of design projects for IQPs. These universities (notably Kyoto University, Kyoto Seika University, and Kyoto Institute of Technology) are already providing design projects to their own students, and both Professor Flores Urushima and Professor Jacquet have told us that these universities will be open to collaboration with foreign universities such as WPI. Professor Jacquet pointed out that these Kyoto universities are in competition with each other, and having a foreign connection, especially for smaller universities like Kyoto Seika, will be helpful in recruiting new students in the future. Professor Flores Urushima emphasized the potential for WPI students to collaborate with Kyoto students on design projects, as a way to cross cultural barriers in design thinking and come up with truly optimal solutions to design problems. Professor Flores Urushima, Professor Yanagisawa, and Professor Jacquet all work at Kyoto University, and Professor Flores Urushima has indicated that she has connections to Kyoto Seika University. Professor Jacquet has also provided us with an additional contact, Professor Sushi Suzuki, who works for Kyoto Institute of Technology, where they have more engineering focused design projects.

However, Professor Jacquet mentioned some potential barriers to collaborating with Kyoto universities, number one being the language barrier, but also the difference in school schedules between Japanese and American universities. Japanese schools start in April and end in March, so it might be difficult to work on a project with Japanese schools if WPI's terms do not line up with the term schedule of Kyoto universities. Professor Suzuki, contrary to what Professor Flores Urushima and Professor Jacquet told us, mentioned that a significant issue with collaborating with Universities in Kyoto is that these universities are busy coming up with projects for their own students, and might be unwilling to also provide projects for foreign students. He also emphasized that the language barrier might be a bigger issue than originally realized, since the difference in language leads to confusion and uncertainty in communication, and the conservative nature of Japanese society leads Japanese people to be hesitant to take action if they are unsure of all the details involved. So, there is certainly potential for collaboration with Kyoto universities, big and small, but each university will have its own needs to consider first, and starting a new collaborative relationship with an American university might present them with challenges they will prefer to avoid.

4.4.5 Influence of Spiritual Beliefs on Design in Japan

'Wabi-sabi' is a state-of-mind in Japan that partially centers around the idea that imperfections in objects are to be revered, and how those imperfections tie to the spirit and history of the object (L. Cowing, personal communication, November 2020). This relates closely to Professor Jacquet's statement that in Japanese culture, objects have spirits, and is another aspect of object design that must be considered as WPI design projects are pursued and created in Japan. Lucinda Cowing spoke about this in detail, and also pointed out the juxtaposition of wabi-sabi, the acceptance of imperfection, and the mastering of a craft that Japanese craftsmen convey as they strive for perfection in their work. The contrast of these two ideals leads to high quality crafts, with imperfections in the work or design of them being just as important as the artistic or practical intent of the craft.

Wabi-sabi is not just focused on imperfections, however. Another foundational aspect of the wabi-sabi mode of thinking is the acceptance of the inevitable, and the surrender to the natural order of things, far beyond our control (Koren, 2008). Wabi-sabi additionally has an intrinsic philosophy of minimalism, with focus being put on the removal of the superfluous or unnecessary (Koren, 2008). As pointed out in his book, '*Wabi Sabi for Artists, Designers, Poets, and Philosophers'*, Leonard Koren speaks also of the egalitarian nature of wabi-sabi philosophy. He does this by speaking of the way that the simplicity and imperfect nature of both the world and of the thing being designed put the people who utilize or interact with it on the same level, making them equals in the grand scheme of things. Wabi-sabi overall leads to a very unique spiritual and conscious approach to the design, construction, and maintenance of goods, art, and structures in Japan.

Professor Jacquet spoke about how treating everything from the materials used, to the houses, tools, and nature around as objects with spirits leads to design approaches that are more ritualistic, meticulous, and respectful. He mentioned that the Japanese people's connection to the world around them leads to different viewpoints on art, architecture, and product design, and changes the way design is incorporated into many fields that intersect with daily life in Japan. Whether these viewpoints come from a background of Zen buddhism, wabi-sabi, minimalism, craftsmanship, or perfectionism, they all come together to build the very unique design philosophies of Japan.

4.4.6 Project Opportunities in Spiritual or Traditional Fields

One example of a company in Kyoto that practices very traditional design with an emphasis on wabi-sabi is Kaikado, which we learned about through Lucinda Cowing. This company handcrafts tea caddies which are specifically designed to show their age over time, as the outer metal layer of the caddies changes color due to erosion and reaction with human skin oils. This could serve as a good opportunity for students to learn about traditional Japanese design principles while designing a commercial product that will be sold to Japanese consumers. One potential problem with this contact, as Professor Jacquet pointed out, is that many of the traditional companies in Kyoto who hand craft their products are not likely to have good English speaking capabilities.

Also, we learned about two Zen Buddhist temples in Kyoto from Lucinda Cowing, called Taizoin and Shunkoin, which have English-speaking abbots who might provide good opportunities for design projects that emphasize the spiritual philosophies in Kyoto. It is unclear what specific projects they could offer, but the fact that they can speak English means they will be a good connection point to broader project opportunities in Japan, both design related and otherwise.

5 Recommendations

In this section, we lay out the recommendation for the creation of the Design Center, and detail the steps necessary to successfully implement it into the current IQP program at WPI. We also give the final justification for the initial setting of this Design Center to be in Kyoto, Japan.

5.1 Proposed Operations of the Design Center

As the conclusion of our research, the best method to further design education in the IQP program is to create a new global, IQP center with a specific theme of design, called the Design Center. This new design themed project center will direct and advise six student teams, at a maximum, per project term offered to work on design projects being sponsored at other IQP centers around the globe, like Kyoto and Venice (deWinter, Personal Communication, November 2, 2020). In an interview with Professor deWinter, she introduced this idea and helped brainstorm some of the specifics needed for the new project center. Based on her original thoughts and additional investigating into the matter of creating a new themed IQP center, we developed the following proposal for the best way to implement the Design Center.

Students will apply to the Design Center by the same method of applying to any other project centers: by placing strong interest in it among other non-design project centers during the normal IQP application process. However, potential design students will not know which off-campus project center they will travel to when they apply to the Design Center. Instead, upon being accepted to this project center, they will then be given a second round of picking to rank their preferred project. Since there will be only one project per location, the project they choose will also decide their location. Once students have been assigned their location/project, they will then go through the normal preparation process for IQP. The only exception to this will be an extra pre-PQP in order to teach the Design Center students about design topics prior to ID2050.

This pre-PQP will be run by the Design Center director who will instruct and assist student design teams in learning about design. The content of the course will be left for the director to determine, but a list of all of the design education materials collected in this project will be created so that the director may potentially use some of it in the pre-PQP. The reasoning for including this extra learning is that WPI students do not have enough prior education about design concepts to be properly prepared to take on a design project (Personal Communication, B. Sanders & M. Munyon, November, 2020). After the pre-PQP, design student teams will then enter ID2050, which will be taught in the same manner as all other ID2050 classes. Following the completion of ID2050, the design students will be sent to their respective project centers, along with the location's normal IQP groups and the on-site advisors will take care of them in case of emergencies. It should be noted here that each group of design students will add to the total number of students headed to any one project center, resulting in there being seven project teams at a single location. From here, the student design team will complete their project like any normal IQP. The only significant difference in the IQP for the design students is that their advisor(s) will be communicating with them and their sponsors remotely from WPI. At the conclusion of the project, the student team will present their results to their advisors and sponsors, and the design advisors will then assess and grade the students' work.

5.2 Phased Approach Implementation

While the end goal of this project is to create the Design Center at WPI, it is not often possible to implement a new project center to its full capacity immediately. Therefore, we recommend that a phased approach be utilized to slowly integrate design projects into the IQP system and eventually accumulate enough resources to fully install the Design Center. This phased approach has three main steps: the first is single project replacement in Kyoto, the second is to replace one project at multiple centers, and the third is to finally implement the Design Center.

5.2.1 First Phase

In the first phase, one project will be replaced at the Kyoto project center with a design project. This means one of the projects at the Kyoto project center will be a design project and students include this in their project rankings at the start of ID2050. The replacement design project will run like any normal project. By replacing a single project at one IQP center, it will allow for the idea of design projects to start taking hold. Introducing design projects to the system slowly will allow time and space for any unforeseen consequences to become apparent.

Further, by starting the process of finding and running design projects, the center will also be able to build relationships with sponsors to continue sponsoring design projects into the future. The reason for replacing one project instead of adding a seventh project is tied to the issue of faculty workload. According to our own advisors, Prof. Belz and Prof. Sturm, advising six student project teams is a substantial workload. Therefore, in their opinion, the idea of having to advise seven project teams in addition to having seven project teams in ID2050 will negatively affect the outcome of projects.

As a point of clarification, this replacement design project will not have a pre-PQP as stated in the full description of the Design Center. This is because the students who will ultimately select and be placed on this design project will not know which project they will be completing until they start ID2050, which then leaves no time for a pre-PQP. Instead, the list of design education readings and videos (Appendix J), initially produced by this report, will be given to the Kyoto project center director, Prof. deWinter. She will then give this list of design resources to the Kyoto ID2050 instructor. The ID2050 instructor will then pass on a selection of those readings to the design project team as additional readings for them to complete. By including these extra design resources into the design team's ID2050 course in replacement for a pre-PQP, the design team should have a decent introduction to design before they start their project. The reason for giving this list to Prof. deWinter is that a Design Center director may not have been determined at this phase because they are not required yet. Therefore, since the Kyoto project center is the only location with a design project replacement, it makes sense to give these materials to her until a Design Center director is determined. Plus, she is working closely with one of our sponsors, Prof. Telliel, so she will most likely be willing to do this and could easily pass it on at a later time.

5.2.2 Second Phase

The second step of this process is quite simple. In this step of the implementation process, the process undertaken in phase one, of incorporating one design themed project, is replicated in more project centers. The reasoning for expanding the number of project

replacements is to more adequately prepare the IQP system for integrating with the Design Center. Since the Design Center will need projects in multiple locations around the globe, the director needs to begin the process of finding projects and becoming familiarized with conducting design projects at that location. As noted previously, culture is a large determining factor in the manifestation of design and because of this, design projects may vary in their implementation from place to place. Therefore, they could be piloted in these locations before they are officially included into the list of locations to which the Design Center sends students.

By this phase, a Design Center director will need to be specified. In order for this plan of project replacement to expand to multiple project centers, someone needs to convince local project directors to replace their sixth project with a design project. The local project center directors will not want to find a design specific project by themselves because this is additional work for them without any benefits. Therefore, a requirement for this phase is that the Design Center director must be determined and they must begin the process of assisting other project center directors find design-related projects.

In this phase, the pre-PQP will still not be taught. It will be impossible to teach pre-PQP in this phase because, similar to phase 1, students will not be able to choose their projects until they enter ID2050. Therefore, the method of including the list of design readings and videos into the design teams' ID2050 will be utilized. After the Design Center director has been determined, they will be given the list of design learning resources from Prof. deWinter and they will take over the role of providing the list to all the ID2050 instructors who teach one of these design project teams.

Another important consideration to note is that all of the design projects will not be run in the same term. In the interest of not disrupting the IQP system while building the Design Center, the Design Center director should find projects at existing centers and run those projects during the already planned IQP project term for that center. While in the future the Design Center will need all of its design projects to occur in the same term, it does not make sense to try and enforce that restriction before the center exists. It is in the best interest of the Design Center to attempt to unify all of its design projects into one term, but it should not be a requirement for this phase. It is not known which term or terms will be the best time to run design projects, therefore, it is best to let the process of project discovery determine which terms will be optimal for the Design Center.

5.2.3 Third Phase

The third and final step in this process is the full installation of the Design Center. Hopefully, by the end of step two, there will be enough support in place to see the Design Center smoothly integrate into the IQP system. In order to enter this phase, there must be at least six project centers that offer projects in the same term. These six centers need to have had design projects completed at their center, and there must be at least two faculty members with experience in design willing to participate in the Design Center as advisors. The offering of the pre-PQP, taught by the Design Center director, will also begin in this phase and it will be taught two terms before the Design Center's chosen project term. An important note here is that at the time of implementing the Design Center to its full capacity, the process of substituting projects will end. The project centers will go back to their normal project capacity and breadth. This will be done to ensure that the operations of project centers will return to normal once the Design Center starts operating. At that stage, one will see the beginning of seven project teams attending project centers, as the design projects disperse and join with the cohorts departing for select

project centers. While there are many other challenges and difficulties not listed in this simple plan, this plan may assist those whose goal is the creation of the Design Center.

5.3 Kyoto, Japan as a Pilot

A fundamental question of this project remains: "What makes Japan a suitable location for the pilot of this design center?" Based on the research completed, Japan, specifically Kyoto, does indeed make a suitable, even exceptional, location to launch and implement this design center. This is based on the unique design concepts in the city, and the country as a whole, that can be studied and considered when completing design projects. Furthermore, the existence of project opportunities and potential sponsors within each of the design categories detailed, strengthens the fact that Kyoto is an ideal location for the pilot of this design center, as there are teams and organizations willing to work with WPI students. The combination of the two means that projects are ready to be undertaken in Japan, and that these projects will benefit student teams by exposing them to new and unique design concepts.

5.4 Conclusion

Overall, we believe that the Design Center is a necessary addition to WPI's educational experience. WPI has a lack of easily accessible design education and this could negatively impact students' desirability to employers post-graduation. The interdisciplinary nature of the IQP allows all students to access this new project center and the Design Center can be implemented without excessive disruptions to the current IQP system. Finally, Kyoto, Japan is a suitable starting point for the Design Center due to the plethora of unique design philosophies, potential sponsors, and project opportunities that exist within the city.

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Appendices

Appendix A: Sample Interview Questions for Japanese Design Experts

Introduction: We are a group of students from Worcester Polytechnic Institute (WPI) who are exploring the feasibility of creating a student project center in Japan. The idea behind this center is that it will have a strong focus on design projects to teach WPI students about design thinking. We are speaking to you to understand how designers in Japan view design, and to get information about potential opportunities for design projects in the future. Your answers are confidential and your names will not be used in the project (unless you wish them to be).

1. What is the first thing you think about when you hear Design in Japan?
2. In Japan, what do you think are the most important types of design?
3. What are some projects you are currently working on or involved in?
4. What are some potential design projects you'd like to see undertaken?
5. Do you think your colleagues or other designers in Japan would have interest in working with WPI students on design projects?
    1. *Would you personally want to work with WPI students?*
6. Do you have any concerns about the idea of working with students from abroad on design projects?
    1. *What is causing those concerns?*
7. In what ways do you think the project center could help the Kyoto community?

Appendix B: Table of Recommended Project Opportunities

Company/ Organization	English?	Location	Design Fields
17-BIT	Yes	Unsure	Game design, graphic design
Nintendo	Yes	11-1 Hokotate-cho, Kamitoba, Minami-ku, Kyoto 601-8501, Japan	Game design, graphic design
TCI Laboratory	Yes	203 Tateyashiro Kitahancho, Kamigyo-ku, Kyoto, JAPAN 602-0098	Traditional Japanese craft design, Product design,
Kyoto Journal	Yes	76-1 Tenno-cho, Okazaki, Sakyo-ku Kyoto-shi Kyoto-shi, 606-8334 Japan	Graphic design, media design
Kyoto VR	Yes	Unsure	Software design, virtual space design
Kyoto Maker's Garage	Yes	73-1 Sujakuhozocho, Shimogyo Ward, Kyoto, Japan	Product design, More of a useful resource than a sponsor.
Monozukuri Ventures	Yes	Kyoto Research Park – 93 Chudoji Awata-cho, Shimogyo-ku, Kyoto-shi 600-8815	various/unsure
Nota	Yes	Kawamoto Bldg., 5th Floor, 110-16 Goshohachiman-cho, Kamigyo-ku, Kyoto, 602-0023 Japan	Software design, user experience design
Hacarus	Yes	Dai 12 Hase Building 5A Hashibenkei-cho, Nakagyo-ku Kyoto, 604-8151 Japan	AI design, software design
Atmoph	Yes	75-6 Yanagihachimancho, Nakagyo-ku, LS Kyoto 3F Kyoto, Japan, 604-8101	Software design, product design, aesthetic design, user experience design
Kyoto University	Yes	Yoshidahonmachi, Sakyo Ward, Kyoto, 606-8501, Japan	Urban design, environmental design, aesthetic design,

			architectural design
Kyoto Seika University	Yes	137 Iwakura Kinocho, Sakyo Ward, Kyoto, 606-8588, Japan	Aesthetic design, Human environmental design
Kyoto Institute of Technology	Yes	Matsugasaki, Sakyo-ku, Kyoto 606-8585 JAPAN	Engineering design
Kyoto Animation	Unsure	32 Oseto, Kohata, Uji-shi, Kyoto 611-0002, Japan	Aesthetic design, animation design, product design, graphic design
Kaikado	Unsure	84-1 Umeminato-cho, Shimogyo-ku Kyoto, Japan 600-8127	Traditional Japanese craft design
Taizoin	Yes	35, Myoshinji-cho, Hanazono Ukyo-ku, Kyoto 616-8035, JAPAN	Unsure, More of a potential contact than a sponsor
Shunkoin	Yes	42 Myoshinji-cho, Hanazono, Ukyo-ku, Kyoto 616-8035 JAPAN	Unsure, More of a potential contact than a sponsor
Kyoto Artisans Concierge	Unsure	9-1, Okazaki Seishoji-cho, Sakyo-ku, Kyoto-shi, 606-8343 Miyakomesse	Traditional crafts design
Murinan	Unsure	31 Nanzenji Kusakawa-cho, Sakyo-ku, Kyoto City, Kyoto Prefecture 606-8437	Landscape design

Appendix C: Interest in Design at WPI Student Survey Questions
(Using Google Forms)

Introduction: Hi! We are one of the Kyoto, Japan IQP teams and we want your opinions! Our goal is to determine the feasibility of a design focused project center for WPI by exploring opportunities in Japan. With this in mind, please answer the following questions. Your participation is completely voluntary, and you may withdraw at any time. Your answers are confidential, and your names will not be collected, nor used in the project (unless you wish them to be, or wish to schedule an interview).

1. What is your graduation year?
2. What is your major
3. Have you ever taken any courses at WPI related to design (any type you can think of?)
4. Do you think students in your major would find a project center focused on design useful?
5. Are you getting credit on Sona Systems?
6. Would you be willing to do an interview with a person of our team? If not, enter "no" into the text box. If yes, please enter your WPI email address into the text box. We welcome all opinions, whether you think a center is a good idea or not! If you're from Sona, doing an interview can get you 1 whole credit.

Appendix D: Interest in Design at WPI Interview Questions - Faculty

Preamble:
       We are a group of WPI students working on developing a design project center in Japan. Our goal is to determine the feasibility of a design focused IQP center for WPI by exploring opportunities in Japan. This center will sponsor and assist in the development of interdisciplinary design projects for students at WPI on the international stage, with a focus on Japanese design as a test case. Currently, we are conducting this interview to try and investigate student and faculty interest in design at WPI in order to support our decision to create a design-themed IQP center. Your participation is completely voluntary and you may withdraw at any time. Your answers are confidential and your names will not be used in the project (unless you wish them to be).

1. Were you a part of the group that helped brainstorm this IQP?
    a. If yes, can you list the other members of that group so we can contact them. (Only for Jennifer deWinter)
2. What made you believe that this IQP of interest/value to the students and faculty at WPI?
3. Do you believe there is a high interest in design at WPI?
    a. If so, what departments or examples?
    b. Should we contact these departments to further investigate student and faculty interest?

Appendix E: Project Description and Interview Questions for Professor Ingrid Shockey

We are a group of IQP students working on developing a test case for a global project program at WPI with a focus on design. This pilot project center will be located in Kyoto, Japan. Our goal is to determine the feasibility of replicating our test case to other project centers around the globe. In order to do this, we seek your insight about conducting globally connected projects through your climate change stories. Your participation is completely voluntary and you may withdraw at any time. Your answers are confidential and your name will not be used in the project (unless you wish them to be).

Mainly, we want to know:

4. How did you collect your climate change stories?
5. How did you connect all of these stories (to create a single narrative)?
6. Were the projects led/designed by students or faculty or both?
7. How did you get all of the student groups to effectively contribute to the project? (i.e, what preparations did they receive to properly document the story)
8. How did you come into contact with those who wished to tell their story?
9. How did you handle communication and correspondence between locations?
10. Did your methods differ by location or were they the same?
11. What major challenges did you encounter with interdisciplinary and inter-project-center work?
12. Do you think there's potential to undertake projects similar in scope of your climate stories project, but focus on design?
13. Do you see any similarities between our project and yours?

Appendix F: Project Description and Interview Questions for Professor Fabio Carrera

We are a group of IQP students working on developing a test case for a global project program at WPI with a focus on design. This pilot project center will be located in Kyoto, Japan. Our goal is to determine the feasibility of replicating our test case to other project centers around the globe. In order to do this, we seek your insight about conducting internally stackable projects through the Venice project center. Your participation is completely voluntary and you may withdraw at any time. Your answers are confidential and your name will not be used in the project (unless you wish them to be).

Mainly, we want know:
1. What is your experience running the Venice project center?
2. What makes the Venice project center unique?
3. How do you choose the projects for this center?
4. How do you handle "stacking" IQPs on top of each other?
5. What sort of cultural variables do you need to consider when running projects and how do you overcome/circumvent them?
6. How much do future projects depend on past projects?
7. Would you say that the projects at this center have a lasting impact on the Venice community? If yes, how so?
8. (If yes to the previous question) What are some important considerations to make when trying to create a lasting impact?

Appendix G: Project Description and Interview Questions for Professor Kent Rissmiller

We are a group of WPI students working on developing a design project center in Japan. Our goal is to determine the feasibility of a design focused IQP center for WPI by exploring opportunities in Japan. This center will sponsor and assist in the development of interdisciplinary design projects for students at WPI on the international stage, with a focus on Japanese design as a test case. Currently, we are conducting this interview to try and investigate the feasibility of integration into ithe IQP system in order to support our decision to create a design-themed IQP center. Your participation is completely voluntary and you may withdraw at any time. Your answers are confidential and your name will not be used in the project (unless you wish them to be).

14. What are some issues you see immediately with the Design Center?
15. Has anything similar to this happened in the past, but not related to design? If so, what happened?
16. Do you think it would be possible to form a "design board"?
    a. Same idea as an advisory council learned from Sanders, each department has a board type deal when creating new courses and the tracking sheets
17. Do you know of any programs/departments/courses which already teach design at WPI? If so, to what extent?
18. In your opinion, would it be better to create a new system to teach design or instead modify something that already exists?
19. Is there a way to lessen faculty workload so that they may participate in this Design Center?
20. Who and in which departments would this Design Center need to be approved by?
21. What would be some requirements we would need to get this past the Administration/IGSD?
22. Have you noticed any issues from the lack of design in the current IQP program?
23. Do you think there is any interest in design education on the administrative level of WPI?
24. How can we prove to the administration that a Design Center would be useful?

Appendix H: WPI Catalog Course Codes

Abbreviation	Full Name	Abbreviation	Full Name	Abbreviation	Full Name
FY	First Year	AR	Art	BUS	Business
BB	Biology	EN	English	ETR	Entrepreneurship
BCB	Bioinformatics and Computational Biology	HI	History	FIN	Finance
CH	Chemistry	HU	Humanities	MIS	Management Information Systems
CS	Computer Science	INTL	International and Global Studies	MK	Marketing
GE	Geology	MU	Music	OBC	Organize Behavior and Change
MA	Mathematical Science	PY	Philosophy	OIE	Operations and Industrial Engineering
PH	Physics	RE	Religion	AS	Air Science
AE	Aerospace Engineering	WR	Writing	CP	Co-operative Education
ARE	Architectural Engineering	ECON	Economics	DEV	Development
BME	Biomedical Engineering	ENV	Environmental Studies	DS	Data Science
CE	Civil Engineering	GOV	Government, Political Science, and Law	IMGD	Interactive Media and Game Design
CHE	Chemical Engineering	PSY	Psychology	MFE	Manufacturing Engineering

ECE	Electrical and Computer Engineering	SD	System Dynamics	ML	Military Leadership
ES	Engineering Science	SOC	Sociology	MME	Master of Mathematics in Education
FP	Fire Protection	SS	Social Science	MPE	Physics for Educators
ME	Mechanical Engineering	STS	Society/Technology Studies	MTE	Material Science and Engineering
RBE	Robotics Engineering	ACC	Accounting		

Appendix I: Interest in Design at WPI Interview Questions - Students

Preamble:

      We are a group of WPI students working on developing a design project center in Japan. Our goal is to determine the feasibility of a design focused IQP center for WPI by exploring opportunities in Japan. This center will sponsor and assist in the development of interdisciplinary design projects for students at WPI on the international stage, with a focus on Japanese design as a test case. Currently, we are conducting this interview to try and investigate student and faculty interest in design at WPI in order to support our decision to create a design-themed IQP center. Your participation is completely voluntary and you may withdraw at any time. Your answers are confidential and your names will not be used in the project (unless you wish them to be).

      Definition of Design: "Design is the process of planning, optimizing, and producing an effective solution to a known problem"

1. What is your major?
    a. Would you say your major is associated with some type of design? How so?
2. Have you taken (or plan to take) any design related courses at WPI? If so, what were they?

Give them our definition of design before the next questions

3. Would you say WPI students are involved with a lot of design processes or thinking?
4. Would you say the seven week long terms affect the amount of design experience a WPI student can get?
5. Based on the definition of design we gave you, what concepts related to design do you think are the most compelling?
6. Following our definition of design, do you think you personally would be interested in a design project?
    a. Additionally, would you be interested in a center, an off-shoot of normal WPI Project Centers, dedicated to projects falling into this type of design?

Appendix J: Table of Noted Potential Teaching Materials

Websites			
URL	**Site/Organization**	**Category**	**Other**
https://canvas.wpi.edu/courses/13957	Canvas Global Lab	Example Canvas Page for Pre-PQP Set Up	
https://video.wpi.edu/hapi/v1/contents/permalinks/Kf2n5C6Y/view	WPI	How to Make a Research Video	
https://designthinking.ideo.com/	Ideo	Fundamentals of Design Thinking	
https://www.desisnetwork.org/the-desis-map/	DESIS Network	Social Design Considerations	

Books			
Title	**Author**	**Category**	**Year**
Design, When Everybody Designs: An Introduction to Design for Social Innovation	Enzio Manzini	Design	2015
Cruel Designs, The Funambulist Pamphlets	Leopold Lambert	Design	2013
Ecological Democracy Just Transitions and a Political Ecology of Design	Damien White	Social Design	2019
Metaphors, hybridity, failure and work: a sympathetic appraisal of Transitional Design	Damien White	Design	2015

Papers			
Title	**Authors**	**Publication**	**Category**
An Interdisciplinary Design Education Framework	Hye-Jin Nae	Nae, H. J. (2017). An interdisciplinary design education framework. The Design Journal, 20(sup1), S835-S847.	Interdiscplinary Design
Comparing the dialogue of experts and novices in interdisciplinary teams to inform design education	Louise Kiernan, Ann Ledwith, Ray Lynch	Kiernan, L., Ledwith, A., & Lynch, R. (2020). Comparing the dialogue of experts and novices in interdisciplinary teams to inform design education. International Journal of Technology and Design Education, 30(1), 187-206.	