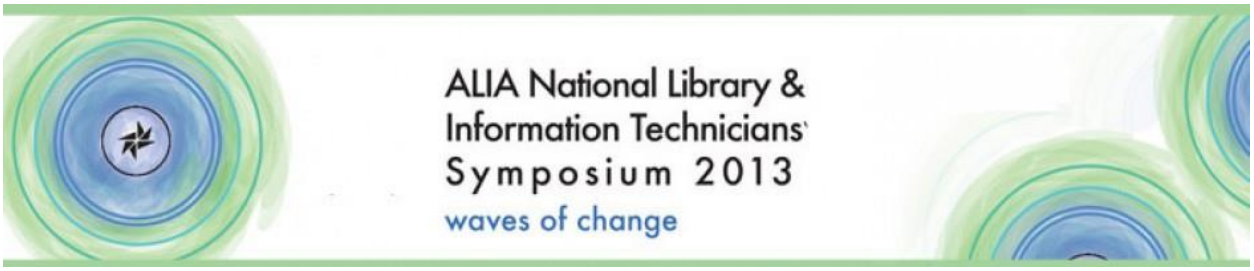


# Why do we need one of those? The role of the public library in creating and promoting makerspaces.

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## Abstract

Between the internet and an ever growing number of eresources, many people are going outside libraries for their information needs. This makes it harder to justify the continued existence of libraries. Useable space and local communities are looking to be two of the biggest assets for libraries today. Creating and managing community connections is a growing area, one which could help to secure a continued place for libraries in our modern world.

Makerspaces (also referred to as hackerspaces) are community-oriented spaces where people gather to create, make, and learn using a variety of tools. We are seeing more of these spaces in some form or another slowly infiltrate libraries as an additional service. The Edge, an initiative of the State Library of Queensland, is a great example of this new form of library, managing not only the makerspace itself but the community knowledge it creates. Simply dropping a 3D printer into your public access system isn't enough - the community needs to engage with the space and be allowed to influence it according to their needs. The community behind the makerspace is where libraries should focus their attention, helping to cultivate existing networks and create new ones.

In Western Australia, the Town of Victoria Park Public Library has entered into the maker community through the use of information sessions, forums and community engagement. Using social media, local networks and models from other libraries, the Town of Victoria Park Library aims to engage the community and improve the Town's 'vibrant lifestyle' message. This paper will show participants how to set up their own creative space and build up those vital community links around it. Practical examples backed by research will present a good starting model to help other libraries implement their own maker projects.

## Introduction

> *"Librarianship is not about artefacts, it is about knowledge and facilitating knowledge creation. So what should we be spending our precious resources on? Knowledge creation tools, not the results of knowledge creation." (Lankes, 2011)*
>
> *"A makerspace culture supports the mission of libraries to enable lifelong learning and to support knowledge creation in their communities" (Hamilton, 2012)*

There is a growing change in libraries, one that is attempting to redefine how the community sees libraries as creative spaces. There's a noticeable shift away from traditional services and knowledge curation in the form of print materials, to the digital world (Duncan, 2010; Griffey, 2010). More electronic elements are entering the commercial space and as clients embrace new media, their demands for new services are growing (Duncan, 2010; Zurinski, Osborne, Anthoine-Ney & McKenney, 2013). As Lankes (2011) indicates, libraries should be looking towards facilitating knowledge creation in our communities rather than hoarding knowledge in the form of artefacts (i.e. print collections). Current library programming is aimed at engaging our communities and encouraging them to interact with the existing collection (Robertson, 2005). By comparison, this shift to knowledge creation is aimed at helping our communities create their own knowledge and feed the collection (Lankes, 2011). Enter maker culture.

Maker culture actively encourages people to explore their environment by accessing knowledge and learning new skills to make things that ultimately improve their own community. Makers often flock together to create makerspaces where they can access knowledge and skills from other members and the technology that populates the space. These shared environments can take many forms; which are usually defined by the needs of their members. This makes each a unique and fluid space that can grow and change depending on who uses it. There is a strong overlap between makerspaces and public libraries that can be easily tapped into; one that can enhance both libraries and the communities they serve by providing a space for knowledge creation and allowing members to create a new path for library services.

## Definition of Makerspace

In their broadest sense, makerspaces are community-oriented spaces where people gather to create, make, and learn using a variety of tools. Many makerspaces take the form of large community areas, often warehouses or shop fronts, filled with tools such as laser cutters, routers, sewing machines, 3D printers and the like that members can use to create a variety of products. It could be argued that one of the most important tools in a makerspace is the people. Their knowledge and skills are resources that other members can access and learn from. This information sharing helps to create and promote this new culture. In today's world, cultivating an interest in technology is extremely beneficial not only to the self but to the community. It raises digital literacy and provides a deeper understanding of the changing world.

Makerspaces were born out of early hackerspaces; shared spaces where computer programmers would gather to work and share knowledge (Cavalcanti, 2013). These evolved into small communities worldwide and expanded to include circuit design, manufacturing and eventually physical prototyping. Some offered classes on various skills, taught by members, to the wider community. The switch from hackerspace to makerspace was one that might be contributed to marketing (Cavalcanti, 2013), as the term 'hacker' has negative connotations around it, whereas the older and more accurate term of 'maker' doesn't. Makerspaces have

appeared all around the globe offering members access to tools they otherwise could not afford (such as industrial laser cutters) and teaching valuable skills to their communities .

The Perth Artifactory (http://artifactory.org.au) is a makerspace in Western Australia. It occupies a large warehouse in Osborne Park full of tools, both robotic and non-robotic, technology, desks and workstations. It has over forty financial members that use the space. The Artifactory is *"dedicated to providing a place where people of all backgrounds with an interest in technology can come together to work on projects, share ideas and socialise" (The Perth Artifactory, 2011)*. There are open nights for members of the public to attend workshops and learn new skills including programming, textiles and music. The Artifactory has a great sense of community; members are frequently willing to help one another with projects. This leads to new ideas and projects; feeding the cycle of creation and growth.

There are several definitions of a makerspace that can be applied to libraries. The implementation of makerspaces in libraries can vary greatly based on resources and the needs of the community. Some are able to set up dedicated maker areas such as the State Library of Queensland's The Edge project (http://edgeqld.org.au), which offers workshops all year around and provides industrial and technical equipment to members as well as meeting spaces and guidance to those who need it. At the other end of the scale there are small libraries offering community space, occasional library programming and minimal equipment (computers, work stations, software, et cetera). The essence of makerspaces allows for a wide interpretation; maker culture is, by nature, open and makerspaces can grow and shrink to best fit the needs of the communities they serve.

At the Town of Victoria Park Public Library, in Western Australia, a makerspace was created by providing maker based library programming, computers with various open source software, a 3D printer and general public space. The majority of maker exposure is done through programming and fostering community interaction using social media and outreach techniques. Due to the relatively small size of the library and its lack of public meeting rooms, some programs and events are held externally, often in partnership with other organisations. This deals with space limitations while also building community links and promoting services to non-library users. With minimal extra funding and small changes to event programming, a makerspace can be easily set up in most public libraries.

**Literature Review**

A review of the literature around public libraries and makerspaces shows that there are a great number of similarities between the two. Both serve their communities and help to promote lifelong learning. When talking about makerspaces, many of their defining principles could be applied to public libraries. In his article 'Hackerspaces and Meta-creativity', Seckinger (n.d.) talks about how maker-labs are community hubs and how the "sharing of knowledge is more important than ever". These ideas are arguably key principles of modern libraries; bringing communities together in a shared space and allowing knowledge to be shared. Alternatively, aspects of maker culture are also present when discussing libraries more generally. Jason Griffey (2010) says in his book 'Gadgets and Gizmos: Personal electronics and the library', "If I were in charge of a young adult section of a public library, Make [Magazine] and its projects would be very near the top of my collection list." These two services: libraries and makerspaces, can exist and work separately as they frequently do now (Bilandzic, 2013; Kalish, 2011; McCue, 2012), or they can blend together and embrace the cross over, creating an enhanced library service.

## Why be a Makerspace?

The Fayetteville Free Library (FFL) in New York State was the first public library to create a makerspace in the United States (McCue, 2012). The idea of libraries providing free and open access to information, technology and ideas (McCue, 2012) marries well with maker culture; so much so that Phillip Torrone (2011) of 'Make Magazine' penned an article entitled 'Is It Time to Rebuild & Retool Public Libraries and Make "TechShops"?' Closing the gap between libraries and makerspaces is becoming much more achievable with technology like 3D printers coming down in price. In 'The Atlas of New Librarianship' (Lankes, 2011) we see that the core mission of libraries is "to improve society through facilitating knowledge creation in their communities." This could equally describe a makerspace.

"Libraries have traditionally been 'come in and learn stuff' places, but there's no necessary reason that they couldn't also be, as another maker slogan says, 'get excited and make stuff places'" (Griffey, 2010). Using [the?] library space to bring communities together to learn is not new, libraries have been doing it for years with traditional programming (Robertson, 2005; Robotham & LaFleur, 1976). Zurinski (2013) says "libraries are encouraged to be the centre of community life, going beyond traditional services, to be community builders and places where people get involved." Knowledge, its facilitation and dissemination, is the business of libraries (Lankes, 2011). By being innovative and embracing new ways in which to engage people by providing tools for their communities, libraries can secure a new future for themselves (Rowley, 2011).

Sharing, learning, teaching and creating are all common aspects of both libraries and makerspaces. The literature shows that adding aspects of maker culture to traditional library services can enhance community spaces by facilitating knowledge creation (Bagley, 2012; Lankes, 2011; Torrone, 2011) . In this new world where "atoms are the new bits" (Anderson, 2010) libraries need to move from being "guardians of physical objects to enablers of access" (Griffey, 2010). While not all libraries will embrace this change, nor should they (Rundle, 2013), the pursuit of community centred knowledge - its use, creation, and curation - is a noble goal for those that do.

## Background

The Town of Victoria Park is a vibrant and diverse town situated just across from the Perth CBD in Western Australia. The population is over 32,000 and is growing. The Town's community has historically been a working class and ethnically diverse area. Victoria Park is increasingly being sought after as a destination for residential properties and commercial developments. A thriving café culture has developed. The Town of Victoria Park Library is a medium sized, single branch public library.

The library forms a core focus of the Town's Community Life Program which aims to create a vibrant town that is a place of social interaction, creativity and vitality; where cultural diversity and harmony are celebrated. The Town wants to connect people to services, resources, information, facilities and experiences that enhance their physical and social wellbeing and provide opportunities for lifelong learning for all sectors of the community. With this greater mission in mind, the library strives to investigate and implement new programs and initiatives to promote and encourage a vibrant lifestyle for the Town and its residents.

Proper implementation is vital in establishing a new space in the existing library system and requires a balance of good programming and community support. Expanding library services to include facilitating content creation helps to foster creativity in the community and expands the

library’s collection, by retaining the community-created content. It also promotes vibrancy within the community and secures a future for the library.

**Project Overview**

In July 2013 the library purchased a 3D printer with the intention of helping focus innovation and creativity in its programs and services. Engaging the thirteen-seventeen age bracket (young adults) can sometimes be difficult. Working with The Perth Artifactory, the library offered a four part introductory course in maker culture to a local primary school. The course was designed to suggest professions and hobbies the students may not have previously considered such as electronics, programming and 3D design and it promoted content creation rather than curation.

Each session focused on a unique aspect of maker culture and aimed to cultivate participants’ curiosity, enabling them to use the library makerspace to build upon this interest after completing the course. After the sessions, participants were invited to use the library's resources (physical collection, 3D printer and open source programming software on the public computers) to continue to improve their skills. The overall focus of the maker sessions was to inspire an interest in technology in a safe and fun environment where participants could explore new concepts.

Members of The Perth Artifactory were initially approached to facilitate the sessions, as members had both teaching and specific technology skills. A brief was presented asking for a simple electronic project to teach soldering, programming and 3D printing skills to the school group. After discussion of the initial project brief, interested Artifactory members proposed the creation of a unique project that would incorporate all the elements into a final piece. An exciting and impressive part of the project was that participants would be able to 'hack' the completed device afterwards and create their own unique piece.

If the project was successful, there was a potential for more maker sessions to be run during the year, expanding to other schools and a Mini Makers Fair designed to showcase the projects created by the community and highlight the new technology of the Town.

**The Project**

Inspired by sessions run by The Edge, the maker sessions required a three stage project that would use basic electronics (soldering), programming (Arduino), and 3D design/printing. This would culminate in a final product that incorporated each element. Initially this was to be based around a simple off-the-shelf electronics kit, to keep the project under ten dollars per child and to make it accessible enough for other libraries to offer similar sessions. A prototype kit was created and approved for the sessions with components being sourced from a local electronics wholesaler who donated the microprocessors (the most expensive part of the kit). Due to time constraints, the circuit boards were hand etched and unprinted. If the project were repeated this would be outsourced, with several components built directly into the board to reduce costs and soldering time.

The finished kit was an electronic stroboscope (strobe light) consisting of a programmable LED array attached to a laser cut stand populated with 3D printed animation cells. A simple twelve frame animation would be created in OpenSCAD (3D design/programming software) and printed out on the library's 3D printer. Once the light was added to the stand and power was applied to the LED array, it would strobe and 'animate' the 3D cells and give the illusion of a single 3D animation. The LED array came complete with a programmable microcontroller which would allow each kit to be hacked, i.e. slowing down or speeding up the strobe effect. Each

session would cover a different aspect of the kit. The lessons built on each other until all the separate elements came together in the last class to compete the kit, giving each child a working stroboscope they could take home.

The sessions were run after school at Ursula Frayne Catholic College, a kindergarten to year twelve co-educational College in the Town of Victoria Park. Initially, the sessions were planned for ten participants but the response from the year sevens was so enthusiastic that the session sizes were expanded to allow extra students to attend. The school was asked to encourage girls to join, to help break down traditional gender barriers that exist in the information technology/engineering community. The class consisted of fourteen year seven students (with a 50/50 gender split), most of whom had no experience with electronics, 3D design or programming. When asked about their reasons for joining the project, the majority cited that they 'wanted to learn something new'. Only one child dropped out of the program and that was due to other commitments.

**Sessions**

Each session was planned around the kit's requirements and components. In the first session the LED array was created, in the second they created the 3D animation for printing, in the third students programmed the microprocessor, and the fourth session was reserved for completing the kit. Four sessions of one and a half hour duration were planned and arranged with the school to be held in a spare classroom after hours on Fridays. This made it easy for the students to get to and from the sessions, and reduced stress on the library's limited facilities.

During the organising period, a partnership was established with the Engineering Outreach Coordinator from Curtin University. He asked several engineering PhD students to attend and assist in the sessions. This resulted in two Artifactory members acting as facilitators, supported by three engineering students, a science teacher from the school and the eServices Coordinator from the library. Each of the supervisors was thus able to work closely with one or two participants.

**Session One**

Before the first session, each participant was sent a copy of 'Soldering is Easy: Here's how to do it' by Mitch Altman, Andie Nordgren and Jeff Keyzer (2011), an open source comic book guide to soldering. Before starting the soldering, the class ran through the basic principles covered in the comic to reinforce the safety techniques and ensure correct soldering techniques were adhered to. Due to the project being designed specifically for these sessions, detailed kit instructions were not available until the third session, so students had to rely on instruction from the facilitators to compile the components. Despite their young age and unfamiliarity with soldering techniques, the majority of participants managed to successfully assemble the components.

While the hour and a half session was intended to be long enough to complete the circuit board, many participants only managed to complete 20% of the planned work. Upon reflection this was due to the inexperience of the participants and the lack of clear instructions for the assistants to follow. From the beginning, session four was intended to be a 'catch-up' session for participants to complete their kits if time ran short. It was decided that session three would be moved back to provide extra time for participants to finish soldering their kit.

**Session Two**

As a requirement of the school, each child was provided with a MacBook Air for their normal studies. Prior to the session, it was arranged to have several types of open source software installed on the laptops: OpenSCAD, Arduino, and Makerbot's Makerware. Benefits of using open source software include: it is free of charge, Mac compatible and allows the students to use the software at home. In this session, participants were shown the basics of OpenSCAD, a software for creating solid 3D CAD (computer aided design) objects using a command line interface, to create the simple 3D animation. Students created two cubes and had them rotate through each other in a twelve frame animation. A clip platform had been pre-designed to fit into a laser cut stand and was added to the model, creating the required 3D image files needed for printing.

While participation and interest levels had been high in the first session, it was anticipated that they would drop when confronted with text based graphical design and programming. This proved to be untrue and many participants quickly worked through each exercise with ease. Several moved ahead and were searching online tutorials to see what else they could create in the program. One student returned for the next session having created a simple streetlamp design with some help from her father.

**Session Three**

In the third session, participants continued working on their circuit boards, this time with some experience in soldering and better knowledge of the kit. Again, the hour and a half was not long

enough for most to complete their kits; the majority of students had completed 80% of the project by the end of the session. Some students had left their kits at home (or simply lost it, in the case of one student), these participants were given some one-on-one instruction in the basics of Arduino programming, exploring the built-in libraries and playing with the presenter's Arduino board.

In the week between session three and four, fourteen copies of the 3D animation set were printed out ready for the final session.

**Session Four**

Despite the aim to have mostly completed kits by the fourth session, many students were still working on their soldering. Even with the kits incomplete, the laser cut stands were handed out and everyone was instructed on the final construction, including adding the 3D printed model pieces. In addition to this, a practical demonstration of the 3D printer was shown to the class, none of whom had seen one before in real life. Students were provided with a help sheet to continue their introduction into maker culture. The sheet included online resources and a book list of items recently purchased by the library to tie in with the sessions. Contact details were also included to enable students to come into the library and complete their soldering under the supervision of the eServices Coordinator.

**Feedback**

While the project exceeded expectations, it was still a pilot project and there were several lessons learned. Issues were encountered that would need to be addressed for future versions of the project.

The feedback from the supervising teacher showed that the sessions were very welcome and fitted in well with the current curriculum, so much so that future sessions have been planned to run during class time.

The time and length of the sessions worked well with students and parents, and did not clash with existing after-school commitments. It was suggested that the sessions run at the end of the school year so that students in electronic streams could gain enough basic skills to get the most out of the course.

A stronger course framework with clearly defined steps would also benefit the classroom setting and enable students who excel to move ahead at their own pace. Further sessions are planned to be run with the school, this time aimed at year nine and ten students who have already completed a semester of basic soldering.

This was a new style of project for the members of the Artifactory, who had previous experience teaching older students and less complex tasks. In addition to this, the project was still a prototype less than a week before the first course. As a result, documentation for the circuit board wasn't available until the third session. Given more time, the circuit boards would be better refined and include several components already on the board to reduce the amount of soldering required. Mass production of the kit would reduce costs and allow for designs to be printed onto the board. Both presenters were enthusiastic about the longevity of the project and are interested in working with other libraries to run similar projects to help expand the maker community.

The outcomes for the library were all positive. All four sessions ran well, taught the participants new skills and broadened their definition of 'library'. The collaboration between Ursula Frayne Catholic College, the Artifactory, Curtin University, and the electronics supplier, Altronics, was a perfect example of developing community partnerships. The potential for future collaboration is enormous.

Very few library events run by the Victoria Park Library target young adults as the primary audience, because historically such events generate little engagement from the community. However, these maker sessions proved that the young adult audience could successfully be engaged in a library event. For four weeks there was consistent attendance and participation. The sessions gave the participants a positive library experience and reinforced the value of libraries and what they offer.

In all sessions, participant engagement was high and in many cases children had to be encouraged to leave the class by waiting parents. All of the involved parties agreed that the sessions successfully exposed the participants to new skills and different ways of thinking.

**Future Plans**

As the first of many projects planned to combine public libraries and makerspaces, the pilot program showed great potential for developing public library services in the Town of Victoria Park. Currently the library is working with Curtin University's engineering outreach team to expand current courses and use their technology and skills to assess and improve the pilot project.

Adult courses are also being planned, using a similar format to the pilot, but incorporating pre-existing hardware called Lilly Pad. These courses will combine textiles and electronics. Participants will be shown how to attach LEDs to clothing and program a circuit board to control the lights. Projects such as this change the role of the library; switching from pushing content out, to facilitating the community in creating their own space and programs. This is enhanced by collaborating with skilled members of the community.

**Conclusion**

With each new innovation, the divide between libraries and makerspaces is shrinking (Bagley, 2012). The intersection potential between makerspaces and libraries is high (Torrone, 2011). This is not only practical, but may play an important part in bringing the community together (Audunson, 2005). As technology continues to rapidly develop, people’s information needs have changed (Griffey, 2010). It is important to address where the traditional library sits in this new era. Libraries can continue to gatekeep information in the hope that communities will still search, find and utilise it, or they can take a more radical approach and actively encourage and promote knowledge creation (Lankes, 2011). A key principle of libraries is to support lifelong learning and knowledge creation in local communities (Hamilton, 2012). Libraries may do this by taking an active role in their community's learning, by supporting new ideas and helping to make clients’ interactions with the library more collaborative and vibrant.

**How to hack your library**

This new library model can exist in many forms, each unique to the community it serves. The nature of maker culture is such that it can change to suit new users. Some models, like The Edge, are full makerspaces co-existing with the traditional library service. Other libraries are implementing simple maker concepts within their range of library services (Good, 2013). The

latter option can be achieved by providing a variety of free, open source software on public computers (OpenSCAD, Arduino, Blender, GIMP, et cetera), incorporating a variety of maker activities in library programming, and promoting the sharing and growth of ideas in the community. These are all simple and low cost ways to promote a library-maker alliance. Incorporating aspects of maker culture, such as 3D printers, into regular library services can be the first step to enhancing a library (Groenendyk, 2013; Hoy, 2013). To be successful and to create a true makerspace, these projects require constant promotion and community involvement (Norman, 2012).

Makerspaces can take many forms and can focus on technology, equipment, skill, or a mixture of all three. Being flexible enough to allow spaces and services to change according to community needs is a key component of a makerspace (Good, 2013). As long as the community is engaged, how they make use of the space is up to them and libraries are in a unique position to determine their community's needs and respond to them. Traditional library programming includes author talks and information sessions (Robertson, 2005); maker sessions build on this by expanding to include interactive workshops. It is a logical progression and supports standard library key performance indicators about visitation (Regional Access and Public Libraries, State Library of Queensland, 2013). Spreading sessions out over several weeks encourages return patronage and may increase library access. Promoting learning and creativity in communities can help to sustain library services far into the future (Rowely, 2011).

Technological advancements and community needs will ultimately shape the way libraries operate in the future (Griffey, 2010). If managed correctly, this can work to the advantage of members and library services. Incorporating makerspaces is one way libraries can evolve, by creating a cycle of content creation and curation (Lankes, 2011). This may secure the place for libraries in the centre of communities (Zurinski et al, 2013). An important lesson libraries can take from makerspaces is to allow the needs and skills of members to shape services. This principle is instantly transferable to existing library programming and services. In isolation, embracing maker culture may not ensure the continued relevance of libraries (Rundle, 2013), but it certainly makes strategic sense to incorporate valuable elements of it to enhance a library’s services and ultimately the community it serves.

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