
Open, Small-scale Fabrication: A Catalyst for Educating Communities about the Creation of Products

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Abstract

We introduce an experimental platform called *Project Provenance* that connects small-scale makers with people in their local community to share information about the products they make. The findings from a series of interviews with both digital fabricators and more traditional craftsmen are presented. A strong desire to promulgate 'making stories' was discovered. This paper also explores associated technologies, particularly product supply chain transparency through open linked data. There is potential for promoting small-scale urban fabrication, made increasingly viable

through digital methods, by connecting makers with people in their cities. This could enable 'making education' at all ages, employment and empathetic connections within different sectors of local communities.

Author Keywords

Making, transparency, local, sustainability, cities, knowledge, design, open data, products

ACM Classification Keywords

K4.m Computers and Society.

Introduction

The rise of Internet technologies, such as open data and social media, present an opportunity for creators of products to connect with local people, young and old, in search of knowledge about how, where and by whom the things they buy are made, but how do we achieve this? *Project Provenance* (www.projectprovenance.com) is concerned with how to enable makers to share stories and information behind the products they create in an open, social format. Through a series of interviews and initial tests with a web-based prototype, behaviours of 'new' and 'old' small-scale makers of consumer products emerged. Initial findings showed that makers of products want to share information and stories about the creation of their products. This can

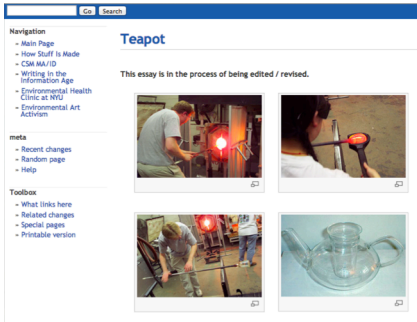


Figure 1. Natalie Jeremijenko's 'How Stuff is Made' interactive wiki.

Prefix	GCP Length	Number of GCP with a GEPH Return Code = 0	Number of GCP	%	GS1 Member Organization	Number of barcode that can be assigned (per GCP)
000	7	2 162	10 000	21.62 %	GS1 US	100 000
001	7	8 666	10 000	86.66 %	GS1 US	100 000
002	7	8 727	10 000	87.27 %	GS1 US	100 000
003	7	8 652	10 000	86.52 %	GS1 US	100 000
004	7	8 708	10 000	87.08 %	GS1 US	100 000
005	7	4 341	10 000	43.41 %	GS1 US	100 000
006	7	4 85	10 000	4.85 %	GS1 US	100 000
007	7	9 353	10 000	93.53 %	GS1 US	100 000
008	7	8 826	10 000	88.26 %	GS1 US	100 000
009	7	8 532	10 000	85.32 %	GS1 US	100 000
011	7	0	10 000	0.00 %	GS1 US	100 000

Figure 2. One of the many databases in Open Product Data a open source project by the Open Knowledge Foundation to open the worlds barcode information to consumers: This one shows the number of GTIN codes (format that makes the Barcode) by country and category.

help towards building community connections and leading to new ways of educating about the making of things, both online and in real life.

Background

The last fifty years has seen the mass globalization of manufacturing of almost all consumer products sold in the UK today. The environmental and social impacts inherent in the creation of the goods we buy are missing from the shopping experience. Moreover, we often “buy into products and systems that worsen environmental and social problems” [1]. The decline of local manufacturing has created a structural hole or information gap rarely bridged – except by press reports and investigations by NGOs [2]. It is difficult to discover where or who made your new t-shirt or table. In response there has been a trend emerging to “buy local” and some 10 million online shoppers in the UK identify as “ethical” [3]. However, there is currently an ‘attitude-behaviour gap’ or ‘values-action gap’ where 30% of consumers report that they are very concerned about environmental and social issues but they are struggling to translate this into purchases [4].

There have been several organizations aiming to bridge the knowledge divide and make information available. Accreditations such as the Forest Stewardship Council (FSC) helps consumers choose sustainable timber. There have been efforts to educate through films such as “The Story of Stuff” and also projects like “How stuff is made” an editable database that demystifies the production of “water bottles, Ethernet cables, and fortune cookies” by Natalie Jeremijenko (Figure 1). Work thus far has focused on information about highly globalized supply chains of mass produced products.

Current and emerging technology

While globalization has increased overall complexity of the production of our products, the Internet has enhanced our global interconnectivity. The rise of open data, crowd sourced information, social media and

mobile technology over the past decade is fuelling the knowledge economy resulting in “demands from consumers in the Global North for greater transparency in production processes” [5]. When we combine this with the rise of small-scale digital (or part-digital) fabrication the viability of affordable local product manufacture and the potential for the ‘values-action’ gap to close emerges.

The *Internet of Things* will enhance our interconnectivity still further. In the future all objects may have intelligence and the ability to communicate through embedded hardware or through augmented reality systems. The *open data* (defined as “information that is available for anyone to use, for any purpose, at no cost” [6]) movement is fuelling the sharing of data related to physical products. One example is the formation of Open Product Data by the Open Knowledge Foundation, which gives people the ability to access information about a product from it’s barcode number. However, the user interface for accessing this data is still in its early stages and only provides relatively low-level to the underlying data (Figure 2). Through the creation of linked open data and APIs it’s becoming easier to assemble information from different sources about products online. “*In the same way open software allows anybody to look into the code and check what it is doing, open data would allow anybody to find out about what we buy and use everyday*” describes Chris Taggart, founder of Open Corporates.

The workers and other stakeholders within supply chains, big and small, are increasingly digitally enabled through mobile technologies and particularly social media. Leveraging this mobile connectivity could enable small-scale vertically integrated makers to educate their communities. There are over 66,000 SME consumer facing registered making or manufacturing businesses in the UK alone [7]. Digital fabrication methods, such as CNC, laser cutting and 3D printing, have potential to empower small-scale local

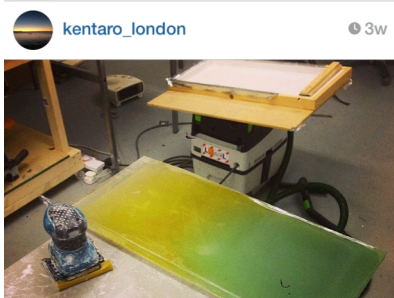


Figure 3. Small-scale makers sharing the process of making via Instagram



Figure 4. Maker interviews: (top) digital and hand leather work, London; (bottom) laser cutting in Deptford, London

manufacturing as an alternative to the mass production of consumer products. Digital fabrication connects citizens and the creators of products – educating and involving people in the making process.

Interviews with makers

To gain understanding of a maker's behaviour, in order to develop the web tools for Project Provenance, a series of over thirty interviews were conducted with small-scale makers in London and the South-West of England. Approximately half the interviews were with makers using new digital fabrication methods and half with more traditional craftsmen – some are a blend of both. The purpose of the interviews was to gain understanding of how to enable makers to share information about their process with the public - promoting making education, skills and jobs.

Findings

All the makers interviewed had insightful stories about their manufacturing, interesting workshops and a high level of social and cultural value. *"I prefer to spend my time creating things well rather than telling people about them"* said Hugh Laughlin a maker of CNC furniture. One finding across our interviews was that digital makers were more adept at sharing their creative process online predominantly via Facebook, Twitter and Instagram, an example is shown in Figure 3. However, there is a common motivation for the makers to focus spending their time creating their products and not maintaining websites and social media. Many voiced their concerns that in order to compete with larger, cheaper, mass manufacturers their brand and story needed to be salient. For example, bike maker James Kennedy said *"Small-scale making is still less financially competitive and therefore competing in a higher end market, where brand value carries weight"*.

The personal motivation for the creation of products varied from maker to maker, but to create products

that would be loved, to minimise waste and to be true to materials all arose as key concerns. All makers were local employers, paid taxes in the UK and were open to apprentices or internships to help pass on skills. There was rich knowledge of how to design for their specific materials and processes. The extent to which they knew about the origins of raw materials generally depended on material type. In particular, makers working with natural materials generally knew the raw material's origin. Responsive or bespoke making was a commonly identified unique selling point across makers both digital and more traditional.

There was a strong desire amongst the non-digital older craftsmen to share skills with a younger generation. Watchmaker Harold Pinchbeck said, *"there are so many skills within these workshop walls that are quite unknown to the outside world, apprentices are our best chance at preserving them."* This lends itself to consumer involvement, creating a relationship between the maker and the buyer. Will the founder of Gaolhouse said *"a huge motivation for starting a making company was to give ex-offenders the chance to learn a trade work in a skilled job in the UK and have shoppers support that"*.

Education and making skills were often acquired through experience in workshop environments rather than formal training. Mark Tallowin, a hand and digital leather worker (using processes is shown in Figure 4), said *"learn from the best if you're going to learn from someone, so I learned from the most traditional tradesmen. I'm taught every day by the materials I'm working with. The joy of this world is that you can pick up a hundred year old briefcase, and see the same decisions made by your predecessors a century ago."*

Design Project Provenance first prototype

To bridge the gap identified in the interviews between the creator of the product and their local community, we are currently working on a web tool for makers to

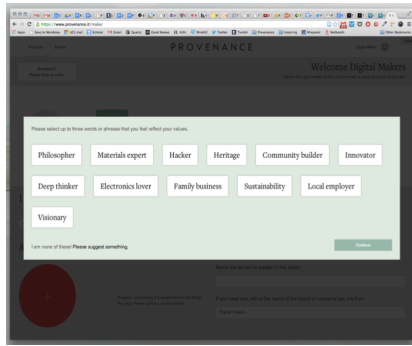


Figure 5. Data gathering with the Project Provenance web tool: This screen asks makers to identify with different keywords, such as 'hacker' or 'family business' to build up their profile.



Figure 6. Exploring products on a map by where they are made to join makers with their local community

share information about the materials, places, processes and people behind their products online (Figures 5 and 6). Project Provenance web tool gathers data and stories about the maker and the creation of the product. For example, the site asks makers to identify with different keywords, such as 'hacker' or 'family business' to build up their profile.

The goal is to use shared data to enhance the information available about products online. Furthermore, we conducted an experiment with a GPS responsive web tool that shows a person the products made closest to where they are – educating on things made near by. So far 10,000 people have explored the site and 10% of those people have clicked 'buy' (which links out to the maker's website at this point, because we are store front rather than an actual shop). Over 70% of people who clicked by, where clicking on a product within the 20% closest makers to their current location, fostering a connection with local makers.

Planned future experiments

Project Provenance is in its early stages. Future plans are to help join makers with their community and increase the sharing and gaining of scale-scale production knowledge, which can lead to the advance of education on the making of things. Up and coming experiments include a sharable memento or receipt to enable the sharing of the stories behind products with others and a Narrative camera worn round the neck to real-time share the making process within communities

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using social media hash-tags and linked accounts to build up a dialogue around the making of a product.

Discussion and conclusions

All products have a *data shadow*: the thousands of independent pieces of information concerning a product that collectively tell a product's complete story, the online information made available about a product is only a sliver of it. Small-scale digital fabrication presents a unique opportunity, given the technology context of open data and physical and digital connectivity, of connecting 'the workshop' and the community. Given the strong desire of digital and non-digital fabricators interviewed to pass on skills and share stories there is potential to increase making skills, employment and local connections. We propose that simple, less time-consuming tools are needed, and that open, accessible stories about consumer products can help educate society on the making of things.

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