A CONCEPTUAL EXPLORATION IN THE INTERSECTION OF CRAFTS, TECHNOLOGY AND ACADEMIA FOR SUSTAINABLE JOB AND SKILLS DEVELOPMENT IN THE 21TH CENTURY

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Abstract

Since the beginning of the new millennium, the rise of the maker movement has sparked again interest in crafts in academia and high-tech industry. Some attempts at establishing collaborations have been tried, but have not solved the overarching problem of how our economy and society can find ways to cope with the perspective of technological unemployment. In this position paper, we propose a reflection, that leads to a model for a university laboratory that operates at the intersection of the three sectors of crafts, high-tech industry and academia. We outline a vision where each of these sectors contributes with its main strengths to the creation of a laboratory that lies at the intersection between Making, Innovating, and Learning, that we call the MILE Lab, that can aim to address the challenge at stake.

Keywords: skills development, interdisciplinary education, hands-on learning, technological unemployment.

1 INTRODUCTION

With Artificial Intelligence widening its fields of application at an increasing speed, a similarly increasing number of jobs appears to be threatened by the perspective of the so-called technological unemployment [1]. This view is currently strongly debated [2], but one aspect remains factual: some jobs are rotating out of the market, or have been otherwise significantly resized by the impact of automation. One such class of jobs is that of crafts [3].

The decline of crafts, it could be argued, started with industrialization almost two centuries ago. One of the side effects of digitalization, however, has been that of increasing economic inequality [4], which also contributed to this trend. The parallel increase in scholarization in the West [5][6] also reduced generational turnover in the field of crafts, since the newer generation saw those jobs as less attractive. The final tally leads to a situation where crafts are hardly at the center of the political, academic and economical discourse, and products of these activities have been by and large replaced by industrially-manufactured goods.

In this landscape, however, the arise of the maker movement can be seen as going against the trend. The vision of enabling rapid, accessible technology-powered crafting at small scale has gained substantial traction in the crafts, higher education and industrial sectors alike. The movement impacted all these sectors, and has recently also started to produce significant results in the education field, especially at the school level [7].

In this paper, we want to propose a reflection and a model for a university laboratory that operates at the intersection of the three sectors of crafts, high-tech industry and academia by leveraging the defining aspects of those areas. We will outline a vision whereby each sector contributes to a common vision, leading on their core area of expertise and supporting those of the other sectors. Mirroring the expansion of STEM to STEAM [8], the key advancement proposed in our model is that of enhancing university makerspaces by actively including craftsmen as co-designers and co-leaders of the process.

We will approach this task by first defining what are the problems of each of these sectors, focusing on how their job market operates and what skills they might need to remain sustainable in the digital era. For each sector, we will also look at what solutions have been attempted both on a per-sector basis and by grouping them in pairs and draw, making some critical considerations and highlighting where they could be improved. We will then briefly outline our model, and finally look at the limitations and potential impacts of our vision.

2 PROBLEM DEFINITION AND PARTIAL SOLUTIONS

In pre-industrial contexts, a large majority of the workforce was employed in farming, and crafts represented the more highly skilled segment of the labour market. Socially, this set them as a middle point between those that had to work to produce basic subsistence (farmers) and those that - in a form or another - employed workers (aristocrats). With the rise of industrialization, market demand for crafted goods decreased, making these jobs less attractive as a venue to economic stability.

Nonetheless, crafts kept developing well into the 1900s thanks, in greatest part, to the model through which skills used in the craft are transmitted, namely the master/apprentice relationship. Even this institution, however, has been disrupted by two key factors: first, as mentioned before, crafts became in general less lucrative and attractive as jobs; second, the rise of a competitive job market made the choice of working an unpaid apprenticeship position at a workshop usually a less interesting proposition than taking a job in the industrial sector. In spite of this, crafts have grown to be part of our human and social heritage, to the point where they have been ascribed as a category to be part of the UNESCO Intangible Heritages. Some of them, however, have also been flagged as “endangered” [3], due to the shrinking number of people able to perform these crafts and low generational turnover in spite of many efforts undertaken to consortiate and consolidate crafts at local or national level (for example, see [9]).

Since the 2000s, the maker movement has revitalized the interest in crafts for the younger generation through the use of technology. The idea of combining the latest technologies with creativity and handcraft to create physical artifacts gained substantial traction. Crafts, however, have been mostly seen as something to be optimized through the use of technology, rather than a skillset with its own dignity. In other words, we could say that the maker movement has a tendency to “tech-wash” the crafts.

The same high-tech industry enabling the maker movement, however, isn’t immune from the changes of the last years. Currently, industry employs a substantial amount of workers in lines such as clerical work and programming. These jobs have been recently framed as the most threatened by the perspective of technological unemployment [10]. Indeed, industry and academia alike recognize the need for engineers to develop a skillset which goes beyond technical skills [11]. Interestingly enough, some of these skills are integral parts of crafts, such as creativity and communication skills. To solve this, a great number of training programmes for young professionals have recently sprung as a way to complement academic education, offered by many heterogeneous organizations.

In parallel, academia has been facing the issue of making their educational offer more relevant to the jobs market and increase its mobility to industry and back [12]. In trying to fill industry demands, it focused its efforts on delivering technical skills, but the need of expanding academic education beyond such skills has been documented since the early 2000s in, for example, the EU’s University Modernization Agenda [13]. In the European Union, substantial effort has been devoted to strengthening the ties between academia and industry to bridge the so-called innovation gap [14] through programmes such as the EIT, but there is no consensus yet as to the degree of their effectiveness. It should be noted that these collaborations have often seen innovation as the product of the cross-pollination between academia and industry, but have not involved crafts. Crafts are often involved as local stakeholders in lower level of educations (i.e., schools), but rarely they are involved in Higher Education. The general attitude toward crafts has seen the sector as one which is not academic enough, and especially not belonging to the much-sought STEM area.

The inclusion of Arts in STEM, however, creates a natural fit to deliver on the teaching of skills such as creativity by collaborating with those professionals that have historically pushed the boundaries of “applied creativity” in our societies. This trend also matches well with the pedagogical reflections of the last decade that have disrupted the traditional teacher/student roles in the classroom. Examples of these are methods based on experiential, project-based, hands-on learning. Indeed, as the speed of knowledge generation and obsolescence increases, all these methods have shown that changing the fundamental relationship of the classroom can be a powerful tool to provide more effective education. These settings also provide a scientifically validated playground in which craftsmen can attempt to disrupt the aforementioned master/apprentice relationship in novel ways.

If disruptions, and therefore innovations, are born in the boundaries between disciplines [15], the three-way boundary between these three sectors is one in which we can search for solutions that might be otherwise impossible if each sector approached this with a silos logic. We will now look at one possible model where such intersection can be created, and what solutions it opens to.

3 A POSSIBLE COMPLETE SOLUTION

The solution spaces outlined above address the overarching problem in a "segmented" manner, but are insufficient to achieve a holistic solution. Therefore, we argue that such a solution has to be constructed by drawing from all of the solution spaces outlined above at the same time.

In our view, each sector should contribute with their defining features: crafts are defined by non-repetitive work crossing over with arts; high-tech industry is defined by exponential growth in terms of product and process innovation; academia by its commitment to education and use of the scientific method.

Our proposed solution is a physical and metaphorical space that we call the "MILE Lab", a space for Making, Innovating and Learning. This idea is modelled after a number of inspirations: the biggest is, for sure, the maker movement and Fab Labs, but we also see the MIT Media Lab, the Stanford d.school and (something European?) as inspirations. Each of the three sectors converging in the MILE Lab can be seen as the leader of one of its dimensions (crafts for making; high-tech industry for innovating; academia for learning), with the two others supporting and complementing the dimension leader.

Making, inspired by the crafts, should be unique and *artful*. If the core problem to be solved in crafts is that of creating resilient jobs, the focus should be put in the features of that work which are the hardest to replicate automatically. Namely, these are the artistic, creative and cultural aspects of crafts. This type of making, however, should also be *technology-aware*, to avoid repeating the errors of the past and ensure turnover and scalability of a craftsman's activity. This is where we envision the collaboration of industry, which can contribute bleeding-edge products and solutions. Academia also has a key role in ensuring that making is not done for its own sake, but has *purpose* (educationally, and in terms of skill acquisition). Making should be visionary and flexible enough not to be a mere application of currently available technologies, but instead seen as a process independent from the tech substrate, so that expertise acquired in the process can be adapted and applied in the future.

The view of innovation driven by the high-tech industry is *focused on the generation of value*, since businesses need to be sustainable. Our view of the MILE Lab also sees innovation as something that should be applied, and oriented to value generation (not necessarily in monetary terms, but also in terms of social, human and community value). In the duality of radical/incremental innovation, industry has been mainly focused on the incremental side. Integrating these "continuous improvement" processes into the architecture of the laboratory can add value to both crafts and academia. Academia, on the other hand, contributes to the innovation dimension by means of *interdisciplinarity*. Computer Science, Electronics, Design, Social research and many more academic disciplines all contribute to the implementation of the lab. The benefits of this interdisciplinary approach have been validated in terms of research, business, and especially education since the beginning of the 2000s [16]. The setting of the MILE Lab would allow industry to integrate these approaches to renew their commitment toward radical innovation.

Finally, the learning dimension is the true backbone of the MILE Lab. The main position that we want to take here is that learning in this lab should be *researched*. Epistemological stances, engagement strategies, teaching methods, outcomes and reflections should be documented and shared formally (e.g., through research papers) as well as informally (e.g., through whitepapers; workshops). We argue that our lab should follow educational models based on hands-on/experiential learning (which is also a key part of crafts) and divergent thinking (found in high-tech industry), but that these should nonetheless be subjected to the scientific method. Keeping this in mind allows to construct a framework for consolidation and incremental improvements to be put alongside the more disruptive approach that these learning strategies imply.

Table 1. A summary of the three sectors and areas of intervention of the MILE Lab, highlighting which sector leads on which area of intervention.

	Making	***Innovating***	***Learning***
Crafts	Lead (creativity)	Support (human heritage)	Support (hands-on learning)
High-tech Industry	Support (enabling solutions)	Lead (value generation)	Support (incremental, explorative learning)
Academia	Support (skill acquisition)	Support (interdisciplinarity)	Lead (education research)

4 CONCLUSIONS

In drawing some preliminary conclusions about this reflection, a first limitation comes to mind: our model for the MILE Lab ends up framing, at the end, an exercise which is still driven by academia. It would be interesting to discuss a similar model where the lab's leadership is left to crafts or industry. The main problem in this case, however, would be ensuring that the organization taking the lead has enough manpower and capacity to commit to pursuing the goals of the laboratory as a whole together with their own goals. Another key factor that favours academia taking the lead is the fact that universities have a much longer lifetime as organizations than both workshops and companies.

In conclusion, with our reflection we aimed at drawing the attention at what we feel are some missing links of the models that we have taken as inspiration. In particular: 1) bringing the artistic part of crafts in the dialectics of technology-enabled making provides us a way to train students and construct jobs that are by construction harder to replace with machine; 2) the focus on value generation in such hybrid context makes this an exercise not just in creating a novel experimentation space, but one that - through its alumni - can one day feed back into the economy; 3) researching education both in a formal and informal way hopes to break one of the deadlocks that our field is facing, namely the fact that studies can be either scientifically meaningful or visionary, but hardly both.

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