



‘Fostering creative technologist and maker communities’

Brad Hammond

2014 Inaugural Melbourne Knowledge Fellowship

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i. EXECUTIVE SUMMARY

We live in a world of ubiquitous computing, software controlled machines and internet connected systems with new digital technologies being developed every day. We have access to the most powerful tools ever created but currently only a small percentage of people know how to use these tools to create, let alone how to create the software to make these tools run. Creative technologists and makers (CT&M) get to learn and understand the abilities and limitations of these tools through creative exploration and experimentation. The communities of creative technologists and makers have a vital role to play in the education of our future innovators and as major contributors to the knowledge economy.

Creative technologist and maker communities and events have started to move into the cultural mainstream over recent years. A major contributing factor to this has been the expansion of grass roots creative technologist (tech) and maker communities driven by access to affordable tools and internet bandwidth which is now readily accessible in many Australian cities and towns.

These communities cover a broad range of interests and skills such as programming, electrical engineering, arts, music, industrial design, game development, the internet of things, wearable technology, computer aided design, CNC machining and 3D printing. The ability for these communities to engage members in creatively motivated practice while teaching them skills that have been identified as being in short supply in the Australian economy, provide us an opportunity to foster these communities so they might thrive.

The Fellow, Brad Hammond, is a Melbourne based creative technologist and teacher who has been actively engaged with various creative tech pursuits and communities for the past ten years. The Fellow's firsthand experience of these communities has led him to understand their ability to:

- Engage and facilitate the teaching of STEM skills
- Inspire self-directed learning
- Facilitate interdisciplinary collaboration
- Develop innovative ideas by making use of new technologies
- Build knowledge sharing networks and communities
- Engage kinaesthetic learners that are often overlooked in traditional educational organisations
- Gain an understanding of experimental and iterative design approaches
- Quickly become familiar with emerging technologies
- Build supportive and encouraging community and lasting friendships.

The federal government is now placing an economic focus on innovation, start-ups and a knowledge economy. This report highlights the potential for CT&M communities to play a strong role in helping people to learn the skills and build the networks and interdisciplinary collaboration required to contribute to an innovative knowledge-based economy.

CT&M communities are growing the world over and often face the same challenges. The Fellow's research overseas highlighted the need for deliberate strategies to increase diversity in these communities, increase accessibility to the knowledge they create and tools that they provide. The Fellow's research also shows a need for some top down assistance to help communities with the challenges they face such as securing appropriate spaces that are affordable and accessible.

The Fellow will be putting some of the recommendations into practice through a residency program with the Melbourne Library Service by developing workshops and programs that will allow a broad audience to engage with the libraries new maker spaces.

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ii. ABBREVIATIONS/ACRONYMS

AEC	Ars Electronica Center
CAD	Computer Aided Design
CNC	Computer Numerical Control
CT&M	Creative Technologist and Maker
DIY	Do it Yourself
FLB	Fab Lab Berlin
FLRUC	Fab Lab Roskilde University
LED	Light Emitting Diode
ISS Institute	International Specialised Skills Institute
STEM	Science, Technology, Engineering and Mathematics
VFX	Visual Special Effects
VR	Virtual Reality

iii. DEFINITIONS

3D Printing

A method of printing 3D objects by extruding layers of plastic atop one another.

3D Sculpting

A method of creating a digital form in three dimensions through the use of virtual sculpting tools.

CNC

Computer Numerical Control. A computer control system that removes the need for manual human control. Found in machines like mills, lathes and 3D printers.

Creative Technologist culture *

Contemporary culture defined by creative and experimental uses of primarily digital technologies. This may include but is not limited too programming, electrical engineering, game development and experiential design.

* This is a term that the Fellow believed is more encompassing of the relevant communities addressed in this report than just those identifying as 'Makers'.

Creative Technologist

A person engaging in the Creative Technologist culture.

Generative Art

Generative art refers to art that in whole or in part has been created with the use of an autonomous system. An autonomous system in this context is generally one that is non-human and can independently determine features of an artwork that would otherwise require decisions made directly by the artist.

Jam / Hackathon

An event, typically lasting several days, in which a large number of people meet to engage in collaborative computer programming.

Maker Culture

Contemporary culture representing a technology-based extension of DIY culture. Primarily focussed on physical outcomes involving technologies like 3D printing, CNC milling, electronics and wood/metalwork.

Maker

A person engaging in the Maker culture.

Makey Makey

A simple microcontroller that allows users to simulate keyboard presses by connecting it to common conductive materials. This allows users to create improvised input systems for computers.

iii. DEFINITIONS

Virtual Reality

A simulated 3D digital environment which a user experiences through the use a stereoscopic headset.

Workshop

A meeting at which a group of people engage in intensive discussion and activity on a particular subject or project.

1. ACKNOWLEDGEMENTS

Brad Hammond thanks the following individuals and organisations that have generously given of their time and their expertise to assist, advise and guide him through this Fellowship program.

Awarding Body – International Specialised Skills Institute (ISS Institute)

The International Specialised Skills Institute (ISS Institute) is an independent, national organisation. In 2015 it is celebrating twenty-five (25) years working with Australian governments, industry education institutions and individuals to enable them to gain enhanced skills, knowledge and experience in traditional trades, professions and leading edge technologies.

At the heart of the ISS Institute are our individual Fellows. Under the Overseas Applied Research Fellowship Program the Fellows travel overseas. Upon their return, they are required to pass on what they have learnt by:

- Preparing a detailed report for distribution to government departments, industry and educational institutions
- Recommending improvements to accredited educational courses
- Delivering training activities including workshops, conferences and forums.

Over 300 Australians have received Fellowships, across many industry sectors. In addition, recognised experts from overseas conduct training activities and events. To date, 25 leaders in their field have shared their expertise in Australia.

According to Skills Australia's 'Australian Workforce Futures: A National Workforce Development Strategy 2010'.

Australia requires a highly skilled population to maintain and improve our economic position in the face of increasing global competition, and to have the skills to adapt to the introduction of new technology and rapid change. International and Australian research indicates we need a deeper level of skills than currently exists in the Australian labour market to lift productivity. We need a workforce in which more people have skills and knowledge, but also multiple and higher level skills and qualifications. Deepening skills and knowledge across all occupations is crucial to achieving long-term productivity growth. It also reflects the recent trend for jobs to become more complex and the consequent increased demand for higher-level skills. This trend is projected to continue regardless of whether we experience strong or weak economic growth in the future. Future environmental challenges will also create demand for more sustainability related skills and knowledge across a range of industries and occupations.

In this context, the ISS Institute works with our Fellows, industry and government to identify specific skills and knowledge in Australia that require enhancing, where accredited courses are not available through Australian higher education institutions or other Registered Training Organisations. The Fellows' overseas experience sees them broadening and deepening their own professional knowledge, which they then share with their peers, industry and government upon their return. This is the focus of the ISS Institute's work.

For further information on our Fellows and our work see <http://www.issinstitute.org.au>.

Brad Hammond also thanks the Bella Irlight AM and staff (Ken Greenhill and Paul Sumner) of ISS Institute for their assistance in planning and development of the Fellowship and completion of this report.

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1. ACKNOWLEDGEMENTS

Fellowship Sponsor

City of Melbourne

Knowledge Melbourne is an initiative designed to showcase, enhance, and connect the knowledge and innovation capabilities of Melbourne.

Melbourne Library Service is one of Australia's busiest public library services. It aims to ensure the people of Melbourne have access to skills and knowledge and a place to read, connect, explore and learn.

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Supporters

The following organisations/individuals were involved in and supported the Fellowship application and submission:

- Kendyl Rossi Federation Square, Creative Projects Producer
- Stuart Smith Professor of Disruptive Technologies, University of the Sunshine Coast
- George Hedon Pause Fest, Founder

Organisations and Individuals that participated in this Fellowship

The Fellow would like to thank all those who gave their time freely to contribute to their experiences to this report and helped facilitate events.

- Bruno Fonzi Codame, Commodore
- Jordan Gray Codame, Founder
- Nicole Gruneis Ars Electronica, Head of Education and Cultural Mediation
- Kristefan Minski Ars Electronica, Artist / Producer / Researcher
- Bo Thorning Fab Lab RUC, Technology Guru
- Lotte Nielsen Next Library Festival, Library transformer & Project Manager of Next Library
- Lieke Anne Spektrum, Co-founder / Community builder
- Thomas Gnahn Wear It, Founder
- Erich Stussi Fab Lab Berlin, Lab Manager
- Lisa Lang ElectroCouture, Founder & CEO

Organisations impacted by the Fellowship

The following organisations and industry groups should benefit from the findings of this report:

Government - Federal

- Communications and Arts portfolio
- Employment portfolio
- Education and training portfolio
- Industry, Innovation and Science portfolio

Government - State

- Education portfolio
- Employment portfolio
- Small Business, Innovation and Trade portfolio
- Creative Industries portfolio
- Training and Skills portfolio

City of Melbourne

- Melbourne Library Service
- Knowledge City portfolio

Industry

- Software engineering
- Mechanical engineering
- Electrical engineering
- Product design
- All STEM related industries
- Education (Primary/Secondary/Tertiary)
- Game development
- Creative Technologies
- Marketing

Community groups

- All the many and varied creative technology and maker groups in Australia
- Community centres

2. ABOUT THE FELLOW

Name: Bradley Hammond

Employment: Creative Technologist, XY01 Design

Memberships: Media Lab Melbourne

Brad Hammond is a Melbourne based creative technologist, teacher and artist with a strong focus on interactive works and community building.

After honing his skills in the games industry for six years, he left to explore the forefront of technology through the creation of interactive experiences for artistic and commercial purposes.

Hammond's portfolio encompasses a wide variety of mediums including games, projection mapping, electronic micro controllers, 3D printing, experimental digital sculpture, virtual reality experiences, real world interactive sculpture and generative artworks. This varied approach to arts and commercial practice is driven by an insatiable curiosity and desire to learn and create with the technologies that drive human and social evolution.

In 2012 he co-founded Ethno Tekh with Chris Vik. Ethno Tekh was founded on a philosophy of evolving and sharing new forms of expressive human/ digital interactions. Since the inception of Ethno Tekh, they have exhibited works around the world including CeBit Germany 2013, Pause Fest 2011 - 2015, Dark Mofo Hobart 2013, Republika Fest Croatia 2013, Vivid 2014 and Light in Winter 2014.

In recent years Hammond has developed a passion for community building as a means of bringing people together to share ideas, inspiration and skills. This is evidenced by his work with the Melbourne Library Service, helping to develop workshops for their new maker spaces and computer labs, founding and administering an online generative arts group of over 6,000 members and his work with Media Lab Melbourne.

3. AIM OF THE FELLOWSHIP PROGRAM

Creative Technologist and Maker (CT&M) communities provide people with a means of developing skills together, sharing knowledge across disciplines, connecting and working with likeminded individuals and more generally promoting cohesive community. In recent years Australia has seen a strong grass roots growth CT&M communities and events. These communities often face similar challenges to one another as they seek to foster and grow their communities in the same way that many other countries have been successful in doing so.

The Fellowship provided the opportunity to travel abroad to gain a better understanding of how we can better foster CT&M communities, by understanding the benefits that they can offer and the collective challenges that they face. This was achieved by visiting relevant events and facilities as well as interviewing CT&M practitioners and community facilitators both formally and informally. The Fellowship was undertaken with a focus on developing recommendations that highlight the need for communities that are inclusive, accessible and financially and socially sustainable.

Aims

- Identify and broaden the demographics participating in CT&M communities. Gain an understanding of the potential flow on effects of broader demographic engagement.
- Gain an understanding of the various business models that CT&M communities use and what has and has not worked in regards to building a financially sustainable community.
- Raise awareness in government and related industry of the societal, economic and educational benefits that CT&M communities and skills provide.
- Develop opportunities for creatively motivated, informal learning experiences that teach STEM skills.
- Build connections with other CT&M communities so that we might encourage stronger knowledge sharing relationships and potential collaboration.
- Help CT&M communities become recognised as a specific group of pursuits to help them be more easily engaged by government and relevant industry.
- Use the findings of the report to work with the Melbourne Library services to engage with and foster CT&M communities around Melbourne.
- Implement some report findings during a residency with the Melbourne Library Service.
- Make practical use of the findings and start a 'Creative coding' community in Melbourne.
- Identify and document successful marketing and communication strategies used by CT&M groups.

4. THE AUSTRALIAN CONTEXT

Description of the creative technology and maker industry

Creative technologist and maker communities have evolved as a form of 'Do-it-yourself' (DIY) culture, built around tinkering with technology and software for practical, creative or experimental outcomes. In recent years the Maker culture, and to a lesser degree creative technologist culture, has started to come into and be accepted by the mainstream.

Australia, a country recognised for its early adopters of technology¹, has a rich variety of grassroots communities starting up that fit within the creative technologist and maker umbrella. In Melbourne alone there are biohacker, experimental gaming, maker space, 3D printing, health technology, virtual reality and microcontroller meetups, community events and spaces.

The rise of CT&M culture into the mainstream has been largely driven by grassroots communities. Hammond's research into the Australian industry found this has been possible in recent years due to a number of factors:

- Increased affordability of hardware and tools
- Increased digital literacy
- Open online knowledge sharing
- Open source software and tools
- A push by some community groups to involve the broader public in creative technologist and maker culture.

The bottom-up growth of these communities, along with the Fellow's own facilitation experiences make it evident that there is a desire among the broader populace to be able to make use of the technologies that are pervasive in modern society. This self-directed and self-motivated participation in the technology culture is important to tap into as we come into a time where Australia and the world are starting to focus on a knowledge economy which is often underpinned by technological and creative innovation.

The Australian government's 2015 Intergenerational report highlighted some key points for future economic growth and productivity of the country as well as highlighting the benefit of community participation especially in an aging population.² The need for new industry based around new technologies, innovative start-ups and knowledge based skills to fuel the growing knowledge economy. These were echoed during the 2015 innovation policy announcement, with its focus on supporting start-ups and the need for new and innovative small businesses that are agile in their response to technology and the digital landscape.

As we can see this report signifies a significant issue: All of these technology based skills are vital for the growth of Australia's innovation and start-ups sector as well as helping to create a cohesive and creative community that moves with technological innovation. As CT&M skill sets and methodology teach people to be agile with the use of their technology based skills in application and responsiveness, this experience teaches them to be innovative and experimental in their design approach.

Hammond's experience and research around CT&M communities indicates that they provide multiple beneficial outcomes that address societal as well as economic needs such as:

- Are a means of connection between people with similar interests that allows for networking and forming of community and friendships

¹ Australia Destination Innovation Brochure, Australian Government – Australian Trade Commission, The Lifestyle, Page 31

² Intergenerational report 2015, Australian government, Chapter 3: Preparing for the Future, Page 89-97

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- Provide formal and informal learning opportunities, which are often employ more kinaesthetic and self-directed learning experiences than those provided in traditional Australian curriculum
- Encourage interdisciplinary and interindustry collaboration and knowledge sharing
- Build a stronger understanding of how to make use of technology to help bring ideas to fruition often through creatively motivated practice.
- Are recognised as a means of exposing members to STEM skills in an informal setting
- Increase digital, technological and design literacy and understanding
- Often use agile and iterative design methodologies that acknowledge learning from failure as a key step in a successful project
- Encourage open sharing of knowledge and resources with one another as well as online
- Encourage experimentation with multiple mediums and across industry.

While Australia does have a growing number of CT&M communities, spaces and events they often experience similar difficulties when starting out or trying to expand. Some of the problems cited by Australian CT&M communities are:

- Access to suitable and affordable spaces to host events
- Ability to secure spaces that are in accessible areas, often due to the requirements of the tools being used
- Inability to secure funding through grants, often because they do not neatly fit into traditional prescribed category of arts, business or a traditional community group
- Limited demographic participation with a large gender gap and often underrepresented minority groups
- Limited top down intervention by local, state or federal governments
- Not presenting a cohesive front to local, state or federal governments to engage with.

The lack of demographic diversity is the same that has been recognized internationally in STEM fields³ as well as other related fields such as the gaming industry, Visual Special Effects (VFX) and programming to name a few.

This research indicates that if these common problems were better understood and strategies to overcome them were developed, it would give CT&M communities a better chance to contribute to the societal and economic growth and education of Australia into the future.

The potential benefits that Australian CT&M community organizers foresee, include:

- Broader demographic participation in CT&M communities and a potential increase the demographic participation in STEM fields
- Easier access to cutting edge technology and learning opportunities involving these technologies
- Access to lifelong learning opportunities that would allow people to develop skills and networks at any age
- Increased technological literacy that would allow people to better engage with the tools that are pervasive in modern society
- Increase on community participation which helps to create a cohesive and understanding society
- Allow Australia to show progressive leadership in inclusive and equitable community development.

³ Ethan Zuckerman & Chelsea Barabas, "Diversity challenging not just tech companies but universities too", The Conversation, Link

SWOT Analysis

The following Strengths, Weaknesses, Opportunities and Threats analysis has been compiled by the fellow to identify the areas that already are addressed and present in the Australian community, and those that need attention in order to improve CT&M activities in Australia:

Strengths

- Expanding the breadth of demographics involved in the communities by ensuring equitable and accessible community building.
- Provides new ways to highlight the innovative uses of technology.
- Increasing digital and technological literacy.
- Interdisciplinary skills and knowledge sharing.
- Promoting skill and knowledge sharing among, local and global communities.
- Learning through doing and play.
- Provides informal setting to learn STEM skills especially for kinaesthetic learners.
- Encourages experimentation and iteration in the design methodology.
- Promotes the underlying skills needed for the creation of innovative uses of technology.
- Community engagement allows for lifelong learning opportunities and reskilling.

Weaknesses

- The breadth of creative technology and maker communities and the varied interests makes it hard to make sure everyone is catered for.
- Some of the technologies used have specific OH&S requirements of the space they are used in.
- Lack of appropriate spaces and facilities to host certain CT&M communities and events.
- CT&M communities don't easily fit into a lot of funding categories offered by government.
- Due to distance and lack of financial sustainability, it is difficult to attract international practitioners or projects to Australia.
- CT&M pursuits don't neatly fit into many grant criteria across the industries involved, making it difficult to attract funding.
- Awareness of the educational value and benefits of CT&M activities.
- Narrow spread of demographic engagement.

Opportunities

- Address the underrepresentation of women and other demographics in STEM skill areas.
- Bolster the intersection of the arts and technology in Australia.
- It will ensure that communities incorporate new technologies early and place Australia at the forefront of potential innovations.
- Delivers informal learning opportunities that focus on STEM skills in a way that isn't available in much of Australian curriculum. This could help to encourage people who learn differently to pursue STEM skills at a higher level.
- Encourage engagement with physical construction using digital skill sets for a younger generation.
- It offers the opportunity to create role models out of CT&M practitioners and to help make STEM

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skills more approachable and desirable for a younger audience.

- It will help Australia build strong CT&M communities that will be able to adapt and respond to technological changes quickly and in turn help to educate the broader public.
- Allow Australia to show strong leadership on equitable and inclusive community development.

Threats

- Lack of a unifying identity that contributes to the difficulty of categorisation for top down intervention or recognition.
- Lack of inter-community communication.
- The geographical isolation of Australia makes it difficult to bring international CT&M practitioners and projects over for events.
- Deficits in digital literacy amongst the broader community may become more of an issue as the government aims toward a digital first model by 2017.
- Potential for communities to dwindle without the proper support structures and funding opportunities.
- Lack of affordable and accessible spaces for communities and events.

5. IDENTIFYING THE SKILLS AND KNOWLEDGE ENHANCEMENTS REQUIRED

These are examples of areas in Australian industries where there are weaknesses in innovation, skills, knowledge, experience, policies and/or formal organisational structures to support the ongoing successful development and recognition of individuals and the particular sector.

The focus of all ISS Institute Fellowships is on applied research and investigation overseas by Australians. The main objective is to enable enhancement and improvement in skills and practice not currently available or implemented in Australia, and the subsequent dissemination and sharing of those advanced skills and recommendations throughout the relevant Australian industry, education, government bodies and the community.

Skill enhancement 1:

Build communication and marketing strategies to help increase participation in CT&M events and communities with a specific focus on broadening the participating demographics.

- Effectively engaging with existing CT&M community members.
- Effectively engaging with relevant industry partners to build mutually beneficial relationships.
- Effectively engaging with demographics that are underrepresented in the CT&M communities and events.
- Effectively marketing events to the general public to increase awareness and interest in the CT&M practices.

- Action: Conduct formal and informal interviews of community and event facilitators to gain insight into their communications and marketing strategies, especially those with a focus on inclusivity and accessibility.
- Action: Conduct formal and informal interviews of community and event facilitators to understand how they build successful industry engagement and partnerships, especially relationships that are mutually beneficial.
- Action: Conduct informal interviews of interview event participants to understand what communications and marketing methods engage them.
- Action: Work with the Docklands Library to help build an ongoing program of workshops that focus on broadening the demographic engaging in CT&M events.

Skill enhancement 2:

Build strategies for the delivery of CT&M events and spaces with a focus on accessibility and inclusivity.

- Build an understanding of the common event delivery modalities.
- Gain insight into common failures in event delivery strategies.
- Effectively deliver events that encourage participation through inclusive and accessible practices.
- Develop strategies to target underrepresented demographics such as the elderly, early childhood and women.

- Action: Conduct formal and informal interviews of facilitators to gain insight into the modalities employ when delivering events.
- Action: Conduct formal and informal interviews of facilitators to gain insight into event strategies that have been used to engage specific demographics. Build an understanding of

5. IDENTIFYING THE SKILLS AND KNOWLEDGE ENHANCEMENTS REQUIRED

what was successful or unsuccessful about these strategies.

- Action: Attend CT&M events to observe and participate to understand how delivery strategies are employed. While at events conduct informal interviews with participants to understand what has engaged them at the event.
- Action: Deliver a workshop at the Next Library Festival on 'Playful and creative uses of technology' to try and engage librarians in creative technology practices and their ability to provide for informal learning experiences.
- Action: Employ these findings during the workshop development for the Docklands library by ensuring workshops and knowledge are accessible and inclusive.

Skill enhancement 3:

Develop strategies and opportunities to share knowledge and resources with CT&M practitioners, communities and the broader public as well as highlighting the skills being delivered.

- Effectively share knowledge among local and international CT&M communities.
 - Understand what knowledge sharing platforms and resources CT&M communities commonly make sure of.
 - Cultivate relationships with CT&M communities to encourage collaboration, knowledge exchange and practitioner visits.
 - Develop an understanding of how to best communicate the advantages of the skills being delivered in CT&M communities and events.
-
- Action: Conduct formal and informal interviews of facilitators and practitioners to understand what relevant knowledge resources they make use of.
 - Action: Conduct formal and informal interviews of facilitators and practitioners to gain insight into how they share their knowledge with others. Build an understanding of what stops them from sharing knowledge with others in regards to resources.
 - Action: Document and openly share workshops created during my residency at the Docklands Library maker space.

Skill enhancement 4:

Develop strategies to help avoid common problems facing CT&M communities in terms of resourcing and sustainability.

- Understand common problems with creating financially sustainable CT&M communities and events.
 - Understand common problems with building cohesive communities with regular participation.
 - Identify common resourcing problems with regards to space and hardware.
-
- Action: Interview community and event facilitators to understand the problems they face in regards to sustaining their community in terms of participation as well as resources.

6. THE INTERNATIONAL EXPERIENCE

The Fellowship travels consisted of visits to CT&M communities, festivals, workshops, conferences as well as formal and informal interviews with practitioners, facilitators and participants. These took place in Austria, Denmark, Germany and the U.S.A.

These activities provided the Fellow with the broad perspective needed when taking into account community facilitation and participation.

Location one: Ars Electronica Festival, Linz, Austria

Contact/s

Kristefan Minski - Artist / Producer / Researcher

Nicole Gruneis - Head of Education and Cultural Mediation

The Fellow's first visit was to the Ars Electronica Festival in Linz. Ars Electronica is a long running Austrian institution that focuses on the interlinkages between art, technology and society. Ars Electronica is one of the world premier institutions championing maker and creative technologist culture. The visit to Ars Electronica Centre (AEC) consisted of visits to the festival and museum.

Since its inception in 1979, AEC has grown into one of the world's premier events in its related fields. It has grown to include a permanent Museum space, an auxiliary art event Prix Ars Electronica and the Futurelab which is a research and development branch with commercial interests relating to creative and innovative uses of technology. These multiple divisions are able to feedback artworks, research and technology to one another, creating a dynamic and progressive environment for the public to come and learn and from which practitioners and facilitators can work.

Ars Electronica Festival

The Ars Electronica Festival is an annual event that focuses on themes relating to the intersection of technology, culture, art and society. The festival theme for 2015 was Post City. This theme explored concepts such as the smart city, increased automation and its effects on employment, autonomous transportation and rethinking urban living spaces.

The festival was setup throughout the city across multiple venues including universities, a disused post office warehouse, public spaces, galleries and a church. The public presence and pervasive public signage made it plain to see that there was a festival happening and that there were activities that the public could engage in.

The attendance was much higher than other CT&M events the Fellow had previously attended. The demographic diversity was extremely broad with adults, children and whole families engaging with the festival. It was noteworthy that there was a strong female attendance in comparison to other technology events. It was clear from the offerings at the festival that they had explicitly catered for a broad age range by including CT&M activities that children as well as adults could participate in as well as specific children's areas in the large exhibition space.

The festival employed a multitude of delivery modalities to explore the theme and encourage participation. These delivery modalities ranged from art exhibitions, symposiums, talks, workshops, gaming, interactive digital experiences, film viewings and technology demonstrations. Most of the

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delivery was presented in such a way that little prior knowledge was needed to be able to understand what was being shared. These factors made for an event that the Fellow felt was accessible and inclusive in its intention as well as its implementation.

The multitude of events and delivery modes would not have been achievable without the significant contribution of the different groups involved. Ars Electronica actively engage with CT&M community groups, galleries, education institutions and artists to bring the variety of events to the festival. This broad engagement helps the festival present many different perspectives on the same idea through a range of skills sets, as well as exposing event participants to networking possibilities with related disciplines or motivations.

The Fellow met many CT&M practitioners while at Ars Electronica who work throughout the world. The information and idea exchange was inspiring and will lead to ongoing connections, knowledge exchange and possible collaborations. The importance of these networking events was reinforced when the Fellow later met some of the same people at Wear It festival in Berlin.

In regards to marketing and communication strategies, Ars Electronica has a strong online presence and strong brand recognition due to it having provided quality events over the years. They have a strong online presence with websites for each of their events, a permanent museum space and Future Lab. They have a newsletter sign up that delivers up to date information to subscribers and they have a strong social media presence on the major sites, Facebook, Twitter and Instagram.

Ars Electronica Museum

The Ars Electronica Museum in Linz is in their own words “a place of inquiry and discovery, experimentation and exploration, a place that has taken the world of tomorrow as its stage, and that assembles and presents influences from many different ways of thinking and of seeing things”.¹ The centre is a place where people can come and learn about new and emerging technologies, cutting edge scientific concepts and the gain insight into the intersection of technology and its influence on culture through predominantly interactive and participatory exhibits.

The centre is home to variety of labs that make use of cutting edge technologies that people don't often have access too in their homes. The center has a Robotics Lab, Fab Lab, Bio Lab, Sound Lab and Brain Lab. Each lab consists of specialised tools and technology, interactive displays and exhibits showcasing the potential uses and outcomes of applying the technologies in experimental and creative ways.

The labs are staffed by 'Info trainers' whose job it is to answer the visitor's questions about the technology, their applications and how they themselves can make use of it. The Fellow's experience of the info trainers was that they were not only very knowledgeable on all aspects of the labs but also passionate about getting people to engage with the technology. Having knowledgeable info trainers there allowed for customised experience and knowledge sharing that took into account the visitor's level of knowledge and ability. During the Fellow's visits to the labs there were info trainers helping people to sculpt objects on tablets for 3D printing, visitors having objects laser cut and groups being taught how to splice plants together in the bio lab.

The Fab Lab displayed work of CT&M practitioners from around the world, to highlight the variety of potential uses for the different tools and technologies on offer. The Fellow noted a work from an Australian artist, Matthew Gardiner, called 'Mechaniflorum Quinquiplicatum' which explored the intersection of biomimetic, kinetic origami and robotics. It was exciting for the Fellow to note that Australia is having an impact in a meaningful way in the CT&M communities abroad.

¹ Ars Electronica, About Ars Electronica Center

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In regards to increasing diversity in demographics Ars Electronica centre has implemented multiple strategies to encourage engagement with the space. The Fellow has outlined two of these strategies below.

The first strategy - a children's research laboratory that is dedicated to helping children discover and experiment with technology. The implementation follows a method of teaching called 'learning through play'. An example of how this is implemented is their stop motion Lego animation stations. There is a screen with instructions, a camera looking down at a desk, a bucket of Lego and a few simple buttons to control the taking of pictures. The children are then able to create simple stop motion animations by taking successive pictures of their Lego creations interacting. This allows the children to experiment in a playful manner with Lego, of which most of them would be familiar with as well as a simple camera system and the methodologies of stop motion animation. This program has been very successful at Ars Electronica and has led them to expanding their target age range to now include children as young as four. This new program has seen AEC engage with the kindergartens as a joint venture with local government to offer a discounted admission to the centre.

The second strategy - AEC implemented a program to offer guided tours of the centre which are tailored for the elderly. These tours cover fewer works to take into account lower energy levels, they are lighter on in depth technical details as not to assume too much pre requisite technical knowledge and the guides talk more slowly to account for potential poor hearing. Originally this strategy was delivered as a tour at a set time on a Friday afternoon. Attendance wasn't what was expected and some feedback indicated that the cost of public transport at that time may have factored into this. The strategy has now been modified to allow for tours for elderly visitors at any time of the visit upon request.

Regarding community engagement, AEC work closely with the local schools and universities to engage people from a variety of ages and abilities. The city government works with AEC to help subsidise schools visiting the centre. Some of the AEC and Future Lab staff also take their skills to local universities where they teach.

Delivery modalities at AEC are varied. There are talks, exhibitions, bookable workshops, informal visits and engagement with info trainers and special events.



Public space exhibit at Ars Electronica Festival, Linz

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One of the special events they run is 'Game Stage'. Game Stage invites those with an interest in all types of gaming, be it digital, board or urban gaming to share their prototypes, participate in talks and hear presentations. This event runs in the evenings and allows people to network and learn from another. This event is of particular interest to the Fellow, as the game developer groups are often left outside of the definition of creative technologists and makers. The Fellow hopes to encourage inclusion of gaming groups in this definition as they use technology in often novel and experimental ways in a creatively motivated context.

Funding for the centre comes from a mix of government funding, ticketed entry and grants for collaboration with education institutions. Government funding comes from multiple levels, the City of Linz, the Province of Upper Austria and the Republic of Austria.

Location two: Next library festival: Aarhus, Denmark

Contact

Lotte Nielsen - Library Transformer & Project Manager of Next Library

The Fellow attended the Next Library festival in Aarhus, primarily to deliver a workshop on 'Playful uses of technology' and to meet with facilitators of maker spaces that have become popular in the new library model context.

The Next Library festival focuses on bringing librarians and those working with libraries together from around the world to discuss innovative and emerging ideas in the library space. There was a strong focus on how libraries can make use of new technologies to deliver new learning opportunities for the patrons. The Fellow's prior work with the Melbourne Library service delivering creative technology workshops and post Fellowship residency made this a great opportunity to learn more about libraries and librarians and how they relate to the CT&M activities happening in the library space.

The aim of the workshop was to expose participants to how emerging technologies can be used in creative and playful ways to provide opportunities of discovery and inspiration as well as informal learning opportunities. The Fellow focussed on the potential for these interactions to provide inspiration for self-directed inquiry and further learning for all age groups. The workshop in the Fellowship context provided the Fellow with an opportunity to share knowledge, develop networks and experiment with delivery modalities for a group that may or may not have technical backgrounds and get feedback.

The Fellow presented the group with a range of interactive creative technology outcomes. These included a webcam driven visual synthesizer, the Makey Makey input device, 3D sculpting using freely available software, motion controlled instruments and a mobile Virtual Reality (VR) experience. All of these technologies are easily accessible, relatively affordable and most have free learning resources online.

The workshop consisted of a short talk and explanation of the technology being shown. The Fellow relayed the experiences he has had delivering workshops on these technologies at the Docklands Library in Melbourne. He communicated the ability he has seen for these technologies to successfully engage a diverse demographic of participants ranging in age from five to 60s from various backgrounds and with a variety of interests in the technology and their creative applications.

The attendees were then invited to playfully experiment with the different technologies, discuss among themselves and ask questions. Once people started to experiment with the different technologies they started to ask questions about their relevance to the library space and how it can be used to provide learning opportunities. The Fellow was able to talk from personal experience about his own learning and teaching outcomes that pragmatically demonstrate the ability for these technologies to provide informal as well as formal learning opportunities and inspire self-directed learning. The Fellow followed up the workshop by providing documentation on how to access the free software demonstrated, where to find free learning material and shared assets.

After the Fellow reviewed the workshop delivery critically, the Fellow felt that there were elements that needed improvement. After the talk component it took some time to encourage people to participate and experiment with the technology as is often a problem when adults are asked to take part in interactive workshops. It was determined that it could be remedied by having another presenter familiar with the technology help facilitate the event and demonstrate the works to help excite the attendees.

Most of the participants understood the information and answers presented but there were some that did not. The Fellow felt the information he presented could have been made more accessible and

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explained in such a way as to take into account a broader range of technological understanding. This was likely due to time constraints as the Fellow has noticed that when he is teaching he under time pressure, he often reverts to using acronyms and vocabulary that explains concepts quickly but may not be understood fully by those unfamiliar with the technology. This may be remedied by allowing more time and being more mindful of vocabulary being used.

While at the festival the Fellow networked with many librarians from around the world. Discussion pertinent to the Fellowship centred on how best to make use of new technology in the library spaces and how they can be curated by library staff. There was a mix of excitement for the possibilities of CT&M technologies in the library space but also a distinct apprehension by some. Those who were apprehensive had concerns about the pragmatic outcomes of the new technologies, the broadening of the libraries focus and the budget and upskilling requirements that came with it.

While at the festival the Fellow met Justine Hyde, the acting CEO of the Victorian State Library. It came to light that the State Library and the City of Melbourne Library service were interested in developing similar ideas and the Fellow suggested a meeting to discuss the possibility of knowledge and resource sharing.



Visiting the Dokk 1 Library, Aarhus

Location three: Fab Lab RUC, Roskilde, Denmark

Contact

Bo Thorning – Technology guru

Fab Lab RUC is an open Fab Lab that has tools, equipment and staffing to allow for rapid prototyping and digital production. The Fellow was given a tour of the lab by the labs technology guru, Bo Thorning. Bo is an active maker and artist himself and has been a part of the local maker community for many years.

The term open, means that it is open to all, not only RUC students or researchers, but anyone from the general public who is interested in developing a project can walk in and start learning about the tools available.

Fab Lab RUC try to be as inclusive as possible of all demographics. One program they ran worked with people in wheel chairs and invited them in to use the space. They used the opportunity to work with these people to modify their wheel chairs and add drink holders and buttons and customise their wheel chairs. They then took the feedback for this group to better understand how the space can be made more accessible too and inclusive of those in wheel chairs.

Regarding accessibility, Fab Lab RUC recognises the need to be open beyond business hours to allow for those working during these hours to have access to the space. With this in mind they have implemented extended opening hours on Tuesdays which Bo noted has been a successful practice.

Fab Lab RUC try to encourage knowledge sharing as much as possible. The Fab Lab charter states, “Designs and processes developed in fab labs can be protected and sold however an inventor chooses, but should remain available for individuals to use and learn from”². Bo noted that sometimes people using the Fab Lab may be from a small business developing an idea or prototype and that it is perfectly acceptable for them to keep any proprietary invention to themselves, though they are encouraged to share anything that is non-critical to their invention. Users are also expected to help one another to learn tools, processes and maintenance. This knowledge sharing among users of the space takes some pressure off the staffing as well as cultivates a culture of collaboration and sharing.

One strategy employed to encourage diversity and increased participation is the hosting of open days. On these days people are invited in to visit the space and see some of the projects made by the Fab Lab. This makes the space more inviting for those who may not have a project in mind but are curious about the tools and technology on offer or just curious about the projects that the Fab Lab create.

Denmark has a strong policy on publicly funded educational institutions that allows the Fab Lab, via the University, to stay financially sustainable. This is one of the very few cases in which a CT&M community is funded in whole by the government.

Delivery modalities used by Fab Lab RUC are hackathons based around a theme, workshops, group projects and personal project work. One of the successful qualities of the Fab Lab RUC delivery was the ability for anyone to have access to a skilled staff member to help them get familiar with tools and materials as well as to discuss and plan out projects. If a new user comes in with a project they would like to make, a staff member will discuss it with them, break down the tools and materials needed to achieve the outcome, and then show them how to work with these tools and materials. Once the user is familiar with the tools they are able to use them on their own and complete their project. Users of the space are also expected to help with maintenance of the tools where possible. This helps encourage a sense of shared responsibility for the shared tools and space.

² The Fab Charter, Who owns fab lab inventions?

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In regard to marketing and communications, Fab Lab RUC maintain a web site, make use of social media and rely on word of mouth. Their website features a program of all upcoming events so users can find events of interest to their practice. The website also serves as a knowledge sharing platform where they document projects made by the Fab Lab users. They often feature tutorials on how to recreate the projects, with video and pictures to accompany them. This also serves as a means of increasing accessibility as it allows those who may not be able to make it to the space to create projects at home.



CNC fabricated seats, Fab Lab RUC

Location: Wear It Festival - Berlin, Germany

Contact

Thomas Gnahn – Founder

The Fellow gained insight into how creative technologists are building new events around emerging tech fields like wearable applications while visiting the Wear It festival in Berlin. Wear It festival has been running for two years and was developed with a focus on ‘wearable electronics and fashion technology’.

Thomas Gnahn founded Wear It in 2014 as a response to the increasing interest he was getting in another project he had started called Trafo Pop. Trafo Pop is a community group that create cycling jackets that use microcontrollers to drive LED lighting. The group then holds night rides through the city to display their creations. As Trafo Pop became more successful Thomas noticed that people were becoming increasingly interested in other wearable technologies and decided to start Wear It.

Wear It takes a multifaceted approach when looking at its target demographic by including speakers and presenters that are not only creative technologist practitioners but also industry partners and research and development practitioners. In their own words Wear It brings together, “...designers, artists, inventors, entrepreneurs, business, science and media to experience the most exciting innovations in wearable electronics and fashion technology”³. The event was delivered through workshops, an exhibition, talks and networking events with performances. Thomas’s goal for Wear It was to keep it ‘playful and to encourage interaction and networking’.

The workshops hosted at Wear It allowed people to get hands on experience with making their own wearables and electronic textile objects. The workshops were geared toward introducing people to the possibilities of wearable technologies and giving them hands on experience. Wear It worked together with external creative tech practitioners to facilitate the workshops. These collaborations were vital to the success of Wear It given the limited team size and budget constraints of Wear It to facilitate the workshops on their own.

The Fellow experienced a variety of talks from international speakers covering a broad variety of topics related to wearables, including the internet of things, artistic and fashion applications, research and development of electronics and textile integration and industry partners talking about the tools they have created to enable the creation of wearable technologies. It was impressed upon the Fellow throughout the talks that for wearable technologies to be able to be taken from a lab or studio to a fully realised concept and mass production, that an understanding of all aspects of the industry and manufacturing need to be taken into account. The inclusion of relevant industries and researchers into the presentations provided valuable insight into the commercialization of products and the challenges involved.

Regarding demographics, Wear It has a very high female participation rate compared to most other creative technologist festivals. At an approximation there was a 60/40 split of females to males. This is remarkable in comparison to many other creative tech events. The Fellow discussed this with some of the female participants as well as the organisers and the general consensus was that the cross over with fashion and the textile industry was a major contributing factor.

The gallery exhibited wearable technology creations with a variety of uses. Some were purely artistic outcomes while others focused on medical and sporting applications. The creators were often standing by their works ready to answer questions. This made the works more accessible, as participants could

³ Wear It Berlin, Press, Event Description

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gain insight into the technology and concepts behind the works as well as the motivations of the practitioners.

Thomas is hoping to build a sustainable festival from Wear It and attract more funding for future events. The current business model is based around funding from industry partners and ticket sales. The event was staffed by volunteers because it doesn't yet have the financial sustainability to accommodate paid staff.

Wear It attracted Garmin as an industry partner to the event because of the mutually beneficial access it provided. Wear It received some funding and Garmin gained access to an audience of people interested in wearable technologies as well as software developers who might be interested in developing for their platform.

Wear It marketing was primarily conducted via targeted, paid Facebook ads, the website and word of mouth. Google Ad words were used but weren't found to be very useful as they are less targeted than Facebook advertising.

Aside from the festival, Wear It also run a variety of other events such as bi-monthly meetups where participants meet to discuss new technology and their own creations, workshops, hackathons that sometimes involve industry collaborations and collaborations with other CT&M events such as Maker Faire.

The hackathons in collaboration with industry have allowed CT&M practitioners to understand a new platform and allows the industry to develop a conversation to understand the needs of developers. The creative outcomes of the hackathons provide insight to the industry partners on possible ways in which developers want to use their platform. This highlights the mutually beneficial arrangement for industry as well as CT&M practitioners.

Location four: Spektrum - Berlin, Germany

Contact

Lieke Anne – Co-Founder

Notes

The Fellow's research into Berlin's thriving creative tech and maker communities led him to visiting Spektrum on multiple occasions and interviewing Lieke Anne, one of the co-founders of Spektrum.

Spektrum is a relatively new space, having only started in June 2015. Despite having only opened in June it is one of the most active community spaces that the fellow visited. Spektrum is in their own words "a space of convergence for cultural communities and transdisciplinary groups emerging and operating in and off Berlin".⁴ Spektrum hosts meetups and events that have a focus on open knowledge, science, technology and "futuristic utopias based on the principle 'do-it-together-with-others'".⁵

From the outset Spektrum made a concerted effort to engage with local CT&M community groups to get input and ideas about what they want from a meetup and event space. This early engagement process enabled the groups to collaborate on the design of the space and helped to define the direction in which the space grows into the future. Lieke feels that this has been one of the underlying successes of Spektrum and its ability to attract communities to the space. Since they opened they have formed lasting partnerships with a wide variety of community groups that run regular events in the space.

From the outside Spektrum looks like a small shop front, with a little bar, featuring small art installations. Once inside there are tables, couches and a big event and exhibition room.

In regards to financial sustainability of the space, Spektrum has a simple business model in place that allows them to stay viable. Their shopfront is open during the week and the money they make from the bar covers rent of the space. The space is free for community groups to run meetups in but larger events and exhibitions take a cover charge. This charge allows them to pay artists and event organisers for their material costs and time. They are currently seeking extra funding to help expand their space and provide extra services and tools.

Their focus on community first has seen them grow into a hive of activity since June. They are now hosting five to six events per week with a mix of different community partners. Events all have a strong focus on inclusive participation and collaboration.

Spektrum communicate with their community via a variety of digital marketing methods. They maintain a web presence through their website and social media platforms, Facebook and Twitter. They have a newsletter which is sent out weekly with the upcoming program for the week. All events are also registered on Meetup.com. Lieke believes that the newsletter along with event listings on Meetup.com are their most effective forms of communication.

Regarding demographics, most of Spektrums attendees are in the 20 to 40 year old age range, though some events and exhibitions see children attending. They try encourage events to have a balance in male and female participation though Lieke noted that the more tech heavy events attract a much larger male audience, a phenomena apparent in many CT&M communities. Spektrum try to encourage not only practitioners but also those interested in learning more about the CT&M groups to attend events to gain insight into the practices.

⁴ Spektrum Berlin, About

⁵ Ibid, About

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Moving forward, Spektrum are looking to grow their offering by developing strategies to encourage more participation by children, offer more workshops to increase learning opportunities and to develop more collaborations with community groups. They are also trying to develop more connections and collaborations between the communities that use the space to facilitate knowledge exchange and skill sharing.

The Fellow attended two Spektrum events: a robotics exhibition 'Human (heart) Robot' and an audio visual jam 'LC Lab'.

'Human (heart) Robot' exhibited four robotics projects from local CT&M practitioners. During the Fellow's visit there was a family in attendance with young children. The children were interacting with humanoid Nao robots that can take voice commands and follow your actions through visual recognition. These robots were trained to play soccer by a local university that were there to demonstrate them. These robots are very expensive research robots that are not easily accessible at a commercial level. This exhibition provided a unique opportunity for these children to have access to technology that is ordinarily out of their reach and may help to trigger an interest in mechatronics or robotics.

'LC Lab' was an audio visual jam that invited anyone who was interested to bring their visual and sonic instruments along to jam. The Fellow brought along some of his own visual performance tools he created to participate in the jam and get a feel for the Spektrum community. There were seven visual artists and five sonic artists along with approximately six audience members with an approximate 70/30 split of male to female.

Most of those performing had built their own instruments and were very happy to share their ideas and show how they had built their tools. The tools were built from a variety of software and hardware, requiring a variety of programming and electronic engineering knowledge.

There was a single screen with multiple projectors pointing at it and an audio mixer to which the sonic artist were plugged in. The sonic artist then started to build a base of sound to which the visual artists responded. As with jams, this ebbed and flowed, some moment of cacophony and others of harmony were experienced throughout the jam.

After the jam had finished the Fellow had a chance to talk to participants. The feedback the Fellow got was that the experience was very enjoyable and people were curious about the other tools people had created. Among the audience were some contemporary art curators who were looking for innovative artists working with technology. This is a novel delivery modality for CT&M events that the Fellow was inspired by and will be experimenting with in Melbourne in 2016.

Location five: Fab Lab - Berlin, Germany

Contact/s

Erich Stussi - Lab Manager

Lisa Lang – ElectroCouture

Fab Lab Berlin (FLB) is a well-equipped modern digital fabrication studio along with a co-working space. The Fellow was shown around the Fab Lab by Lisa Lang, whom the Fellow met during the Wear It festival. Lisa Lang runs her business 'ElektroCouture' from the co-working space in the Fab Lab. As a user of the co-working space Lisa has access to all the tools and spaces of the Fab Lab as well as an environment in which she can share knowledge and skills with other CT&M practitioners. The co-working space is thriving and is at capacity with CT&M skill based businesses.

Fab Lab Berlin is a for-profit, private business that generates revenue from memberships, renting out co-working spaces, entry to workshops and from industry partners. Memberships range in cost, depending on the tools that the member wants access to. To gain access to the more expensive tools such as CNC machining and laser cutting the membership prices are increased to account for the increased maintenance and tool costs. Erich noted that workshops formed one of the primary sources of income for the space.

Ottobock, a prosthetics manufacturer, are the primary business partner for the Fab Lab. Ottobock funded the creation of the new space and own the building which is rented out to the Fab Lab. The Fab Lab was previously located in a much smaller space when they were approached by Ottobock to form a partnership. Erich feels that the new location and larger space has been a significant influence on the success of the space and its ability to reach more people as it is placed in an easy to access central area of Berlin.

The Fab Lab employs a business strategy of partnering with businesses as well as education and research institutions. In exchange for financial or hardware partnerships they offer their partners access to the tools and facilities for company events. This strategy has been successful, with the lab attracting partnerships with Makerbot, Laydrop and Big Red for 3D printers.

In regards to inclusivity, the lab runs open days every Friday to allow people to visit the space and learn more about the tools, facilities and the community using the lab. The open lab nights also free up staff time by allowing them to show potential new members around the space once a week rather than having to do individual tours throughout the week.

Their communications and marketing are done via a simple website, social media platforms, Facebook, Twitter and Instagram as well as placing events on Meetups. Erich told the Fellow that he believed that meetups.com and the open lab nights are the most successful communication avenue aside from word of mouth for their marketing.

The demographic make-up of the people using the space are usually late 20 to 30 year olds and a mix of male and female with a skew towards males. The space is often used by freelancers who are prototyping ideas for a project, artists and occasionally university students. Occasionally small business will approach to ask about having an idea prototyped for a fee.

The community making use of the lab host events that seek to actively increase participating demographics and to make the space inclusive. For example they run 'Junior lab' which is focussed on bringing more children into the space with child friendly projects as well as 'Geekets' women only workshops which are run by Lisa Lang.

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Large format 3D printer, Fab Lab Berlin

Location six - interview: Codame – San Francisco, U.S.A

Interview contact

Jordan Gray, Founder

While in San Francisco the Fellow saw Codame showing some of their work at the California Academy of Sciences 'Nightlife' event. The Fellow followed up this introduction to the work of Codame by interviewing one of the founders, Jordan Gray.

Codame are a San Francisco based group that run non-profit events that focus on the intersection of art and technology. Their aim to inspire people through experience. Their target audience covers a broad range of interests such as artists, coders, designers, game developers, makers, performers and musicians.

Codame was founded in 2000 by a group of creative technologists, artists and makers who met at a tech conference. They all shared a similar interest to develop an event to showcase creative projects that focused in technology and art. Over the past six years it has grown from an annual festival to include multiple events throughout the year. Codame has grown to have a community large enough to sustain monthly meetups, workshops and gallery exhibitions.

Codame is run by a core group of ten people, along with the contributions of volunteers and artists to help facilitate events. Codame have faced some challenges in their development over the years. After the first three years, Jordan was questioning the sustainability of Codame due to the lack of financial sustainability and the amount of work involved. They have also faced challenges with working with volunteers in festival settings. To try and fix this they incentivised volunteers with 10 per cent of anything the festival earned. Codame have also been successful in engaging big brand sponsors from relevant industries. These include Google, Adobe and Mozilla. These connections were formed from personal connections some of the Codame group had to industry in the area as well as people from industry attending Codame events.

Codame communicate and share knowledge with their community via maintaining a website, using a variety of social media platforms. The website features a collection of documented projects, a list of artists and information about upcoming events. They are active across social media platforms such as Facebook, Twitter, Instagram, vine and LinkedIn. They use Vimeo as a platform for sharing video of documented projects and maintain a GitHub account for sharing programming projects with their community. Codame use Eventbrite for event ticketing and organisation. Jordan noted that when they do paid events, attendance is usually 80 per cent of those signed up while free events only attract 50 per cent attendance of those signed up.

The gender equality at Codame events have a good representation of both sexes. This is a natural evolution of their community with little deliberate intervention. Jordan did note however that when they hosted a fashion event this did seem to engage more woman than men, which may have helped to attract more women to future events. The age range at Codame events is quite broad and Jordan noted that this is likely due to San Francisco having one of the world's strongest technology cultures.

Codame have a unique strategy called 'Adopt art + tech' designed to facilitate collaboration and engagement between CT&M practitioners and other organisations. The program offers organisations the chance to work with the Codame artists by providing office space for installations, opportunities to work collaboratively on projects, have artists give talks or have the artists facilitate workshops for the organizations team to upskill. The program has had ten successful placements over its two years it has been running and has received good feedback from the placements. From a practitioner's point of

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view it has been successful in offering opportunities that may not be readily available if not promoted by a community like Codame.



Interactive installation by 'All of it now', California Academy of Sciences 'Night life', San Francisco

Location seven - interview: Gray Area Foundation for the Arts - San Francisco, U.S.A

Contact

Barry Threw – Strategic partnerships / Community member

The Fellow was made aware of the work of the Gray Area Foundation by a number of CT&M practitioners that spoke highly of their contribution to the CT&M community. The Fellow was put in touch with Barry Threw who looks after the Gray Area Strategic Partnerships. The Fellow conducted a formal interview with Barry to gain insight into Gray Area's experience of fostering CT&M communities.

Gray Area Foundation for the Arts are a non-profit organisation focussed on the use of art and technology to create positive social impact through education, civic engagement and public programs. They are inclusive of a variety of practices and mediums such as generative art, interactive media, data visualisation, projection mapping, augmented reality, spatial sound, art games and soft circuitry. This broad inclusion has seen them grow a thriving and sustainable organisation over the last ten years.

Barry relayed some of the challenges that Gray Area had when they first started up. Their original business model was to operate as an arts gallery curating works that combine art and technology and generate revenue through sale of works and events. This proved to be an unsustainable model for Gray Area as the demand for the works wasn't high enough and it took more work than was able to be accommodated with the revenue.

Since being founded in 2006, Gray Area's business model has grown to incorporate an incubator, a theatre, educational events and short courses, hackathons, exhibitions, residencies and a festival. Their business model financially sustains itself through ticketing of events, renting out of co-working spaces, membership drives and The National Endowment for the Arts grants. The National Endowment for the Arts in the U.S.A counterpart to the Australia Council.

They actively engage established as well as emerging artists in the art, tech world to participate in their residency programs. They also offer a seven-week immersive program that allows people who are interested in learning more about the intersection of art and technology, the opportunity to get an overview of different creative tech skills and the different approaches that they might take in pursuing their own practice.

The gender-divide at Gray Area events, from Barry's observations, is approximately at 70/30 split between male and female. The age range is more varied, attracting a broad interest from multiple generations. Gray Area try to curate events to be inclusive and inviting to all and work with other organisations that attract different demographics to try and broaden their own participatory demographic.

Gray Area engage and communicate with their community via a variety of digital means. They maintain a website that has a comprehensive listing of events, facilities, services and employment opportunities offered by the organisation. Social media such as Facebook groups and Twitter allow them to update their community on the latest news. They use Meetups to organise specific events and manage RSVPs. They make use of email lists to directly contact members. They maintain multiple email lists that focus on separate areas of interest so that members are only getting the information that they need. They also have a newsletter which gives an overview of all the Gray Area activities and developments.

Barry feels that the Gray Area contributes more than just a learning experience to its members. From his experience he felt that it developed a strong sense of community, allowed people to share their

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ideas with like-minded people, helped to develop collaborations between the members and allowed people to present their work to a broader audience than they would have on their own.

In regards to promotion of knowledge sharing, Gray Area have a focus and encourage members to open source and share projects where they see fit. This means projects are not just generating an art outcome but also generating a knowledge resource which can be used to develop skill and relate ideas. Gray Area also document and record some events and which makes the knowledge accessible to those unable to attend events or people who wish to access the information at a later date.

Gray Area collaborate and partner with a plethora of tech companies, community groups and arts organisations which gives them a broad reach in the community and a well-respected name. Barry made not of his experience in trying to engage contemporary arts groups and their hesitation to collaborate. Barry felt as though this may be due to a lingering cultural aversion by some arts communities toward the inclusion of technology in works. The Fellow has experienced this same culture in Australia and believes it may be founded on an assumption that tech art work may be seen as using tech as a novelty rather than a useful tool for artistic response and communication.

7. KNOWLEDGE TRANSFER: APPLYING THE OUTCOMES

Residency Experience

The fellowship comprises two phases: a learning phase in an international setting followed by a knowledge sharing phase in Melbourne including a six month residency at Library at the Dock. The residency is supported by the Copyright Agency Limited (CAL) Cultural Fund in partnership with the City of Melbourne, Melbourne Library Service. The Fellow completed his residency in December 2015 and enabled him to put into practice some of the recommendations of the Fellowship. Part of the residency program consisted of developing CT&M workshops, documenting then openly sharing the documented knowledge. They were designed to be accessible to beginners and across a broad age range. The Fellow also made sure to try and broaden the participating demographic by selecting mediums that usually attract larger female demographic.

These activities included the following

- Developing and delivering a series of workshops on Sculptural papercraft
 - » This workshop was aimed at creating an accessible, all ages workshop in a medium that, from the fellows experience in paper craft has a high percentage of female practitioners. For this workshop the fellow bought 2 computer controlled paper cutting machines for the library service as well as the relevant software licenses.
 - » The workshop focussed on a process of taking 3D digital models from the computer, using specialized software that creates paper craft templates and then printing those templates or sending them to a paper cutting machine. Once the templates were created, the participants use paper and dowel to assemble their own geometric sculpture. In practice the workshops attracted predominantly an audience of children, families as well as a few 20 - 30 year old, predominantly male participants. The workshops were successful in showing a process and keeping participants interest over multiple sessions. During the sessions there were a lot of wander in participants. Once the space was being used, coloured paper out, paper cutter cutting up designs and people crafting, it attracted a lot of attention and interest.
- Developing and delivering a series of Introduction to Unity 3D workshops
 - » Unity 3D is a games engine that is used not only for gaming but for developing all kinds of interactive 3D experiences. This series of workshop was aimed at delivering a quick introduction to Unity and delivering a creative outcome. During these workshops participants were guided through a quick overview of the software and shown how to sculpt a simple island scene and create a character that can explore the scene. The idea being that the user leaves with enough knowledge to create a simple experience and enough knowledge to be able to further their skills at home or by attending the Unity short course.
 - » The audience for this course extended from approximately 10 - 60 year olds, predominantly male. The fellow had actively invited some interested women but the timing of the workshops after work didn't suit.
 - » These workshops did attract one particularly keen participant who came to every workshop, a young boy who often would hang out after and ask questions and show me things he had made in his own time. The fellow was very happy to see someone take on-board a new tool and push forward with their learning and creative outcomes in a self motivated way.
- Developing and delivering a workshop on 3D scanning and sculpting
 - » The 3D scanning and sculpting workshop showed participants how to use simple, free tools, to scan real world objects into a digital 3D format and then showed them how to sculpt those 3D scans. This workshop was delivered as part of the Mini Make Day at the Library at the Dock as part of Melbourne Knowledge Week 2015. The workshop had a broad range of participants, from young children with parents to an elderly couple. The fellow was cognizant of conveying running the workshop in a way that assumed no pre requisite knowledge about the technology

7. KNOWLEDGE TRANSFER: APPLYING THE OUTCOMES

or digital tools. This approach led to everyone having time to ask questions, help one another if one of them got ahead and to all finish the creative outcome of the workshop. This was one of the most successful workshops the fellow has run. From talking to the participants and asking for feedback, at the end of the workshop most of the participants expressed a genuine excitement at the fact that they had been able to understand and make use of cutting edge digital tools to create something that before the workshop they had little understanding of.

- Making use of the maker space to develop an lighting sculpture as a method to encourage passers by to ask questions and take an interest in the space.
 - » During the residency the fellow wanted to try and attract more attention to the maker space to increase it's exposure to library patrons. The fellow did this by using the space to construct a lighting sculpture using a variety of tools available in the space and engaging with library patrons as they came past. The lighting sculpture made use of 3D printers, CAD programs, LED strip lights, Arduino micro controllers and programming. The fellows experience of this was that patrons were generally surprised that there was a maker space at the library and that they could use. Most conversations with patrons centred what was available in the maker space and how they could learn how to use the tools available. During these maker days, the same young boy who was involved in the Unity workshops was often in the maker space working on 3D printing projects for a costume. The fellow helped the young boy to redesign his project to make better use of materials and take less time to create. The young boy also showed the fellow some of the tricks that he head learned from 3D printing which were new to the fellow. These moments of incidental knowledge exchange and collaborative design are a small demonstration of how these spaces can be used effectively.
- Developing and delivering a Unity and Virtual Reality short course
 - » This course was a deeper look at using Unity 3D over 3 weeks, to create a simple game and getting it running in virtual reality. The short course thought participants how to create a simple physics system, the basics of 3D manipulation, level design, interface design and how to publish their games. The fellow took an experimental approach to the teaching of this course and allowed the students to help choose the direction of the class and the ideas they explored, while still delivering the core technical content. By the end of the course they each had created their own version of a simple game called 'Flappy Bird' and had the opportunity to experience it in virtual reality. Three of the participants were teachers from RMIT who had come to learn Unity as they are hoping to transition away from teaching an old technology called Flash, in their own courses. This demonstrates the ability for these short courses to effect change not only in the individual but also in the broader community by giving people the ability to up skill in skills relevant to their profession. In regards to gender ratio the group was 50/50 male and female.
 - » The fellow will continue to deliver this course at the library as there has been a lot of demand for it since this first iteration.

In summary the fellow felt that the residency was an important part of the fellowship as it provided a chance to implement the research findings in a practical manner and asses the real world value of the outcomes. It was a valuable experience that will lead to a continued collaboration between the fellow and the library service to deliver creative tech and maker workshops and short courses.

8. RECOMMENDATIONS

The Fellow has identified numerous areas of his Fellowship that form recommendations for government, industry and other organisations. Through his work, he identified the following key learnings that have informed these recommendations.

- Enthusiasm for CT&M is clear and communities are growing all around the world and have a strong presence in the places visited. It is clear that there is a strong desire by people around the world to learn about and create with new technologies and be involved in creating innovative ideas and uses for them.
- Demographics are starting to broaden but are still largely 20 to 40 year old males in a lot of communities visited. More needs to be done to make sure that there is an inclusive and accessible approach to community development that will encourage participation with a wider demographic.
- There are very few publicly accessible maker spaces and creative technologist facilities. Communities have a hard time finding appropriate spaces in easily accessible areas.
- Invite the public in to see the work produced and the facilities offered.
- Be aware of the other relevant communities, industry and facilities locally to your location.
- Reach out to related industry and education partners and local practitioners and encourage -
 - » Practitioner placement
 - » Industry partnerships
 - » Local educators and practitioners linkages
 - » Invites for talks and sponsorship of events.

The Fellow has identified the following range of recommendations for consideration.

Government – Federal and State

- Engage with CT&M communities to gain insight into their needs, especially concerning availability and cost or suitable spaces, accessibility of available spaces and mutual benefits for government and CT&M communities.
- Identify the role of CT&M communities as economically important to the fostering of start up culture.
- Support events that have a focus on CT&M communities and skills to help engage the broader public in creatively motivated learning opportunities.
- Work with CT&M communities to help broaden the engaged demographics by incentivising or facilitating collaborations between CT&M communities and groups representing the underrepresented demographics.
- Support CT&M communities in their endeavour to deliver an informal introduction STEM skills in a creatively motivated environment.
- Support events that focus on bridging the gap between CT&M practitioners skills and the delivery of a fully realized products.

Creative Technologist and Maker community facilitators and events

- When starting a community, identify and consult with all stakeholders from the very start. Stakeholders that should be considered include community members as well as related industry, local businesses interested in partnering, local government, education institutions and other CT&M communities. Listening to all stakeholders will allow you to form partnerships, keep communications open and for partnerships to enable future growth.

8. RECOMMENDATIONS

- Engage with other CT&M communities in your area. It is likely that you have overlap in your areas of interest and member base. Collaboration with other communities can help to provide you with a broader public engagement, open channels for skill and knowledge sharing across the communities and allow for pooling of resources to run larger events.
- Establish a cohesive identity in partnership with other CT&M communities. Government and other organisations will have an easier time working with your communities if they can be placed neatly into a category that identifies the many and varied interests of CT&M communities. The Fellow proposes the adoption of a 'Creative Tech and Maker' labelling as it includes all the interest areas identified in this report.
- Identify demographics that you are failing to engage with your community and develop strategies to encourage broader participation. As found during this research most technology events currently have a significant gender divide that, if addressed, has the potential to increase participation and bring fresh ideas and skills to your community. Strategies should take into account accessibility via public transport, time of day, costs and overlap with other interests groups. A good starting point would be to engage with groups that focus wholly on the underrepresented demographics such as 'Girls in Tech' and 'Girl Geek Academy'.
- Develop and budget for good knowledge sharing and documentation practices. Documenting projects and events will allow you to turn primarily creative outcomes into a valuable learning resources and marketing material. This also provides you with material that communicates your communities' outcomes when applying for funding, spaces or collaborations.
- Engage with local government. They like to know and understand what communities exist within their constituency and engage with them. Let them know, who you are, what your aims are and what you needs are and how they might be of help.
- Form partnerships with local businesses that are mutually beneficial. For example you might partner with a microcontroller company and get cheap hardware for promoting their goods at events or you might partner with a software company that can provide cheap licences in exchange for access to the developers in your community. CT&M communities should not be underestimated in their social capital in your community.
- Form an interest group of CT&M stakeholders to represent the group's challenges in fostering their communities and events to the government.
- Develop a marketing strategy that makes use of popular online social networks and tools. The Fellow found that Meetups.com or Facebook is often the first point of contact a CT&M practitioner will have with an event or community other than word of mouth.
- Build and maintain a web presence with up to date information about events, documented projects and community developments.
- Build and maintain an email newsletter list so you can engage with users who may not use social media often or visit your website.
- If your event format allows for it, encourage public audience of events to try and build an interest outside of the current membership group.
- Facilitate events that share experience and skills that will allow CT&M practitioners to take their ideas to realized products.

Creative technologist and maker practitioners

- Document and share projects online using platforms like GitHub, Instructables and Thingiverse. Sharing your projects will help others learn from your successes and mistakes and allows for feedback which may help you improve your practice.

Melbourne Library service

- Develop a responsive social media presence across commonly accessed mediums such as Facebook, Instagram and Twitter.
- Provide workshops and training programs for library staff to help them better understand potential benefits of CT&M practices for their own uses as well as the library service customers.
- Employ dedicated staff that can focus on championing the creative tech and maker spaces within the library service.
- Develop and document beginner workshop/tutorial resources that libraries can share amongst one another to help make best use of their maker spaces. Make use of online platforms like Instructables to share knowledge resources.
- Form partnerships with other libraries to share CT&M knowledge resources.
- Investigate the potential to expand the libraries lending capacity to technology such as laptops, wifi hotspots, cameras and other technologies that the public may not easily have access too at home.

Melbourne Knowledge portfolio

- Continued collaboration with Melbourne libraries as they are focused on managing the provision of social and material resources needed to help support CT&M communities.
- Investigate the potential for a publicly accessible CT&M space in Melbourne.
- Continued engagement with CT&M communities around Melbourne.

International Specialised Skills Institute

- Continue to support the City of Melbourne Knowledge portfolio.
- Continued support of fellowships relating to creative technologies and maker communities. In light of the Federal governments focus on innovation and digital knowledge economies the ISS Institute can play a vital role in supporting these growth areas.
- Continued vision for supporting fellowships that help to promote and build community engagement as a means of skill sharing.

