The practical maker: investigating the definitions and requirements of and exploring the motivations behind bespoke making.

Robert Phillips,
Brunel University, London UK
info@rdphillips.co.uk

Sarah Silve and Sharon Baurley
Brunel University, London UK
sarah.silve@brunel.ac.uk, Sharon.Baurley@brunel.ac.uk,

Abstract

This paper reports on a study using cultural probes to investigate the definitions of making amongst groups of hobbyists. It examines communities of enthusiasts who regularly make tools and equipment for their activities and explores examples of things made and practical problems solved in order to gain insights, opinions, circumstances and motivations from them. The study included over 60 participants from mixed demographic backgrounds with diverse types of hobbies and levels of ability. The access to commercial manufacturing processes has been lowered through systems and spaces known under the term 'open design'. Open design has enabled users to make bespoke products with a higher quality output through to the use of digital fabrication.

KEYWORDS: Making, Amateur, Cultural probe, Digital manufacture, Open design

Introduction

The process of making is not a new phenomenon, it has evolved from the prehistoric tools that ensured survival, or the home knitting guides that moved economic clothes production into a more scalable design area. Interest groups have "made" to suit their needs for many generations,

with mixed skillsets. "The skill level of making is becoming more accessible to all with digital manufacture. Digital manufacture has enabled [what many see as] the democratisation of product design, enabling people with motivation and little or no funds to finance mass manufacture, developing their own bespoke solutions" (Von Hippel, Paradiso 2008). Digital manufacture is the remote creation of objects using an automated process to cater for low volume production (Jamais Cascio & Alex Soojung-Kim Pang 2007). These approaches of user led making can support new opportunities that were previously unviable, due to scale or finance (Daniels 2010). These manufacturing methods have been explored in hacker spaces (open access technology spaces), in design, engineering and other professions but it is widely believed that "the hobbyist can offer new insight to the custom requirements of products" (Bie Prett 2008). This investigation aims to observe communities of practical people that could utilise this approach to create bespoke products. This study compiles insights from an initial investigation using "cultural probes" (Gaver, Dunne & Pacenti 1999) and photographic journals, completed by beekeepers, birdwatchers, archaeologists, gamekeepers and woodsmen.

A cultural probe is a research tool used and "completed by a participant in their own environment in isolation from the researcher" (Gaffney Gerry 2012). The rural nature of the participants' activities is of interest because these undertakings are becoming more common in urban environments. The study uses cultural probes to gain insights from the participants' environment. The participants involved were from mixed locations nationwide (UK), of mixed ages over 18 and mixed gender, resulting in a wide demographic. The participants were all expert hobbyists (not professionals) with mixed perceptions of making 'products' for personal needs. The motivation behind investigating amateurs is to develop an understanding of the non-professional as a specific field of dedicated individuals outside of mainstream commerce, and how to best meet their requirements for future design proposals. The groups are of interest as their pastimes are focused around practical elements: they have practical knowledge useful for product creation. The participants were asked to use their experience, knowledge and approach to define what constitutes analogue and digital making. Their specific requirements can embrace digital technologies to create bespoke products. As Kuznetsov and Paulos state, "understanding the amateurs' motivations will highlight the requirements of information required for the practical 'layman' to deploy digital manufacture" (Kuznetsov, Paulos 2010). The groups will define making, opening up areas for further design investigation.

Method

A design probe was deployed to a group of mixed applicants who self-selected to take part. A design probe is a tool that enables researchers to examine an environment, process or group at a distance and in the participants' own time (Wyeth, Diercke 2006). Probes are described as "objects, physical packets containing open-ended, provocative and oblique tasks to support early participant engagement within the design process" (Boehner et al. 2007). The probes are designed

for a site or environment-specific investigation ranging from photography to physical products (Mattelmäki 2006). They can provide a different perspective or "window into the user's life" (Herd, Bardill & Karamanoglu 2009).

"Cultural probes are appropriate when you need to gather information from users with minimal influence on their actions," ensuring that you are not influencing the tasks and outputs of the participant (Gaffney Gerry 2012). Probe tools are usually well-designed activities that are described as "valued opportunity not problem solving" (Boehner et al. 2007). Probes are purposefully designed to "provoke, reveal and capture" the intended environment or situation (Hemmings et al. 2002). It is a mistake to think "probes make design easy;" they are a process that allows interpretation by actively engaging the user (Gaver et al. 2004). The probe packs were designed to ensure the process was intuitive, positive and open to interpretation. "If the packs are unconsidered, badly designed [or] substandard the participant will not engage as effectively or as positively" (Mattelmäki 2005).

Guidelines followed in the deployed design probes:

- Asking unambiguous questions tends to give you what you already know.
- Posing open or absurd tasks, ensures that the results will be surprising.
- Summarizing returns tends to produce an "average" picture that may not reflect any individual well, and that filters out the unusual items that can be most inspiring.
- Analysis is often used as mediating representations for raw data.
- Searching for justifiable accounts of probe returns constrains the imaginative engagement and story-telling which can be most useful for design (Dunne et al. 2001).

Design tools/guidelines

The participants were recruited by email targeting specific interest groups. The participants were then sent packs to complete, ensuring privacy and ethical approval. The criteria of the groups included were based on the following factors:

- They use practical tools or have a practical task that they complete as part of their activity.
- They have a practical approach to their task.
- They are not professionals; they are hobbyists.

The groups that participated included: beekeepers, birdwatchers, archaeologists, gamekeepers and woodsmen. They were of interest as they use products with specific needs and requirements; they all deal with bespoke environments and have particular insights into making. They are early adopters of new ideas that can improve their process or outcome and make adjustments to their equipment independently.

Approach

Once recruited, the participants were issued with a digital camera or memory card, depending on their personal equipment. The photography equipment was accompanied by a notebook to document explanations about the images. The notebooks had enlarged page numbers to be included in the participants' photographs ensuring that the documented notes correlated. The participants were asked to document specific activities, highlighting touch points with making. They were asked not to simply document their hobbies and interests but to draw on their experience to define making. The process avoided setting rules as probes "should embrace the abstract as they can offer insight" (Gaver et al. 2004).

Results

The feedback from the use of the probe was varied and findings were classified into groups. The classifications built on the approach of DIY cultures and classifications of motivations (Hanington, Martin 2012). The groups are as follows:

- Making in the everyday/essential need
- Making for everyday improvement
- Making for demonstrating skill
- Making for bespoke requirement
- Making for financial requirements
- Making for re-appropriation
- Making for documentation
- Making for secondary use

The study identifies and defines making by participants who have specific requirements in their daily environments. Digital manufacture can support these insights for higher quality user created products and processes. Insights from the probes which have been excluded from this paper included: knitting, hand crafting of cards, cuisine, the making of social relationships, children's toys, laundry, cosmetics, mundane battery changes to make a product work, and drawings by young children that were too young to explain. These were not included due to the lack of information given or the mundane nature of the insights. The results for each group are as follows:

Making in the everyday/essential need

The everyday/essential need defined by repetitive tasks that are required on a daily basis for the smooth running of a particular environment, reinforcing the ideal of "design meets need" (Atkinson 2006). Tasks included bed making, produce making, journey making, making a call,

making clean or washing, fire making, health making, routine making, prescription drug making and equipment renovation.

Participant 025: was focused on routine making that included pharmaceuticals and diabetes medication to ensure health and well-being for that day. This was classified in their text as "making necessities" that they relied on in their daily life. Making necessities is dependent upon context and location: this is an interesting view of making as it is about critical aspects of everyday life (Figs.1 and 2).

Participant 022: was focused on making a meal and collecting materials for the meal, in which the firearms (Fig. 3) were seen as tools of the user's daily routine. This revealed inspiring approaches to and perceptions of food and nutrition, and specifically how it is made or 'caught'. There are different skills within the confines of different users' definitions of everyday making: the preparation, the practise, and knowledge of the environment (Fig. 4).

Making for everyday improvement

Tasks including furniture making, gym equipment making, musical instrument making and home improvement are built around integrating making as a tool to enhance an environment.

Participant 025: Making of a loft conversion, the participant paid a contractor to carry out the work, but referred to it as "them making and their construction". Just because one pays for the fabrication of an object, raised the insight how involved are you in that making process? Would participants want to be more involved in the steps involved in "making" if they could be? (Figs. 5 and 6).

Making for demonstrating skill

Making processes that demonstrate skills inspire craft carving in making, using difficult tools, craft processes for presents, mark making, alcohol brewing, recording, stone carving, using which people are "going beyond the act of making and considering craftsmanship" (Potter 1980).

Participant 031: Mark making by their child. Interesting as it is thinking about the semi-permanent nature of objects, their meanings and symbolism.

Participant 030: Illustrated skills that they were learning from on-line tutorials of stone masonry, something they were driven to make developing a skill set (Figs. 7 and 8).

Making processes that demonstrate skills can also include custom making of products inspired by leftover material, where the user assembles parts (Figs. 9 and 10). Kit-based making will open up new possibilities for makers with limited or no skill, and may be a more accessible means of construction. This can lead to a greater perceived value of objects that is not just purchased, but constructed (Sennett 2008). This type of making can involve social prowess, and demonstrating skills for peer recognition.

Making for bespoke requirements

This classification area included making custom equipment that is not catered for by manufacturers, making of instructions for others, making from the instructions of someone else, "relying on skills of accuracy for repeat reinterpretation of an object" (Michael I. Norton, Daniel Mochon, Dan Ariely 2011).

Participant 032: Making maps for future reference and comprehension by others of an archaeological dig site (Fig. 11). This is very specific in nature, as signs and symbols used were created by the user. The symbols were particularly advanced; they were only understood by the documenter, which narrows the use and limits the further possibilities of the object produced.

The learning of new skills to be able to make bespoke furniture plans by *participant 015* (Fig. 12).

Participant 004: Explored fence making and creating bespoke objects to create a growing/organic environment (Fig. 13), addressing the semi-permanence of an object or the legacy that it can have once created for the immediate environment, user, material or financial gain.

Participant 019: A set of instructions for a bird feeder adaption they created to send to their social group (Fig. 14). There were a number of "Instructables", (internet forum demonstrating constructions through images for global understanding) where the participant was using documentation to inform a remote maker on their construction method (Valentine 2011). There is an inherent knowledge of the material and its appropriateness to create specific products; questions arise as to how this can be relayed at a retail level to the layperson?

Making for financial reasons

Making for financial reasons included shoe repair, making allotment equipment, making for personal retail, and equipment for a specific purpose.

Participant 036: Made products to sell internationally, thinking about shipping, durability and online presence. The object was a specific tool for bee keepers (Fig. 15). There was a great deal of consideration of design values related to ergonomics, processes and postage considerations, with the participant having had no formal design training.

Participant 036: A home for a pet constructed due to financial cost and the thought that they could do a better job than those available through retail outlets (Fig. 16).

Making for re-appropriation

Making for re-appropriation is about making equipment, treating products as components adapted to suit new or uncatered for needs, and is known as "hacking" (Doctorow 2010).

Participant 032: Edited household tools for archaeological explorative purposes by hand shaping the objects to meet a custom need (Fig. 17). Each tool had a specific purpose to which it was tailored. This raises the question - can a custom group of components be redesigned so the user

can find their own use within their environment or context, specifically ensuring correlation between parts to facilitate only a positive outcome, regardless of skill?

Participant 028: Used leftover materials to make transport products, requiring skill and access to tools (Figs. 18 and 19). Can we consult the second and third life of a product without processing?

Making for documentation of knowledge

Making as a means to document knowledge can include image making, recording and documenting for third party use. *Participant 035:* Making records of valuable Neolithic finds, including; location, object specifics and predicted uses based on experience detailed for 3rd party understanding (Fig. 20). These records were made for the participant but then validated by a professional.

Participant 020: The imparting of making knowledge by teaching one of their siblings to safely use a publicly perceived dangerous tool (an axe), communicated the correct use of a skill by word of mouth and tuition (Fig. 21).

Participant 022: Produced an image taken from an observatory created by user, which showed a tremendous amount of technical skill from a hobbyist. This was taken in the quest for knowledge but it also demonstrates what information users can gather or make, and demonstrates a motivation to contribute towards global knowledge (Figs. 23 and 24).

Participant 028: Engaged in image making for conservation of species, classified as making 'notes' by the user. This information was shared as part of a wider community information gathering and making (Figs. 25 and 26). This exercise also involved an inspection of a new nest to ensure that it had been made correctly by the first time parents.

Participant 028: produced specific notes on the birds seen that day (Fig. 27), by making detailed sketches (participant has no formal art training), using analogue documentation for the pleasure of making. They stated they would rather draw than take a photo or digital memory as it is more personal.

Making for secondary use

Making an environment that has specific requirements for a secondary function.

Participant 005: Editing the environment of their garden to suit their hobby (beekeeping), carefully selecting flowers to flavour the honey (Fig. 28). Tailoring an environment for a specific outcome, and thinking about making for a subsidiary effect. Raising the question how can users make their immediate environment benefit those around them? *Participant 026:* Interpretation of making happiness: a country walk (Fig. 29). This is a refreshing opinion in this study as it is thinking about the social wellbeing of how to make ourselves, which raises the question of how we can make our environment optimise our happiness. The making of a personal environment is something deeper, but it would be an interesting area for bespoke manufacture.

Defining not making

The participants found it easier to define making because they focused on the value of their constructions rather than on the outcomes. They started to see making in everything which was interesting but this initial interest began to wane over a longer period of time. The initial probe insights were more insightful.

Conclusion

Insights gained from the study that can be applied to systems, products that user-designers could use.

- Making in the everyday/essential need, ensuring processes are optimised for user-designers.
- Making for everyday improvement, designing to include non-makers in the process.
- Making for demonstrating skill, lowering entry level for all to make.
- Making for bespoke requirement, allow for product adaption and tailoring.
- Making for financial requirements, achieving mixed levels of financial entry.
- Making for re-appropriation, treating products as components to meet other functions.
- Making for documentation, cataloguing processes for repeat use.
- Making for secondary use, think holistically about the wider implications of the "make".

Defining the role of what qualifies as making is not as simple as creating an object or physical artefact. This study refers to making as creating environments, social wellbeing, creating finance, documenting, pride in tasks, craftsmanship, knowledge and skill that can define making. In this study the process of making was explored in its widest possible sense, and was often viewed differently by different generations (Anonymous2012). New and different ideas emerge, new areas that can become the subject of experimentation within the field of making, and new elements to be considered are established by having an open interpretation. Overall, the users had a comprehensive understanding of making within their own everyday context.

Within this study the theme and already the need for making had clarity, due to the applications and motivations that the participants had prior to the study due to their interests. Prototype exploration and editing in the sense of professional design iteration was rare in the study; this could be based on the skill that the participants already possessed: participants quickly identified and established a limit where a 'made' solution will serve its purpose. The design process (by professionals) is iterative and observes multiple optimisations rather than the probe insight of solo over-engineering to ensure functionality and longevity on the creation.

Most of the insights documented as 'making' in the study were over-engineered, perhaps as a result of a lack of material knowledge on the part of the participant, or the trust that was wanted

or desired in the object. Participants over-compensated in their constructions to ensure a positive outcome: this needn't be a problem for the task of making, for it serves to reassure the element of trust in self-fabricated objects. The complexity and ability of products that can be adapted; self-evolved and edited in kit form will advance over the next few years. Products will become more personalised, people will push their skills further to make or assemble. There are several components of the definition of making that require more investigation. It is unclear how much value participants placed on their 'made' artefacts or the knowledge gained. It might be that having increased access to design facilities and techniques may empower the designer to use different materials and be more ambitious in the making process, leading to an increased range of products.

Discussion / further research

Most of the observations were based around what participants had access to in their environment. Aspirational making, the insight into what people would want to make, is challenging because it needs to occur naturally over a period of time and with experience, often addressing latent needs that the participant cannot see for themselves. The results from the probes raised the following questions:

- Should design cater for the layman to create objects that are worthy of higher financed production?
- Would aiding the access of people's aspirational self-makes open a direction for products that designers create?
- With the open access of technology, will people financially commit to something they make?
- What is the financial threshold for a self-made object?
- Can digital manufacture enable multiple international users to virtually test a design proposal prior to fabrication? Can we design systems to ensure form, function and mechanical failures or make suggestions accessible by the hobbyist? Or is this the role of the machine/system technician?

There is less of a need for material efficiency to craft a bespoke object: perhaps this indicates a bigger divide than is usually identified between hobbyist and expert. Whilst the layman perhaps demands functionality without an awareness of the design process or the specifics of construction, others are more inquisitive about the internal logics of an object. Is this a mark of the expert maker? The expert goes beyond the functionality of the object "going beyond the act of making and considering craftsmanship" (Timothy Taylor 2010). The next step is applying insights raised from study to specific niche groups to explore opportunities for open design.

References

Instructables, make, how to and DIY.2012, . Available: http://www.instructables.com/ [2012, March 4th].

Atkinson, P. 2006, "Do it yourself: Democracy and design", *Journal of Design History,* vol. 19, no. 1, pp. 1-10.

Bie Prett 2008, *Hackspaces The Beginning*, Self-Published by Author, New York.

Boehner, K., Vertesi, J., Sengers, P. & Dourish, P. 2007, "How HCI interprets the probes", *Proceedings of the SIGCHI conference on Human factors in computing systems* ACM, pp. 1077.

Daniels, S. 2010, *Making Do, Innovation in Kenya's Informal Economy*, Analogue Digital, San Francisco, California.

Dunne, A., Royal College of Art (Great Britain), Gaver, W. & RCA CRD Research. 2001, *The Presence Project,* RCA CRD Research, London.

Gaffney Gerry 2012, *, What is a Cultural Probe?*. Available: www.infodesign.com.au [2012, March 26].

Gaver, B., Dunne, T. & Pacenti, E. 1999, "Design: cultural probes", *interactions,* vol. 6, no. 1, pp. 21-29.

Gaver, W.W., Boucher, A., Pennington, S. & Walker, B. 2004, "Cultural probes and the value of uncertainty", *interactions,* vol. 11, no. 5, pp. 53-56.

Hanington, B. & Martin, B. 2012, *Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions,* Rockport Pub.

Hemmings, T., Crabtree, A., Rodden, T., Clarke, K. & Rouncefield, M. 2002, "Probing the probes: Domestic probes and the design process", *Proceedings of the 11th European conference on Cognitive Ergonomics, Rome. Catania, Italy: European Association of Cognitive Ergonomics*, pp. 187.

Herd, K., Bardill, A. & Karamanoglu, M. 2009, "Development of a design probe to reveal customer touch points in the sale of mass customised products.", *Design Principles and Practices,* vol. 3, no. 3, pp. 193-208.

Jamais Cascio & Alex Soojung-Kim Pang 2007, *Manufacturing: Do it yourself?*, Institute for the future, Palo Alto California.

Kuznetsov, S. & Paulos, E. 2010, "Rise of the expert amateur: DIY projects, communities, and cultures", *Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries*ACM, pp. 295.

Mattelmäki, T. 2006, "Design probes", .

Mattelmäki, T. 2005, "Applying probes–from inspirational notes to collaborative insights", *CoDesign,* vol. 1, no. 2, pp. 83-102.

Michael I. Norton, Daniel Mochon, Dan Ariely 2011, "The "Ikea Effect": When Labor Leads to Love", .

Potter, N. 1980, *What is a Designer,* Hyphen press.

Sennett, R. 2008, *The craftsman,* Allen Lane, London.

Timothy Taylor 2010, *The Artificial Ape, How Technology Changed the Course of Human Evolution,* Palgrave Macmillan, United States, New York.

Valentine, L. 2011, "Craft as a Form of Mindful Inquiry", *The Design Journal,* vol. 14, no. 3, pp. 283-306.

Von Hippel, E. & Paradiso, J.A. 2008, "User Innovation and Hacking", *Pervasive Computing, IEEE,* vol. 7, no. 3, pp. 66-69.

Wyeth, P. & Diercke, C. 2006, "Designing cultural probes for children", *Proceedings of the 18th Australia conference on Computer-Human Interaction: Design: Activities, Artefacts and Environments*ACM, pp. 385.

Fig 1.


Fig 2.

Fig 3.


Fig 4.


Fig 5.


Fig 6.


Fig 7.

Fig 8.

Fig 9.

Fig 10.

Fig 11.

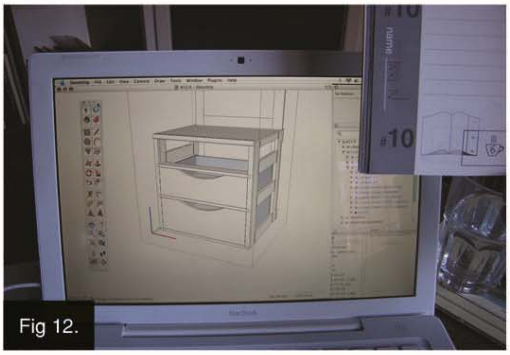

Fig 12.

Fig 13.

Fig 14.

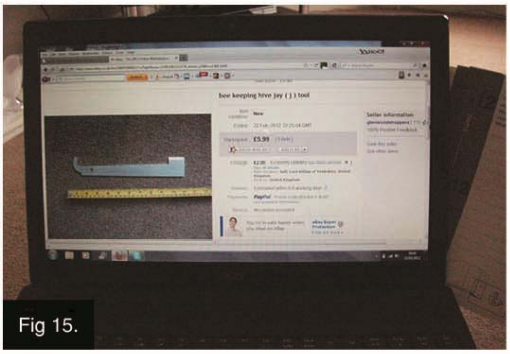

Fig 15.


Fig 16.


Fig 17.


Fig 18.

Fig 19.

Fig 20.


Fig 21.


Fig 22.

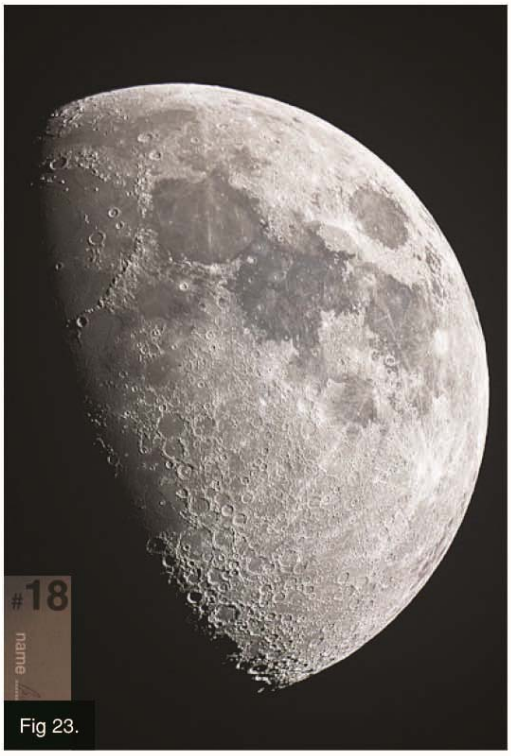

Fig 23.

Fig 24.

Fig 25.

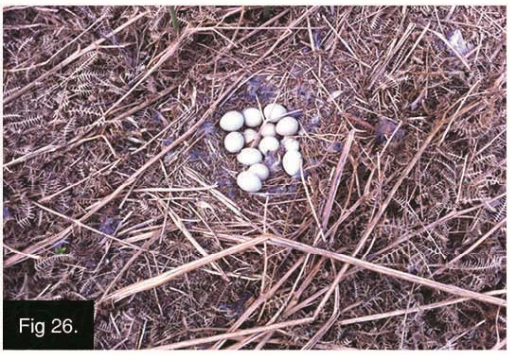
Fig 26.

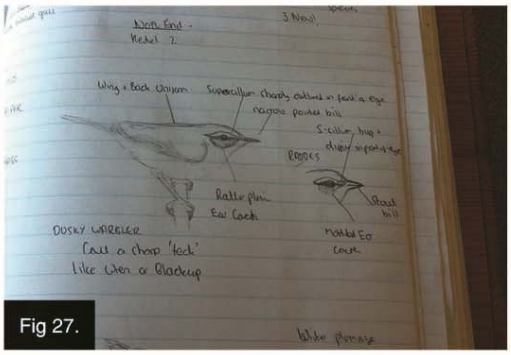

Fig 27.


Fig 28.


Fig 29.