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ADOPTING 'FABLAB' MODEL TO EMBED CREATIVE ENTREPRENEURSHIP ACROSS DESIGN PROGRAM

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ABSTRACT
This paper sets out to describe and contextualize the impact a new FabLab workshop program has had on the direction and curriculum development at Gray's School of Art, Robert Gordon University towards more clearly linking current developments in rapid prototyping, rapid manufacturing, and e-manufacturing services in engaging creative technologies and embedding entrepreneurial skill sets within our undergraduate program. These ambitions are set against specific rural issues of location, within a Northern European context, and associated 'creative rural economy' agenda[s]. This paper will report on specific issues and insights, and their impact, by examining the role design education can play in developing clearer and more sustainable patterns of entrepreneurship within an undergraduate design program, set against these external factors. Whereby, an emerging FabLab model, is developing within this design school, this technology has been positioned as a catalyst to integrate the Rural + Enterprise + Mixed Interdisciplinary Design approaches.

Keywords: Entrepreneurship, FabLab, interdisciplinary, art & design education and rural

1 INTRODUCTION

This paper sets out to describe the ambitions of an evolving design program, in more fully responding to and integrating developments in rapid prototyping, direct and custom-manufacturing technologies, by examining the role design education might play in developing clearer and more sustainable patterns of entrepreneurship within its undergraduate design program. The paper reflects on recent developments in 3D rapid prototyping, open source software and industrial rapid manufacturing technologies, broadly defined as a FabLab model (Gershenfeld) to examine what new creative conditions (and/or skill sets) these technologies offer [1]. This is examined against a specific rural context, which offers an added dimension, namely engaging issues of regional catchment and potential technological, educational, and cultural isolation in reflecting on and considering this evolving rural lifestyle agenda. The pedagogic opportunities resulting from these evolving technologies and linked service-based initiatives, offer the authors suggest the potential for new entrepreneurial models, which will inevitably impact on the development and or ambitions of undergraduate design programs in quite possibly unforeseen ways.

2 DIGITAL AS NON-PLACE

The notion of a *Digital Commons*, where the digital is common to all, commonly owned, or commonly accessed or available, has become synonymous with digital media, driven in the main by free and open source software development and distribution. Today we have come to expect to freely customise music, photographic and moving images, all from the comfort of our laptop, tablet or digital device. This ability and expectation now, to customize, and to re-mediate our experiences and visual surroundings, might easily also include the ability to virtually and physically manipulate and subsequently reproduce or design new objects, or we might choose to customise or redesign existing objects / products. The conception of *Designed Objects* or *Products* having more in common with this inherent 'copy n paste' reproducibility, of digital codes, scripts and files, might increasingly be seen as the cultural norm in the near future. The FabLab model as a platform for digital object commons has come a long way, driven in the main by

significant cost reductions and increased accessibility of the technology and expertise via networks and web. This has lead to resurgence in more open participation in the production and the distribution of design ideas, and a wider cultural discourse around attributing and distributing ownership in the traditional sense we might have defined Product Design and Product Development previously.
Clearly definitions of both the *Design Process* and *Intellectual Property* are being challenged by open-source networks and web 2.0 (Lees-Maffei) (Von Hipple) (McCullogh) [2][3][4], with the user-up redefinition of modes of production, consumption and interaction being rewritten by designers and users who are willing to embrace more 'open source,' methodologies, critically based on and driven by this notion [Open-Ideo http://www.openideo.com/, Global Service Jam http://www.globalservicejam.org/, SoLoCo http://www.soloco.co.uk/], that the currency of ideas might now rest within a mixed and distributed network of loosely *affiliated* and *interested* groups and/or users. Based on the concept of managed hierarchies of interactions, that draws on an idea of democratizing value and creative currency as opposed to in the main financial currency [3]. Where embedding social enterprise (Mair & Schoen) [5] or truly distributing cost structures have resulted in a number of viable models having developed and gaining maturity:

1. 'Hacking' clubs that encourage people to dismantle, understand and 'mod' existing products with new and additive functions.
2. 'FabLab' concept developed by Neil Gershenfeld Director at The Centre for Bits and Atoms at MIT. It provides a hub to learn and share ideas, techniques and skills openly. It has grown to be a global network of over thirty workshops from as far afield as Afghanistan, Amsterdam, South Africa, Iceland, USA and Manchester.
3. 'Crowd funding' provides a way to generate funding for ideas from a wide range of people who share a common interest; it works well with the concepts of open source and rapid prototyping.

The key role these distributed and evolving network models & services are playing in extending design opportunities, which are independent of place or locale, are clearly significant. Whilst it might be fortuitous to consider as outmoded those industrial production templates that have equated manufacturing and materials with fixed geographic entities, clearly the sands are shifting.

3 THE RURAL - IMPLICATIONS ON HIGHER EDUCATION

An observed conflict between 'smallness' based on geographic location and 'openness' to innovation (as a function of creative commons), within the sector at large and in particular within the Northern Scotland, is an issue funding councils have recognised. In their paper on emerging policymaking and research into rural creative industries, (Bell and Jayne) [6] refer to the identification of 'new consumption patterns in the countryside that are seen to create new markets for both 'traditional' and 'contemporary' cultural products.'[1] Their research has also sought to understand the motivations and aspirations of rural creative workers and references the so-called 'lifestyle migration' as cited by other researchers. In the past regionalism was viewed as a negative, but increasingly now it is lending support to the benefits of attracting, responding, training, and equipping 'creatives' specifically within the rural. The Craft Council Report 'Craft in an Age of Change, 2012 [7] identified Scotland as having both a significantly 'distributed' creative economy, but interestingly a statistically higher digital literate and dependent creative sector than England for example. Previously, Gray's School of Art commissioned a study to understand the regional market (EKOS Report 2009). In response to the findings Gray's has developed and delivered a program called *Cultivating Creativity*, *Creative Cultures* [http://www.creativeculturescotland.co.uk] which actively facilitated network building, digital competencies, and linked communities of designers, makers and audience, in order to create an open and transparent environment in which to talk about and support creative enterprises in the NE of Scotland. The report emphasized that "specialist art schools have a particularly important role to play in the 'place' development agenda. They are powerful attractors of talented people - students and staff – with growing international reach, and are a major contributor to the cultural life of our cities and regions", and further asserts that "while the creative industries are a powerful economic force in their own right, it is worth

[1] *The Creative Countryside: Policy and practice in the UK rural cultural economy*. Bell and Jayne, 2010.

noting the wider influence of creativity on economic success. Whilst recognition of the need for a regional network of *Digital Economy* hubs, Regional Councils UK (RCUK) funding has supported for example the Dot.Rural hub at nearby Aberdeen University, which has brought together researchers from a range of disciplines to explore the digital challenges and opportunities for rural communities through the themes of Accessibility & Mobilities, Healthcare, Enterprise & Culture, and Natural Resource Conservation.
One might also consider, as a counterpoint to the drive towards truly open and fast digital info-structure, the increasingly important aspects of quality of life and wellbeing: specifically, Slow food and Slow Design ambitions in balancing individual, socio-cultural, and environmental needs, where Design for manufacturing might more closely be aligned with local or regional materials and technologies or design that supports local industries, workshops, and craftspeople. As these modes of engagement and platforms mature, it might be necessary, the authors suggest, to develop a more refined or appropriate model, which embraces *Design's* broader engagement with and association with location, both rural and urban, and with enterprise through a broader discourse around the cultural currency of the products we might seek to make, produce or discard.

4 EMBEDDING ENTREPRENEURIAL SKILLS

The key role that the creative economy plays is its increased profile and importance, which reflects the strong economic performance of this sector nationally and internationally. However, the strategic importance of higher education to the creative sector is not always so clearly apparent or well understood. Any pedagogic engagement in developing clearer links between internal academic info-structures: pedagogic, research or enterprise for example, with external economic or commercial drivers, necessitates clearly developing and embedded entrepreneurial set skills. Echoing the needs identified in RGU commissioned research, which empirically identified the need to place greater importance on growing these entrepreneurial cultures amongst our undergraduate design program. The need for embedded creative complementary skillsets has informed to a large extent the relationship between RGU Design and Aberdeen Business School, with the Centre for Entrepreneurship (CE) offering a base of academic excellence in both teaching and in research of entrepreneurship. Whilst the wider discourse and developing recognition for the need in closer links between academia and industry an area seen as increasingly critical for many Universities' drive to develop the next generation of enterprising students (FuelRCA, DigiLab Warwick, InfoLab21 Lancaster etc.). A driving ambition of this design program in working with the CE is to inspire our design students to find out about the world of entrepreneurial opportunity and to equip them with the knowledge, ability and understanding required to build the creative businesses of tomorrow. Specifically the program and modules being delivered to the Product Design program at RGU take place in stages 2 & 3 and include: Business Start Up, Consumer Behaviour and Enterprise modules, providing students with enviable business engagement models and team working skills.
We might also consider within the context of this discussion the notion of 'fitness' in recognising the ambitions of graduates and the need for on-going skills uptake within design disciplines which might more deeply embed entrepreneurship skillsets into the 'Design Process' [8] [9]. The UK Creative Graduates Creative Futures report [10], clearly pointed to gaps or a misalignment between the needs and expectations of both students and academia around what had been perceived as narrow definitions and applications of critical *business 'life' skills,* whilst interestingly entrepreneurial skills where also perceived as being less *'important for career development'*, further the research findings reported by EKOS [11]. This work further highlighted that these practitioners have an exaggerated predisposition towards very small businesses within the creative industries regionally, with many creative businesses opting to stay small, only expanding and contracting as required through short term contracted labor, or through collaborative or network-based models of production. So how can Design Education best equip and prepare our graduates for responding to and embracing a 'de-centralised' 'fluid' work environment? And how can we develop digitally fluent graduates best suited to respond to and embrace a rural context? And how can our graduates lead in setting-in-motion new design and manufacture models based on 'co-creation' and 'custom' production methods or networks.

5 CONCEPTUALIZING A RURAL FABLAB

The development of the embryonic FabLab facility within RGU is seen as being a key element to these ambitions. Informing this ongoing process, is the development of rural FabLab resources and agenda that will respond to and bring together Design practitioners, academic researchers, local businesses and manufacturing needs. In examining the opportunities for developing a particular 'FabLab' model for the rural, the authors have built on research undertaking over the last three years with SME's in collaboration with C4Di the Centre for Design and Innovation at the Robert Gordon University [http://www.c4di.org.uk/index.html.]

Stimulating conditions or convergences are key to growing greater levels of business and industrial interaction within this rural creative economy context (Gjengedal) [12] (Song, G, Zhang, N and Meng, Q) [13] and embody the unique challenges and opportunities of this project framed by this 'rural' context. Across a broader spectrum of the creative industries within the region there exist a number of interesting models that serve to inform the RGU Rural FabLab ambitions: Deveron Arts, Scottish Sculpture Workshop Metal Casting Foundry, and Shetland College Textile Facilitation Unit. By building on well established links with initiatives such as Dot-Rural, Creative Waste Exchange, Wood Recyclability and Deveron Arts, the ambition is for the FABLAB studio to have more direct involvement in broader regional issues in order to widen the scope and engagement of our graduates around key entrepreneurial and employment skills relevant to a constantly changing 21st Century Creative Industries.

The symposium held at The Lighthouse, Glasgow Nov 2011, sought to examine design's engagement with this FabLab enterprise model in a specifically urban setting. The MAKLab - launched June 2012 and with funding from Creative Scotland, has clear ambitions to establish a decentralized network of fabrication facilities that with the assistance of local creative networks will provide the platform to explore 21st century entrepreneurialism with tangible local and global community benefits. Alignment between the MAKLab initiative, housed within a public design agency, and RGU's FabLab housed within a rural Higher Education setting, have provided an opportunity to examine the discourse around notions of 'rural' as they might impact on FabLab models appropriate within a Scotland wide complimentary perspective.

Instead of trying to claim ground or restrict access, this notion of Product or Designed Object[s] as Digital Commons is a key tenant of the FabLab model proposed. But within an educational context, open-source participation tests pedagogic criteria and extends way beyond collaborative norms, where the role of the designer and the design task might be seen as a point of convergence leading to the production of more collective shared ideas supporting a much larger cultural discourse or 'landscape' of networks. Consider for example traditional taught design methods, such as haptic workshop and model making skills, and this model of a *Digital Commons-based Peer-to-Peer methodology* Troxler, P, Wolf, P [14], where our design vocabulary we might seek to draw on and teach, might seem outmoded or quaint.

6 FABLAB IN PRACTICE – AN EVOLUTIONARY APPROACH

Within Gray's School of Art, RGU, developing a FabLab facility has been very much an incremental process involving building internal staff expertise, while engaging University systems of capital bidding for plant or new equipment. But one of the key drivers has been the increased demand from students for technology- focused solutions, and maker-based projects, within a context of enterprise. With the first CNC machine having been in the building for more than 18 years, to the position now where the whole production and RP facility draws access from across all of the school's design and fine art disciplines. With some significant investment by the university in hardware, estates refit and staff development over the last 14 months the facility now offers FabLab capabilities[2] and occupies a central role in the whole workshop provision offered by the school.

With a mixture of undergraduate projects drawn from across all RGU Art & Design disciplines: Architecture, Fashion, Textiles, Product & 3D Design, together with the Fine Art subjects Printmaking,

[2] **FABLAB**: ISAL 3 Axis CNC Router 1600x800mm, FB Series 1800 Laser Cutter, Roland Model MDX-12, Stratasys Dimension Elite SST 768 FDM RP, Roland CAMM-1 GX-24, ArtCAM Pro 2011, various 3-axis CNC lathe and milling machines, investment casting & metallizing processes.

Sculpture and Painting – a key factor is having made it freely accessible with the result that we are finding students seek out appropriate and often idiosyncratic working methodologies, in response to this FabLab resources. The approach has been developmental throughout, whilst also building confidence through projects, which clearly link this resource to the entrepreneurial modules, our students take in their second and third years of study, with a "Ponoko" type, and 10x10 multiple projects (batch-manufacturing) which dovetail with the 'pop-up design shop' intuitive coordinated by the *Cultivating Creativity retail programme* in Aberdeen. With the latter serving to introduce aspects of creative enterprise at an early stage of the student development.

7 CONCLUSIONS

The interdisciplinary aspect, and connectedness of technology enabled making within a mixed design program, is a key aspect of the FABLAB future ambitions of RGU and initiatives in place. Whilst recognizing the need to keep the undergraduate courses invigorated and current so that they remain responsive to societal changes by providing an effective way for businesses to engage with academics, the RGU FabLab initiative supports knowledge transfer activities, consultancy activities, and partnerships across quite different areas not only within the cultural sector but including food and drink, and renewable energies within the region. This FabLab model will we hope offer opportunity for education and the development of new ideas and products which will contribute directly to our students understanding of design and entrepreneurial skills when linked to new modes of production and evolving digital competencies supporting 21st Century graduate attributes.

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