

The Maker Fables

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Abstract. This Science Fiction Prototype explores the idea that the current interest in maker space activities could continue to grow to the point where it causes a sea change in the manufacturing industry as it shifts from centralised production in factories, to a distributed production in people’s communities or homes. This move is a natural extension of a number of research trends, such as the increasing ability to personalise products and the popular trend of making or adapting things. We contextualise this within current concepts such as virtual appliances and buzzboards and micro industries before presenting a series of vignettes that take a potpourri look at some related ideas. Finally, we conclude the article by reflecting where this technology could go in the future.

Keywords. Maker-space, hacker-space, virtual-appliances, science-fiction, product innovation

Introduction

One of the current trends in technology is personalisation [1]. Personalisation is evident in many areas of people’s lives such as their choice of clothes and home decoration through to more technical environments such as personalizing screen layouts on computers. It seems that this propensity for personalisation is closely related to people having a fascination with making things, as is evident by the vibrant hobbyist scene and, to some degree, the related cottage industries. The ‘arts and crafts’ industries are one such example that unleash people’s creative talents and fulfil their desire for personalisation. While there are all kinds of such activities, in this article we are especially concerned with technology, particularly computing and electronics. In this area there are a number of popular movements, most notably ‘maker’ or ‘hacker’ spaces. According to Wikipedia, ‘maker’ or ‘hacker’ spaces are “*a community-operated workspace where people with common interests, often in computers, technology, science, digital art or electronic art, can meet, socialise and/or collaborate*” (<http://en.wikipedia.org/wiki/Hackerspace>). Their roots can be traced back to the early nineties, although it is only in the last 5 years that their popularity has soared. These spaces often go by a variety of other terms such as ‘hacklab’, or ‘hackspace’. Many people claim the terms ‘hacker’ and ‘maker’ are interchangeable, although purists would argue that ‘maker spaces’ have a broader remit that extends into non-technical areas, such as ‘arts and crafts’. For the purposes of this article, I will use these terms interchangeably. The fact that the ‘maker’ activities are group based is an important distinguishing feature to the isolated home hobbyist, as the people that participate in maker spaces are often professionals, sometimes with aspirations of inventing products and establishing new businesses. As these are largely ad-hoc groupings, drawn together by a shared interest in building personalized goods, it’s hard to generalize on their

motivations, apart from noting that a common denominator across these areas is personalization, albeit often in a more physical sense. The kinds of tools that are used in these spaces are highly modularized embedded computer systems. An excellent example of these are *Buzz-Boards* (www.FortiTo.com), in which developers can plug together boards with differing electronic functionalities to produce products with an overall; functionality they desire [2] [3]. A useful feature of *Buzz-Boards* is that they allow different physical configurations thereby enabling the constructed system to take on a shape that is closer to the envisaged final product. Thus for example they can be used to make products that range from small wearable medical systems, through desktop robots, to large living spaces such as smart-homes. Maker-spaces can be regarded as a type of informal learning environment, as the group support is often focused on instructive advice, resulting in learning, especially by less knowledgeable members. Indeed, there is a wider commonality between hobbyists, maker-spaces, education facilities and company R&D laboratories as they are all trying to rapidly create working prototypes. Interestingly, the class of technology they use is more frequently referred to as rapid prototyping systems. The *Buzz-Boards* are good examples of this but there are more, such as Arduino [www.arduino.cc/], Raspberry Pi [www.raspberrypi.org/] and mbed [<http://mbed.org/>].

The movement from centralized to local production is a fascinating development that is well described in an interesting article published in February 2010 by Chris Anderson for Wired in which he describes what he refers to as a coming “*age of open source, custom-fabricated, DIY product design*” [4]. In particular he explores the potential for what he terms new ‘micro-factories’ with the current tools of the trade being products like electronics modules through to 3D printers. In that respect he notes that hardware is becoming much more like software in terms of its malleable design features. It’s a powerful vision of a distributed industry made up of thousands of micro-producers varying in size from individuals to small groups of people with a shared need. He points out that, with computer networks connecting such micro-factories (or even current factories), there is the potential to set up a meta-layer of virtual-micro factories able to design and sell goods without any infrastructure. In other words, such supply chains become scale-free, meaning they can serve small and large customers with equal ease. One very interesting issue he explores is “Why do companies exist”? He quotes Bill Joy of Sun Microsystems as saying “*No matter who you are, most of the smartest people work for someone else*”. Given the changing capabilities and economics of production, that question seems worth revisiting especially as everyone’s shed or garage has the potential to be a high-tech factory. Interestingly, Anderson reports that most such micro-factory units produce thousands of devices with a shipment of 10,000 being considered a breakout success. One inspiring example he cites is Aliph, who make the Jawbone Bluetooth noise cancelling microphone / headset which they ship by the million, without any factory facility (outsourcing all the production), an achievement that demonstrates the potential for this approach. Another interesting example he cites is a new breed of ‘open source company’, ‘Local Motors’ (a car producer), whose first car the ‘Rally Fighter’ is based on a crowd sourced design and is manufactured with the help of a kit car company in numerous locations, close to where the potential owners live.

Concerning computers their programmable nature of make them especially well-suited to personalization and micro-production. The challenge for computers is that, although

programming makes them ideal candidates for maker-spaces and micro-industries, it also demands highly technical skills, such as those offered by university level degree courses. Fortunately there is an area of study that is seeking to make computers easier to programme; end-user programming. One notable approach was devised by Chin, Pervasive-interactive-Programming, which provides an ingenious natural way for people to program pervasive computing systems whereby, they simply demonstrate (via physical action), the behaviour they want from the system [1]. Moreover, Chin also proposed a novel idea for creating a new generation of ‘maker’ compatible appliances (ie appliances that can be built or adapted by ordinary people) that she labelled “virtual appliances” [5]. Virtual appliances are created by aggregating network services (including physical services such as lighting, media etc) to create a virtual product that acts directly in the real physical world. The principle is based on disaggregation of traditional appliances into basic services and then offering them for re-aggregation to network users. The re-aggregation process can create regular appliances such as TVs or home security or, by using more creative mixes, can lead to novel appliances “invented” by the user. In that sense, when combined with end-user programming tools, this is the ultimate of the current maker space approaches. Perhaps the definitive example of this type of localised making capability is the Star Trek ‘replicator’, which is a machine capable of creating objects (including food) from more basic atomic material but, of course it’s just fiction! Whether such a vision will ever come about is uncertain, but in the following fictional tales, it’s fun to mull over some of the possibilities.

1. Science Fiction Prototyping

In this article we will explore a number of possible futures based on the use of a type of scenario called a science fiction prototyping (SFP) [6]. The differences between SFPs and more common scenario based design that are used in other areas, are that they are set in a more distant future time (usually, at least 20 years out and often much longer). The idea is not necessarily to produce a prototype directly from the story (although that is always nice!) but rather to inspire a type of thinking that may lead to innovative concepts and products at some later time. Another important role of an SFP is to set the technology discussion in a holistic and credible social environment, using the story to explore the potential and consequences of the technology (www.creative-science.org). For the interested reader, there are numerous other examples of SFPs [7] [8] [9] [10]. In our case we have set our stories in periods that range from as little as 5, to as much as 50 years in the future. We are employing a diverse mix of characters, each with their own situations and peculiarities, as is the way of the human condition.

In the following section I present four very short SFPs that provide different views of what maker spaces are, or what they might do.

2. The Vignettes

The future is impossible to predict and the range of possibilities is enormous, so the following are just small potpourri of tales that are intended to stimulate a wider discussion rather than motivate any particular thread of research. The first, “*Daisy’s Present*”, explores a near term view of maker spaces; one that embraces school kids

and multidisciplinary possibilities. The second “*The Dream*” is timeless, and just poses the question as to whether universities’ are maker spaces, or could be. The third, “Immortality” is more futuristic and centres around a near-singularly period, examining the notion of maker spaces applied to people making reproductions of themselves. Finally the fourth story asks if maker spaces are intrinsic to our existence.

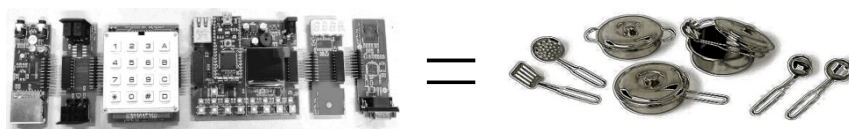
2.1. *Daisy’s Present*



Dale and Daisy

“Fatty, fatty, you’re a massive fatty fatty, fatty, you’re a massive fatty”, Daisy sobbed quietly, as her friend, Dale gently rested his arm around her shoulder. *“It’s not fair is it, what have I got to do, you know my mum tries so hard to give me the right food but still this happens”* (she sobs a little more). *“What more can I do, she murmured”*. Dale felt heartbroken to see Daisy in such pain, they had been friends since they were crawling babies, and she was always beautiful in his eyes. *“Daisy, this may sound a little crazy but I may have an idea of how we might be able to help ourselves, and maybe lots of other kids”*. Daisy’s face brightened up a little as she looked up at her friend; she knew she could always rely of him to reach out his helping hand whenever she was in trouble, so even though she didn’t think there was any answer, other than people having more empathy and love, she was touched that Dale wanted to help make her world better. *“What would I do without Dale in my world, it would be a horrible place without him”*, she thought. *“You know on Tuesday and Thursday nights I have been staying behind at school at the ‘Makers Club’”, “that’s because you are a geek”*, cut in Daisy, with a slight smile returning to her face, *“don’t tell me the school’s maker club can do something to help me, what have geeks ever done to help girls apart from turning them off”*, her face now almost laughing! *“Whatever your idea, you have already made me feel better”* she said, now audibly chuckling *“a geek’s club helping me!”*. *“Well”*, said Dale, with his arm still around his friends shoulder, *“you see, in this club we are learning how to invent our own products, there is this system called Buzz-Boards (www.FortiTo.com) that operates*

with a cloud based supporting infrastructure, and all you have to do is to plug them together in different ways to create really cool things; we have been making robots but there is a whole set of body sensors that measure things like physical activity and even what's happening inside your body; I thought I could make something for you, to help you, maybe to monitor how much exercise you have every day and how healthy your body is?". He looked at daisy, the smile had gone from her face, he was worried he had upset her, maybe, he wondered *"talking about attaching technology to her made her feel even more of a freak than she already felt, maybe she was horrified and thinking he was proposing to turn her into some kind of Frankenstein"*; the silence and emotionless expression remained on Daisy's face drilling a painful hole into his heart, until she threw her arms around him, gave him a massive hug and said *"that is brilliant, and you know what, I'm going to ask the domestic science teacher if we can start a makers club for cooking; ok, I know it's not technology, but it is about lifestyle and you can't argue that cooking is not about making things; the difference will be we will making healthy food, which together with your maker club technology we will be able to produce something really useful for kids, thank you so much for that truly wonderful present; it's going to take us on a great adventure, who knows where we will go, but I already feel so much better so much better maker spaces are cool!"* .



Creative Maker Activities
Electronics (Buzz-Boards, www.FortiTo.com) versus cookery?

2.2. The Dream

Bang was wandering along Binjiang Avenue, next to the Huangpu River in Shanghai, feeling a little lonely, mostly because his girlfriend, Bik, was spending 12 months as a visiting professor at Essex University. However, as much as he missed her, he was grateful for modern technology that kept them in contact, especially instant messaging (IM) as it provided a type of always-on connection without being too intrusive, which was important as he shared his office in Shanghai Jiao Tong University with other people. Bik was 8 hours behind Shanghai time, so it was almost 4pm before Bang saw her appear on IM.'

Bang: *Hi Bik, nice to see you online, how did yesterday go?*

Bik: *..... and really nice to be talking to you, I'm missing you :-)*

Went to an interesting meeting in Colchester about 'Maker Spaces

It's a neat idea, a community of people helping each other build things

Bang: *You mean like the communes we had under communism?*

Bik: *Haa haa, maybe a bit like that!*

Bang: *what kind of things do they build?*

Bik: *mostly technology, they have a neat plug & play system, see www.FortiTo.com*

Bang: *what is the goal of it; why do people go?*

Bik: *seems they have lots of different reasons, such as:*

-some for education (learning new skills, maybe for new jobs)

-some to build a new product they think they have invented (budding entrepreneurs!)

-some to network (connections for jobs, sales, friendship etc)

-some with a community project in mind

Bang: *It's curious the West is reinventing our communes but, actually it sounds useful!*

Bik: *yes, and after I was talking to one of my English colleagues about it.*

He said it reminded him of the way universities once worked

A place for mutual help (including between academics in different universities)

A place that promoted open standards and sharing (crowd sourced IP)

An educational environment that helped people achieve their aspirations)



The Dream – A United Academic World (The Faculty Cooperative)

Bang: *So, are you saying that Universities are a kind of maker space?*

Bik: *Haa haa, as always you are reading my thoughts!*

Well, maybe what I am really saying is

that they are the perfect place to start a new type of Maker Space, one that

-utilises the wide ranging expertise & skills in universities (from science to business)

-embraces the international reach of university (easy to do an international start up)

-harnesses academic motivation to support innovation (maybe even finance it)

Bang: *Wow Bik, I am impressed, that is a big vision and a beautiful dream!*

Bik: *I'd like to make it more than a dream; make it a reality*

Bang: *I suppose it would have to be a virtual community; online in the cloud*

Bik: *Yes, now breath deep; I made the first web page for it; www.facultycooperative.com*

I hope you can help make this dream come true :-)

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2.3. Immortality

Jax sat in the offices of his company, QSH (Qin-Shi-Huang), or as it was publically known, ‘*Immortal-Me*’; they had just signed up their billionth customer; an amazing achievement which was why he was so thoughtful today. He remembered how he founded the company with the simple idea of providing an eternal memorial for the deceased by, during their life, letting them sign up for a web page that was guaranteed to be maintained as a record of the person concerned forever (well, as much as anyone could guarantee forever!). That was how his company operated in the early millennium, with simple web page based records but all that changed when he came across a book that described the technological singularity.



Playing God!

The book was mostly a dystopian account of the ills that would arise from machines becoming too intelligent. He had to smile when he thought of that moment in 2060, as it changed his life forever. While all those worries about dystopian futures never materialised, the chase for super-intelligence yielded some very useful spin-off technologies (much as the space programme did in the 20th century). Top of that list was ‘whole brain emulation’; the early 21st century was littered with attempts at this, as computers got ever more powerful, with ever more storage space. To the huge disappointment of the scientists concerned, none of their efforts had led to the sort of independent consciousness that we associate with our own lives, rather they achieved somewhat eerie effects that were more reminiscent of the earlier ‘*brain in a vat*’ thought experiments, which have fascinated both philosophers and science fiction writers alike. However, while these emulations did not function like fully living people, Jax was fast to realise the technology would be good enough for his company needs (creating crude facsimiles of people) and was quick to advertise “*whole brain simulations*” as a service for his ‘*Immortal Me*’ venture, which was operated as a type of Maker-Space in which ‘*Immortal-Me*’ provided the tools for people to build online

versions of themselves; perhaps, mused Jax, the ultimate manifestation of Philip K Dick’s famous novel ‘*We Can Build You*’. Of course people could be quite kind to themselves and create somewhat improved versions, maybe more handsome or more generous than in real life. These whole brain emulation had full access to the Internet (being hosted in cloud based engines) and could, for example send birthday wishes to friends (either alive, or perhaps sadly ‘whole brain emulations’ themselves – which, of course, was a little bizarre!). It was even possible to invent new people that had no prior existence, creating the children you never had, or the partner you never had, perhaps exemplifying the maxim “*there is nought so queer as folk*”. Jax chuckled to himself when he thought about these bizarre uses of his technology as he recalled the irony that the failure of whole brain simulation to capture those often bizarre or idiosyncratic qualities of real people in a convincing fashion (and hence the failure of attaining the singularity) was, oddly, the key to the success of his company!



Emperor Qin-Shi-Huang’s Immortal Terracotta Army

Finally, he reflected on his original inspiration that had led to the company’s name, QSH (Qin-Shi-Huang) which was motivated by an account he read about the first emperor of a unified China, Qin Shi Huang (or Shi Huangdi), who ruled China from 246 B.C. to 210 B.C. During his 35-year reign, he transformed the geography and politics of China to an extent that led to him being immortalised in history and through the world renowned terracotta army of at least 8,000 clay soldiers placed in his tomb. However, ironically, he had not seen this would be his best route to immortality as, his main goal towards the end of his life, became finding the elixir of life, which would allow him to live forever! Of course he never found it but his, his story was the inspiration for Jax’s company (www.immortal-me.com), so as Jax arose from his chair to face the new day, he couldn’t avoid wondering how would he, or even would he, be remembered 2000 years on!

2.4. Genesis



“In the beginning God created the heavens and the earth” (The Book of Genesis)

The speaker began”*there was a Maker-Space where the group took on the challenge to create the most advanced intelligent machine possible. They were inspired by the ideas of the singularity and far from being afraid of it, wanted to embrace it and build machines that would surpass their own intelligence. Ideally, they wanted to include all the characteristics that make up the human condition (eg free-will, spirituality). There were lots of ideas about how they might do this, one being that they would design machines to design even better machines that would, in turn, design even better machines and so on, ad-infinitum. So the members of this particular Maker-space decided that they would embark on an experiment to do this, where sets of machines would try to construct slightly better versions of themselves by including some structured (incremental) and random (disruptive) changes to their designs and, assessing the worth of the designs by means of a competition in which only the best survived*. A voice from the darkened lecture room rang out “*so where is this maker space group, I would like to join them?*” “*you already are part of that maker space*”, came the reply”

3. Summary and reflections

In this article I have described the current interest in maker-space activities. In doing this I set out the current context which is driven by various technologies such as virtual appliances, 3D printers, modularised embedded-computing kits and the cloud-of-things. I also touched on wider visions for manufacturing that envisage a move away from centralised to localised production, which is typified by the vision for micro-industries. The future is impossible to guess and the possibilities are too large to do justice to any attempt to discuss them in a meaningful way so I simply presented a small potpourri of tales that were intended to engender a wider discussion rather than motivate any particular thread of work. Most of these SFPs assume the existence of a well performing Cloud-of-Things infrastructure. The first story, “*Daisy’s Present*”, is a near-time SFP that presented the more classic idea of a ‘maker space’ being a physical club where people attend but in this case, based in a school and developing multidisciplinary tentacles. It both illustrates classical approaches to system building

(the modularised *Buzz-Boards*) and the potential for a more interdisciplinary approach than some hacker spaces adopt. It also raises the idea that maker space ideas might be a highly motivational concept for schools to adopt. The second story "*The Dream*" is a timeless SFP that sets out to introduce a broader perspective to maker-spaces by raising the possibility that the entire academic system might be considered as being a maker space, and that by overlaying a formal maker-space layer, it might be possible to create the perfect engine to drive forward innovation and entrepreneurship. The third story "*Immortality*", a futuristic SFP set in a near-singularity period examines an application involving maker-spaces being used by people to make virtual facsimiles of themselves. Apart from the more obvious implications about the changes technology might bring to society, it reminds us that neither our lives nor technology will last forever. The final story, "*Genesis*" revisits the age old question about the nature of our existence posing the question are 'maker activities' intrinsic to our existence and can our world be regarded as a gigantic maker space!

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