On a HCI Motivated Perspective for Establishing and Positioning a Fab Lab

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Abstract
Based on the foundation of Fab Lab Siegen, a makerspace in Germany, we introduce our tentative concept of how a Fab Lab can be integrated with University education and research as well as the region, the global context and the economy as its central pillars. In presenting our concept, we argue that HCI and CSCW research provide potent approaches and traditions that have the potential to expand the existing body of work and inform the development of new concepts that enrich makerspaces and research alike.

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Fab Lab; making, HCI, CSCW; innovation; education

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction and brief State of the Art
Fabrication Laboratories (Fab Labs) [2] are open, democratic high tech workspaces geared towards digital fabrication. They are often associated with the notion of *Making / the Maker Spirit* [4], empowering people to participate in what is often dubbed the next stage in the digital revolution [3]. In this respect, they are related to a paradigm shift in the design and production of artifacts and goods towards the end-user. In recent years, Fab Labs and making have become more and more common worldwide and there are far too many publications, success stories, case studies and projects out there to even attempt a comprehensive overview. Hence, we would like to refer to [2] for the basics, to [1] for a comprehensive contribution on the background of Fab Labs and making regarding learning theories and education as well as some very descriptive sample projects, as well as [5] for a very recent and extensive paper on making, the

return to craft/materiality and innovation practices in HCI. We think it is safe to say that the relevance of Fab Labs and making is well established by now. We are currently founding Fab Lab Siegen, a makerspace in Siegen, Germany, associated with and initially funded by our university. Our concept is strongly driven by situated, practice-based and ethnographically grounded research in the domain of HCI [9]. Hence, our perspective might differ slightly from more "traditional" engineering, educational or entrepreneurially oriented Fab Lab foundations. As Lindner et al. [5] phrased the relation of HCI and making: "We argue that HCI is positioned to provide critical reflection, paired with a sensibility for materials, tools and design methods". We agree with this statement: apart from utilizing the lab and its equipment for projects and research, we are also interested in a comprehensive understanding of the lab and its evolution, grounded in long-term ethnographic work and have a practice-based research lens, honed by end-user and context centric concepts like appropriation and the establishment of related infrastructures [7]. Based on this argument, after briefly explaining the local context, we would like to outline our situated concept for the establishment of Fab Lab Siegen as well as a broad research agenda from an HCI-motivated perspective. Both aspects are grounded in literature, some pilot projects, first empirical work as well as our own hands-on experience. The accompanying poster visualizes the concept.

Local context

Siegen is a city in the mid-west of Germany with about 10000 residents. Generally speaking, the area is rather on the conservative side but still places emphasis on innovation. Economically speaking, there is significant metalworking industry and many specialized (up to the point of "hidden champions") small and medium sized enterprises (SME). The traditional retail sector is struggling due to bigger malls, which lead to significant vacancies in the old city center. The university (about 20000 students) is located rather secluded but our faculty will move right in the city center in autumn 2014 which is also where Fab Lab Siegen will open.

Teaching and learning

The first pillar for Fab Lab Siegen will be educational. The relevance of making for education has been well established [1] and we will draw on the literature here, establishing a project and constructionism based curriculum, consisting of a regular course introducing the basic equipment and skills (e.g. 3d-modeling) as well as regular seminars focusing one area more in-depth. The HCI perspective will expand more traditional CSCL into the physical realm. Furthermore, we will treat the lab similar to a boundary object, hopefully spanning different academic communities (of practice) in an interdisciplinary, interfacultative way, also bridging current gaps between research and adademic education, everything grounded in evolving practice as well as basic ethnographic work with researchers, faculty staff as well as students.

Research

Fab Lab Siegen will be less about specific scientific projects planned in the lab (like e.g. the work on self-replicating machines at MIT) but about tie-ins to other research projects. We believe that there is a huge range of academic research going on that might benefit from, be enriched or expanded on by connection to a Fab Lab, its equipment and its interdisciplinary perspective, similar to the disruptive effects the PC had on work. We have e.g. already started to transform a

research project which was originally centered around teaching children basic ICT skills into the realms of making by introducing 3d-printing which lead to new perspectives on the relation between the physical and the digital. Another example would be a project about e-mobility for citizens which will get a completely new angle through the availability of the Fab Lab and its possibilities for DIY repair, fabrication and customization of the e-bikes. We believe this approach which, in a way, treats research projects like end users in CSCW and EUD, giving them access to tailorable, innovative and accessible new infrastructure while fostering their appropriation work is not only sustainable but will also yield innovation and results regarding linking academic research and making.

Region

On the one hand, universities are embedded in the local region (and have extensive networks), on the other hand, they are still often viewed as "ivory towers". Fab Lab Siegen will be open to everybody and also offer specific workshops and other events empirically grounded in local culture, values and challenges – e.g. inviting retired local metalworkers to give introductions to their craft in the Fab Lab, passing on their traditional skills and combining them with the digital fabrication technologies in the lab. This might not only help to integrate university and city more and start more meaningful dialogue between citizens and students or researchers but also yield novel insights into the relation of craft and academia, especially HCI. CSCW and HCI are often concerned with communities and dialogue, again making them a fitting perspective to take on such questions. Furthermore, we plan to address issues like the aforementioned vacancies in the city center through the development and end-user customization of commercial products, hopefully giving new impulses and opportunities to the local retail and SME sector.

Global scale

Fab Labs are deeply embedded in local communities but also have very global aspect, as is obvious in the whole concept of placing them with similar equipment around the world [2] in order to make and share anything from anywhere. We already started on this line of work, doing action-research motivated fieldwork in refugee camps in Palestine with 3d-printing as well as starting collaborations with a Fab Lab in Egypt relating to a DIY-Lasercutter which, like 3d-printing, we will not only use as a means for making but also as a research object, analyzing related practices, opportunities and working towards implications for the future design of such tools – globally, in order to broaden our understanding, produce thicker descriptions and, not least, to help advance making as a strategy in ICT and HCI for development (ICT4D).

Economic aspects

Economic aspects are arguably the area where the worldwide Fab Lab movement is least developed [6]. There are many opinions and predictions relating to economic disruption through digital fabrication, but setting aside the long-term vision of the Star Trek inspired replicator in every home and concentrating on the more graspable future, there is almost no work on actual business models and sustainability for Fab Labs and making – a notable exception being [8] who studied business propositions of Fab Labs worldwide and subsequently propose economically framed guideposts relating to openness, interdisciplinary collaboration, effectiveness and transferability, all

focused on value propositions centered on innovation. We plan to expand on this work together with chairs from the department of economics, the universities support office for start-ups as well as local SME. Again, we argue that a HCI perspective on such issues is very potent – especially CSCW has always been in the field of tension between leftist empowerment ideals (in this case personified by the open and open source maker movement) and work/economic context (here: business models and sustainability). As such, this lens and its traditions are uniquely well suited to conduct research into economic aspects of Fab Labs and to facilitate the collaborative development of new business models to help make Fab Labs more economically sustainable.

Conclusion

The contribution of this paper is a tentative concept for a FabLab that is based on concepts and approaches from the fields of HCI and CSCW, situated in the interconnected space between the categories discussed above. We believe the concepts and point of view we reported on above focused on Fab Lab Siegen are applicable to more such labs in a more generalized and interwoven sense, as visualized in the accompanying poster. We explicitly encourage deeper discussion about this in the HCI community and will report back in more depth in future work.

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