The role of online communication in a maker community

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1. Introduction
Tinkerers and makers around the globe are meeting and collaborating in makerspaces to create, hack, and innovate with various tools and technologies. Our research group has defined makerspaces as, “communities of practice constructed in a physical place set aside for a group of people to use as a core part of their practice” (Halverson & Sheridan, 2014, p. 502). In our research, we found that a physical place does seem to anchor a makerspace. Moreover, we have found that makerspaces are constituted by a range of individuals including children, adults, experts, novices, and a diversity of racial and ethnic backgrounds, depending on who runs the space and where the space is located (Sheridan et al., 2014). Though some may distinguish between a makerspace as an instructionally- and youth-oriented place from a hackerspace as an adult-orientated place for professionals and hobbyists, the maker community we examine in this study publically identifies as both a hackerspace and a makerspace, and serves a wide demographic of both adults and young people.

Physical place is a core part of the maker movement; it is not, however, fully constitutive of the practice of and participation in making. Often overlooked is the role that the Internet plays in supporting such physical communities. Online places for engaging in and talking about making are also a robust part of the maker movement. MAKE founder Dale Dougherty (2012) points out that the maker movement is largely driven by the Internet; others even argue that such a movement would not exist without the Internet (Denmead, 2013). Websites like hackerspaces.org, diy.org, makezine.com, thingiverse.com, kickstarter.com, etsy.com, instructables.com, and many others heavily support connections between makers and making communities that transcend space and time (“More than just digital quilting”, 2011; Richardson & Haylock, 2012; chapters 10, 11, 15, and 16 of this volume). Within these online communities, the maker movement is sustained by makers’ ability to leverage the Internet to transcend the often physically limiting constraints of makerspaces.

To further explore how the Internet supports maker communities, we conducted a phenomenological investigation of how asynchronous online communication affords community building in a single makerspace, Midwest Makers1. Midwest Makers maintains a public online forum open for anyone to join, and in this chapter we describe who participates, how, and in what ways this digital space connects forum participants. Our purpose is to understand online asynchronous interactions and what role such interactions play in supporting or shaping a maker community. We conducted this inquiry with an eye toward using online asynchronous communication to deepen and expand current maker initiatives that may struggle to extend their reach beyond individual drop-in learning experiences.

2. Background: Engaging, learning, and participating in and through online communities
Though asynchronous communities of interest have been thriving since before the Internet revolution (Jenkins, 1992, 2006; Lewis, 1992), our access to and understanding of communities that develop based on topic and content and not location have exploded as we near ubiquitous access to the Internet. Gee (2004) defines these communities as affinity spaces, “a place or set of

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1 Pseudonym to maintain anonymity.
places where people affiliate with others based primarily on shared activities, interests, and goals, not shared race, class culture, ethnicity, or gender” (p. 67). Jenkins et al. (2007) describe participatory cultures, communities where participants engage in affiliations, expressions, collaborative problem solving, and circulations as core activities. Many of Jenkins et al.’s paradigmatic examples are in online spaces to emphasize how the affordances of the Internet mediate interactions. The online component of affinity spaces and participatory cultures is deeply embedded in (and important to) modern production-oriented communities of practice like makerspaces. Internet technologies connect people across time and space, and with this, maker communities are not limited by location, but rather are organized around interest and passion.

Through their extended ethnographies of young peoples’ new media use, Mimi Ito and colleagues (2008) documented online communities as either friendship-driven or interest-driven. Friendship-driven networks refer to opportunities for already existing peer groups to deepen their relationships and extend communication into the online space. Building on their existing, offline relationships, young people are able to maintain an “always on” availability. By contrast, interest-driven networks refer to communities that come together based on a shared passion. Interest-driven networks are those users build around their new and old interests, which usually requires them to interact with new people outside of their local community. These communities transcend physical space; in fact the Internet makes many interest-driven communities possible and affords their explosive growth and maintenance. Makerspaces likely serve as both friendship-driven and interest-driven networks, depending on where they are located, how people come to participate, and for what purpose the makerspace was originally designed (Sheridan et al., 2014; chapter 3 of this volume). Relevant to our discussion here is whether the addition of asynchronous, online communication impacts the kinds of networks constructed in a makerspace.

The role of asynchronous communication in online communities

Our interest in online communities is focused on the relationship between online and face-to-face interactions. We are inspired by research that has explored the relationship between affinity spaces and online interactions. For example, Squire and Giovanetto’s (2008) ethnography of Apolyton University - an online informal university associated with the Civilization video game series designed to teach and support game play – shows how the gaming experience is enhanced and the game’s rules extended through online forum participation. These new experiences facilitate identity trajectories that move users from peripheral to more central participation; “they enter [Apolyton University] as players and leave as designers” (p. 2).

Durga (2012) extended this work by looking at the emergence of an interest-based community of Civilization “modders”, those who change the game itself through programming. Her work describes how users engage in a range of discussions from, “how to make minor customizations in the game to elaborate accounts of creating game mods from scratch that entail complex scripting and often high-order programming skills” (p. 90). An elaborate organizational structure is put in place by the forum’s moderators in order to ensure that newcomers to this affinity space may participate successfully without having the full range of expertise required to engage in the highest level discussions. Most relevant to our discussion is her description of the forum as, “provid[ing] access to niche or highly custom content while also providing opportunities for diverse ways to participate” (Ibid). Both of these studies demonstrate how the online forum provided opportunities for alternate content and forms of conversation beyond the original design of the gaming environments.
3. Studying Online Makerspace Participation
In order to understand the role of asynchronous online communication in the construction and maintenance of a maker community, we sought to capture one key aspect of makerspace communication: Midwest Makers’ public Google group, which functions much like a community listserv. The Google group is a series of nested discussion threads and those who join can choose to receive email notifications when someone posts to the group to keep updated on conversations. It is important to note that joining and participating in the public Google group was free and not conditional on becoming a member of the makerspace itself. Midwest Makers is an example of a space created by adult makers chiefly for other adults with making interests and is primarily supported by the membership fees paid by these members. We chose this site for our inquiry because there are no pedagogical scaffolds in place for participation and therefore interactions emerge naturally over the course of time. Additionally, the physical space functions the most clearly as a community of practice for makers, where the identity of the space changes as members change and as members’ ways of participating change. We captured all of the activity on Midwest Makers’ public Google group from December 2011 to January 2013. During this time, the Google group garnered 226 members, about one-third (76) of whom posted to the group resulting in a total of 370 posts. Three leaders at Midwest Makers contributed roughly 41% (153) of the posts, and the majority of posters (70) generated less than ten posts each. For each post we tracked who posted, the date of post, and the number of exchanges related to the post. Our focus for data analysis was on how people used the Midwest Makers public Google group and what their language use reveals about why they choose to participate and who they are vis-à-vis membership as makers. We focused on full
discussion threads regardless of the number of exchanges, which afforded a comprehensive overview of the discussion themes and purposes.

In our first rounds of data analysis, we conducted a thematic analysis (Saldaña, 2009) where we tagged every post based on topic and/or purpose. For example, a post informing the community about an upcoming Arduino class was tagged “Arduino” and “event distribution.” From these tags, we conducted another round of analysis by creating larger themes; for instance, the “information sharing” theme included “advice giving”, “FYI”, and “what are you hacking?” tags. Table One (see below) explicates the nine different themes and their prevalence across the dataset.

<table>
<thead>
<tr>
<th>Bucket</th>
<th>Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>External opportunities</td>
<td>Things happening externally or indirectly related to Midwest Makers (e.g., employment opportunities, community events)</td>
<td>15%</td>
</tr>
<tr>
<td>Social activities</td>
<td>Social, non-making events at Midwest Makers (e.g., game nights)</td>
<td>4%</td>
</tr>
<tr>
<td>Information sharing</td>
<td>Sharing information to support making (e.g., giving advice, public classes offered at Midwest Makers, etc.)</td>
<td>38%</td>
</tr>
<tr>
<td>Advice seeking</td>
<td>Requesting help from the community on an existing project or idea</td>
<td>14%</td>
</tr>
<tr>
<td>Materials/supplies</td>
<td>Specific materials and supplies needs for projects</td>
<td>11%</td>
</tr>
<tr>
<td>Individual project ideas</td>
<td>Pitching an individual or group project idea</td>
<td>3%</td>
</tr>
<tr>
<td>Press</td>
<td>Media and press coverage on Midwest Makers</td>
<td>5%</td>
</tr>
<tr>
<td>Maker events</td>
<td>Invitations to or discussion about Maker Faires, design-a-thon, hack-a-thons, etc.</td>
<td>4%</td>
</tr>
<tr>
<td>Community-wide Project</td>
<td>Discussion about community-wide group projects at Midwest Makers (e.g., balloon launches and powerwheels)</td>
<td>6%</td>
</tr>
</tbody>
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We then took a discourse analytic approach (Gee, 2013) to two of these themes (information sharing and project ideas) in order to understand more about what was being said and how posters were communicating ideas. Communities use language for a range of purposes and discourse analysis gives us insight to this and how it characterizes the community as a whole. For this more in-depth analysis, we included all posts (58 total) that had five exchanges or greater. We found that posters used language to: 1) make connections between people and ideas, 2) attract new people into the community; 3) claim identity as either a core member or an potential members – someone who intentionally expressed interest in becoming a member of Midwest Maker; 4) build relationships either interest-driven or friendship-driven (Ito, 2008);

Subject: Can this bicycle wheel be straightened?

Z: ...or is it beyond repair? Halp. [Link to YouTube video of bicycle wheel spinning unevenly.] Thanks, Z

L: Could definitely be improved, though it will probably never be perfect. Do you have a spoke tool [Link to spoke tool on Amazon]? Often, you can do a rough job of straightening it just on the frame using the brakes as a guide. --L

Z: Hi L, I did buy that exact spoke tool (which, from Bike Shop, cost as much as the bike itself) but I think I only made it worse despite my best effort. Some of the nipples rounded off as well, of course. I am also concerned about the slight oscillation of the rear cassette (I tried to show this at the end of the video), and am wondering if that will go away if the wheel is trued. Long story short, I'm bad at this.

L: I didn't noticed that the first time around. I am by no means an expert, but here's what I know.
1) That slight oscillation of the rear cassette will not go away. That isn't about the wheel being true, that's probably a slightly bent hub or axle. Though I wouldn't worry too much about it, I've been riding a bike with worse wobble for several years now.
2) Wheel truing isn't all about tightening of the spokes. Sometimes it can be about loosening too. If you're rounding the nipples, then you might be over-tightening them. Also, they may be corroded (see 3).
3) When truing an older wheel. Spray all the nipples with some sort of light lubricant and/or rust penetrate. They can be pretty stuck.
4) Wheel truing and building is an art. It is not easy to do and often, you can only get good with practice. It is hard to put such experience into words, but here's a go.
a) A wheel is a balance of forces on all spokes. Keep this in mind. It is not a digital system. It is analog.
b) Because it is a balance, never tighten or loosen a single spoke at a time. I do it in units of 3. Find the area that is off and tighten or loosen three.
c) Make *small* adjustments. I often do only 1/4 turns. Sometimes 1/2. Never more.
d) You can over-tension spokes. Easily. Don't. If you do this, sometime in the near future, you will break a spoke.
e) If it feels like one spoke has drastically different tension than the rest in a region of the wheel, break rule (b). But do it carefully.
f) Your goal is to get every spoke at the exact same tension as every other spoke. You will fail, but that is the goal. Squeeze two spokes on the same side together to get a feel for the tension.
g) Never build a wheel by starting with a bent rim. I'm sure there is a lot to disagree with in there, but this is what I know.

Good luck! – L

A: Good points. I've got a few more (including a disagreement) to make things more complicated:

- For rear wheels with multiple gears, the drive side flange offset (WR in the figure) is almost always different than the non-drive side flange offset (WL in the figure) -- see figure [Link to image of diagram]. Because of this asymmetry, you don't want all the spokes at the same tension; your goal is to have all the drive side spokes at one tension and all the non-drive side spokes at another tension. For a properly dished wheel, the former tension will be higher than the latter tension.
- Most front wheels don't have this asymmetry, so you're going for uniform spoke tension on front wheels.
- There's not just side to side truing to worry about; there's also radial truing -- keeping the rim at a constant radius.
- So there are three goals: getting the wheel true side to side, true radially, and having even spoke tension. You're not going to get them all perfect at once, but the function you're trying to maximize should depend on all three. - A

and, 5) use specialized language that marks posters as insiders. Figure 1, for example, is a sample of a thread, “Can this bicycle wheel be straightened?”’, that illustrates an interest-driven discussion among core members about fixing a bike wheel, as the problem gets deeper the language use gradually becomes more technical.

4. Language use across information sharing and project making practices

In our analysis of the two themes, we get an idea of how participants in the Midwest Makers forum use language to build meaning. Specifically, the “information sharing” posts are both the most prevalent and reflect Martin’s (2012) finding that asynchronous online communication

\[\text{Figure 1: "Can this bicycle wheel be straightened?" Google group thread}\]

\[\text{2 We dropped the ‘non-participant’ code from analysis since there was no activity from lurkers.}\]
tends to promote information sharing. We also chose the “individual project ideas” posts because we felt that discussions about what and how to make were the closest to the kinds of conversations that we want to extend to those who may not be co-present in the physical makerspace. These two types of posts reflect predominant reasons for communicating in online spaces and may provide some insight into the affordances and constraints associated with asynchronous online communication.

Building connections to stretch across online and face-to-face spaces.
We found examples of clear and direct connections between the online forum and face-to-face interactions that occurred at the physical makerspace. For instance, in the February 2012 “what have you been hacking?” thread, one member begins his project update: “Thanks to some help from Frank and a Midwest Makers all-nighter,” a clear reference to work being done in the physical space itself. In another thread, a participant refers to a discussion about “Cool End” at a prior face-to-face monthly meeting and invites the list to a more specific Google group he created for those interested. One third of the discussion threads had direct connections present between the online and physical spaces and it is likely that online conversations continued in the physical makerspace, though for this study we do not have the data to draw further conclusions. Future work could trace conversation from face-to-face conversations out into the online discussion boards.

Politics and invitations.
We found multiple strategic exchanges connecting the online and physical spaces. Specifically, we dub these posts as political, since they were designed to attract people to Midwest Makers by claiming that “cool things” are happening at the physical space. For example, Midwest Makers hosts “Go nights” every Thursday. Through the Google group, they invite the expert players, those that don’t know how to play, and others that don’t like the game but want to hang out and play other board games. The invite reads: “All are welcome…most folks [in the group] are beginner to novice level… if you hate Go then bring your own friends/games.” While playing Go is a community activity that is peripheral to making as a practice, it is part of the “cool things” mantra of the space that might attract new members.

Core members also solicited project updates from the community in an effort to draw more people to the space and to participate in making activities. In a call for project updates, one member sees project updates as a way to, “make the people who haven’t had the time to be around the space in person jealous that they haven’t.” Roughly one third of the posts had evidence of politics; many of these overlapped with posts labeled for connections, which may suggest that direct connections to the physical makerspace are intended to attract online forum participants to Midwest Makers.

Membership, participation, and audience reception.
We found that nearly all threads (48 of 58) in this sub-sample were initiated and sustained by core members of Midwest Makers. This is surprising considering Midwest Makers also maintained a members-only list. Despite an alternate, more expert outlet for communication, the top contributors to the public list are core active members at the physical space. Furthermore,

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3 Pseudonyms used to maintain anonymity.
4 http://en.wikipedia.org/wiki/Go_(game)
member posts were rhetorically different from non-member posts. When non-members did
contribute to the online forum they prefaced their comments with a disclaimer. For example, one
non-member prefaces his project update with: “Alright, so right now, I can’t afford to be a
Midwest Maker, but I believe in the value of makerspaces as a means of sharing creativity,
passion, support, and ideas.” And though we did not trace the location of non-members,
references to desired membership or questions about how to interact with Midwest Makers
indicate that many of these non-member participants lack either the funds or the transportation to
be members, but are potential members who are “hanging out” on the Google group with an
intention of following up with physical attendance.

The open, public nature of the online forum inherently reaches beyond the physical space
itself; even so, we found that the more robust exchanges were initiated and sustained by
members with minimal contribution from non-members. In fact, we found only one instance of
non-members participating in the online forum to engage in project work. A non-member, forum
participant who expressed no interest in becoming a member (unlike the example above where
the poster says that they are not a member “right now”) posted a solicitation requesting car repair
labor; no one responded to this post. This request, for a member or members to complete a
project, is inconsistent with the identities of participation that are available in the space both
online and face-to-face.

Coupling these findings with our understanding of the space, we see an expected way in
which one is expected to engage with the community, and when those unwritten rules are not
followed, posts do not yield any follow-up conversation. Those who wish to engage in
conversation must self-identify as potential members (e.g., “I’m not a member yet”) in order to
receive a response to their participation.

**Building relationships.**
We took up Ito and colleagues’ (2008) interest-driven and friendship-driven framework of
engagement in online networks to understand how *relationships* are built through the online
forum. We found that the majority of the posts (47 of 58) were interest-driven, spanning a range
of topics from tools such as Raspberry Pi to project types such as power cars racing. Friendship-
driven exchanges were rare; one example, though, was a celebratory announcement from a core
member about his securing slot for a competitive startup accelerator in China. One possibility for
the limited friendship-driven exchanges is that they may happen more often on the members-
only list, since that group has already established relationships.

**“It’s easy” but for whom?**
Midwest Makers is a makerspace that claims on its website: “**Zero experience necessary**, only
enthusiasm to learn required” (emphasis in original); the space encourages anyone to join
regardless of prior knowledge or experience level. The public online Google group and face-to-
face monthly public meetings represent two on-ramps for people to check out the space to see
what happens there and to participate peripherally in the Midwest Makers community. Despite
multiple open calls for participation, our analysis of the forum posts demonstrates an abundance
of specialized or technical language across the majority (about 60%) of the posts we analyzed.
Specialist or technical language included tool-specific references (e.g., specs or settings),
software, and programming — with several cases where programming code was inserted
directly into the thread. Whether the project entailed programming to extract data from the hard
drive of an old school computer or physics to straighten a bicycle wheel, specialist language was
often preceded by the claim that “it’s easy” to do. Though threads often stated that the work was “easy!” we would ask ‘for whom?’ since the language that followed was often inaccessible for beginners. One example of this tension was exhibited through one forum participant’s request for help with a physics problem, which — realizing the typical use of technical jargon — he titled his post: “Explain it like I’m five”. Though the space is open to beginners, the sign systems and knowledge used on the online forum seem very difficult to interpret for the uninitiated.

5. Does openness lead to democratization at the Midwest Makers?

The maker movement has been described as democratizing: “Now, almost anyone can innovate. Now almost anyone can make. Now, with the tools available at a makerspace, anyone can change the world” (Hatch, 2014, p. 10). And while this claim is debatable (Halverson & Sheridan, 2014) we have found that Midwest Makers tries to make their community an open, accessible space through their monthly meetings, their website, and through their open, Google group. Specifically, we identified two primary ways in which members use the online forum to entice new people to the makerspace: constructing ethos and making-at-a-distance.

First, constructing ethos — adopting and breeding a particular way of being — gives potential members a window into what it means to connect with others around making and be a “Midwest Maker”. Ethos-related posts support and reify identities and/or values about what it means to be a maker at Midwest Makers. These posts (roughly half of our full data set of 370) include informing the community about upcoming classes or social events at Midwest Makers, external opportunities or events happening in the local community, and other news pieces related to the local or global maker communities. Additionally, members use the Google group to engage in community activism including posts relating to changes in local or national laws (e.g., informing the community that unlocking personal mobile phone is now illegal, which limits hacking these technologies). While many of these posts seem like general information sharing, embedded here is an assumption of shared values (e.g. we all enjoy hacking our personal devices and view the ability to do so as a personal right). When there is controversy a lively debate often ensues within the group. For example, the group carried on an extended thread critically discussing the effectiveness and ethics of the 100+ Bluetooth data loggers they discovered on a local highway, which were tracking driving patterns using drivers’ Bluetooth devices without their explicit consent. In this way, the Google group functions as a community where members engage in seeing, doing valuing, believing, and being through language as described by Gee (2013).

Second, making-at-a-distance both supports making activities happening outside the space and gives potential members a taste of the range of activities and projects occurring in and around Midwest Makers. Many posts draw from the wider Midwest Makers community to support making activities through distributing expertise and sharing resources. For example, one member posted a message asking what programming language is the “best” first language to learn, which sparked a robust discussion and grew into being the largest thread in our sample (>50 messages). In addition, the interest-driven nature of the Google group exhibits the myriad projects and activities in which members participate with the underlying agenda of attracting a diverse group of people to the makerspace. For example members often discussed the large community projects – the development of power cars for racing at Maker Faires and the many iterations of balloons launched into space – on the Google group and promoted these as fun projects that required people with a range of expertise. The two primary themes (i.e. constructing ethos and making-at-a-distance) we identified as salient shape our understanding of how forum
participants use asynchronous communication to engage with others and how members in particular attempt to open up Midwest Makers to a broader audience.

While Midwest Makers strives to make their space accessible to newcomers through their online presence, we also found that identities of participation that are constructed through language use can inhibit newcomer engagement. The phrase “it’s easy” often accompanied descriptions of how to solve problems, yet the language used to describe the solution or the process was often overly technical and required prior knowledge to understand. The relationship between “it’s easy” and technical language indicates a kind of expert blind spot in members’ interactions with novices (Nathan & Petrosino, 2003). The online Scratch community has dealt with similar challenges — newcomers can feel intimidated by the expertise displayed in posted projects and early negative feedback may discourage return visits (Brennan et al., 2010). Our analysis demonstrates that open access is not enough to ensure that makerspaces realize their democratizing potential; instead we need to design for newcomer access in ways that can overcome the expert blind spot and promote identities of participation.

6. How to further understand the role of online communication in makerspaces

When we first set out to do this study, we thought the online forum would represent a standalone dataset that would give us a window into how Midwest Makers extended its reach beyond their physical walls. We were surprised by how much current members dominated the public forum discussion and therefore how interconnected the discourse was across virtual and physical space. As a result, we had to consider the online forum interactions in isolation from the physical makerspaces interactions, which is not a full representation of how makers interact virtually and physically at Midwest Makers. Though there were a few exchanges in which face-to-face interaction was referenced, our current analysis only allows us to tell part of the story. We did, however, shed light on the existence and potential significance of the physical and online communities coexisting, an area we believe is worthy of further research. Given the trends we observed on the public forum, it would be worthwhile to understand how this discourse compares to the members-only forum.

For Midwest Makers, the Google group acts as a foundation for the broader community through harnessing a maker ethos and supporting making at a distance. Further, the forum functions as a virtual bridge between the physical space of Midwest Makers and the expertise distributed across the broader Midwest Makers community; the underlying tone of the forum is to attract potential members to the makerspace. The virtual bridge also troubles the notion that affinity spaces are either interest-driven or friendship-driven (Ito et al., 2008); in this case it is difficult to tell the difference. Collectively, these findings inform and expand the current understanding of developing and supporting online maker communities.

References


