Forging a Makerspace

A contextual inquiry into makerspaces

for Pillar Technology

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Executive Summary

The consulting team interviewed Pillar employees to find out the current situation with their unrealized makerspace: what the employees expect out of it and what challenges they have faced in realizing it. This study focuses on interviews, findings, and possible recommendations addressed by Dragen Consultants on how Pillar Technology can effectively meet their expectations in utilizing a makerspace. More detailed descriptions of the findings and recommendations summarized here can be found in Findings & Recommendations section.

Key Findings & Recommendations

- **Finding:** Employees have valuable ideas and relevant concerns that have gone unheard by upper management.
  Recommendation: Form rotating committees to solicit ideas from employees and spearhead projects.

- **Finding:** No one has been designated to take charge of the makerspace project.
  Recommendation: Appoint liaison committee in charge of makerspace.

- **Finding:** The company may be moving to a new office space within a year.
  Recommendation: Consider portability of equipment procured for the makerspace and possible transportation costs due to a move.

- **Finding:** Employees prefer time specifically dedicated to using the makerspace.
  Recommendation: Makerspace usage can be billed to the client as part of their projects with Pillar.

- **Finding:** Employees interested in the makerspace have different ideas about who the space should serve.
  Recommendation: Design the makerspace with employees in mind first.

- **Finding:** Because of space constraints, there may be more practical uses for underutilized spaces in The Forge.
  Recommendation: Address the space constraints before tackling the makerspace; consider a different location for the makerspace.

Introduction

Pillar Technology is a digital experience design and clean code consultancy firm founded 20 years ago. Its current office space, located in downtown Ann Arbor, is a branded concept called The Forge. When it moved to this downtown location two years ago, the company had plans to found a makerspace that have since gone unrealized. Pillar Technology's Ann Arbor location has a history of hosting open, community-facing events, which they use to encourage clients, students and other technology enthusiasts from community to frequent The Forge, which they envision as a communal space. Employees hope to blend the makerspace with their efforts to contribute to the development of the technology community in southeast Michigan.

Culture at Pillar Technologies

Pillar designed The Forge as an open office space. One of the many strengths of this strategy, and one of the main reasons management cited for choosing it, is that it encourages frequent, casual interaction between employees and increases opportunities for collaboration. The work environment is designed to eliminate physical, structural, and ideological barriers between employees. The open office area is surrounded by few a few conference rooms (crucibles in Pillar parlance) and dedicated work spaces (focus rooms) that are used for meetings, discussions, and conferences. Employees at Pillar Technology work with a mindset called no constraints thinking, which means thinking without considering the constraints that might appear. This enables them to bring more

creative and elegant solutions to their customers. Unbounded thinking is what drives their mission to fuse creativity, innovation and design centered around the human element.

Investing in a makerspace

The idea of founding a makerspace at The Forge is at least two years old, as it was part of the plan for the new downtown office. The original plan was to equip the room with various tools and hardware that could be used by employees to work on extracurricular hobby projects.

The idea of a makerspace reflects the company's ideologies of free thinking and craftsmanship. A space which opens doors to rapid prototyping would support employees delivering more than what their customers expect, helping the company stand apart from its competitors.

A makerspace could also enable Pillar to diversify the kinds of community events they host at The Forge and attract more members of the southeast Michigan community. From our discussions with employees, the makerspace is expected to serve several different user groups, including: employees working on innovative projects; community members attending events in The Forge; and, potentially, clients with projects which involve a hardware element.

Having the capability to do hardware prototyping in-office could increase opportunities for acquiring new talent that is excited to work in a space like Pillar. Additionally, it could open the door to a whole new type of client who requires hardware-based solutions, or who expect Pillar to offer high-quality hardware craftsmanship that matches their software solutions. Makerspaces are popular in Ann Arbor among the students at the nearby University of Michigan as well as the technology community around Ann Arbor and southeast Michigan. Pillar's own makerspace could connect them to the makers among university students and across the area.

It was with a wide range of benefits for both the company and the community that this idea of a makerspace was conceived, and over the last two years employees have used the space for personal projects, brought in their own tools to work on projects there, and built several hardware projects. However the space still feels underutilized and needs to

be designed to cater to the needs of multiple user groups that it could empower in the future.

Methodological Overview

The consulting team's process is based on the concept of contextual inquiry. Contextual inquiry is a research method that is structured around user interviews conducted in the user's workplace, with the goal of obtaining a more complete sense of the strengths of weaknesses of a process or system; the information gathered in these interviews can then be interpreted and unique insights gained. Contextual inquiry is advantageous because, compared with other research methods: it is highly successful at revealing tacit knowledge; it tends to produce highly-detailed information that is relevant to users; and it is adaptable to many situations and contexts.

In this section, the consulting team provides an overview of the process used over the course of the past several months so that Pillar has a better understanding of how they arrived at their findings and recommendations, which are detailed in the Findings & Recommendations section of this report.

1. Initial Meeting

Pinpoint a specific concern to address

At the outset of the project, the consulting team was provided with a list of concerns that Pillar hoped to address. This list included several challenges related to The Forge: underutilization of telepresence technology, an unrealized makerspace, inefficiencies in seating and space usage strategies, and challenges with scaling. The consulting team set up an initial meeting with Pillar to collect more information about The Forge and settle on one specific concern to address over the course of the consulting project.

2. Scope Meeting

Determine the scope of the project

After choosing the makerspace as the primary point of concern for this project, the consulting team scheduled a second meeting with Pillar to determine where and how to be most effective in assisting with the makerspace. The consulting

team met with three employees to discuss the current state of the makerspace, what visions had already been articulated for its future, and what specific difficulties have kept Pillar from realizing the makerspace.

3. Background Research

Conduct background research on Pillar and makerspaces; conduct a competitive analysis

The consulting team spent two weeks conducting background research on Pillar Technology and on makerspaces. The consulting team generated research reports on the culture of Pillar and The Forge; Pillar Technology's relative position in the marketplace; the increased popularity of do-it-yourself (DIY) and makerspace communities; and the effects of corporate makerspaces. This research contributed to the consulting team's understanding of Pillar and of makerspaces, helped them determine which questions to pose in interviews with employees, and informed their recommendations in the Findings & Recommendations section. The background research reports can be found in the Appendices section of this report.

4. Interviews

Generate interview protocols and conduct interviews with Pillar employees

Using the background research and information discovered during the initial scoping meetings, the consulting team developed sets of interview questions designed to get a better understanding of Pillar from internal sources, as well as employee attitudes about makerspaces and The Forge itself. The consulting team then interviewed 7 employees (representing 5 different job roles within Pillar) over the course of two weeks. Each interview session lasted approximately 45-60 minutes and was led by a member of the consulting team, with a second member present to take handwritten notes and observe the session. Audio recordings of each session were also taken for the consulting team's reference.

5. Interpretation Sessions

Recount and review interview sessions; generate new insights and affinity notes

Within 48 hours of each interview session, the consulting team met to conduct an interpretation session. Each interpretation session lasted approximately 45 minutes, and consisted of the two team members present in the interview recounting the session, while the other two team members took additional notes. The consulting team then used the interview notes and insights gained from the interpretation sessions to create clarified affinity notes.

6. Affinity Wall

Organize and analyze interview notes & insights

Once the consulting team had generated several hundred affinity notes, the team began to see areas of concern, patterns, recurrent themes, and insights emerge. By grouping the notes together, labeling them, and creating a hierarchical structure, the consulting team began to identify specific functional and structural insights about Pillar, The Forge, and the makerspace. These insights led directly to our findings in the Findings & Recommendations section (see next section). Images of the affinity wall can be found in the Appendices section of this report.

7. Recommendation Generation

Develop recommendations based on research and interview notes

Drawing on dozens of hours of meetings, research, interviews, review sessions, and interpretation, the consulting team generated recommendations for each of the major findings. The consulting team considered the feasibility and relative time and cost required to implement each recommendation, as well as the level of impact each is intended to have on the concern(s) it addresses. The consulting team's recommendations can be found in the following section, Findings & Recommendations.

Findings & Recommendations

In addition to concerns about the makerspace, the consulting team discovered that many of the concerns and issues raised explicitly by employees and unearthed by multiple interviews revolved around restricted communication lines between employees and management. The findings and recommendations are therefore divided into two sections: the first section deals with structural observations about the flow of information between employees and management, while the second section addresses the unrealized makerspace.

Findings related to restricted communication flow

The consulting team identified some areas of concern regarding communication between employees early in the project. From the initial meeting through the interviews, each Pillar employee we talked to was excited to talk about the culture of the company, which is hugely important to its success. However, the consulting team found it difficult to pinpoint details: a mission statement does not appear on Pillar's website, and could not be provided at the start of the project when requested. Although the organizational structure is ostensibly flat, we found evidence in our interviews that employees have stratified themselves to a point that specific bottlenecks have formed. Although the makerspace was the initial focus of the project, the consulting team found that several of the roadblocks to moving on the foundation of a makerspace, as well as issues with other concerns Pillar raised at the outset of the project, could probably be resolved by tackling the communication restrictions. A significant part of the findings and recommendations, therefore, deal with communication between employees at Pillar.

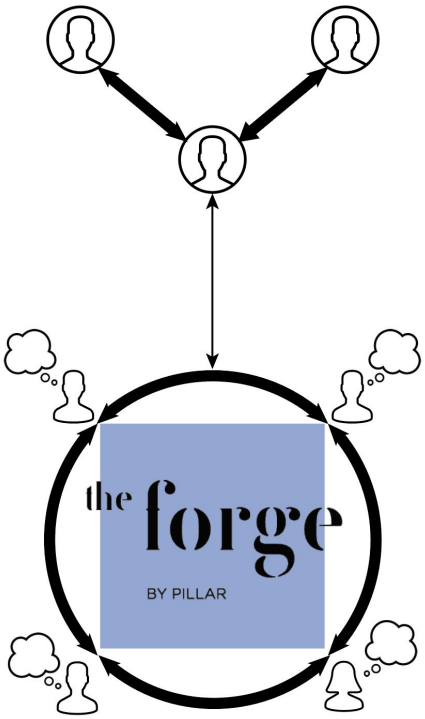
Finding 1

Employees have valuable ideas and relevant concerns that have gone unheard by upper management.

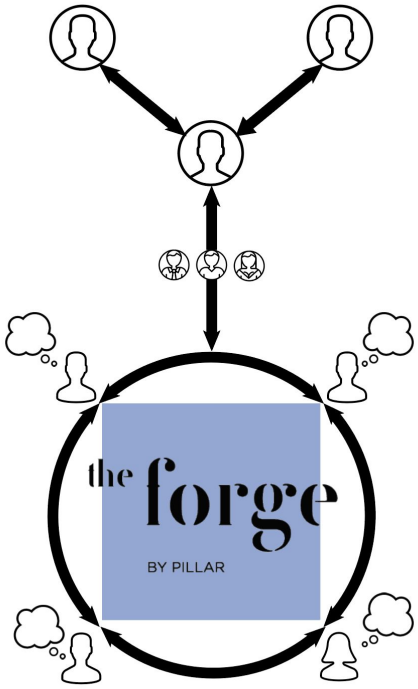
Every interviewee the consulting team spoke with was enthusiastic about the possibilities of turning The Forge's utility room into a makerspace. When asked what they would like to see done in a potential makerspace, every employee had some kind of

a vision for the makerspace: how they would use it; when they would and would not use it; what kinds of equipment and tools they would prefer to have in the space; what projects they might work on; how it might benefit their teams and customers; and how it could better the company. Many of the employees interviewed have been thinking and getting excited about makerspaces for some time prior to this project. It is also evident from comments made during interviews that employees are talking with each other about their extracurricular projects, as well as their hopes for the makerspace; when asked, several employees could say what projects their peers were working on outside of work, and could identify the people who were most excited about founding a makerspace in The Forge.

Despite the breadth and depth of ideas circulating between employees and shared with the consulting team during interviews, upper management divulged that no employees had come to them a plan for the makerspace. Pillar uses employee check-ins every six months to one year to solicit feedback about the company and The Forge, and also relies on the open office concept to circulate ideas, but no other structural mechanism by which upper management solicits feedback from employees was discovered during interviews.



Recommendation: *Form rotating committees to solicit ideas from employees and spearhead projects.*



We recommend Pillar form a rotating committee of employees to act as a liaison between upper management and the employees. The committee's job should be twofold: first, it should actively seek out the concerns and ideas of employees working in The Forge; second, they should explicitly handle larger Forge-related projects, such as forming a plan of action for founding a makerspace and addressing focus room scheduling issues.

Although ostensibly the committee becomes a layer between employees and upper management, the consulting team believes that because it will A) actively seek out employee concerns and ideas, and B) provide office projects with a de facto team of leads, the committee will improve communication of ideas and concerns between employees and management and allow the best ideas and most pressing concerns to be dealt with in a timely, creative, and democratic way. The consulting team believes this will be a low-resources, high-impact solution.

Some suggestions on the formation of a committee are to elect interested individuals; assign individuals on the bench to the committee, or a round robin technique so that each employee has a chance to be on the committee if they wish. Committees could form and dissolve at the completion of specific projects, or rotate on a timed-basis, such as every quarter.

Finding 2

Employees have stratified themselves despite the flat organizational structure preferred by Pillar.

We also found a mismatch between what is thought to be and what is actually in place. Instead of a flat organizational structure, employees unanimously referred to the same two individuals when asked who they would approach to implement the makerspace idea.

Recommendation: *Formalize and openly share an accurate organizational chart.*

This finding can also be tackled by having a committee as liaison. Another approach could be to formalize and share an accurate organizational chart, where employees can get information on job titles and contact details. This way employees can go directly to the source to get the ball rolling instead of feeling unheard or the responsibility of having to fulfill their visions on their own.

Finding 3

The open office concept of The Forge makes it difficult to realize the full potential of the space.

Several employees find the open office concept challenging. When there are times that require privacy and quiet—taking client phone calls, for example—they report that there are often no spaces available for them to use. Also, an unavoidable part of the work at Pillar is the fluid flow of employees and clients in The Forge throughout the day and week, which can be disruptive for productivity or make it difficult to find spaces in which to work.

The open office also poses a challenge for collaboration because employees are in and out of the office so often: the consulting team experienced this firsthand, as the main Pillar contact for the project was unavailable to meet with us on a few occasions due to last-minute scheduling changes.

> **Recommendation:** *Add additional focus rooms & create a long-view employee calendar.*
>
> A short-term solution to assuage the lack of private spaces in The forge is to transform the utility room into one or two additional focus rooms. However, this may not address the issue for long given the growth Pillar has experienced over the past two years. The consulting team suggests that ample consideration be given to the need for small, private spaces as Pillar searches for its next office space.
>
> A more practical solution in the interim is to create a long-view, high-level calendar where employees can record their known, significant absences or presence in the office. For example, if an employee is beginning a project during which they will be at the client's site for several weeks, they might add that information to the calendar so other employees know they will generally be out of the office for some time.

Findings related to the makerspace

The employees who participated in the interviews for this project are excited about the makerspace idea, and many had unique ideas of what the makerspace could look like. The consulting team felt it was critical to evaluate what employees hoped the space will look like and what they hope to do with it. In the two years since the idea of founding a makerspace in The Forge originated, there are a few factors which have consistently kept Pillar from realizing the makerspace. The consulting team feels it is important that Pillar identify and address these long-standing issues before forging ahead with the makerspace.

Finding 4

No one has been designated to take charge of the makerspace project.

Interviewees revealed that there is no specific person overseeing the conceptualization of the makerspace, writing ideas down, or being held accountable for the development of the space, even though there is considerable experience and opinion to be harnessed from Pillar's employees. The interviewees relayed several ideas detailing how the makerspace should look, which tools with which it should be equipped, and what genre of projects to which it should cater. Some of the interviewees have worked in makerspaces before or have their own workshops set up at home, where they work on hobby projects. Pillar need not look beyond its own employees to find makerspace experts.

Interviewee's interests in makerspaces vary from electronic hardware design to clay modelling. It is necessary to organize and filter these notions of makerspaces to reach to a common conclusion for its theme. The consolidated plan of the makerspace should be then presented to upper management to proceed to development. Another prominent finding from the interviews is that once the makerspace is functioning, several employees will likely need incentives to use the space outside of their regular work hours.

Recommendation: *Appoint liaison committee in charge of makerspace.*

To address the lack of a point-person for the makerspace project is to create a committee of employees, elected from among those who will be working in the Ann Arbor office for (at least) the next few months, to take charge of the makerspace (see recommendation for Finding 1). The committee should solicit ideas for the makerspace from employees, determine a common theme, and devise a plan for the makerspace to present to upper management. Designing the space according to the common requirements of the employees will ensure the tools purchased are relevant for employees and their projects (both with clients and extracurricular). This is also a reason why employees should be encouraged to look at the timeline of client projects or future plans of the company when proposing ideas.

To motivate employees to spend time in the makerspace outside of office hours, the entrepreneurship program that will soon be launched in Pillar is likely to be a great incentive for employees to work on projects outside of their work. The kind of product development-driven talent that Pillar employs combined with the no-constraints thinking it espouses, works as a perfect combination for an entrepreneurial idea. The only push needed would be Pillar's support to foster such environment and thinking among its employees. A makerspace could be an active tool in this support. The consulting team believe the space will be exciting for several of the employees interviewed who are active makers and have several of their hobby projects bidding in their home workshops.

Employees can also be encouraged to spend time in the makerspace during their time on the bench.

Finding 5

The company may be moving to a new office space within a year.

Given Pillar's rapid growth over the past two years, several interviewees believe it to be a matter of months before Pillar needs a new, more accommodating office space.

Recommendation: *Consider portability of equipment procured for the makerspace and possible transportation costs due to a move.*

Because a change of space is imminent, whenever the possibility of a makerspace is being discussed portability of material and equipment should be a primary concern. Portability of equipment within the makerspace will not only reduce transportation costs, but also add an additional element of "maker"-like feel to the makerspace. Additionally, this will define Pillar's concept of physical spaces and reflect the company's thinking with respect to innovation.

Finding 6

Employees prefer time specifically dedicated to using the makerspace.

Employees are skeptical about how they will allocate time for projects within the makerspace, given their already-tight deadlines and pressure to acquire billable hours. Interviewees described difficulties maintaining 40-hour weeks at Pillar while trying their best to achieve a desirable work-life balance. Some of the employees mentioned that they are always occupied and do not really find time to stay back for post-office hour events due to family commitments or long commutes. Some of the employees expressed concern about getting involved with a makerspace at the expense of their billable hours. This is an important consideration to keep in mind as not all employees want to stay back for events post-office hours. However, some interviewees believe that incorporating work projects that make use of the makerspace tools could be a good use of the space.

> **Recommendation:** *Makerspace usage can be billed to the client as part of their projects with Pillar.*
>
> Additionally, to foster creative thinking, time spent within the makerspace area can be considered for the calculation of employee's' billable hours.
>
> Based on our interviews, an entrepreneurship program is likely to be launched soon and could be leveraged as an incentive for employees to utilize the makerspace for a variety of extracurricular projects.
>
> People who have relatively less workload or those employees on the bench can make good use of this space. Encouraging employees to take up hobby projects at work will result in higher employee satisfaction in the long run. Additionally, it will add to creative thinking and innovation at Pillar.

Finding 7

Employees interested in the makerspace have different ideas about who the space should serve.

Interviewees described several different user groups they imagined using a potential makerspace in The Forge, some of which include their peers, their clients, their families, and members of the community. The ideal solution will allow each of these groups to utilize the space, but such a solution may not be feasible for some time.

> **Recommendation:** *Design the makerspace with employees in mind first.*

The consulting team believe the makerspace will be most successful if it rides the waves of excitement currently rippling through Pillar's employees. Then, once it is established, the liaison committee can start thinking and soliciting ideas from their peers about how the makerspace can grow to involve other user groups, be they clients or the community at large. The committee can use events such as Creative Collisions, Hackathons, Arcade Nights etc., to solicit feedback from community, clients and employees.

Finding 8

Employees expect the makerspace to be a multipurpose space capable of accommodating varied situational needs.

Interviewees raise several questions about the functional use of a potential makerspace. Some of their concerns include:

1. How can we generate revenue from a makerspace? Is it a space that we want to generate revenue from?
2. Can the space be used to host other events? What kinds of events can make use of such a space?
3. Will it accommodate hobby projects of our employees?

Recommendation: *If revenue is a concern, rent the space to clients or the community.*

The consulting team witnessed firsthand after attending a Creative Collision event how much pride Pillar takes in engaging the community. Creating a makerspace within Pillar will add a new dimension to its core tenant of community engagement. However, as a business organization, weighing the financial aspect of such an investment is good practice. To ensure a balance, the consulting team propose that Pillar use the makerspace to hold small workshops or hackathons. With the help of a subscription model, community members who use this space frequently might not mind paying a nominal subscription fee to utilize the breadth of resources at Pillar's makerspace. Additionally, this will create a brand image that will continue to make Pillar an exciting place to work and a top choice for clients.

Recommendation: *Encourage employees to bring their hobby projects to work or have a mechanism to gather ideas about tools and resources that can be used within the makerspace.*

For a short-term solution, an "Open Idea Box" that can be placed anywhere within the office space that will act as a mechanism to gather anonymous employee feedback cold be useful. The ideas in the box can be read aloud during internal office meetings, and a voting mechanism created to determine which ideas are worthy of investment. If this mechanism turns out to be successful, it may become a tedious method if too many ideas are submitted. In the long run, the liaison committee previously suggested can read the and determine "top 3 ideas" to gauge interest. Gaining feedback about the top ideas can be done either via internal surveys or during other informal events at work.

Finding 9

Because of space constraints, there may be more practical uses for underutilized spaces in The Forge.

Some interviewees suggested that, given the space constraints and the challenges of the open office concept, the area designated as the makerspace might be better utilized as additional focus or meeting rooms. Interviewees said that during a significant number of times during the week, The Forge gets crowded and demand for the limited number of meeting rooms and focus rooms is high. Several employee teams and clients walk in and out during the day and problems with availability of meeting rooms sometimes result in reduced productivity. Several interviewees mentioned that the makerspace area is already utilized for short stand-up meetings or for brainstorming sessions because of a lack of space.

Recommendation: *Address the space constraints before tackling the makerspace; consider a different location for the makerspace.*

The possibility of turning the utility room into a meeting room or more focus rooms could certainly help reduce demand for those spaces on days when The

Forge needs more private spaces. In any case, the consulting suggests that Pillar address the space constraints that were brought up by interviewees before creating a dedicated makerspace.

One interviewee mentioned that Pillar's relationship with the Desai Accelerator located in The Forge has not been as fruitful as either group had hoped. One alternative solution to Pillar's space issues could be to utilize the space Desai occupies, either for more private rooms or for a larger makerspace, although the consulting team is not privy to all the information necessary to know if such a move would be possible now.

Conclusion

The most encouraging finding from our project is that there is an abundance of energy and ideas amongst Pillar's employees to solve nearly all the concerns presented to the consulting team. During the interview process, it became evident that there are plenty of big, creative thinkers in Pillar's employ. Ultimately, by opening the lines of communication a little wider and assigning an excited and savvy internal group of employees, the consulting team believes that Pillar can build a makerspace that will help it attract new clients, further its reach into the community, enrich the work and extracurricular lives of its employees.

Dragen Consulting Team

JD DUVAL

JD is a 5-year student at the University of Michigan, having already completed a BA in English literature and an MFA in creative writing. He is currently studying human-computer interaction at UM's School of Information with the goal of becoming a writer in the video game industry, or designing an app that makes poetry popular with the masses again.

REBECCA CHEN

A California native, Rebecca came to Michigan to study human-computer interaction with the hopes of becoming a UI/UX Designer in the game industry. She has a Bachelor of Science in Computational Cognitive Sciences and a minor in Management. She is absolutely fascinated with the relationship between human and technology.

PALLAVI GUPTA

Pallavi came to Michigan after spending two years as a Software Developer at Samsung Research India. She returned to school in 2016 to pursue her graduate studies in the field of Information with a focus in Human Computer Interaction. She is interested in user experience research and design, user interfaces, ubiquitous and social computing. She hopes that her passion for technology and design will enable her to create better and meaningful products and services.

HRISHIKESH RAO

Hrishikesh has a bachelor's in mechatronics engineering. He is studying human computer interaction at University of Michigan to dive into hardware design-based digital UX in the automotive and mobile industries. He has experience working in makerspaces, from student team workshops to corporate-run makerspace

Appendices

Competitive Analysis

Determining industry categorization

Pillar Technology is a mid-sized consulting firm in the information technology and services sector, with specific focuses on digital experience design, software programming, and emerging technologies. The company is headquartered in Columbus, Ohio, with offices in Ann Arbor, Michigan; Des Moines, Iowa; and Palo Alto, California. During the initial research for this report, I discovered a lot of diversity in how Pillar Technology's employees describe the company's business activities versus the way the company reports itself to the IRS and how market research databases and news organizations categorize Pillar Technology. This probably has more to do with bureaucracy and paperwork than anything else, as I'll discuss below, but makes for an interesting starting point because it demonstrates just how wide and varied the kinds of services Pillar provides for its clients.

The IRS requires businesses to classify themselves by their principal business activity, using codes determined by the North American Industry Classification System (US Census Bureau). NAICS is the standard that federal statistical agencies use in classifying business establishments "for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy" (US Census Bureau). On a recent Form 5500 filed last year, the business code Pillar Technology used was 541511, which indicates its principal business activity is "Custom Computer Programming Services," an industry described by NAICS as comprised of "establishments engaged in writing, modifying, testing, and supporting software to meet the needs of a particular customer (Avention) (US Census Bureau). Statistics on the NAICS website indicate that there are 86,957 U.S. business in this industry (NCAIS).

While the writing, modifying, testing, and supporting of software may be Pillar Technology's principal business activity as reported to the IRS, the company itself purports to do much more than simply software development. The company's website describes what it does in much broader terms:

> We design and we build. We innovate and we deliver. We solve big problems. Quickly. Fusing creative & marketing, data & analytics, UX research & design, emerging technologies, and cutting-edge engineering and software development practices, we're creating the world's most compelling, engaging, impactful digital experiences (Pillar Technology).

Here (and elsewhere on its website), Pillar Technology markets itself as providing a great deal of value above and beyond software development: it purports to do marketing, data analytics, and engineering. This positioning also aligns with my own experience of their Ann Arbor office, where I met and spoke with several employees who described projects on which they had recently worked that also included hardware components as well as software development. This large range of reported services makes it difficult to classify Pillar Technology, which in turn makes it difficult to determine what industries it should be monitoring and exactly who its competitors are. Even news organizations have a difficult time describing Pillar Technology: a press release from The Zell Lurie Institute in June 2015 referred to the company as "a multi-faceted technology company solving complex business problems with innovative software and engineering methods," which is a lot of industry jargon with little in the way of specificity (The Zell Lurie Institute).

Without a client list or a portfolio of projects available to the public via its website or in available literature on the company to help determine how to describe its work, I think Ann Arbor SPARK said it most succinctly in a June 2014 press release when it called Pillar Technology "a business consultancy and software development company" (Ann Arbor SPARK). Although the NAICS does not currently have a code/category which correlates to technology consulting or computer consulting, the United Nations' ISIC classifications (which are used by the European Union) does. An Avention report on Pillar Technology reveals that the company's ISIC code is 6202 – "Computer consultancy and computer facilities management activities" (Avention). Given the myriad kinds of technology services Pillar Technology provides, as well as conversations with employees that have indicated they see the company as a consulting firm, computer/technology consulting seems like the most appropriate industry categorization for the company.

Identifying & comparing local competitors

According to Avention, Pillar Technology has about 150 employees and annual sales of about $50 million USD, numbers which put it in a unique market position in both Columbus, where it is headquartered, and in Ann Arbor, where the current project is located. Using data from Avention to search for other local companies with similar primary reported activities (computer programming, computer consulting, computer system design services, other computer related services), number of employees (50 – 200), and annual sales (0 – $100 million), Pillar Technology has several competitors of similar size, and with which it shares significant overlap in Columbus—including Quick Solutions and Navigator Management Partners—while in Ann Arbor, it has fewer competitors with less overlap—companies like TekWissen and Dynamic Edge.

Navigator Management Partners

Navigator Management Partners is Pillar Technology's closest competitor in Columbus, with just over 150 employees and $52 Million in annual sales (Avention). On its website, Navigator Management Partners describes itself as "a management and technology consulting firm," that works to grow and scale organizations "in a more efficient and effective manner" with a "width breadth and depth of capabilities and solutions" (Navigator Management Partners). The website breaks down the company's services into categories like "Business Analysis and Process Design," "Program and Project Management," "Technical Architecture," "Testing and Deployment," and "Strategy." These service categories are then further broken down into "Offerings," which are specific deliverables, products, or skillsets described in detail. This level of specificity shows customers exactly what the company is and what it does, and even though there are still marketing buzzwords in abundance, the specificity of the services, products, and offerings help to identify the company's place in the market and their value to their customers.

The Navigator Management Partners site includes the different industries it services (e.g., education, energy, financial services, healthcare), a client list, and a project portfolio ("case studies") which gives insight into their methods and results. This inclusion goes a long way toward giving customers an idea of the kinds of projects the company has expertise in, as well as what they can expect from the company in terms of results. Navigator Management Partners markets itself on its website as professional,

focused on growth and scalability in businesses, and adept at a specific set of skills and services.

Quick Solutions / Fusion Alliance

Quick Solutions is another of Pillar Technology's competitors in Ohio. Located in Westerville, about 10 miles outside of Columbus, Quick Solutions has just under 180 employees and annual sales of about $60 million (Avention). In 2014, it merged with the larger, Indianapolis-based Fusion Alliance; the two firms combined assets, but both kept their local offices, brands, and employees at the time of the merger (Ghose). Since then, the Quick Solutions website has been redirected to Fusion Alliance. Fusion Alliance describes itself on its website as "an enterprise solution provider, delivering the practical insights, engaging customer experiences, and human-driven technologies that transform the way our clients do business," with expertise in "digital, data, cloud, and technology" that "shapes our clients' businesses, giving ideas lift, clarity, and a clear path to execution and measurable results" (Fusion Alliance). Rather than offer any descriptions of the services it offers, Fusion Alliance instead has an "Expertise" page, with downloadable case studies in one of three categories (foundations, insights, and experiences). With titles like, "What You Need to Know about Mobile Engagement," and "How Dynamics AX in Cloud Reshaped Affinity Apparel," the case studies are free, and designed to "help you dive deep into the latest trends in digital marketing, data management, technology and the cloud" (Fusion Alliance). With no services listed or described, no portfolio, and no mission statement or company goals anywhere on the Fusion Alliance website, it's difficult for customers to know exactly what's on offer here.

TekWissen

In Ann Arbor, where the current project is located, the most comparable competitor is TekWissen, a company with about 130 employees and $45 million in annual sales (Avention). Most of Pillar Technology's competitors in this area are much, much bigger, having been bought out by larger, national or global conglomerates (like Fry's and Enlighten). The ones that remain have a much larger scope, or don't overlap quite as much. TekWissen's website describes the company as providing "a unique portfolio of innovative capabilities that seamlessly combines clients' insights, strategy, design, software engineering and systems integration" (TekWissen). Under its services,

TekWissen lists categories which include “Product management,” “Project management,” “Software engineering,” “Quality assurance,” “Software operations,” and “Customization & maintenance.” They also include a menu of technologies and industries with which they’re familiar. TekWissen’s website is far less polished than the other companies’ websites; a great deal of moving, animated menus and content, along with un-edited body text and poor text formatting leaves the site wanting.

Dynamic Edge

Dynamic Edge, another Ann Arbor competitor, employs about 60 people and has annual sales of about $21 million (Avention). The Dynamic Edge website describes the company as eliminating “computer headaches for small to medium sized business that have outgrown their current computer support” (Dynamic Edge). They divide their services into three categories: fixed IT support, custom programming, and fitCloud hosting, with specific services like business application integration, intuitive web design, backup and disaster recovery, and automated data backups. Dynamic Edge is more representative of the kinds of Pillar Technology competitors Avention indicated in the Ann Arbor: geared toward small- to medium-businesses, and with a smaller range of more specific services than something like Navigator Management Partners or Pillar Technology.

Makerspaces as a possible differentiator

Pillar Technology occupies a space in the market that overlaps with several different industries: its competitors report themselves as being part of a number industries revolving around technology, including computer programming, software development, and technology consulting. In such a hazily defined industry, Pillar stands out from its competitors by focusing more on innovation and speed than stability and dependability. Given these conclusions, the current project of implementing a makerspace in the underused utility room at The Forge in the Ann Arbor office could be another way of further differentiating the company from its competitors. With a mission to design, build, and innovate, a makerspace would fit right in with the company values, as well as possibly help the company navigate the uncertain future of technology consulting as it goes forward by providing a space for “no constraints thinking” and experimentation with hardware as well as software.

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Corporate Makerspaces

The current maker movement in corporates

Current work structure in most of the leading tech giants offer open working environment.

Google being one of the leading and famous examples of such a work-culture, there are several other mammoths emerging out to boast about similar work culture. Google's offices are designed to " create the happiest, most creative workplaces around the world " says Jordan Newman, google's spokesperson. A 2013 New York Times article describes the open work culture at the Chelsea office of Google in New York and talks about the conference rooms that are themed and gourmet shops that are lined across the office space, making it a chaotic tech work space referred to as a "tech refugee camp". This shift in working style is promising and has cause a disruption in the educational institutions to rework the syllabus and teaching style to introduce collaborative learning within a project-based curriculum. Corporates are blending in the makerspace like work culture by introducing an open working environment. After tech companies, digital consultants like Deloitte are leveraging the benefits of the disruption of makerspace culture and have shown significant interest and attention to the maker movement. Sharing office space between technical and artistic background and designing the work space to highlight a "open-minded" and "free spirited" work space supports the multi disciplinary collaboration, and it was brought to life at Deloitte's london office by the Perkins+will design firm. The company speaks about a sense of community within their working style and having informal terms as names for the working areas. They have also setup a cafes for the office reception instead of the regular desk and assistant to boost client and company partnership and encourage transparency which is something common for an open working environment workplace.

Work-from-home vs No-work-from-home

Corporates have offered several steps to create a better working place for their employees. A gym, subsidized cafeterias, corporate benefits and tours or even arcade game rooms. They are going all out to make it look like a fun work place however key of an innovative working environment may be more than just making the workplace “look fun”. Working-from-home is one trend that has faced mixed reviews from critics.Other one being furnishing an open working space which again has its own pros and cons. This section analyses the effect of these two in different organizations.

Pros and cons of work-from-home

Workspace interactions between multidisciplinary teams are valued for the collaborative culture they bring up. Working from home was believed to work with the comfort of employees and with the revolution of online collaboration tools, was considered as a benefit for organization to cut on office space, however to leverage the benefits of creativity produced in face to face interactions and attract innovation. Factors like company culture, employee benefits, corporate outings and cafeterias, further attract employees to the workplace and this has been a rising trend in large companies who are agreeing to trade off the benefits of working from home for producing innovation.

Yahoo specifically needed an intervention as such to also re-energize their workforce. The company formerly known to offer a comfortable working style for its employees sent out a memo in 2013 calling back most of its work-from-home force (allegedly following google's style of working) to also keep an eye on its employees who some claim were working on startups while being on startup salary.

On the other hand, studies reveal that allowing employees to work from home does save office space and furniture. A harvard business review research, sheds light on the massive amount saved by a company by allowing its employees to work from home. The research refers the ban introduced by Yahoo for employees to work from home with a belief that this will make their offices more creative and interactive. However productivity and creativity are different qualities a company would want to balance in this war between work-at-office and work-at-home . The HBR research talks about a call center performance which is easy to monitor remotely versus Yahoo which explained its memo to be for “re-energizing” the task force.

Pros and cons of open office plan

Discussing the benefits and shortcomings of an open office layout, it is safe to say that creative thinking and innovation could use the walls that are being broken down. A study shows increase in interaction could be linked directly with how open or accessible one is to their co-workers. Also, companies are working to mix employees of different job roles together to produce some of the greatest and most creative works. This holds true only for industries that are dependant on creative aspect of the employees like animation, creative code, design. There are equal claims of dissatisfaction and distraction among employees due to the introduction of such an environment. Studies conducted in oil and gas companies showed that bringing down separations in workspaces induced higher level of stress and caused easy distractions to them. The study went on to claim that it “ undermines the very things that it was designed to achieve” This is different from the sound and visual privacy issues discussed earlier. Again it is a reflection from study conducted in employees that performed “robotic” or something needing a silent environment In situations, having an open workspace or a creative maker environment that resulted in hampering the flow of working. Some believed that loss of privacy was a primary cause while others feared it's a way for their boss to keep an eye at their work or catch someone leaving early.

The article concludes that It is necessary to design sufficient private areas and develop a respect for a colleague's privacy .

Revolution in manufacturing

Maker movement has enabled the US companies and institutions learn to tailor thinking and design process to produce a healthy environment for creativity, learning and disruption through multidisciplinary connections.Bringing on board teachers and managers who are themselves makers has been an increasing trend to adapt to the benefits of this work culture and government agencies like DARPA provide grants and seek for individuals to work in such areas that empower schools to work in a maker environment

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Do-It-Yourself concept

Over the years, the definition of “Do-It-Yourself” has evolved from the “how-to” content to something that involves creative thinking. Today, it simply can mean anything from baking a pancake to tinkering your bedroom to sing a song when you enter (Morin, 2013). The definition of “Making” or “Maker” or “DIYer” has changed considerably and is influencing a lot more people positively than earlier.

The DIY culture has led to free exchange of ideas among people around the world and the global nature of Internet makes it easier for like-minded people to connect across borders, thereby creating a space for innovative growth and personal development. In (Morin, 2013), the author discusses how communities like Etsy, Pinterest, Quirky, Kickstarter are enabling artisans around the world to share their ideas and build products giving people access to resources. Organization, libraries and museums, technology firms, small and large, are investing in DIY culture with the launch of maker garages like “GE Garages” or “Makerspaces” in libraries, where people learn and build prototypes. This has resulted in a flood of hobbyists making their mark as creators in the world inspiring thousands of others to make something themselves. This is just the beginning of the next revolution in learning. “It is a special time in history that will have a transformative impact on our future.” (Morin, 2013)

The Forge by Pillar has its own in-house chef who creates delicious meals, which is just the beginning of a unique culture that Pillar embraces. Artisans, Craftsmen, Ninjaneers, Delivery Leads, Apprentices, Vanguards – they have them all. Based on our initial meetings with Pillar Technology, we gathered that Pillar employees use the underutilized space for hobby projects. We learnt that certain times, employees go to the printer room (currently, the space houses printers and supplies) and work on their personal projects, if any. When asked why the space was left unused, we understood that there were plans of starting a Makerspace in 2014 and somehow the idea did not go through. This is something that we will investigate during our interviews. Since, creating a makerspace was something they had initially thought about, we would want to understand the reasons why the proposal did not go ahead. A makerspace within their creative office

space will be like icing on the cake, given their unique philosophy of creating digital experiences.

Makespaces, Maker Movement, Maker Faires, Maker Community

The Maker movement garnered tremendous attention when President Barack Obama hosted the first ever White House Maker Faire in 2014 (Office of the Press Secretary and launched the initiative "Nation of Makers" ("The Nation of Makers", n.d.), sparking interests in children and adults by giving them access to a range of technologies such as 3D printers, machine tools among others to design, create and build their ideas. Soon after Obama's address at the White House Maker Faire, optimism rose and the Maker community grew. American Society for Engineering Education hosted a Maker Summit (Gregory, 2015) later in November that year, bringing together maker enthusiasts who wanted to broaden learning in STEM fields.

While Makerspaces were not a new thing altogether ("More than just digital quilting", 2011), the president's address heightened curiosity once again and captured a lot more media attention. For instance, in 2012, The Defense Advanced Research Projects Agency (DARPA) awarded MAKE magazine for its efforts in establishing a worldwide community of good will, through its Manufacturing Experimentation and Outreach (MENTOR) initiative that is aimed at introducing new design tools and collaborative practices of making to high school students (Dougherty, 2012). Every year thousands of people throng the Maker Faires that happen in several cities around the world to see the creations of young inventors and innovators of tomorrow.

Maker movement is evolving in an age where everyone is leading individualistic way of life. The reason that it is gaining heightened momentum is because it brings like-minded people together fostering bonding and innovation. The Maker Movement emphasizes creative thinking and making, which have been innate human qualities right from the Stone Ages (Martinez and Stager, 2014).

Maker Communities and Resources

Pillar Technology has won multiple accolades in corporate innovation. Having visited their office space in Ann Arbor, I can say that it has a modern touch and feels like a

startup environment despite Pillar's existence for close to two decades. The Forge hosts a wide array of events and loves involving the community. Based on discussions with them and their social media presence, we observe that community activities are something very cultural at Pillar Technology. Winning Ann Arbor Tech Track's People's Choice Award, and the When Work Works, among several other awards shows that the community loves the events that Pillar Technology hosts. In fact, I have been a part of one of their Plugged In events. "Plugged In" is a series of talks that The Forge by Pillar Technology hosts, where the Craftsmen and Artisans talk about the latest trends in technology and their work. Other such events include Code Saturdays and Creative Collision events on Fridays where they actively engage with the community. As per their company blog, (Brace, 2016), "Each Friday features Creative Collision — a catered lunch and a chance to mingle with Pillar clients, staff and members of the local tech and innovation communities. We'd love to see you there." This demonstrates that they are enthusiastic to involve the community. Given the company's exuberant enthusiasm, investing in a makerspace will be a great way to utilize the space at The Forge.

Resources and competencies for Makerspaces

Today, an increasing number of transformative learning spaces termed as "Learning Labs" or "Makerspaces" have emerged around the world. These collaborative spaces are places where youth interact with their peers and mentors, have access to cutting edge technology and fabrication resources apart from a collaborative making space. Makerspaces offer a range of tools (Koh and Abbas, 2015) such as "Arduino, Raspberry Pi, power tools like sewing machine, drill, mechanical tools apart from digital fabrication technologies such as 3D printers and laser cutters". Some of the activities include hacking the programmable Arduinos, soldering, woodworking, tinkering wearable devices, Internet-of-Things (IoT) and working on long-term projects.

The study by Koh and Abbas (2015) identifies the top competencies that are necessary to run a Makerspace or Learning Lab include: "ability to learn, ability to adapt to changing situations, ability to collaborate, ability to advocate for the Makerspace, and ability to serve diverse people". Since Makerspaces foster a collaborative learning environment, diverse teams and cross-disciplinary projects become essential.

On the other hand, Martinez and Stager (2014) present a contrary view and discuss how Makerspaces should not be swanky places that are visited once a week but highlights how it should foster a learning, collaborative and inclusive inter-disciplinary environment, which is defined by people. Makerspaces ideally support a range of potential projects, diversity of activities, genders and learning styles. By embracing “an expansive view of technology, providing access to a variety of high and low tech construction materials and embracing choice in project selection”, Martinez and Stager (2014) believe that educators are encouraging a larger population to get involved with the community.

Infrastructure and Rules

When a collaborative space like a Makerspace has to be created, certain points have to be kept in mind to ensure there is proper supporting infrastructure. This means that the needs that the space will serve must be assessed to determine the facility requirements and location (Crumpton, 2015), which can hinder or assist the space. Given that the space is a constraint, appropriate steps must be taken to ensure that it is not a hindrance in case a lot of people use the space at the same time. The journal article (Crumpton, 2015) introduces the concepts of fines (with respect to libraries or publicly funded spaces) as “some of the legal and/or ethical issues that surround makerspace use within publicly funded institutions”. It also highlights how the libraries must have policies in place “to protect users’ intellectual freedom as well as addressing concerns over safety access, liability and legal use of equipment designated in makerspaces” (Crumpton, 2015). Drawing an analogy to this, given that the space will be used to engage with the community, certain policies must be in place to ensure no hassles. Additionally, a subscription or a membership model can be put in place, similar to the library model, in order to sustain the makerspace in the long run. Fees and funds become an important as “the use of technology, in particular, with makerspaces can be expensive”. (Crumpton, 2015)

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