Turning Dead Space into “ThinkSpace”

Abstract:

Introduction and Context:

The University of Sydney Library launched the inaugural ThinkSpace in early 2016. By attending this presentation you will be taken on a journey from dead space to ThinkSpace, outlining the strategic thinking, challenges and successes in prototyping this new concept.

The Challenge:

The University of Sydney Library inherited an area above one of our main libraries that came with issues such as size and the location. We have been able to turn these challenges into an opportunity to maximise the utilisation of the space so that it aligns with the strategic objectives of both the Library and University in helping to future proof the Library in a fun and exciting way.

The Solution:

In line with current thinking on future academic library trends we knew that makerspaces were on the short term horizon as an emerging trend (Johnson, Adams Becker, Estrada, & Freeman, 2015). After reviewing existing makerspaces in public libraries we decided to establish a slightly different model that provided more opportunity to experiment and collaborate with the ultimate goal of driving innovation.

The library had also spent some time rethinking our strategy in order to better position ourselves to contribute to University-wide institutional goals (University of Sydney, 2016) and to our profession as a whole. Two of the main pillars of the Library’s strategic plan are to “Provide a thinkspace” and “Facilitate collaboration &

creation” (University of Sydney Library, 2016). We decided to create a hybrid makerspace that combined these two objectives and “ThinkSpace” was born.

The Concept: ThinkSpace;

1. Introduces people to new and existing technologies and ideas they may not have experimented with before in order to support innovation,

2. Facilitates collaborative opportunities between disciplines,

3. Acts as a showcase for experimental design.

The space has a 3D printer, 3D scanner, high end Mac computers equipped with Adobe Design Suite and drawing pads, a BB8 programmable droid, Google cardboard VR viewer and a Carvey tabletop 3D carving machine. In development is a small one button recording studio.

Results:

ThinkSpace is a new and growing initiative aimed at inspiring and encouraging creativity. The space is still growing but already we have garnered the interest of many students, student clubs and academics alike. Students are excited about the space and using play and experimentation as a way to learn and share knowledge.

We’ll share insights from attendance at workshops as well as some of the fabulous things we’ve created along the way.

The Library has taken an unloved, underutilised space and turned it into a vibrant ThinkSpace to help future-proof the library in a fun, creative and collaborative way, so come along and be inspired!

Paper

Introduction:

At the end of 2015 the University of Sydney Library found itself in possession of a small space on the floor above one of its larger libraries; the SciTech library, on Camperdown campus. The potential uses for this space were limited by its size (60 square metres) and it's location; a main thoroughfare for students and staff moving around campus and the building. Faced with these challenges, along with a recent restructure and new strategic plan, the Library decided to craft its own version of a makerspace to best utilise the space and respond to both current trends in libraries as well as the University's strategic vision.

The University Sydney Library's ThinkSpace was thus born as a technology showcase and creative play space, designed to spark ideas and provide opportunities for collaboration.

With ThinkSpace having recently launched, this paper will outline the rationale behind the process of executing the concept, along with the successes and challenges faced throughout the implementation phase.

Makerspaces

As noted by Bagley (2014) there is no one clear definition of what constitutes a makerspace. Indeed, a plethora of different definitions can be found, however simply described, the common theme behind makerspaces (also sometimes referred to as "hackerspaces") is the idea of learning by creating in a collaborative environment that provides access to technology and tools. The key concepts that run throughout the various definitions of makerspaces are those of collaboration, innovation and experimentation and epitomise the principles of the maker movement, which Van

Holm describes as a “democratization of access to and information on using tools” (2015, p. 24).

Makerspaces have been gaining traction in many libraries over the last few years, firstly within public, then school libraries and more recently within museums. More broadly, a Google trend search for the term makerspace demonstrates the rise in popularity of “makerspaces” as a search term: https://www.google.com.au/trends/explore?q=makerspaces

A search of the literature suggests that public libraries have been at the forefront of early adoption of the makerspace movement. This can be attributed to public libraries’ strong focus on craft-based community outreach programs that have traditionally centred around knitting, sewing, crochet and scrapbooking (Slatter & Howard, 2013). The strong correlation between the Maker movement and collaboration (Davee, Regalla & Chang, 2015) also embodies the deep-rooted mission of public libraries to be community spaces for people to meet, socialise, learn and create.

One may question the need for, or indeed the purpose of, makerpaces in a university setting, given that public libraries, museums and schools have already made significant inroads into establishing these communities within their spaces. The answer can be seen in the NMC Horizon Report: 2015 Library Edition which notes that “University libraries are in the unique position to offer a central, discipline-neutral space where every member of the academic community can engage in creative activities” (Johnson, Adams Becker, Estrada, & Freeman, p. 36).

Further to this, the importance of cross-disciplinary collaboration to solve big problems has been a key feature of university strategic planning around the world

(Griffiths, 2014). According to the University of Washington, “collaborative work will bridge the sciences, social sciences, and humanities, linking scientific and technological advances with ethical, behavioral, and economic implications” (2011, p. 1) and that these cross-disciplinary relationships will created the best opportunities to “address society’s most pressing issues” (p. 1).

The University of Sydney has similarly recognised the need to develop partnerships by creating dedicated collaboration spaces for industry, community, students and researchers as a key theme emerging in its new 2016-20 strategic plan. Pip Pattison, the Deputy Vice Chancellor for Education has also identified the “capacity to work effectively in interdisciplinary settings” (2014, p. 5) and the need to draw on different perspectives, knowledge and modes of enquiry in order to “solve authentic problems” (p.5)

As such, there has been a strong emphasis on building and developing cross-disciplinary collaborations at the University of Sydney. One example is the Charles Perkins Centre, which as one of its goals has the aim of bringing together scholars and researchers from a broad range of disciplines to create healthier and more sustainable living (University of Sydney, 2015a).

A makerspace (or ThinkSpace) in an academic setting should present opportunities to create, nurture and strengthen collaboration across different disciplines. In fact, a common theme emerging from the literature about makerspaces is that they are most successful when they emphasise collaboration and “community mindsets” (Davee, Regalla & Chang, 2015, p. 7). In the short time since the University of Sydney Library’s ThinkSpace has been open, there are already strong indicators of this community mindset being created as evidenced by the “pull” that makers feel in

gravitating to our space to meet and talk with like-minded people. Mitch Byrson, one of the early adopters of ThinkSpace, recently gave up a day out of his busy research schedule to showcase the games he had programmed and the gaming consoles he'd printed using the 3D printers in the ThinkSpace. Not only that, he developed and presented a hands on workshop on sewing felt wearables with embedded electronic circuitry. He reflected that he was just "happy to do [it] because sometimes it can be lonely, and it's nice to be able to talk to other people about what [he's] interested in" (Bryson, personal communication, September 1, 2016), thus demonstrating early indicators that ThinkSpace is creating this "community mindset".

Graduate attributes and employability

The 2016-20 University of Sydney strategic plan also emphasises the need to develop the employability of graduates. Pip Pattison's white paper, which underpins the educational goals of the new strategic plan, highlights the need to support and embed those "generic and employability skills" (Pattison, 2014, p. 3) most valued by employers. There is also the requirement to create a framework to build competencies in project management, entrepreneurship, and critical thinking (University of Sydney, 2016), as well as infrastructure to enable experiential learning projects to be completed by students to prepare them for work life beyond university (Pattison, 2014, p. 4).

This can be summarised by the following statement:

"We have a joint responsibility – Education Portfolio, Faculties, Library, and everyone in the University community, to think about the ways that students learn, and look at ways to embed our graduate qualities so they are real.

We want to equip students with a way of thinking that will set them up for success in careers that haven't been invented yet. We're interested in the role of informal learning spaces like ThinkSpace in developing students' digital skills and building their capacity to adapt to new technology, think creatively and cope in a rapidly changing environment." (Adam Bridgeman, personal communication, September 1st, 2016)

According to the World Economic forum report, there is a Fourth Industrial Revolution, which is defined as "developments in previously disjointed fields such as artificial intelligence and machine-learning, robotics, nanotechnology, 3-D printing, and genetics and biotechnology" (World Economic Forum, 2016a, para. 2).

The top three skills needed by the year 2020 in order to thrive in the Fourth Industrial Revolution, are as follows:

1. Complex problem solving
2. Creativity
3. Problem solving.

Also included in the top ten list of skills is coordinating with others and cognitive flexibility, (World Economic Forum, 2016b) all skills and attributes that have already been explored as key elements of the makerspace/making community (Hlubinka, 2012).

Therefore, through ThinkSpace, the Library has taken the opportunity to create infrastructure to realise not only the University of Sydney's educational strategic goals but to also create a space in which students can develop these highly regarded employability skills.

Making and Pedagogy

The principles upon which makerspaces in general, and therefore ThinkSpace, are grounded are pedagogical theories of inquiry and education.

As commonly suggested in the literature, the principles of experiential, playful and practical "hands-on" learning developed by key educational thinkers such as John Dewey, Friedrich Froebel and Maria Montessori (Vossoughi & Bevan, 2014) are strongly reflected in the Maker Movement. Vossoughi & Bevan suggest that the maker movement in America has signalled a return to "earlier learner-driven, inquiry-oriented pedagogies" which have over recent years taken a backseat due to increased accountability and emphasis on league tables. Certainly, the hands-on and practical aspects of making have also been attributed to other early teaching pedagogies of Papert's constructionism- "learning by constructing knowledge or through the act of making" (Martinez & Stager, 2013 in Halverson & Sheridan, 2014, p. 487). If we delve back though the evolution of constructionism theory, we discover that Papert was in fact a student of the great educational innovator Piaget, who, along with Vygotsky proposed that learning is socially constructed, that is, the basic tenet of learning is that it is done by "doing" in a social context with others (University College Dublin, nd).

Peer and student-led learning was a core pillar upon which ThinkSpace was developed, not only because of the influence it can have on student learning outcomes but also because of the positive impact it can have on the student experience.

The power of peer-led learning and support has been well established (Macquarie University, 2015; University of Sydney, 2015). The importance of providing much-

needed assistance and support to students at university has also been well documented in the literature (Masten, Tusak, Zalar & Ziheri, 2009). University of Sydney Library took the opportunity to expand Library services in 2015 with dedicated peer support by establishing a Peer Learning Advisor (PLA) team. This team was developed to provide peer and learning support in order to assist navigation of the student experience, and has worked across many library locations at the University of Sydney, including ThinkSpace, to develop and foster peer-based learning communities.

In fact, evidence of the effectiveness of peer-led support and its positive impact on the student experience can be demonstrated through some feedback that was received from a student using ThinkSpace:

“Words cannot express how grateful I am to the University of Sydney... This is because of the amazing team that you guys have at ThinkSpace and all the support and advice you guys have offered me over my innumerable visits.. You guys have been super and have definitely made my experience at the university a whole level more of awesome.” (Ahmed, personal communication, July 31, 2016)

Also central to the values underpinning ThinkSpace are the concepts of equity, inclusion and nurturing, which are also core values of the University of Sydney Library’s strategy. Making a range of technologies available that are accessible to anyone regardless of their level of experience or aptitude with technology, from entry level to expert, has been a strong consideration in the development of our ThinkSpace community. The support provided by the Peer Learning Advisors (PLAs) who work in the space are also a key pillar in providing a nurturing, open and inclusive environment regardless of background or experience.

Space - formal and informal learning spaces

Learning no longer only takes places in the traditional classroom, lecture theatre or laboratory. Learning in fact can take place anywhere, and according to Oswald & Hammond (2008), learning can take place “wherever the learner is inspired”. (p. 1)

The ubiquity of technology, the mobility of technology and its power to disrupt education, as well as the more general changing nature of education, has created a problem that universities and higher education providers now face, in that they must now re-develop, retrofit or build new learning spaces that reflect these changes in learning. ThinkSpace was the Library’s solution to this problem; an attempt to take a previously unused space and re-purpose it to reflect 21st century learning.

Progressing this idea a step further, in future, we plan to support the learning “anywhere, anytime” principle, by taking ThinkSpace on the road, literally, through the creation of “pop up” mobile iterations of the ”ThinkSpace. These “pop-up” ThinkSpaces could be erected in all manner of locations not traditionally associated with learning or in spaces have previously not been occupied by the Library. For example on the University front lawn in conjunction with student orientation events, or outside lecture theatres and in research spaces.

Technology

One of the most common pieces of technology associated with makerspaces is a 3D printer. This type of technology can have enormous benefits within an academic institution. A pilot project conducted at Dalhousie University found that the benefits of a library situated 3D printer included an increase in the number of faculties than had previously had access, an ability for clients to “store physical items in digital format” and then reconstruct them, and new methods for staff and students to represent

data” (Groenendyk & Gallant, 2013, p. 40). ThinkSpace has two 3D printers, a Makerbot and a fun introductory-level 3D doodler printer pen.

Another technology that has been gaining traction within academia is virtual reality (VR). As noted by Lau & Lee (2015, p. 15), VR assists in making learning “fun and interesting, but also challenging, tasks could be one effective method to release students’ creative potential”. ThinkSpace has three Google Cardboard viewers which have not only proved extremely popular with users who had not experienced VR previously, but was a relatively inexpensive introduction to the technology. As the cost of VR technology has started to come down with headsets that can be used with any mobile phone, the interest in VR has risen and ThinkSpace has since acquired several more VR headsets to meet this demand, incuding an Oculus Rift.

Other technologies that ThinkSpace has incorporated into the initial model include:

- a BB-8, a programmable droid robot which can be used to introduce clients to the basics of drag and drop programming through a free application named Tickle,
- Carvey, an easy to use tabletop 3D CNC carving machine,
- high end Mac computers equipped with design software to enable clients to design their own projects,
- An Intuous Pro drawing pad, also to aid with designing,
- Makey Makey, an invention kit that uses every day objects as a replacement for keyboards and mice,
- Mindwave, an EEG headset that measures and interprets “brainwaves”,
- Leapmotion, a sensor and software package designed for hand tracking in virtual reality.

The power of community and collaboration in the evolution of ThinkSpace

When building the concept of ThinkSpace, the goal was for the technology and facilities to be user driven. One of the reasons that makerspaces, and the technologies that they contain, are so difficult to define, is that each makerspace is unique to its community. Or as Van Holm (2015, p. 29) describes, as communities evolve, so too do the makerspaces and the projects that are facilitated within them. ThinkSpace has been a constant evolution- as the community has developed, so too has the technology, the events and collaborations that have grown out of the space. We have discovered that these facets are in fact intertwined and that one development rapidly gives rise to a new piece of technology, or new opportunities such as events, projects or collaborations.

One example of this may be demonstrated through the evolution of the 3D printers in the space. ThinkSpace started with a few basic technologies and facilities that appear to be consistent amongst many other similar spaces. Alongside the purchase of a Makerbot 3D printer, ThinkSpace approached the University of Sydney 3D printing club, one of the student union societies to become involved. On the back of this, ThinkSpace was donated a second 3D printer by the Sydney 3D printing club. The successful donation of the printer has spawned a robust collaboration between the Library and the 3D printing society which has facilitated club gatherings in which the use of a laser engraver was demonstrated. It has also resulted in the club's participation in launch day events, and has had further flow-on benefits to both the Library and the 3D printing club through the increase in exposure of the ThinkSpace facilities within the University student body and vice versa, increasing the publicity of the 3D printing club to students previously unfamiliar with the club.

Another successful collaboration was formed with both the University Educational Innovation unit and Information and Communications Technology (ICT) department, where we have developed events which showcase the potential uses of VR within an academic environment. Eighty academics and professional staff attended a seminar on VR as a learning tool, and had the opportunity to try a range of VR headsets, ranging from the Google cardboard to the high end Oculus Rift set ups. The success of this event has led to further collaborations between the Library, Education Innovation portfolio and ICT with events such as the official ThinkSpace launch and Education & Research Innovation Week in 2016.

Not only has ThinkSpace discovered collaborative opportunities with current University groups, it has also become involved in helping the University attract future students of Low Socio-Economic Status (Low SES), Aboriginal and Torres Strait Islander and from regional and remote areas though the University of Sydney's Compass program. The mission of Compass is to "prepare, motivate and engage young people, with the support of their communities, to access, participate and succeed in higher education" (University of Sydney, 2016). ThinkSpace was approached by Compass to participate in a number of student engagement activities with an aim of providing incentive for young people to enter higher education. Utilising the Peer Learning Advisors, particularly those studying education, ThinkSpace has held successful events in which students were introduced to technology with simple hologram building tasks which helped them to see the link between interest, learning and choice at university. Due to the success of these events, further collaborations have been planned.

A chance walk through of ThinkSpace on a researcher's daily commute led to the loan of a number of pieces of technology to ThinkSpace, including two Oculus Rift

VR headsets and a Leap motion controller device which senses your hands moving naturally in 3D, so you can experience virtual reality using your hands. Leigh Stevenson, a researcher with the Australian Centre for Microscopy & Microanalysis, had various technologies lying unused in cupboards and thought they might get better use if they were loaned to ThinkSpace. As a result of this collaboration, not only has it meant that ThinkSpace has added to its suite of technology, but it has enabled trials of expensive equipment before making a permanent investment. This has also led to discussions with the Australian Centre for Microscopy & Microanalysis researchers to develop a pilot research program whereby an honours student or student from the Talented Science Program (TSP) undertakes a project within ThinkSpace using these technologies to develop functioning applications for microscopy and microanalysis researchers.

Not only has ThinkSpace facilitated collaboration with University and external partners, it has also led to an increased ability to work with, and showcase, other divisions within the University of Sydney Library resulting in greater collegiality and higher visibility of the various services that the Library has to offer. In-house collaborations have so far included showcases from the Library's Academic services and its Digital Scholarship studio along with utilising some of the individual expertises of Library staff, such as Design Thinking, videography and musicianship.

ThinkSpace launch

ThinkSpace officially launched on September 1st, 2016 after an initial soft launch period of around 3 months. The soft launch was used to assess how the model of operation should work, as well as logistical issues such as creating booking systems for equipment and staff training. Once these issues had been ironed out, the concept

of the launch was to provide a day long program of events that showcased not only ThinkSpace itself, but also the learning and collaborative opportunities that the space can potentially facilitate in the future. A day long program of workshops, talks and hands-on experimentation opportunities was held in an effort to produce ideas for how ThinkSpace can be used in the future.

The program included:

- Technology “play stations”,
- A presentation on data visualisation and data rescue,
- A talk on research innovations;
- An introduction to coding workshop,
- A design thinking workshop,
- A talk on using 3D printing to prototype for market,
- A “Wearables/Soft Electronics” Workshop,
- A 24 hour 3D printing design competition and
- An evening cocktail event with talks from the University Librarian, Anne Bell, Director of Site Services, Coral Black and University of Sydney Director of Educational Innovation, Professor Adam Bridgeman.

Feedback from presenters was extremely good; “overall the vibe was great, enthusiastic”, “it was well-attended and I got several excellent questions”, “I liked that everything was all together in one room, even the presentations and workshops. Made it fun for people coming in for a look.”

Lessons Learned:

Although makerspaces have been in existence for a few years now, attempting to create such a space in a traditional institution has not come without its challenges.

Students within Library spaces will often study anywhere. If there's a space available with Wi-Fi and computers they will generally occupy it for individual or group study. This type of activity is not conducive to a makerspace environment due to the noise and activity that a makerspace generates. One of the challenges ThinkSpace has encountered has been managing the expectations of users of the space.

On top of this, ThinkSpace has needed to find an equitable method of sharing the equipment, in particular the 3D printers, to ensure that they are not monopolised by a few clients, nor used for printing large amounts assessment based work. This was essential to maintain the focus of the area as one of experimentation, rather than a printing "service". In order to ensure this goal was met, ThinkSpace utilised Springshare software as a booking system, with print jobs limited to a maximum of 4 hours.

Due to the multiple pieces of equipment in the space, which were implemented within a short time frame, staff training in their use proved to be difficult. The staff who facilitate use of the equipment are student casuals who are generally rostered only 8-12 hours per week. A peer-to-peer method of training was utilised to ensure staff were trained adequately for the equipment initially procured, however ongoing training needs for future technologies will continue to be an issue. The Library also has a Work Health and Safety responsibility to both users and staff, so safe work method documentation and training are needed for each piece of equipment implemented.

Evaluation of ThinkSpace continues to be more qualitative than quantitative. Whilst the number of bookings on equipment can be easily measured, the value of output is

harder to define. ThinkSpace relies on user generated social media posts to validate proof of concept.

An unexpected issue that occurred within the soft launch phase of ThinkSpace was requests for unusual 3D print jobs. One client printed a butterfly knife, which was then posted on the ThinkSpace Facebook group, which resulted in a concerned email to library staff from another user. On further investigation, the knife that was printed proved to be a commonly printed item amongst 3D printing enthusiasts. The print job in question had multiple reviews and had been described as less sharp than a butter knife by some. Still, the question of what is acceptable to print was raised, along with the dilemma of the role of Library as censor.

Conclusion:

Even though ThinkSpace is in its early infancy, the qualitative feedback has been extremely positive, and the content that has been produced and shared through ThinkSpace social media channels has shown that the objective of the community producing creative and innovative output is being realised. The next steps for ThinkSpace include further collaborations, enhanced integration of Peer Learning Advisors into the service, constant scanning and assessment of new technologies that could be implemented, and a more robust system of ensuring equity of access to the service, both physically and online. By it’s nature ThinkSpace will always be a work in progress, however there is a certain freedom in creating and maintaining a space that is easily adaptable and responsive to the communities needs.

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