New Spaces of Innovation

The emerging landscape of workspaces in the (omni)presence of technology

Faculty:

Laura Forlano

The Team:

Aashika Jain, Minji Kim, Priyanka Marawar, Keta Patel, Kunitake Saso, Paul Sheetz, Stefania Sini, Chia-ling Yu

Sponsored by:

Herman Miller Inc.

New Spaces of Innovation

The emerging landscape of workspaces in the (omni)presence of technology

Abstract

Work environments are changing. The Digital era has enabled new spaces of innovation. People are increasingly picking up on the notion of coworking spaces, but how do they fit within the greater context of the emerging work environment? Spaces that support hackers, coworkers, collaborators and incubators all fit within a similar network, especially within the modern city landscapes. As students of the IIT Institute of Design in Chicago, Illinois, we have begun to take a closer look at these new spaces of innovation to inform ways of thinking about the evolution of the workspace. Through this paper, we introduce, analyze and synthesize our data collected through primary and secondary research processes with the objective of forming a comprehensive understanding of the new forces at work.

Introduction

Digital technologies have enabled emergent forms of collaboration, organizing, and urbanism. Increasingly, work is project-based, virtual and embedded in complex socio-technical systems. In order to capitalize on these developments, cities around the world have heralded the economic potential of new spaces of innovation such as entrepreneurial incubators, innovation labs, media labs, living labs, coworking communities, and Hackerspaces. Throughout the Fall 2012 semester, our Networked Cities Workshop at the Institute of Design, of the Illinois Institute of Technology, attempted to better understand the emerging socio-technical practices by studying the people and technologies that inhabit these spaces in the city of Chicago and surrounding areas.

The class, taught by Professor Laura Forlano, was comprised of 10 multi-cultural students spanning countries of Korea, Japan, India, Peru, Italy, and the United States. We sought out local spaces within Chicago that fit the parameters of our research project and conducted ethnographic observations and comprehensive interviews at coworking, collaboration, and hackerspaces, and innovation spaces around the City of Chicago. Over an eight week period, the motivated students succeeded in immersing themselves into both the culture and physical environments in order to collect, analyze, and synthesize the rich findings. As a result, the class has developed several key themes congruent among the spaces, interesting stories, quotes, and design guidelines to consider for future development. The purpose of this paper is to present the composite knowledge as derived from the in-depth study of these spaces.
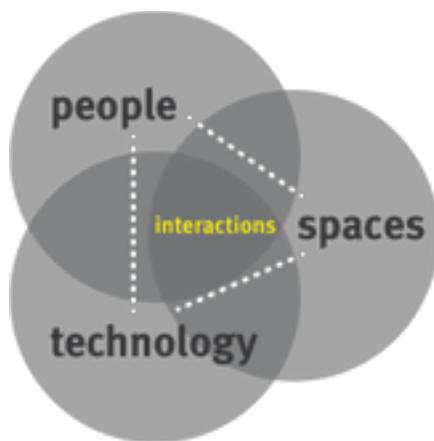
Background

The class looked at new environments of work that have thrived since the dawn of the century due to the affordances of ubiquitous computing increasingly being embedded in our immediate environment. With the shift from production economy to a knowledge-centred economy, space no longer dictates work. A new wave of mobile workers are emerging who consider *the office* as a state of mind; separate from the space itself. Jerry Kang and Dana Cuff's "Pervasive Computing" illustrated a world where internet and computing are embedded everywhere. It posted the conflict between privacy and public information, the blur between physical and virtual reality, the irony for sensing technologies that help peoples' lives and the danger of its intrusiveness.

Pervasive Computing is what enables the mobile and transient workforce. Workers are no longer confined to desk space with hard connections. Embedded and wireless technologies in physical spaces have given rise to a wide range of occupations and a new definition

of work. Ubiquitous computing has also allowed fast and transparent sharing and accessing of information, and in turn allowed these innovation spaces and practices to spread rapidly.

These new spaces we studied are based around this new value system and allow a conducive environment for this new culture to thrive. These spaces are an important marker of the evolution of workspaces and will inform design for the work environment of the future. From our study, we found that these environments fell in one of four categories of Coworking Spaces, Hackerspaces, In-house Innovation Labs and Design Consultancies.

We hypothesized that these environments are fundamentally different from *conventional offices* in the realms of physical structure and space; social interactions and culture of work; and in the way methods and tools are used for accomplishing tasks. Using the lens of Interactions, Spaces and People we explored these hypotheses to collate a body of research that expound upon our analysis of these realms. In Susan Leigh Star's "The Ethnography of Infrastructure", we learned that infrastructure could be relational and ecological. It must be studied in context with the things associated to its usage and be considered as an ecological system, identifying the integral parts and realizing the interconnectedness of the networked effects. Therefore, our study of innovation spaces is not be confined to the physical spaces themselves. The attributes of the environment that form the infrastructure for these innovation and collaboration spaces often depend upon the people that occupy these spaces. The ecology of these innovation spaces with its networked effects functions as a support system, with each space spreading its effects onto the local community, organizations, and global networks.

The focus of our research was interaction between people, technology and spaces

Methodologies

After a preliminary secondary research aimed at familiarizing the team with contextual background information, the nine-person research team focused mainly on gathering primary data through interviews and observations techniques to better understand each of the four categories of innovation spaces. Various primary research methods were used, from scheduled site observations, fly-on-the-wall, participatory studies, and culture probes to conducting ethnographic, structured, and casual interviews with participants in each space.

A total of twelve innovation sites around Chicago, IL were studied, resulting in over seventy hours of field research, thirty interviews and several field notes.

Co-working Spaces: 11 interviews

We visited *1871, COOP, Next Door, Enerspace, and Workspring* for site observations and conducted three structured interviews with *1871*, three with *COOP*, two with *Enerspace*, one with *Workspring*, and two casual interviews at *Next Door*.

Hackerspaces: 10 interviews

We visited the only hackerspace, *Pumping Station: One*, in Chicago, for site observation and conducted four structured interviews with *Pumping Station: One*, and five with a hackerspace in Milwaukee, *Milwaukee Makerspace*. One expert interview was conducted with a researcher participant who had done prior study with various hackerspaces in U.S.

In-house Innovation Labs: 2 interviews

We visited *McDonald's Innovation Center* for site observation and conducted one structured interview with *McDonalds Innovation Center* and one with *Whirlpool Innovation Center*.

Design Consultancies: 7 interviews

We visited *gravitytank, ideaMomentum and IDEO* for site observations and conducted six structured interviews with *gravitytank and one with ideaMomentum*.

Our research protocols aimed to understand the relationship between people, technology and spaces, specifically about participants' background, changes in their daily routines, over the project horizons, and their career aspirations. The Culture probes were developed to engage with the research participants and further understand their preferences toward work environment, daily routines and background. Our probes were deployed either with the participants directly or placed on site to have occupants of the space fill them out anonymously.

The structured interviews we conducted were mostly face-to-face interviews, some had to be done with Skype video and phone interviews due to distance and time constraints. One interview was conducted through email due to the unreliable signal of participant's internet connection.

In addition to interviews, we leveraged embodiment methods to empathize with the occupants of the space and experience what it was like to work in such environments. For example, few members of the team worked and held meetings at *Next Door* to personally experience the co-working environment. One researcher joined the *Pumping Station:One* hackerspace as a member for a month to immerse himself in the culture of the space, while the other researcher participated in a Halloween makeup class that was held at the same location to experience the community outreach aspect central to hackerspace.

Sites Overview

The following is a brief description of each of the spaces collated from analysis of observations and inputs from secondary data:

Coworking Spaces

Coworking spaces are shared workspaces where collaboration happens through cohabitation and sharing of physical space & resources for mutual benefit. Coworking is a self-directed, collaborative and flexible work style that is based on mutual trust and the sharing of common core objectives and values between members. As one of the research participants said it, "We are all in this together by ourselves." We understand that,

Coworking is a style of work by which the exchange of ideas and resources across multiple disciplines sustains the community.

Demographic Data:

Deskmag's *Global Coworking Survey 2012* estimates there are now 2,072 coworking spaces around the world. The average coworker is 34 years old, university-educated, and earns an average to above average income; males outnumber females two to one. While most individuals working at a coworking space still self-identify as freelancers (53%), other demographics are embracing the shared-workspace concept as well. The survey found that 14 percent of coworkers are entrepreneurs with employees of their own, while approximately 24 percent are employees of a company. Seventy-one percent of the survey's 2,007 respondents said their creativity had increased since joining, and 62% said their standard of work had improved *(source: http://www.slideshare.net/deskwanted/global-coworking-survey-2012)*

> *Characteristics of scale: One of our initial assumption was that the scale of the co-working space plays an inversely proportional role to collaboration. But our observations and findings turned out to be the opposite. Also, the Global survey done by DeskMag reports that on average, most coworkers meet at least three useful new acquaintances in the two months preceding the survey. Bigger coworking spaces seem to generate more inter-coworker acquaintances than small spaces.*

List of coworking spaces visited:

1871: What happens when venture capitalists, universities and 100+ entrepreneurs work together in a big space in the Merchandise Mart? You get 1871. Mix in an Intelligentsia coffee shop and you've got all the ingredients you need to kickstart whole bunch of startups. This place suddenly feels like the center of the Chicago tech startup universe. It's a versatile space on the 12th floor designed by Gensler to have plenty of conference rooms, classes, lecture, networking and an event space.

The COOP is a neat, modern, open space located in a River North loft building, downtown Chicago. Amenities include a spacious kitchen, wireless Internet, conference room with whiteboards, rental management on Desktime, and, oftentimes, an office dog named Eli. Open 24/7 every day except holidays, the COOP offers flexible hours and visiting frequency. Being near the Art Institute there are a lot of artists and designers that co-work here.

Enerspace is a coworking spot that was built to enhance wellness. Located in the West Loop of Chicago. The loft space includes a modern mix of brick walls, bright colors, and contemporary furniture with lots of natural lighting, optimized for health and fitness. Enerspace features a fitness studio, yoga classes, a spacious kitchen and showers.

NextDoor: Next Door Chicago is a new concept for State Farm Insurance that's a great example of social business in insurance. It differentiates the firm by interacting in the Social Channel by targeting the youth. Next Door offers free coworking space and wifi, classes on financial management that are free of product pitches, free events, free conference rooms and an energetic environment. The only thing not free there is the coffee.

Hackerspaces

Hackerspaces are community-operated physical places, where people can meet and work on their projects.(*Source: hackerspaces.org*) In other words, Hackerspaces can be viewed as open community labs incorporating elements of machine shops, workshops and/or studios where hackers can come together to share resources and knowledge to build and make things (*source: Saini, Angela. DIY Gadgetry. BBC News. June 19, 2009*). Hackerspaces are usually referred to as hacklabs, makerspaces or creative spaces.

We define Hackerspace as a community workspace which operates on the principles of shared facilities and tools among members.

Hackerspaces can be found that are involved with every technical niche you can imagine. However, there are some hackerspace types that are more common than others. Some common ones are computer technology, industrial art, robotics, and electronics based. These are generally non-profit spaces where members pay certain membership fee fo cover the operating expense., but some of them are for-profit.

Members**:** A hacker, in the original sense of the term is a person who takes things apart to learn about them, rebuild them and improve them (*Joseph Schlesinger, Md Monirul Islam, Kelly MacNeill, Founding a hackerspace, 2010*). Hackerspaces emphasize hacking is not cracking. They are not interested in to show off their skills for malicious or illegal means; they are focusing on sharing, developing creative ideas.

Hackers can be considered Lead Users. Von Hippel introduced term of 'Lead Users' in his article, Development of Products by Lead Users. Lead users are defined as users at the leading edge of an important market trends and so are trying to innovate the products by their inner motivation.

Activities: Hackerspaces are typically very social environments running several activities. Open Houses are events where hackers show off what they have been working on to the public. These events are critical to attract new members. Classes or workshops are held in which members learn skills taught by other members or people brought in. It is common to see members working together to build something. Fundraising is important as an activity that supplements the money collected through

membership to buy equipments and/or fund projects.

Demographics: Hackerspaces are located in many countries around the world; 1065 hackerspaces globally, 517 in US, 127 in Germany, 60 in U.K, 49 in France, 12 in China (*Sources: hackerspaces.org*) Due to the emergent nature of these spaces, there has not been a formal, comprehensive and reliable documentation of information about demographics of hackers. We can infer though, that the largest portion of the hackerspace demographic is people aged 20 - 40 years old, dominantly male. Educational background wise, most of them went to college. (*Source: Joseph Schlesinger, Md Monirul Islam, Kelly MacNeill, Founding a hackerspace, 2010 along with analysis from interviews and observations*)

Innovation labs

The need for being able to innovate constantly to survive and flourish in business has given rise to Innovation labs.

These are centres of innovation within organisations symbolic of everything that is new and progressive that guide the future path of the organization.

People from myriad disciplines inhabit and work towards a central cause that is specific to that organisation. As spaces that support pioneering work practices within an organization, they organically grow to take different forms and perform varied roles. For example in the case of Mcdonald's, the innovation center is intentionally kept isolated from their main office to ensure that the people who cohabit this space have a fresh perspective to innovate. The innovation center is a place for the privileged. Their belief is that the key to progress is achieving operational efficiency. The space epitomizes this belief.. A large flexible and modular prototyping space is the core of the space that transforms repeatedly with ease. It is used to prototype the innovations in operations of making and serving food by simulating 'real' market environments.

In contrast, the innovation space at Whirlpool is integrated in the core of the main office building. This contrast in view of the two corporates arise from Whirlpool's ideology that innovation should emanate through the entire organisation and be available to everyone. As stated "because they're buttoned up, laced up and kind of quiet, and we're a pretty loud and boisterous group of people…..What this does is, it really promotes the idea that innovation runs throughout Whirlpool Corporation, and it's something that everyone owns and is a part of."

Both these spaces exhibit more open ways of working with reducing the need to have fixed desks/cubicles for people which curb collaborative ways working. The effort is to create conducive, free flowing environments that nurture organic ways of working that foster creativity.

Design Consultancies

..offer professional creative expertise to other organizations that seek innovative solutions.

The nature of this space is often casual, flexible, multi-disciplinary and fast paced. The work is project based and team oriented, with little hierarchy and open communication. A design consultancy may have specific area of expertise such as product, communication and innovation strategy which it specializes in.

These spaces are open and flexible with large windows, movable partitions or semi-open walls, and writable/tack-able surfaces everywhere. Multi-disciplinary team members in research, design, and strategy work closely with each other in the defined project space. Gravitytank and IDEO use designated project "bays" and rooms and unlike admin and account employees, these transient project based workers often do not have individually assigned desks. Thus, individual privacy is hard to obtain. Design consultancies offer workarounds like personal lockers, phone booths, meditation and nursing rooms, etc to satisfy its workers' personal needs. Often, kitchen becomes multi-functional spaces where meetings are held, quiet head down work performed, project showcased, leisure, and workshop activities conducted. In addition, employees receive perks such as fully stocked kitchen with free beverages, food and snacks, lots of parties and celebrations. To keep employees invested with the company, design consultancies also focus on relationship building, letting its employees develop company initiatives and activities that are interest based.

Design consultancies also allow ample room for resources. It is common to have an open library, fully equipped shop for prototyping, audio room for video production and studio room for photo shoot. As with the case of gravitytank and IDEO, they even have separate client facing floor due to the nature of confidentiality in their projects works. With ample resources, IDEO Chicago turns their space into innovation incubator by offering knowledge and hosting an office space to worthy start-ups in the local community. Whereas gravitytank encourages its employees by giving them free time to work on self-initiated projects, such as Arduino, as a way to foster the hacking and incubating mentality in the constantly changing, open knowledge innovation realm.

Analysis

The in-depth research of these spaces of innovation was followed by a group analysis of most striking ideas and observations of all the spaces and corelations between them.

The following themes succinctly describe our analysis and elaborate our findings:

Themes:

Office is a Mindset:

A majority of co-working space are occupied by people who work in creative fields or run startups who need the work environment to drive their creative productivity. They prefer more flexible and customized work-style and they need not have fixed office. They tended to try to start from work at home, but found it difficult to continuously drive themselves inspired, so they tried to work in the inspirational place for them. Maggie (Partner at Gravity tank) mentioned that "I love working on airport lounge...It's quiet. I feel like I can get a lot or work done." Their basic mind set is that they can work wherever as long as there is a desk, chair, plug and WiFi.

Their key needs of frequent mode change can be achieved not only by changing the physical location but also customizing their environment they are working in daily basis, especially in coworking space. For Example at Nextdoor, all furniture is movable and built-in with caster. It even has movable cubic meeting space with curtain to create a private space. This allows users to use this space for both semi-open desk and closed meeting room. Another example is the use of headphone. Most workers in co-working space use this as a way of showing they are busy or in a 'private mode' and do not want to be disturbed. In another co-working space named COOP, Samantha mentioned that "there is a hidden rule that people do not talk to those who wear the headphone". Headphones allow a physical and mental affordance of switching from private to public. Another valuable affordance of these spaces is the change of mental modes. Samantha mentioned that "when she would like to get things done, she uses the COOP".

The kitchen and Café area are designed to be places of relaxation and allow casual socializing. The smell of coffee and food works as a switch to change their mental state. In COOP, there is a regular event called happy hour every Friday. This is a weekly socializing event aimed at creating bonding opportunities for coworkers. The organizer brings beer, introduces music into the space and tries to create an environment congenial for relaxed conversations. These events work to change modes from on to off for coworkers resulting in better new connections and productivity. Smell, taste and sound are the drivers of this switch of modes.

Dual Identity

With rise in new work cultures there is a noticeable increase in dualities of identities. Dual-identity defines the conflict of belongingness of the person to the organization they are working for. The emerging mobile work culture makes an individual think of whom they identify themselves with? And where they belong? We divided the dualities into following sub-categories:

- **Membership versus Employment**
- **Individual versus Community**
- **Hobby versus Profession**

Membership versus Employment

Working for a company within the coworking space projects an image of being serious and driven as an enterprize.. Anna, CEO of a web based startup company that guides a large network of women to nurture, mentor, and support their career goals to succeed said "We identify more with Career Girl than we probably do with 1871. It gives Career Girl credit and legitimacy to say that we are here. I have had people that I tried to get in touch with in silicon valley blow me off until they found out I was a member here and then they are excited to talk to us." Her motivation to join 1871 was that she wanted to take her company one step ahead by gaining technological knowledge from the other members. She considered other options like Panzanzee where the criteria for the members to join is to make sustainable social impact.

Joseph who works for a web-based startup company at 1871 since its inception believes that coworking has emerged from a simple idea: do what you want, with people you like and earn your living so. He opposes the hierarchical

structure of big organisation where he was given less freedom to experiment. He says, "People working here are willing to trade corporate salaries for small companies/startups because they allow you to have ownership, control and freedom."

Individual versus Community

Most coworkers at The Coop are individual workers, yet, there is a sense of community that exists in a the environment. Cindy, the chief Experience officer of The Coop says, "Coopers are all like my family; Ex-Coopers come to our events". Events and workshops planned by the administrators make sure that like-minded people with different skills and backgrounds meet regularly to co-create. Coworking is where everyone does their own thing in the same space until they do it together. Some members of co-working spaces specifically chose to be a part of a co-working community as this is the place where your social network is physical and real. The exchange of ideas and resources across multiple disciplines in these spaces sustain the community and stimulates the mutual growth of businesses.

Hobby versus Profession

These new spaces of innovation help people to pursue their hobbies and also turn them into profession sometimes. Sam from Pumping Station: One said, "I actually quit my full-time gig back August of last year. I am trying to go pro at this stuff... trying to create a company based on stuff I do here." At Hackerspaces most of the members who love tinkering have day jobs in other organizations. They visit the hackerspaces to create products they are passionate about which they don't get to explore while at their bread and butter jobs. The stark contrast of the hackerspaces being vacant in the mornings and filled up during the nights speak to this theme.

Permanently Beta

These spaces demonstrate a state of eternal change that helps the growth of ideas and the space through constant testing. These spaces serve as an avenue for one to find skills that one doesn't possess. Learning from others and benefiting from others' expertise helps the state of permanently beta. This idea ties to Richard Sennett who, in his work, "The Corrosion of Character[1]." explains that the baby-boomer and previous generations took considerable pride in their work. Dedicating the majority of their life to one steady career in order to provide for themselves and family. With this came a considerable sense of pride, community, and honor. However, in our newer age of work, many take on a different approach to their life-long careers. Instead, we are facing a newer work regiment where people move from position to position much more often in hopes to find more happiness and freedom.

Following are the few sub themes.
Growth through constant testing
In coworking spaces, the startups that cohabit this space grow through constant iterative testing. There are smaller coworking spaces and larger coworking spaces. People who work in smaller spaces slowly move into the larger coworking spaces. This

also marks an up in the seriousness or the growing state of their endeavor. Eg Scott moved from Coop (smaller coworking space) said "I personally feel like the Coop is a springboard to some place like this, a place like 1871." to 1871(larger coworking space) which made his endeavor more legitimate and serious in the eyes of the investors. A new worker like Scott whose project is at a nascent stage first finds place in the more open, **transient** space where the places are not assigned to anyone. Here through continual collaboration with the right people, the ideas grow and get tested. Slowly, this growing enterprise moves into the **native space** eg. Fish bowl in 1871. Here they have a designated desk with 6-8 seats each. There is gestation period for the startups within which they thrive or perish. Within that time if the enterprise grows beyond 4-6 people, Its time for them to move out of the coworking space into their private space.

Openness to feedback

Spaces are defined by its people. These spaces are a true embodiment of this thought. We see these spaces evolving by receiving constant feedback from its inhabitants. As Tania, the manager and facilitator of the NextDoor facility said, "We shared the ideas of the space with the lincoln park community to get their inputs". People find their own meaning in the resources provided to them. Some resources naturally run their course and devolve eventually. Example, the yoga space at Enerspace was designed with the intent of providing a work life balance but the space is not used as much, so it served other functions like being a photography studio when not in use. Matt, a coworker said in a very matter-of-fact way, "The yoga space is underutilised as a yoga space... other things like photography happen here".

Another example is that of Next-door in Lincoln Park Chicago. This is an experimental space designed by IDEO for State Farm where the objective is to interact with the youth community of Chicago and provide them with financial consulting. The ideas about this space are constantly being shared with the Lincoln Park community to suit their needs.

Constant flux in routine

The state of permanently beta requires these spaces to be open, flexible and unstructured. People can come and go at their will and sit anywhere they want. Samantha, from The Coop says, "[The] place for creativity is not in any office, this is a place of execution...this place is unstructured." There are no designated spots until one pays for a month or more and reserves a spot. The 'boss' is absent; one is responsible for his or her work. People can take initiative to help others with their projects. This flexibility allows for organic ways of working with creativity as a strong aspect that drives the work culture. When talking to a Anna, CEO of a web-based startup and Julie the chief editor of the company, they discussed amongst themselves with Anna saying to Julie,"Your day is more typical than mine..for me every day is different, which is why I like being here. This is not a static office. I can come and go whenever I want. We hang around here and there"

Mobility and space affordances

" This space can be lent out to anyone who would like to conduct workshops based on events. Most furniture is mobile here", says Tania. All coworking spaces provide with activities that expand the beyond the realm of work. They conduct workshops, talks from experts, wellness activities, community building, screen movies and games for its inhabitants. Hence these spaces need to have mobile elements that can transform the spaces repeatedly. The mobility provides the flexibility for the cohabitants

to make their own meaning of the space. For Example, at NextDoor all furniture is mobile. A space can transform from a conference room into a mini theatre into a yoga studio into a workshop site.

Semi-openness

The open layout and culture of these new spaces of innovation unveil a new kind of tension between 'the private' and 'the public'. from aspects of personal space and territory to issues of Intellectual Property; from the defiance of hierarchy and the emphasis of community spaces to the critical play of noise. The rules of engagement within these new spaces are aimed at supporting a culture of flux.

Coworking spaces are characterised by a vast expanse of open, empty spaces, laid out with desks and chairs. The openness of the environment encourages conversations and serendipity but also result in constant noise and the perception of intrusion of privacy. In order to deal with such constant and omnipresent noise, coworkers adopt an attitude to ignore noise. "Everyone pretends to not hear.", says Samantha from The Coop. Sometimes this is characterised by people wearing headphones as an explicit "Do Not Disturb" sign.

In order to deal with openness of the space, coworkers tend to create an illusion of privacy around them. Matt from Enerspace says, "This Space is too open for me. I try to find a corner spot.. I don't like sitting in the center of such a large open space". Using larger pieces of furniture and elements in the space, people carve a niche for themselves where they feel "settled" and removed from the constant flux of the immediate environment. In cases where people are unable to detach from the expanse, they place their paraphernalia as a means to mark personal territory and claim the space as theirs for the period of time they chose to occupy it. The effect of this territorial behaviour becomes apparent more so when new coworkers try to find a space on tables that have others sitting on them. In the same space, some desks are densely populated and see more flux than others which have had coworkers sitting on them for a long interval.

"This space has no hierarchy.. because tech-startups do not have great hierarchies.. and don't want to." -Julie
The core value system that these spaces are designed around emphasize the absence of hierarchy. The environments are built to encourage 'flat' organizations. The spaces do not have walls separating work areas and the cafe/kitchen are the most 'productive' zones of the space. In this environment, the CEO of a company works across the table from employees.

"This space is more social (than a home/private office). There are people you know peripherally.. I am not saying I am best friends with anyone here but its just nice to have people to say 'hello' to everyday" -Anna
Coworking lie between conventional private spaces like offices or home offices and conventional public spaces like coffee shops. They allow coworkers to inhabit the space for a long period of time and feel "settled" on the one hand and enable a social environment with an opportunity to meet new people like a coffee shop on the other. This environment is conducive for serendipitous encounters with people who may share interests with others or have complementary skills that others may require. Julie among other interview participants mentioned the importance of choosing the right coworking space for the

opportunity to run into people who may help her project. Anna says, "Panzanzee at first seemed like the right place for us as they promote social endeavours and everyone there is passionate about social impact for good but we realised that we needed people with technical expertise around us to help us out when we are stuck. So we chose 1871 and Neil here is always ready to help us whenever we run into trouble with technology."

Do-ocracy

A do-ocracy is a an organizational structure in which individuals choose roles and tasks for themselves and execute them accordingly. We found the concept of a do-ocracy largely present in the Hackerpaces and Makerspaces. They were all fully aware of this term, as it seemed to be coined by the Hackerspace community. Responsibilities attach to people who do the work, rather than elected or selected officials *(source:* http://www.communitywiki.org/DoOcracy*).*

The idea seemed to thrive in the local Pumping Station: One (PS1) Hackerspace. "If you want something done, just do it! Everything that you see was done by someone because they decided it was necessary and were proactive about it." Explained Darcy from PS1. She went on to explain a story about a unique mural on the back wall that embodies the idea of do-ocracy. Darcy explained that there was once a profane quote haphazardly spray-painted on the wall stating as Jim stated word-for-word in his interview, "Just F#cking Do It." One of the female members liked the concept, but not the manner in which it presented itself. One day, she decided to paint her own mural over top of the quote - an ironic do-ocratic embodiment of something she had always wanted to do. As a result, a beautiful mural of Rosie the Riveter now exists on the wall in replacement of the quote. The mural represents the quote, but is more pleasant to look at. Darcy reclaims how many members were somewhat upset at the mural initially, but after the member explained her position, they decided that is was better and agreed with the artist.

The Hackerspaces take much pride in this idea of taking things into your own hands, as opposed to simply talking about them. PS1 member Jim further explained the concept in his own words, "Because people like to talk about ideas and never actually get them done. It's very easy to fall into the trap of talking about how you would do a thing. It's a concept we refer to as 'Brain Crack'." Jim expressed the idea of brain crack as the ability for people to build up an idea in their own mind to such a level that it could never be fulfilled, and therefore they never actually attempt the task at hand. He explained how when people talk about their idea, they slowly refine it and perfect it over time. When it comes to doing something about the idea, since it is so hard to live up to their mental manifestation, they opt to not act. Leaving the rest of the members with nothing more than talk about how they could have done something, but never any action to back it up.

Do-ocracy is a term that lends itself to what Yochai Benkler refers to in the "Wealth of Networks". (*source: Benkler, Yochai. The Wealth of Networks: How social production transforms markets and freedom. Yale University Press. 2006*). In his writings, he analyzes how society used to exist in an 'Industrial Information Economy', where information, knowledge, and communication was centralized and proprietary. However, as we are now moving into an era he calls the 'Networked Information Economy', characterized by non-proprietary production and dissemination of knowledge and information. What this concept describes is the idea that within organizations, power and communication methods are more decentralized now than ever. Citizens are more able to decide what is important to them personally and take action. Do-ocracy is synonymous with Benkler's 'Networked

Information Economy' in the sense that members of Hackerspaces can decide amongst themselves what is necessary to perpetuate the growth of the organization, and take it upon themselves to achieve it, without need to consult any hierarchical system.

Self-motivated Learning

Self-motivated learning means learning driven by inner motivation; to improve oneself, explore interests, socialize and contribute to community. This theme ties to the idea of Transdisciplinary Learning. The ability to easily form new communities around topics is a key driver of transdisciplinarity - historically, "disciplines have been social as well as intellectual institutions. As author Howard Rheingold described it, "transdisciplinarity goes beyond bringing together researchers from different disciplines to work in multidisciplinary teams. It means educating researchers who can speak languages of multiple disciplines - biologists who have an understanding of mathematics, mathematicians who understand biology" This idea of learning from different perspectives is easily lived up to in hackerspaces as their important motto is idea sharing.

"I always leave with something new…either a new idea, a new perspective, a new skill set. I never leave feeling dumber." -Bill, Pumping Station: One.

Bill is graduated from Columbia College Chicago. He doesn't have a job now but his dream job is working in Fab lab. (Fab lab is public working space located in Museum of Science.) He volunteers there. He wants to leave with something new, a new idea, new perspective, new skill-set that he can utilize. As volunteering in Fab Lab, he sees people's eyes turn on and the gears in their heads turning, thinking of all the things they can do with the small tools that they've been given. He wants to inspire that in kids and adults. He has strong desire to improve himself and get multiple skills to inspire people with his idea. When we interviewed Bill, he was wearing a necklace consists of lots of badges that represent skills he got. Bill has been voluntarily holding Halloween make up class annually. He got the make up skill from his elective class in college. He charges only enough money to buy make up materials for the class. Bill is more interested in inspiring people with his capability.

Randy, one of founder of Milwaukee Makerspace says, "They're coming here to build the project knowing that there's people here that have the skills that can show them or help them". He gave us an interesting story. Andrew Nelson wanted an electric car but he had absolutely no clue about cars or electrics. He learned everything from sharing and looking it up, talking to members, coming and participating. And in less than a year, he had built himself an electric car. He's really proud of his electric car and built an electric motorcycle also. Randy said, a guy with no skills, that just wanted to build this project, developed all sorts of skills, and he's able to keep doing more projects.

Ellie majored theatre design and technology but she is now working on board game retail store. She doesn't have strong knowledge of crafting or technology like programming. Rather, she enjoys logistical problem solving. Her inspiration is to accomplish a goal, solve a problem, and create something that has utility. The reason she joined makerspace is that it sounded there would be creative people working on projects, information and she could learn new things. She enjoys being able to just talk to people and have them being able to listen to her ideas and appreciate her input. She says, "I mostly like to just talk to people and offer ideas and examine the logistics.". Her dream job is not working on retail store. She wants to go back to theatre industry like theme part and utilize her logistics and organizing skill. She wants improve her and get new knowledge by talking

to smart and creative people.

Symbiotic Relationships

The theme of Symbiotic Relationships was derived from the key commonality between these innovation spaces, which is mutual benefit through sharing. It links strongly to the current state of social value, networked and knowledge economy. Symbiotic Relationship can also be seen as a movement toward mentoring, apprenticeship and bartering society.

"When I first started at the makerspace, I couldn't afford to properly join. Instead, I showed up to the meetings and helped however I could... Ultimately, those kind souls took up a collection among the members and sponsored me for six months" - Kane, Milwaukee Makerspace

Kane couldn't afford the membership fee of Milwaukee Makerspace, so he would show up to the public meetings at first and did whatever he could to help the Milwaukee Makerspace. Things like designing a poster, organizing and making small things for the space. Through doing these things, he also learned how to use the machines. Eventually, members took him under their wings and sponsored him for six months so that he can concentrate on working his projects full time there. Now Kane helps members with their individual projects, turning sketches into digital files, 3D modeling. He also train members on using various machines and hold workshop classes to public, doing as much teaching as making, and this is his way of giving back to the generosity of members that sponsored him.

"The fellowship program is a way to bring new talent into the organization that didn't necessarily fit in any of those buckets" - April, gravitytank

The fellowship program is set up in a way for all fellows to learn all the different disciplines. It is a way for gravitytank to hire potential talents with diverse background. April served in a support role and rotated around design, strategy and research disciplines. Coming in at such a junior role, everyone took her under their wings and she learned a lot more. Working on various projects, she had wide exposure to different mix of people and opportunities. At end of her fellowship, she got offered an associate position on the research team and decided to quit her PhD program. As April puts it,"I quit my PhD program, because it was just like, I love work. I'm paying money to go learn over there, and I'm getting paid money over here to learn way more, and so, yeah, so I quit the program. I've been on the research team ever since."

"We want to start doing some Arduino hacking, and we don't have a project right now that needs that. But we can get together that time on Monday's and just talk about different experiments, and run our own stuff that has nothing to do with client works." - April, gravitytank

At gravitytank, every Monday between 11am to noon is employees' free time to do whatever they please. Even though these interest based projects may not be linked to current work directly, they encourage employees to incubate ideas and these new gain knowledge and expertise may come in handy in the future. By fostering and nurturing employees' interests, gravitytank promoted an environment of interest based group learning, and enabled freedom for them to explore and prototype.

Design Guidelines

Through the above themes, we identified the key characteristics of these spaces, the affordances that lead to the characteristics and the constraints that arise from the tensions between these characteristics. The exploration of these themes have allowed us to synthesize key Guidelines that should direct design for these spaces. Following are the key Design Guidelines for every theme:

Office is a Mindset

How might we enable people to smoothly transition between mental modes from on to off, and from public to private by this office is a mind-set principle?
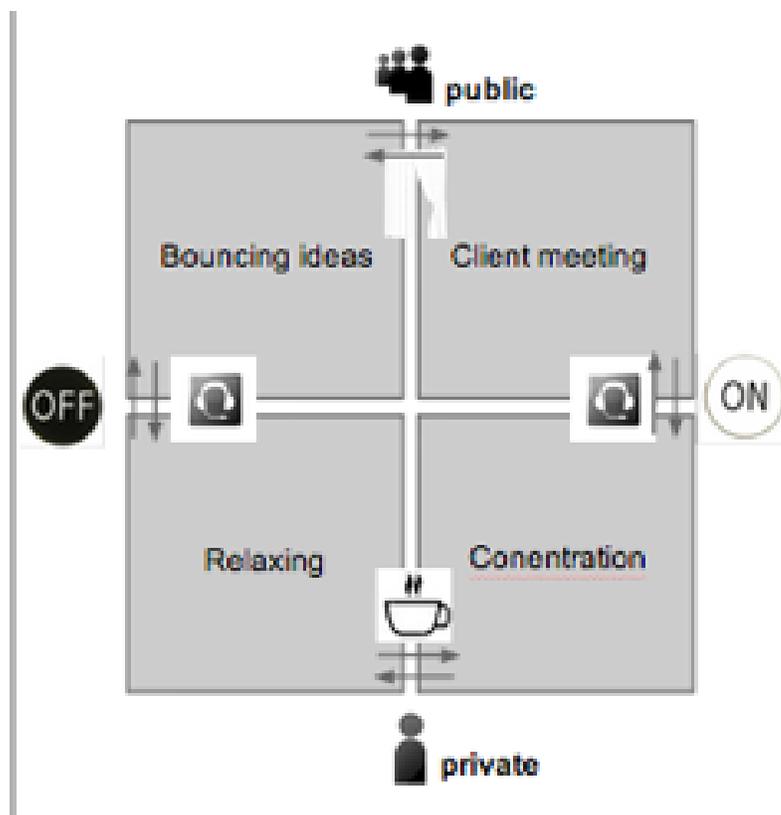

Using the 2 by 2 matrix, we can explore the spectrums of Public and Private by switching modes from ON to OFF

The major Design Principles to keep in mind for designing around this theme are the following:

Identify and control the mood and motivation

Flexible transition from On/Off, Private/Public by using affordances:

visibility lighting   Sound music   aroma   Food Drink
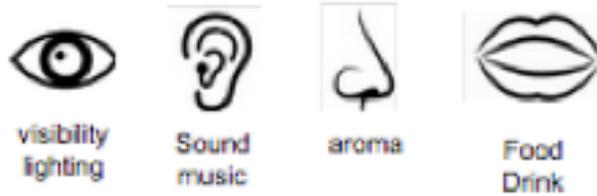
Quickly able to change the mood

Dual Identity

How might we support/enable the display of multiple identities in a digital era? How might we design a space that facilitates the understanding of social roles?

From our observations of these new innovation workspaces we created new user profiles who play a particular social role in the space:

The Node: The user type that falls under this category are mostly the central nodes of the social network. We have observed that often the administrators or the staff of these new workspaces play this role. In this sense, an entire community can be a network, and each member within that network can have their own networks that extend beyond the co-working space boundaries. It is possible in this way to grow increasingly complex, networked communities, where each individual has access to expertise that they share with others.

The Expert: The users who play the role of an expert are not just excelling in their field but also the ones who conduct seminars and workshops on their own initiatives to help the community.
There seems to emerge this sense of giving back to the community that is helping your business grow.

The Learner:
In networked ecologies, it is incumbent on each learner to create their own ecosystem of nested relationships where circles of exchange can take place. Most of the members fall under this category as reskilling is one of the biggest factors that drive them to these innovation spaces.

These social roles will be the driver for design around the theme of Dual Identity for new spaces of innovation.

Permanently Beta

How might we support the culture of constant testing of ideas and integrating feedback?

Semi-openness

How might we support a culture of open environments without compromising on personal space?

Do-ocracy

How might we facilitate collective ownership of a space or organization; a feeling of responsibility?

Self-motivated learning

How might we encourage re-skilling, broadening of knowledge-base, and getting motivation continuously?

Self-motivated Learning in the spaces we studied were mainly one of these four kinds

Given the four types of motivation of self-learning, we can think about people's motivation type before we think about the desired surroundings or stimulants for learning.

Symbiotic Relationships

How might we encourage altruistic tendencies between people to build stronger, symbiotic relationships?

Design Principles:

Define mentoring relationships: identify mentor and mentee relationships that are beneficial for both parties.

Exchange bartering opportunities: trade expertise and skill set without monetary involvement. However, it must be done at equal level to sustain the symbiotic relationship.

Pass down garnered knowledges: knowledge transfer in a company, from veteran, nar retiring employee to new, incoming employee, an apprenticeship style that value the master.

Identify interest based initiatives: empower employees with freedom to invest in self-interested projects. In a long run, company benefits from broaden, diverse range of knowledge and royal employees.

Foster mutually beneficial goals: align individual and company goals to permeate a culture of symbiosis within the company.

Threats, Limitations, Opportunities & Future Directions

The questions to ask now are- How might local manufacturing threaten existing practices of design? What would have been done differently if the change was re-initiated or revised? What are some of the positive outcomes of the emergence of these spaces? The established manufacturing system needs to consider emerging practices of design, which involve novel working styles as well as novel way of production/fabrication.

Coworking spaces constitute an increasing example of peer collaboration, allowing members to improve their own projects through skills and expertise deployed by other members. Furthermore, they are a platform nurturing the proliferation of innovation and creativity, based on self-motivation and collaboration: startups are prevalent among other form of businesses.

Hackerspaces represent a bottom up mode of production, whose philosophy is based on openness, open source and resources sharing . Hackers, thinkers , tinkerers, makers are organized into local community, providing the access to machines and computing skills and facilitating the creation of local networks around shared resources and interests.

Limitation and possible threats are represented by ownership. New spaces of innovation promote free-flow of expertise exchange, sharing of knowledge and resource as well as as open source and crowdsourcing philosophy. Credibility and reputation may constitute a new mode to guarantee integrity, allowing transparency in source recognition, without limiting openness and information exchange.

Coworking and Hackerspaces enable collaboration and satisfy the necessity of individuals to structure their work and discipline themselves. People being part of these spaces can easily enter in an "on work" mode that is magically made possible by the productive atmosphere. Another opportunity inspiring future directions can be seen in the broad variety of hackers and co-workers skills, whose influence on each others allow re-skilling and the hybridisation of professions and hobbies skills.

Looking back, we will now provide a brief critique on what we thought worked well and what we think could be improved for future research in this area. First and foremost, our teams experienced great success in the qualitative interview process. In the short time we had, we were able to conduct lengthy interviews with key individuals in the different spaces. Through audio recording, photographing, and note-taking we were able to extract critical information that was later used in our analysis and synthesis phase. In combination with our secondary research readings, we were able to obtain a comprehensive understanding of the communities of focus in the short time frame. We also feel that the workshops and presentations forced us to further develop our ideas and communicate them effectively.

Inversely, the team thought that we could improve on our analyzation process. Due to the time constraints, we believe that there is still some great information that can be brought out of the ample data we collected. The interviews and observations can be further analyzed in order to draw out perhaps more themes and design guidelines. Overall however, we were pleased with our hard work and dedication to the research throughout the project, and look forward to delivering the information for others to use.