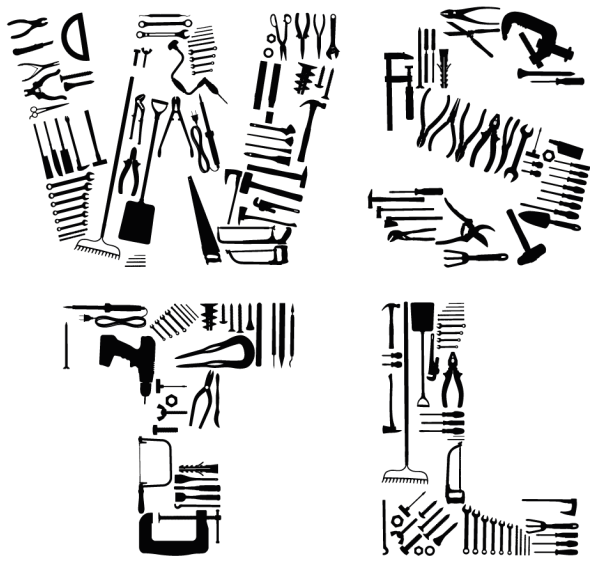

West Seattle Tool Library's Issues of Scale

HCDE Human Centered Design & Engineering

UNIVERSITY of WASHINGTON

West Seattle Tool Library's Issues of Scale

How the West Seattle Tool Library Deals with Issues of Scale

Technical Report

Ahmer Arif
Andrew Neang
Lucas Colusso
Margaret Young

Professor Charlotte Lee

1. Introduction

Non-profit organizations operate with limited or infrequent funding and personnel. As these organizations encounter increasing demand for their services, they face constraints that require them to creatively adapt their work practices in the short term, through forms of contingent action. In the long term, it is necessary for organizations to adapt and re-articulate their practices. Our research team conducted fieldwork in the West Seattle Tool Library (WSTL) from April to June 2015. A tool library functions much like a traditional book library, lending out tools and equipment to patrons. Tool lending libraries like the West Seattle Tool Library (WSTL) offer users access to a wide variety of tools, training and advice free of charge, as a form of community sharing. Through our fieldwork, we asked, "How does the core team of the WSTL manage its inventory, labor and finances in the face of increasing demand?" Our findings surfaced the strategies used by a small non-profit as it responds to membership growth and increasing demand on its resources.

We observed the existing practices at the WSTL through participant observation. This aspect of the work helped us to understand the policies that the WSTL currently has in place, the ways in which these plans and processes are followed, and when and how forms of contingent action arise. We interviewed respondents within the core team, as well as other actors supporting the tool library (like volunteers and board members) to better understand the ways that the organization arrived at its set of existing practices, and how aligned respondents are for how practices should be re-articulated in the face of increasing demand. Using a grounded theory-inspired approach, our analysis helped us understand the relationship of human and non-human factors to the way the core team manages its processes.

Our study of existing and proposed practices builds on previous literatures on 'articulation work:' the processes by which people in organizations plan their practices, and depart from these plans. Our analysis substantiates previous work on how people in organizations align and incrementally realign in the articulation of future plans. First, we found ingenuity in the ways that members of the core team manage their resources when they cannot adhere to planned practices. Second, we found that respondents held different 'stances' about which processes WSTL should adopt going into the future.

Our analysis surfaced important insights for the ways nonprofits respond to increasing demand given fixed resources. We discuss the factors that precipitated the WSTL's current processes, and the forms of ingenuity exhibited by the organization's core team when they must depart from these practices. Some factors in particular played a role in the organization of current practices, like constraints on time and space. Our findings are divided into two parts, (1) the organization's existing practices, and (2) new strategies that respondents cited but have not yet been instantiated, in part because respondents have not reached alignment on what strategies would be best.

Our study of existing practices also revealed a set of design implications latent in the ways respondents imagined re-articulated practices. These design principles can further leverage successful strategies, and mitigate observed and reported frictions. Existing practices and suggested practices informed this aspect of our analysis. For example, the core team already leverages members of the member community to help with tool labeling, organization and repair. However, some tasks require a high-initial time investment to learn, like the inventory system. Our design implications surface ways that processes, like the inventory system, could be made more accessible to newcomers as 'micro-tasks' as well as designing for systems to promote social-nudging and system integration.

Through a theoretical explication of this empirical work, we explore the ways that WSTL as an organization manages its resources in the face of increasing demand. The organization has articulated its work processes under a set of material constraints, which they are constantly innovating around. Through re-articulating its work practices and design, the WSTL is already coming to do 'do more' with fixed resources.

2. Literature Review

Organizations are developed to solve problems of collective action, and above all the cooperation for the production of some collective good by relatively autonomous, albeit organized, social workers (Gasser, 1986). Articulation work is a seminal theoretical framing which examines the "effort required to keep actors aligned with actors, actions aligned with actors, actions aligned with actors" as actors in organizations establish, follow (and depart) from tasks as planned (Thayer 2013). Seminal work by Gasser, Star, Corbin, and Strauss (1984, 1985, 1988, 1987, 1991, 1993) parse the different levels of articulation work, from high-level course-setting, to administrative/support work, to day-to-day task sequencing. Articulation has been theorized across more contexts, and in more forms than we outline here. Here, we focus on four strands within previous work on articulation which are most pertinent to our field site.

Material constraints. Some work in this space foregrounds the role of material constraints on practices. Non-human factors, like the constraints of a space or a digital system, are latent in foundational texts about articulation work, and foregrounded more in other texts. Other non-human elements can play a constitutive role; Steinhardt and Jackson (2014) discuss the role of time rhythms in the planning and enactment of plans in an organization. Boden et al. (2008) try to formalize an account of the role of space in coordinating action. Gerson (2008) speaks to a sense that material constraints on work are changing in his discussion of the 'reach' of a task, in the way digitization removes some frictions posed by space and time.

Contingencies. Articulation work accounts for circumstances under which actors depart from formal plans. Many of these contingencies occur often and are routine (Gerson 2008). In addition to planned arrangements, Gerson and Star (1986) draw attention to "ongoing adjustment of action" in the face of unforeseen circumstances. Suchman (1987) asserts that these *ad hoc* practices are more salient than plans, and are fundamentally tied to the contexts they are situated within.

Scaffolding. Previous work discusses the way that articulation work compounds with the number of contributors. "Collaborative activities necessitate greater amounts of articulation work because more actors are performing a greater variety of actions. ...system users perform a great deal of articulation work just to make

collaboration possible" (Thayer 2013). While few workers in a non-profit would ostensibly want more workers to volunteer with them, this aspect of articulation work surfaces the extra work necessary to scaffold additional contributions.

Alignment and re-alignment. Articulation work constantly requires alignment between workers, or between a worker and related tasks (Corbin & Strauss 1988). Gerson (2008) makes a distinction between this type of day-to-day process, *local articulation work*, and the *metawork* integrating them. Thayer (2013) expands the idea of metawork to describe "the negotiative effort that occurs on collaborative projects when actors discuss how project resources should be aligned across activities" (emphasis added). Re-articulating these arrangements requires a *working out process* to align differently-situated actors and their *stances* (Corbin & Strauss 1993, Bardram & Hansen 2010). Alignment can be negatively impacted by ideological or status differences (Strauss 1988). A lack of alignment between workers can disrupt the re-articulation of the project, because articulation work is distributed more or less amongst actors (Gerson 2008, Star 1986).

As we discuss in the next section, these four strands figure prominently in our findings: (1) material constraints, (2) contingencies, (3) scaffolding and (4) alignment and re-alignment. We were interested in how WSTL manages its inventory, labor and resources in the face of increasing demand. Material constraints, contingency and prep work play a large role in shaping their existing practices. In response to increased pressures on these resources, our respondents are currently engaged in planning for the future, for which we observed different stances between actors in the organization.

3. Site description and methods

Our field site was the West Seattle Tool Library in Seattle, WA. An outgrowth of a citizen-run urban sustainability initiative called Sustainable West Seattle (SWS), the WSTL officially opened its doors in June 2010. True to these roots, the library bills itself as "a community-led project to provide pay-what-you-can community access to a wide range of tools, training, and relevant advice. By providing this service, the West Seattle Tool Library aims to inspire its community to participate in community projects, such as park restorations, and pursue sustainability through fun projects like backyard gardens, home energy improvements, and water harvesting"[1]. Situated in the rear section of the Youngstown Cultural Arts Center – a large red brick building which lies adjacent to a vibrant public park and residential zone, the WSTL is now one of the largest tool libraries in the state of Washington, having grown to house over 2,500 tools and a burgeoning membership base of over 2,275 members. With over 600 of those members joining in 2014 alone, the WSTL is experiencing growth rates that fall around 25-27% annually.

[1] http://wstoollibrary.org/about_tl/

Figure 1. The self-repair manifesto poster, fixed in the TL's front door.

The front doors of the library are marked with a poster that draws upon iconic imagery associated with worker solidarity movements to lay down a "Self Repair Manifesto" which aligns itself with ideas of open-access, sharing economies and anti-consumerism. Membership is open to anyone above eighteen years of age and joining the tool library or remaining affiliated with it carries no mandatory fees. These members are allowed to borrow — for traditionally up to 1 week without renewal — tools ranging from simple hammers and screwdrivers to more expensive or esoteric equipment such as power-saws and cider presses. They can also (for a nominal fee) make use of the tool library's garage-style workshop space for their own projects where staff members provide an environment of well-maintained tools and expert guidance. The library's tools are largely based off refurbished or repaired tools that were donated to the library or otherwise discarded.

The library's vast inventory of tools is arrayed along a multitude of wall-mounts, racks, storage boxes, adjustable shelves, cabinets and rolling trolleys which are dispersed among the tool library, the larger workshop area which is adjacent to it and a communal storage space towards the rear of the building. Although individual tools do not have an assigned place (AA-I-2-429:430), each category and type of tool does appear to have an approximately designated position within the space. A rich combination of offline information artifacts such as color-coded tags and zip-ties along with digital tools, such as an online lending management system called MyTurn, that was developed by a founding member, helps the staff stay up to date on the maintenance status and rental transactions of these tools.

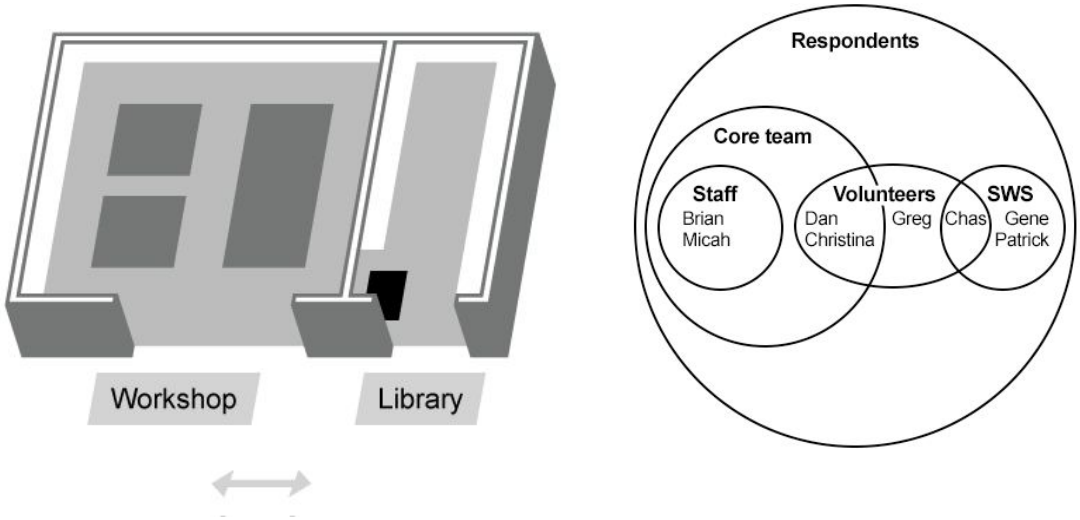

Figure 2. Left- Diagram of the space. The black locale is where staff operates MyTurn and other online systems. That is also the region where members request tools or drop off items. Right- Roles our research respondents hold in the context of the WSTL.

We observed staff, volunteers and members at the WSTL for around 75 hours across six weeks through qualitative fieldwork centered on the day-to-day operations at the library. These ordinary operations are effectively managed by a core staff of 4 individuals: Brian (the full-time assistant manager), Christina (a founding member and unpaid part-time volunteer), Dan (an unpaid part-time volunteer who helps run the workshop space) and Micah (founder and part-time manager). Partially due to the limited amount of full-time labor, the tool library is only open from 11 AM to 4 PM on Saturdays and Sundays whilst being otherwise closed except from 5 to 8 PM on Tuesdays and Thursdays. As a result, the majority of our observations fell around weekends when activity is purportedly high

(LC-FN-2-13:14). Board members and founding members from Sustainable West Seattle also provide the tool library with logistical support in terms of helping with technology, accounting, marketing and events organization. To supplement our data with respect to these aspects of the tool library's functions we conducted additional observations of community events held by the tool library as well as board meetings. To garner additional insights and to triangulate our field observations, we also conducted 8 individual semi-structured interviews of the core staff, volunteers and founding board members of the library.

For analysis, we used a grounded theory approach where we carried out open coding on our observation data followed by axial coding. Codes covered five major areas: Information practices (such as offline information practices); managerial concerns (such as finance and organization of space); growth and outreach (such as onboarding of new members and volunteers); tool handling (such as how overdue or damaged tools were being dealt with) and time rhythms (such as anticipated or observed demand). Reflection upon emergent findings from our observations guided the development of our interview protocol and we conducted the interviews towards the end of the study. The protocol, which prompted participants to reflect upon the topics of constraints, reprioritization and shifting practices in relation to membership growth, produced interviews that averaged 70 minutes in duration.

All interviews were audio-recorded, transcribed, and coded with the same coding scheme used for observation data. While our observations captured researcher interpretations of activities and interactions that took place around the tool library, our interviews captured participant reflections on those same activities. Thus, coding the two data sources allowed us to relate multiple perspectives on the same set of activities. Iterative analysis helped us to establish the ways the interrelationship of these factors, and how they bear on the way the organization is managing its inventory, labor and financial resources.

4. Findings and Analysis

This work explores the organization of work at the West Seattle Tool Library (WSTL), a non-profit organization established in 2009. A tool library is an organization that accepts donated tools and lends them out to members. As is the case in many non-profit organizations, the core team of people who work to support the WSTL operate on fixed resources. Between fieldwork conducted between April - June 2015, the WSTL was facing increasing demand from members for tools.

Our analysis found ingenuity with respect to the practices that the core team of the WSTL use to manage inventory, labor and finances given increasing demand. We outline the existing work processes in the organization, their contingent practices when plans are not sufficient, and different ideas for re-organizing processes in the future. We examine the role of non-human factors in shaping and constraining the way the core team manages their work processes, like space, labor, and financial resources. We also found different suggestions for future planning depending on the situated perspective of different respondents, whether they were members of the core team, members of the board, occasional volunteers. At the time of fieldwork, respondents had not yet reached alignment with respect to future plans on how to manage resources. This work substantiates previous work on the incremental alignment and realignment necessary for differently situated actors in the articulation of future plans.

Analytical dimensions of resources management

The core team has explored new strategies for managing their resources. In this section, we outline suggested improvements to information practices in the tool library. We also explain the rationale that some respondents cited for adopting these practices, and the differences in opinion or other constraints that have led to these ideas not having been adopted to date.

Labor

Full-time personnel are in short supply at the WSTL and the existing staff are in the position of having to do more with a fixed supply. There is one core staff member, Brian, who is paid to be present during the library's operating

hours (MY-I-1-402:403). Other core personnel in the tool library are not paid unless they are filling in for Brian during these hours, on the occasions that he is away or has a day off. Besides Brian, there are two members of the core team who volunteer their time most often, Micah and Dan. We observed that volunteers most often assisted with the work necessary to facilitate the operations of the tool library, but were less often involved in speaking with and helping members of the tool library. We demarcate this distinction as one between 'support work' and 'member-facing work.'

The first strategy that the core team uses to help with rising demand is the division of labor. While both 'support work' and 'member facing work' overlap in terms of necessary capacities, the latter requires more experience. Member-facing work encompasses the following set of activities: (1) project consultation, for which the member is asked about the details of their project. (2) Tool matching, by which the staff person arrives on specifications for the needed tool (AN-I-1-65:69). This activity is closely related to (3) tool availability, which requires familiarity with the library's current collection. (4) Tool search, wherein the personnel needs to know where in the space to locate the tool. After locating the tool, the core team provides (5) tool training on proper use of the tool. We discuss training further in a later section. Finally, the tool is (6) checked-out[2] (eg. AA-FN-2-32:34), which requires familiarity with the use of the MyTurn inventory system. We observed that the more experienced personnel tended to conduct member-facing activities such as the handling of donations (AN-FN-2-267:269)

As part of this strategic division of labor, the core team delegates tasks to less experienced volunteers that do not require as much familiarity with tool use in general; the library's collection; or are less time-confined tasks. This 'support work' most commonly includes the following activities: (1) inputting tools into the inventory system, (2) assessing donated tools, (3) repairing tools to get them ready for checkout. Volunteers also conduct other activities less often, for example (4) clearing out the storage space (AA-FN-4-75-76). While this division of labor is analytically useful for considering the way that tasks are delegated in the space, the staff members and more experienced personnel conduct a large portion of the support-work as well when they have time slots available. This flexibility on the part of the core team to step into whatever role is needed has played a large role in the continued operations of the tool library.

[2] Tools are also checked-in; check-in is less time intensive because it does not require member look-up.

The second strategy that the core team has relied on to demand response is overtime commitment. Staff are paid hourly for the formal hours of operation. However, existing staff contribute many unpaid hours outside of normal business hours — often joined by 1-2 assistive core team members. These members connected their extra work to their pride in the library and their desire to see it succeed (AA-I-1-489:494, LC-I-2-314:330). Rising demand has increased the proportion of time that the staff person dedicates to member-facing work during business hours. However, support work (like repairing tools) is no less important to the continued operations of the tool library. Seasonal demand for tools (e.g. lawnmowers, weed whackers) means that some tools are used more, in need of repair more often, and in need of re-circulation more quickly than others in the collection (AN-FN-1-38:41). One of the biggest distinctions between member-facing and support-work, is that to answer members, staff needs to stop whatever other tasks immediately.

Inventory

The core team has also developed a set of strategies for managing inventory in the space. Inventory management is made of the following practices (1) testing donated tools (2) entering donated tools into the system (3) organizing tools in the space (LC-FN-2-99:103; AA-FN-2-57:61; AA-FN-4-52:56). The core team has successfully made it possible for anyone to test the 'readiness' of a tool for checkout by use of a tagging system. Tools are given a color-coded tag, which designates whether they are brand new tested and working donations (green), new untested donations (blue), in need of regular maintenance (yellow), or out of service (red) (AA-FN-1-65:69).

As more tools are donated, it can be difficult for the core team to enter all of them into the inventory. Each tool has an entry in the MyTurn inventory software. To create a new entry in the system, the software creates a new entry page which must be populated with the name, model number, serial number, and image of the tool; overall this takes 3-4 minutes (AN-FN-4-149:155). We observed that the core team places a higher emphasis on serving its members than it does on correcting the inventory system. If a member requests a tool that has not been entered into the system yet, the core team will lend it out without entering it into the system (AA-FN-4-59:61). Instead of the 3-4 minute process, it takes only a few seconds to write WSTL on the tool in black Sharpie. Here, we see how the core team's non-adherence to formal processes can be deliberate . Members of the core team have their own heuristic for

assessing whether to take the time to enter a tool into the system, but we observed that are less likely to be entered into the system when a queue is forming, or when the tool is inexpensive (AN-FN-4-149:152,).

Volunteers are given opportunities to help enter tools into the inventory system. The core team places new tools into a bin near the computer, so that anyone familiar with the inventory system can address the backlog of tools needing to be entered (LC-I-2-318:323). Two monthly events in particular, Volunteer Night and the Fixers' Collective, attract more volunteers than usual; usually these are experienced volunteers who take time to enter tools into the catalog. We observed that offline information practices like the new-tool bin are part of a set of non-digital information practices that help to communicate needs between personnel.

Other kinds of information in the space are not externalized into information systems (like the tagging system or the bin). Instead, it is in the form of 'head knowledge,' information about the space, inventory, and current state of tools that the most integral members hold as a result of their regular presence in the space. (AN-I-1-864:867,869:879; AA-I-1-423:425) 'Head knowledge' is meaningfully different from expertise with using tools-- rather, it is knowledge about particular tools, where they are placed, whether they are in working order, where they belong in the space, or what needs to happen to them. Integral members' regular attendance in the space allows them to draw on head knowledge to be more efficient; for example, when a member comes in looking for a certain type of tool, the staff usually knows whether a tool is available or not without looking at the inventory. When the core team does document this type of information, we call this 'externalizing head knowledge,' which allows those who are not as integral to the functioning of the space to walk in and help with tool repair, or putting tools back where they belong.

Onboarding and Training

Training membership on the use of the tools is an important part of 'member-facing work'. It is a primary reason requiring those staffing the tool library to have enough experience using the tools to provide consultation and safety advice to those checking out the tools (AN-FN-1-108:114). At this time, the training is provided in-person, to each member who comes in. This training focuses on ensuring member safety (AA-FN-2:183) and avoiding damage to the tools due to misuse (AA-FN-2-226:228) which is a serious concern in cases such as when staff noted how members often try to use axes as hammers. This can damage the tools and extend the time it takes to repair them

(AN-FN-2-175:178). One volunteer who sometimes staffs the tool library, Christina, reported that there are times that she does not have enough expertise to assist members (MY-FN-3-311:316). Training volunteers is also an important need at the library, which we discuss in the next section.

Building membership, building volunteership

The tool library constantly brings new members in while also searching for new volunteers to keep up with demand. There were many experiments and strategies designed for member attraction, because those are the moments when they are able to connect to the community. Evidently, the first thing the tool library had to understand and establish was a comprehensible and accessible schedule for their open hours (LC-I-2-35:45) and also the periodicity of their public outreach events. These two strategies are designed to connect with new and existing members. One might understand them as a clear practice of the "foot in the door" technique — once someone decides to become a member, they have to fill out a form, where they can check boxes expressing interest in becoming a volunteer (LC-I-2-81:85). Usually identifying people interested in volunteering is not an issue, but after that they need to be onboarded and trained. The core staff or experienced volunteers are in charge of that process. Yet all too often, staff spend long hours recruiting and training volunteers, only to have them leave after a few shifts (AA-FN-4-75:83). Sometimes, core staff had to evaluate the less familiar volunteers and put a lot of time to train them to do something that would have taken them far less time to do themselves, only to have the volunteer never show up again. This is described as a frustrating experience for the WSTL. (AN-I-1-324:329; AA-I-1-43:44)

The tool library's core team is working harder to face increasing demand and would benefit from assistance. As previously mentioned, the core team is working unpaid hours outside of normal hours of operation. However, it is not enough to have more volunteers, as the tool library currently depends on head-knowledge to function (AA-I-1-29:34). Volunteers also need to be trained in order to contribute. The following activities made up most of volunteers' time during the time we conducted our fieldwork (1) assisting tool repair, (2) entering tools into the inventory, (3) helping clear out the storage space. Much more experienced volunteers also conduct member-facing activities, like (4) supervise use of the workshop space or (5) oversee tool checkin and checkout in the tool library. Even 'support-work' activities, which do not require as much experience, require a high initial time investment from members of the core team. This initial time investment can take several forms, but each has to do

with externalizing head knowledge and scaffolding the volunteers to contribute. For example, as aforementioned, the core team marks the tools in need of repair with the zip-tie color coding system. However, the details of the repair are not captured in this system. For that, staff write necessary repairs on a paper tag attached to the tool. Usually, the note-taking is initiated through the software. Brian then writes the same thing on a paper tag and attaches to the tools. He says repeating information is important, because the tag may eventually fall, or the volunteer who will repair the tool might not have access to the software. (LC-2-68:71) While this helps volunteers to walk on and assist the core team, it can sometimes take too much time for the core team to follow it regularly.

The WSTL holds a regular event called Volunteer Night, which is a once-monthly designated event set aside for members to show up and donate their time. At this time, the volunteers who attend are those who have been members of the tool library for a long time. Even then, we observed that it takes a lot of time from the core team to walk volunteers through activities that they need done. One volunteer, Greg, noted that having something like a to-do list would be helpful [MY-I-1-436-452]. Regular volunteers are not all trained on the use of the inventory system, MyTurn, which limits the kinds of activities that they can support. Another volunteer, Christina, pointed out that there are so many new tools being donated to the space that the core team is often re-organizing the tool library to accommodate their growing inventory (MY-I-2-241-246). These changes are not documented (in the form of a floor plan or a labelling system), which can make it difficult for even long-term volunteers to contribute to activities like putting new or returned tools in the right place (MY-I-2-288-304).

The core team is consistently engaged in practices of creative strategizing to accommodate increasing demand with fixed resources; re-organizing tools is a primary example of this broader trend. The footprint of the tool library is small. To create more space, the core team has utilized vertical space creatively, installing racks for hanging tools, and tall shelves. They also have adapted several large metal carts into rolling storage. A core team member, Micah, described his approach to managing the space as a form of design; he showed the research team dozens of papers with his ideas for redesigning the space, and processes for managing inventory (LC-FN-4-58:62). This creative method with respect to tool library operations has been an important factor in helping the tool library do more with fixed resources, especially space. We noted that, even though it is a problem-oriented approach, it still relies heavily on core staff knowledge, perception and needs — that is to say, *not* focused on newcomer volunteers or members.

Keeping the Tool Library in the Black

Financial considerations have been observed to play an important role for the tool library's core team as they manage inventory and available labor in the face of increasing demand. For instance, when asked about the constraints faced by the tool library due to growth, one front-line staff member, Brian, emphatically states "well, money, number one. That's probably going to be number one to every answer you have—or question, I'm sorry" (AA-I-1-129:131). He later underscores this relationship between money and inventory by weighing in on the financial costs and benefits to keeping tools in working order "if we actually had access to any of those funds, then you know for 40 bucks we could get 10 tools working and those 10 tools might bring in three, four, five, six hundred dollars in a year, if we had them running … For a lot of them are five, six, ten dollar parts." (AA-I-1-200:204). Another founding member (Gene) points out how money directly enables growth by allowing the library to be open for longer - presumably by paying for staff-time: "If you have the money to stay open seven days a week upfront rather than five days or three or four, it's great because then you're going to get more people and more members — they know it's very valuable resource. But, until you have the money to do that upfront, you're often only gonna be open a few days a week so the growth tends to be slower." (LC-I-1-251:253). As with many other physical businesses, in the case of the tool library money literally buys time.

The library uses its core staff most efficiently by outsourcing the management of its financial accounts to its umbrella organization, Sustainable West Seattle (SWS). This frees up the tool library's staff to concentrate on generating revenue rather than dealing with book-keeping and this comes to be reflected in how the only financial instruments present at the library seem to be a credit card reader and a damaged cash register repurposed as a lockbox for physical donations (AA-FN-1-145:146).

The staff perceives the financial situation of the tool library with a measure of pride whilst remaining cognizant of there being room for improvement. Certain staff members at the tool library bill the organization as the greatest revenue generator under Sustainable West Seattle (AA-FN-1-22:24; AN-FN-2-23:25) and we have observed multiple working revenue streams that could be contributing to this view. These include the suggested donation fees associated with each tool rental (AA-FN-3-138:139), the mandatory fees associated with using the workshop space

for members (AA-FN-3-143:144), and tool sales (AN-FN-5-99:103). It is interesting to note that no mandatory fees are levied on members for joining or renting tools. However, most of this revenue appears to be used upkeep costs since the tool library also carries the distinction of having the highest operating expenses of any organization under SWS (AA-FN-1-22:24; AN-FN-2-23:25). Chas, a board member from SWS explains how the fixed costs keep the tool library near the 'break-even' point: "Right now our biggest costs are the rent, the utilities we have to pay for basically Internet and electricity. So those are all, except for Brian and Micah, whose works schedule comes and goes, so there's a little bit of variation but the rent, the utilities and the insurance are all fixed costs… we are always at the point where every month we're like this (juxtaposes his two hands flat against each other making a line)… So that has kept us, no, it hasn't given us extra money, but it kept us… safe, I guess. So we can pay our bills." (LC-I-2-104:129).

The tool library staff members are experimenting with and using several different strategies to overcome this resource bottleneck. One of these centers around raising donations and tool sales through participating in or organizing community events such as neighborhood garage sales. At two separate events - a community BBQ and a garage sale - my colleagues and I observed how staff members re-organized the tool library space to facilitate the selling of tools (AA-FN-3-24:30; AA-FN-4-47:48) and also focused more heavily on donation collection (AA-FN-3-153:159).

Chas later reflected upon the success of the Community Barbecue as a fundraiser and noted that it was something they were trying for the first time: "so we've tried a barbecue, where we got some new members for the tool library, some new members for Sustainable West Seattle and a little bit of donation… we walked away with a few hundred, few thousand, dollars." (LC-I-2-104:129). Although these events represent a significant outlay of labor to organize, we observed that at least in the instance of the Barbecue, the majority of the resources and labor involved in actually running the event – from the food, its cooking and performing community bio-char demonstrations, to even collecting donations – came from volunteers and non-core staff members (AA-FN-3-2:12). Thus, these events could represent an efficient path for the tool library towards building its financial resources, exercising and growing its volunteer force and even translating some of its excess inventory in sales.

Prospective mechanisms for growth

The core team has explored new strategies for managing their resources. In this section, we outline suggested mechanical improvements to information practices in the tool library. We also explain the rationale that some respondents cited for adopting these new practices, and the differences in opinion or other constraints that have led to these ideas not having been adopted to date.

Bringing “new blood”

Due to the rising pressures on existing personnel, some have discussed the possibility of hiring a new staff person. Currently, there is not enough funding to hire an additional staff member; the other members of the tool library are only paid when they are filling in for the current employee. One volunteer, Greg, suggested that it would be best if the WSTL could hire a volunteer coordinator. (MY-I-1-496:510) A volunteer coordinator would be responsible for volunteer outreach, training and management; this would help the existing staff-member focus on member-facing activities. However, the core team felt that a volunteer coordinator should also themselves be a volunteer. This reticence to hire an additional person is related in part to the lack of funding to support more personnel.

Audiovisuals

Core staff and respondents have noted potential applications of YouTube videos in the training of members and volunteers as a way to reduce training time (AN-FN-1-180:192, LC-I-2-22:25). At this time, members are trained individually on tool use on an as-needed basis. This training is important to prevent accidents and to minimize damage to the tools that would result from improper use. Volunteers, on the other hand, need to learn the library’s modus operandi. However, providing training can be time intensive for staff. Creating training videos for members and volunteers would help reduce this pressure on personnel (LC-I-1-297:301). Core staff have also cited ‘How-To’ videos as a potential revenue stream (AN-FN-1-180:192), since YouTube compensates video creators for the ad revenue on popular content. Videos could also be used to help train new volunteers on the use of the inventory system, for example, but core staff do not have the time to create any type of videos at the time being.

Inventory technology and process

Respondents also discussed ways in which the WSTL could use more features of the inventory system. Currently, there is a problem with people bringing tools back late; members with late returns currently do not receive reminders automatically. The MyTurn inventory system can issue these reminders automatically, but members of the core team turned this functionality off. Currently, reminders are generated manually on an ad-hoc basis; the personnel has been too busy to send reminders very often (MY-I-2-177-206). Another unused feature latent in MyTurn is support for a barcode system. A barcode would be attached to each tool, and each member ID. One respondent (and the creator of the software), Gene, said that barcodes would streamline the checkout process; instead of looking up each member or tool manually, a barcode would pull the file up right away. It would also be easier for volunteers to step into the tool-checkout process, because the system would be easier to use. Similarly, an RFID system has been suggested as an ideal inventory system, as tools could be checked in and checked out automatically as they leave and enter the space. (AA-I-1-215:220)

Respondents are interested in ways that social media can be used for outreach, especially to new volunteers. While some are interested in the use of sites like Meetup.com for organizing volunteer events (LC-I-1-81:85), the core team does not use these websites (AN-I-1-690:700). This disinclination toward the use of digital practices and platforms was cited multiple times by the core team. More broadly, our analysis reveals differences in the disposition of core team and non-core team respondents in their disposition towards digital tools. Members of the core team reported (1) dislike of computer use (AA-I-1-22), (2) feeling overwhelmed by volume of digital needs like email (AA-I-1-257), (3) the high initial time cost of the adoption of any digital tool (MY-I-2-394-418) and (4) the possibility that new tools will not be designed for their needs (MY-I-2-398). To leverage the small periods of time members and some volunteers spend at the Tool Library, there are ideas of leveraging their power in small single-shot activities. One of the tasks that require most time of core staff is checking tools back in the library's protocol. The proposed strategy to assess this bottleneck a technology solution to the time problem. Chas (LC-I-1-43:54) said that having members checking in their own tools, and after that, spending a couple more minutes checking in other tools as well would work for the WSTL. This could be achieved with a bar code scanner and a more streamlined check in system. An extension of this solution would be having the most regular members of

the Tool Library's services to do the same. That way, the WSTL would have somebody who is very knowledgeable about the Tool Library as a user helping in the operation, while slowly getting involved in volunteering.

Funding

In order to enable greater financial growth, the tool library staff seems to be focusing on pursuing grant funding more aggressively. In response to a question about whether membership growth has changed how he pursues grants, Micah, the manager of the tool library space notes: "Part of me always wanted to see if you could make this a functioning model based on donations alone ... without that extra funding. I'm much more active but it's still very time and labor intensive to write good grant.", "I guess my lack of free time to address some of these things is why I keep coming back to the grants as a priority. Basically it's the only way to give us a booster shot." (AN-I-1-459:471; AN-I-1-593:594). This understanding that grants are critical bring the need to build more information resources that facilitate the grant writing process such as lists which identify potential grants to apply for (AN-I-1-471:474) as well as finding personnel with grant writing experience and greater fiduciary knowledge. Chas notes that one breakthrough for the tool library has come through the engagement of a more proactive and involved treasurer than before: "So Fabella and McCoy and Micah have had conversations on how to make the Tool Library more sustainable, how to cut cost, how to be more efficient on their use of the credit card. That evolution is still happening, ahm, but that was one of the changes, having the treasurer much more involved with the Tool Library management. Now we also have aggressively gone out and sought fiscal sponsorship for other grants…because again, we have a new treasurer who is willing to do that" (LC-I-2-149:157). This shift in how different personnel are reprioritizing their time and going 'aggressive' indicates a drive to increase revenue streams to fuel growth.

Another revenue stream that the WSTL staff considers centers around both the issue of inventory management and vision. As the WSTL's membership grows, staff appear to be finding it increasingly challenging to design and implement a coherent set of working practices around overdue tools and fees. For instance, Brian has repeatedly noted the disjunction between the WSTL's stated late policy and actual practice of essentially remaining on the trust system where they don't charge any fees (e.g. AN-FN-2:127; AA-FN-3:129-132). Gene, another founding member, speculates on how this might be affecting the WSTL versus other tool libraries: "I think I have seen West Seattle's list of overdue items — it's incredibly long list, longer than most (tool libraries)" (LC-I-1:570).

Having this long list of overdue tools is often viewed as a serious impediment to the tool library's continued functioning by some of its staff. As Brian explains using the example of lawn mowers: if several customers short them on lawn mowers by being late on returns then new customers who come looking for lawn mowers won't be satisfied. "That means lost donations. And more importantly than that, lost members." If new or potential members don't get what they were looking for the first time "they won't be coming back ever.", "the people who would trust the integrity of the system, lose trust in the system." (AA-FN-3:129-132; LC-I-2-456:457). Furthermore, the related late fees are often not just viewed as a disincentive for overdue tools but as a potentially important source of revenue. Speaking of another tool library, a founder of the WSTL, Patrick Dunn notes that "…we find that that's sort of one of our biggest revenue sources is actually the delinquencies." (AA-I-2:305). Brian seems to resonate with this statement where he also expresses the need to shift the WSTL's practices around overdue tools: "I would love to change it cause it would bring in a lot of revenue that should be brought in. Cause those people should owe money for… I mean, well, like anything, 95% of them should owe money." (AA-I-1:386). Other core staff members have been observed to frame the problem of overdue tools and late fees quite differently - specifically in terms of balancing negative incentives against the vision and principles of the WSTL. Whilst stressing the need to be clear and consistent in their stated policies and practices, Micah expresses discomfort:

> "It's something that I'm very stubborn about enforcing because I don't like negative incentives, and putting… I've known we needed reform for many years, but reform is only useful if it's followed up with enforcement in a consistent way, and it's something that in particular you want to be consistent about how you talk about it in everything from the policy agreement when you sign up to on the website, everywhere it's mentioned you want to be consistent about it … A negative incentive can only leave someone with a bad taste in their mouth, and we're concerned with pushing the merits of collaborative consumption and doing everything I can to I guess sell people on the idea of sharing…I don't have any easy solution for how that works, but I know in lots of places it's a substantial part of their revenue, and we've turned down a lot of revenue, but it… and I guess selfishly it's not something I'd like to enforce" (AN-I-1:781-795)

This clear difference in ways of framing the problem between members of the core team (finances versus vision) may help explain why it has been difficult to design an overdue policy that aligns with the vision, practices and financial needs of the WSTL.

One potential solution to address this challenge that staff members seem to be considering involves leveraging a form of 'social pressure'. When asked about how he might close the gap between policy and practice, Micah relates that "the more you can sell the collective value of the tools the more you can leverage I guess guilt of the people as the enforcement mechanism rather than purely finances because that doesn't really scale well with low income in particular" (AN-I-1:852-854). Gene, corroborates this by considering how the WSTL's software platform might be improved to provide new types of reminders to members with overdue tools: "Using that social pressure, in almost a positive way. Saying 'Hey other people are looking to use this item'. 'There are now seven people waiting for…' I think it might actually put a little more pressure on someone that just... 'Oh, you know tool library has 3,000 tools. It's not a big deal' if they that know they're actually stopping someone else from using that tool that might help…" (L-I-1:571-575). Patrick has noted that this soft approach has already been evaluated to be working well at another TL: "we don't file papers on the people or try to bring 'em to court or anything. It's—it's still voluntary. It's kind of like a guilt-driven system and it works pretty well. Just personal phone calls when we get a chance to do it just to remind people to come on in and also remind 'em of sort of that everybody needs these tools, so that's why you gotta bring it back. And, by the way, you know, you've racked up a lot of fines this year, but, you know, come on in and we'll clear those up." (AA-I-2:307-311).

Space matters

There are also suggestions for other ways the WSTL could organize its space. As discussed previously, the way the inventory is organized in the space is constantly in flux to accommodate new donations to the inventory. While ingenuity with the space is a strength of the WSTL core team, these changes can also make it more difficult for non-core team to assist with the space. Respondents noted this difficulty, and came up with suggestions for making the space easier to navigate, even as it changes. Christina said that taking the time to draw up a floor plan would help her navigate the space when she is staffing the tool library (MY-I-2-288-303). She recommended one that could be re-labeled over time. Similarly, she suggested bold, large labels for drawers with velcro backings that would help

them re-adjust over time. As we found in other parts of our analysis, the large initial time investment was cited as a reason that this has not yet been adopted.

5. Conclusion

> "They're like, you know, almost victims of their own success"
> Founding member (LC-I-1-195:196).

The WSTL is an organization responding to rising demand on fixed resources. Our study offers opportunities to understand the re-articulation of work practices in the face of material constraints. As a field site, WSTL afforded the opportunity to understand the position of each worker in the space deeply. Its small space, labor corps and funding threw material constituents of work practices into sharp relief. Members of WSTL are also driven to a greater and lesser extent by their values-- broadly in support of the sharing economy and building community (although varying with respect to their interpretation). The nature of the tool library's work requires some expertise with tool use, both in repair and fabrication; thus, WSTL also foregrounded the role of different competencies in the articulation of work practices.

Implications for Theory

1. Material constraints played an important constitutive role on work practices

Our study examined the ways existing work practices are articulated; how they came to be and how and when the core team departs from them. It also considered the new strategies respondents offered in an effort to re-articulate practices in the space to meet increasing demand on their fixed resources. In both existing and envisioned practices, we found that respondents in the space were creative with respect to the way they articulated work under material constraints. Funding, space, labor supply, and time were the most salient constraints on this work.

2. The core team used innovative strategies to manage resources under increasing pressure.

The core team used innovative strategies — like working unpaid hours, organizing the space in novel ways, delegating to volunteer labor, and prioritizing their time-- to respond to existing demands.

3. These took shape in contingent routines, ad hoc practices, as well as more reflective, future-oriented suggestions

We found that respondents have been experimenting with novel ways to deal with their existing growing problems. These re-articulations of practices can be in-the-moment, in the form of contingencies, or longer-term, as ideas for ways to change practices in the future. For example, members of the core team routinely did not charge late fees for late tools, in spite of a late fee policy; this departure from formal processes is a form of incremental re-articulation. Other forms of re-articulation took the form of reflective envisioning, like suggestions for new technological practices.

4. Re-aligning future practices was iterative and unfinished; key actors had different stances on key issues, which varied with respect to values and role.

We found that differently situated actors diverged with respect to the practices the WSTL should adopt. For example, on the question of charging late fees, members of the core team were more oriented towards 'sharing economy' and 'community' values; they were disinclined to charge fees, and favored an approach that would leverage social pressure. Others framed this issue as a matter of financial viability for the library, and adopted a more pragmatic stance. In this way, values and work role had a strong bearing on a respondent's stance. This pattern was consistent across other forms of re-articulation. At the time of our fieldwork, the core team reported that WSTL was at a critical juncture in their ability to meet these needs.

Implications for Design

1. Sites that do community reuse points to designing better micro tasking systems

Online micro tasks present the workers only with information about their own small task even when it is embedded within a larger workflow. Interdependent activities create opportunity for easier, faster, decentralized work for volunteership at a non profit organization. People are more and more cognizant and willing to do good, but most often, life gets in the way. A number of practices at the WSTL, specifically, don't need to be done *ad hoc* or *in situ*. It is very likely that a wider spectrum of members would feel inclined to volunteer if they were assigned more

convenient online one-shot tasks. Priming, integrating and facilitating coordination among volunteers and core staff lead us to the second implication.

2. Designing for better integration of systems, with more human scaffolding

One of the central objectives of the study was to examine how systems might be better designed for managing information flows that minimize dependencies and maximize productivity of individual workers in these spaces. We found that a lot of work at this site falls into the hands of a select few individuals. A great deal of the day-to-day practices we observed revealed a large amount of head knowledge required for searching tools in the space and matching them to the needs of members in such a way that satisfies and minimizes the chances that tools are damaged. This compounds the problem of time that is required to onboard new members and volunteers. This represents a rich problem space for designers to address such as figuring out low cost ways for tagging and locating specific tools in a space with no formal demarcation that have been allocated for it so that volunteers can potentially located tools in systematic way without relying on localized knowledge.

3. Designing for social-nudging

The study revealed that in the context of pay-what-you-can systems and sharing economies, addressing the topic of overdue items and other forms of delinquencies poses an interesting design challenge. Traditional forms of negative incentives such as overdue fees run counter to the messaging of open-access and are perceived by some staff members as strongly disincentivizing participation or returning tools back to the space in the space altogether. These findings suggest a future opportunity for the HCI community to explore more diverse ways to support such spaces by building for positive kinds of social messaging or 'nudging' to encourage members to contribute back and share with others. This includes simple ideas such as reframing reminder messages to highlight the social cost of overdue items but could also certainly be expanded to more elaborate approaches such as social comparison feedbacks or goal-setting mechanisms.

A core goal of our study was to explore how non-profit organizations facing high demand adapt and re-articulate their practices. In the words of a founder and core staff member: "We're the West Seattle Tool Library,

we're, it's still a very much experiment in progress. Like it's continually evolving experiment." (AN-I-1-385:386) This type of organization is a rich space for designers to intervene. Small non profit organizations are constantly looking for fresh ideas to adapt and improve their practices, since they are very cognizant of their pains and open to change.

Citations

Bardram, J. E., & Hansen, T. R. (2010, February). Why the plan doesn't hold: a study of situated planning, articulation and coordination work in a surgical ward. In Proceedings of the 2010 ACM conference on Computer supported cooperative work (pp. 331-340). ACM.

Boden, A., Rosswog, F., Stevens, G., & Wulf, V. (2014, February). Articulation spaces: Bridging the gap between formal and informal coordination. In Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing (pp. 1120-1130). ACM.

Corbin, J. M., & Strauss, A. L. (1993). The articulation of work through interaction. Sociological Quarterly, 71-83.

Corbin, J. M., & Strauss, A. (1988). Unending work and care: Managing chronic illness at home. Jossey-Bass.

Gasser, Les. "The integration of computing and routine work." ACM Transactions on Information Systems (TOIS) 4.3 (1986): 205-225.

Gerson, E. M. (2008). Reach, bracket, and the limits of rationalized coordination: Some challenges for CSCW. In Resources, Co-Evolution and Artifacts (pp. 193-220). Springer London.

Gerson, E. M. & Star, S. L. (1986). Analyzing due process in the workplace. ACM Transactions on Office Information Systems 4(3), 257-270.

Schmidt, K. (2011). Cooperative Work and Coordinative Practices. London: Springer-Verlag.

Star, S. L. 1986. "Problems of Due Process in Open Systems." Memo, February 12, San Francisco: Tremont Research Institute.

Steinhardt, S. B., & Jackson, S. J. (2014, February). Reconciling rhythms: plans and temporal alignment in collaborative scientific work. In Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing (pp. 134-145). ACM.

Strauss, A.L. (1988): 'The articulation of project work: An organizational process'. In The Sociological Quarterly, vol. 29, no. 2, pp. 163-178.

Suchman, L. (1987) Plans and Situated Actions. The Problem of Human-Machine Communication. Cambridge University Press, Cambridge.

Thayer, A. (2013). *Understanding University Students' Use of Tools and Artifacts in Support of Collaborative Project Work* (Ph.D). University of Washington.