

Internet of Things R&D
Roadmapping Workshop
Culture, Creative and Design

July 2012

Introduction

Culture, Creativity & Design

Many 'things' are susceptible to being sensed, are able to communicate, can be networked, and produce new information, new activity and indeed new 'things' through an extensive array of technology. So we have smart/connected objects, places, people, and data. When everything is considered a 'thing', we have an explosion of ideas and theory about how they can be connected and used from technological, design and creative perspectives; we also have a multitude of applications from healthcare to museums, from schools to communities; but we also have questions, what is the economic value to be generated and how, what are the social, legal, ethical and behavioural implications?

This workshop is the result of collaboration between the Technology Strategy Board (TSB), Research Councils UK (RCUK) Digital Economy Programme, Arts and Humanities Research Council (AHRC), Engineering and Physical Sciences Research Council (EPSRC), Economic and Social Sciences Research Council (ESRC) and Creative Industries, ESP, ICT Knowledge Transfer Networks (KTNs). The participants who joined the cultural, creative and design theme were part of a larger group that covered economics and business, social,

legal and ethical and technology themes, the aim of which was to form a workshop that focused on developing a multi-disciplinary understanding of Internet of Things (IoT). The objective of the workshop was to inform the councils, TSB, the Catapults, EU, policy makers on the key research challenges from a UK perspective in this exciting, emerging area.

The cultural, creative and design sectors are already immersed in the internet of things, for example: the museums, galleries, and archives are understanding their collections as digitised objects with attributes; the media industry is creating value from allowing audiences to access their archives and services; the gamification of the virtual and real world; whilst the creative and design sectors are hacking and tinkering with the technology to develop new services, products and systems. The aim of this themed workshop was to map and better understand the internet of things in relation to the current cultural, creative and design sector landscape both from an academic and professional perspective, and to envision areas of opportunity and possible focus in the short and long term future.



IoT Landscape Today

Participants discussed their own understanding of the IoT landscape and where they are working currently. These could be clustered into 5 main themes:

Play: Play included gaming and the relationship between real world and online games, the introduction of hybrid forms, using objects, for example dolls in both physical and virtual worlds, building on the relationship between the things (people, objects and space). There was much gained experience and linking up of platforms. It encompassed all forms of cultural experience such as music, theatre, and film.

Material and digital: Currently we have built the digital on material principles, and attaching media to objects, but there are questions arising around how do the material and physical fit together, where are the feedback loops and how do we map the relationships, what are the affordances of things/objects, how do our expectations differ.

Data: Data is creating opportunities for use both commercially and culturally. We are currently looking at grassroots data collection and analysis at all levels micro and macro, looking at authored content and given content.

Manifestation: There are immense opportunities in terms of designing visualisation, ownership and presentation forms. Here there is work around visualisation as objects, for example data sculptures, data through augmented reality the connection between data and 3D printing at small scales, local but in multiples of scale.

Sensing bodies and places: Here IoT is related to voice, sound, brain, senses as objects for tracking, sensing, connecting, and is being applied to areas such as dementia, health, (voice recovery) homes, and wellbeing support in general.

Culture, Creative & Design

PLAY

WORKING LINE
NEW MODELS OF MUSIC
HYBRID FORMS IN MIXING PLATFORM IP
Things that gain experience!
"Skyland Drive"

VIRAL
IN CONSENSUAL MANNER
NARRATIVE STORY TELLING
GRANULARITY OF DATA AND THE CROWD
COLLAPSE OF LINEAR TIME
PSOP

HYPER LOCAL
Narrative + Social

TRACKING PEOPLE THINGS

MATERIAL + DIGITAL
ATTACHING MEDIA TO OBJECTS
CREER PAPER
SENSORS FOR BIODATA OBJECTS
HOW DO OUR EXPERIENCES DIFFER BY DIGITAL + PHYSICAL OBJECTS?
MATERIALIZATION OF DIGITAL CONTENT
MAP DIGITAL CAPACITY + FEEDBACK LOOPS
HOW DIGITAL + MATERIAL FIT TOGETHER
WHAT QUALITATIVE AFFORDANCES OF EACH?
WE HAVE CONSTRUCTED THE DIGITAL ON MATERIAL PRINCIPLES

SENSING BODIES + PLACES

EDIBLE QR CODES
LA REGS
KUL INNOVATION FOSTER AGILITY
SOUNDS THE VOICE
THE DEMENTA TRACKING APP
ACTIVE MEDIA TALKING SPACES
HEALTH WALK BANK VOICE RECOVERY
IMMERSIVE SOCIAL NAVIGATION
SMART HOMES

DATA OCCURRENCES FINDING
DATA

AUTHORED CONTENT + GUESS CONTENT
EMOTION MAPPING - BIOMETRICS PLACE
DATA COOP GRASSROOTS CLOUD
MAPPING THINGS
TOKENS IN POROUS SPACES
ALTERNATIVE MAP OF RADIATION DATA IN JAPAN
ETA DATA PRODUCE ATTRIBUTES
MICRO SCALERS, MICRO DATA

MANIFESTATION

VISUALS
AS OBJECTS
DATA SCULPTURES
CRAFT VISUALISATIONS
RAPID PROTOTYPING IMPLICATIONS
3D PRINTING SMALL SCALE BUT MANY
UNI PRINTING
- Creating
- Using
- Rapid Job
- Products - locale
- Multi-stories

IoT Landscape Today

Tracking and sensing: people, objects can all be considered things, and therefore sensed and tracked. In the culture sector that means collections of any kind, indeed any cultural content and any human behaviour whether that be audiences or the individual. In terms of sensing again human responses to locations such as thermal comfort are relevant to any aspect of creative and cultural industries.

Fluidity and transparency: there is an issue related to how fluid is data between objects and also how transparent it is to the owner/provider of the data, how public and how private it is. This in turn affects our response to the opportunities and barriers of IoT, how much fear is generated or indeed lack of understanding of what is happening to data and how reliable it is. The visual properties of a digital object can be difficult to discern immediately.

Breakdown: the reliability of the components of the IOT is a major issue; the 24hour dependency and thus 24hr breakdown are major concerns today; the boundaries between night and day, global and local, home and work are fragmented; the general trustworthiness of the content as a result of a “cut and paste” culture; the ballooning of of an open source culture.

Objects and system: we are still grappling with the issue of objects and the system, of describing it and seeing objects as a point to connect to other objects; there are technical issues of connecting objects to the system and developing standards for the identity of the object; as well as providing the relationship between the object and its context and classifying that as the object or ‘thing’. We have yet to consider preconditioning the individual to understand legacy and future digital ‘ghosts’.

Tinkering and Hacking: There is a significant emergence of hacking and tinkering, of adapting use, of rapid prototyping with users and customers. Hacking new directions is significant both for the economy. But also it can create fragmentation, which can be misunderstood and disliked, and can result in problems in terms of reliability and control of the system.

User: Current theory of IoT does not allow for human behaviour either as consumers, users, and intermediaries of any kind. However the work in hacking, tinkering and rapid prototyping means we are using much more continuous beta testing and real time design especially in the cultural and creative sector.

Existing projects: Current projects in this field include a wide variety of ideas and applications including digital craft activity, wear-ables for health and wellbeing, hyper-local media, wiki towns, histories of objects, service design and disjunction, gaming (e.g. pokemon, volumique, skylander), physical avatars, robots with agency.



Future Opportunities for the IoT

The participants experience enabled them to represent where they saw the challenges and opportunities for the future as follows:

Hacking, Tinkering, Making: This was recognised as a current activity but with much further to go. New materials, recycling processes, 3D printing, open source ideas and technologies, are facilitating it. The opportunity for communities of practice and social/ interest based communities to share objects, remix and repurpose is exploding. Hacking that includes so-called amateurs and well as professionals is a new form of innovation. It also enables us to rethink community through IoT where tinkering, mending and hacking provide alternative forms of living and working.

Play: Play in this sector encompasses the gaming industry, and play as purely leisure, but the boundaries are blurring. Play is used to develop and test ideas, to develop services and products and as a fundamental part of learning for both adults and children. There is clearly a huge opportunity to start to understand the space in which 'play' as an approach, an activity and a commercially viable strategy within the IoT, can contribute to all aspects of society and the economy. Is everything playable? Where does neuroscience fit into play, learning and behaviour change?

HACKING
New materials | recycle
open source
3D printing access
How to → Recipe/Image ingredients
Hack/Cut + Paste/Invent

COMMUNITY SHARING
Object re-mix
amateur experts (e.g. RP)
hacking as new forms of innovation
Object + human learn to self-hack
hacked object lead to "hacked human behaviour"

TINKERING
Designing for ageing, the repair, for personalisation

REVISIONING COMMUNITY THROUGH IOT AND TINKERING, MEDIA, HACKING

OBSESS WITH NETWORKED AI
MAKE THINGS WHICH CAN LEARN (NEURAL NETS) & EVOLVE (GENETIC ALGORITHMS) FROM THE CONDITIONS/ENVIRONMENT/REQUIREMENTS WE GIVE THEM.

DYING
FUTURE GHOSTS - TRAJECTORY OF LIFE
DNA - TAILORRED MADE OBJECTS - PEOPLE - COMPONEN
CYBERG LIFE
STEERNG - CHIP.

BODIES AS THING. HIERARCHY OF THING. PLACES. + EVENTS

100 CITIES
CITY AS EVENTS
CREATING CITIES.
REACTING + EVENTS FLOW.

COATING FLOW

EVENT PLACE/SPACE OBJECT PERSON

LEAVING TRACES.
ENABLING EXPERIENCES
IMMERSIVE DISCOVERY
PLAY & GAMES.
SHARING
COMBINED ACTIVITY - BUILDING AN OVERALL PURPOSE.
TRACES AS FACILITATORS
↳ WHERE YOU FIND INFORMATION
SERENDIPITY
VALUE - LEARNING TO QUESTION
SPOT THE GAPS.
COOPERATIVE
LIFE LONG LEARNING -
BEHAVIOUR CHANGE - "WILL WE CARE WHERE THE INFORMATION IS?"
WE WILL NEVER GET LOST AGAIN.
PROXIMITY

USER EXPERIENCE & LEARNING

INFORMATION SPACE
MEMORY CONSCIOUSNESS PERCEPTION OF REALITY

I CHOOSE IT CHOOSES WHO CHOOSES?
X Y Z
TRUST

AUGMENTED BODIES
CONSCIOUSNESS
- WHAT WILL IOT DO TO OUR MEMORY.
- WHAT WILL DO TO RELATIONSHIPS.

Augmented Thinking

AUGMENTED BODIES

SENSING BODIES
PEOPLE - NATURAL SENSING.
CONTEXTUALISING EVERYDAY PRACTICES
BEHAVIOR CHANGE
+ ENERGY CONSUMPTION
+ LIVING.

Body PARTS
PARTS OF BODIES
BODIES AS PARTS
BODIES IN CROWDS
CROWDS AS A BODY

SCREENS AUTHENTICATION

WHAT ARE THE IMPLICATIONS OF SHARING MORE WITH INTERNATIONAL SPACES?

WHAT ARE THE ECONOMICS OF PLAYABILITY?

HOW DO WE MANAGE THE ALGORITHMIC SHIFT WITHIN AN IOT?

WHAT ARE THE NEW CURRENCIES FOR IOT?

SENSING BOUNDARIES

COPYRIGHT EN IN USA vs freedom for people
Social, legal + ethical resolve this issue!

CHANGING THE BANDWIDTH TO ACCESS OBJECTS/PLACES.

WHO OWNS WHAT PART OF ALTERNATIVES?

WHO OWNS THEM?

Economics & Business
Social, Legal & Ethical
Technology

Future Opportunities for the IoT

Sensing bodies and place: The body as a 'thing' in this space embodies so many challenges and opportunities, from representing its makeup (DNA, body parts and enhanced body parts); its augmentation (technologically enhanced bodies); its history; its relationship with others; and bodies in multiples as crowds, audiences, participants (both physical and virtual).

Similarly places, cities and spaces are also 'things' and multiples of 'things'. The opportunity to understand the relationship between sensing of the body, behaviour, objects and places as all 'things', suggests the opportunity to investigate a creative method of representing the flows, connections and events, and of addressing them as a curatorial process, i.e. to connect creative approaches to the management of IoT.

User experience and people: All of the opportunities arising from IoT have huge challenges in terms of understanding user experience and human behaviour. The creative, cultural and design sector are people focused and use a multitude of practice and engagement based techniques to understand user experience. This will be critical to tap into and apply, as the explosion of opportunity with IoT occurs.

Breakdown and connections: It is recognised that IoT offers many opportunities, but this is not without challenge. The cultural, creative and design sector are content to embrace change and challenges of new technology and also to tolerate the serendipity of breakdown and novel connections, but for full social and economic value to result from IoT, the implications of breakdown and connections to the application, service or individual must be addressed head on.

Economics & Business

- LOCATION PLAY
Geo-coaching
- Ambient interaction
- no goals - Experience
- no rules
- Authorial / Authoring
Play
- Morphing
"Everything is playable"
Object
- PHYSICAL AVATARS
- GAMES INFLUENCING LEARNING
- MINECRAFT - V- Blender
Item/Inventory management
- NEUROSK
- Pokemon
- Volumique
- SKYLANDER
→ PERSONAS
→ PERSPECTIVES ON EXPERIENCE
- MATERILISATION of in game patina
- ROBOTICS w/ Agency
⊙ Responsibility
- LOT MAY OFFER NEW FORMS OF TRANSACTIONS.
HOW DO YOU FOSTER NEW MODELS OF TRANSACTIONS WHICH DISRUPT ESTABLISHED BEHAVIOURS?
- HOW DO YOU ENVISAGE ENCOURAGING FLOW ACROSS AN IOT (BALANCING)
- WHAT ARE NEW BUSINESS MODELS EMERGING FROM A HACKING OR TINKERING ECONOMY?
- WHAT ARE THE IMPLICATIONS UPON IP FROM A HACKING ECONOMY?

Social, Legal & Ethical

- How would WE BEHAVE IN WORK WITH NO OBJECT DAILY THINGS?
- DOES HYPERNETWORKING CAUSE THE BREAKDOWN OF RELATIONSHIPS?
- Question: Does digital connectivity destroy PLAY?
- How do we manage data collected from kids?
- on what can be cut/saved of ourselves or our things?
- WHAT ARE THE BEST THINGS?
- ES CARRYING OR OUR INFORMATION NETWORK WITH YOU MAKE YOU MORE OF LESS SOCIETY INCLUDED?

Technology

- Question: How Does play happen in the city/ built environment?
- (How) Can People undermine Designed Limitations?
Reactor

Questions for Economics & Business

The opportunities with cultural, creative and design sector gave rise to a number of questions from an economic and business perspective. These included: what are the new business models emerging from hacking and tinkering? How do we track the journey of things across IoT and monitor or indeed generate value? What are the economics of playability? Should we recognise play at work? What is the nature of transaction within IoT? What is a currency in IoT, where will they emerge from, how do we recognise them? How do we understand the behavioural response and disruption? How, what are the institutional, national and trans-national implications?

Response

The participants representing Economics and Business saw the questions as interesting and challenges and did not have any specific answers, however the distinction between bottom up (users, customers, communities developing services, processes, and products through use of IoT) and top down (industry generated and delivered) was an interesting challenge. Whilst it was recognised that new types of 'object' or 'thing' will generate new business, new types of choice for the consumer, the challenge was the failure to recognise it or trade into it. Again there were as many questions about 'play' as an activity, what does play do, are there business models? Whilst, it was recognised play is a component of innovation, and that to operate in this space companies need creativity. Discussion around the transaction and new currencies identified further challenges and questions as yet unresolved.

Questions for
Economics & Business

HACKING, TINKERING, MAKING
USE OF EXPERIENCE + PEOPLE
SENSING BODIES + PLACES
PLAY
BREAKDOWN + CONNECTIONS.

HOW DO WE MANAGE THE
ALGORITHMIC SHIFT WITHIN
AN IoT?

WHAT ARE NEW BUSINESS MODELS
EMERGING FROM A HACKING OR
TINKERING ECONOMY?

HOW DO WE TRACK THE
JOURNEY OF THINGS ACROSS IoT
AND MONITOR VALUE / UNDERSTAND VALUE?

WHAT ARE THE ECONOMICS OF
PLAYABILITY?

WHAT ARE THE NEW
CURRENCIES FOR IoT?

WHAT ARE THE IMPLICATIONS
OF SHARING MORE WITH
INTERNATIONAL OR POST-NATIONAL
SPACES?

IoT MAY OFFER NEW
FORMS OF TRANS-ACTIONS
HOW DO YOU FOSTER NEW
MODELS OF TRANS-ACTIONS
WHICH DISRUPT ESTABLISHED
BEHAVIOURS?

Should we be able to play
at work?

WHAT IS A PENSION IN IoT?

Questions for
Social, Legal & Ethical

HACKING, TINKERING, MAKING
USER EXPERIENCE + PEOPLE
SENSING BODIES + PLACES
PEACE PLAY
BREAKDOWN + CONNECTION.

- How to get informed consent from children?
or other vulnerable groups
- Does digital connectivity destroy play?
- Who owns the boundaries of our bodies?
- New types of transaction/direction affect social/legal?
- Ethics - copyright versus freedom for people? How have 'open' communities?
- HOW WOULD WE BEHAVE IN A WORLD WITH NO OBJECTS, ONLY THINGS?
- ARE OBJECTS MORE HONEST THAN THINGS?
- DOES CARRYING YOUR OWN INFORMATION WITH YOU MAKE YOU MORE OR LESS SOCIALLY INCLUDED?
- WHAT ARE THE BOUNDARIES OF WHAT CAN BE OUTSOURCED OF OURSELVES AND OUR THINGS?
- DOES HYPERNETWORKING CAUSE THE BREAKDOWN OF RELATIONSHIPS?
- HOW CAN PEOPLE UNDERMINE DESIGNED LIMITATIONS

imagination

Questions for Social, Legal and Ethical

Participants from culture, creativity and design had a plethora of questions for colleagues representing social, legal and ethical theory and practice. Much of the questions related to ownership of data, transparency of data, and access to it. If our bodies, our information, behaviour, possessions, products, services are all 'things' where are the boundaries, who owns them in the flow, sharing and use process, how can we track it, how is it commodified and categorised (copyright, licensing). Are the 'things' entities in their own right, are objects (people, products, places) more honest than things.

Response

In discussion with colleagues, it was clear that many of the issues raised by developments in culture, creative and design sector were still emergent for the social legal and ethical community and therefore a critical challenge to address.

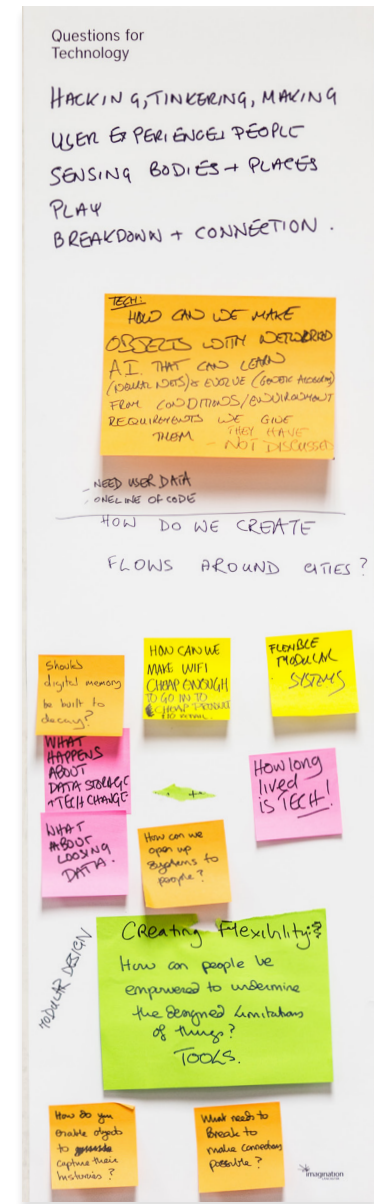
Questions for Technology

Questions to technology experts of course related to the technology available to facilitate IoT ideas, trends and possible developments. For example how can we make objects with networked AI that can learn from or enquire from the conditions /environment and requirements we give them? How do we create modular systems? How can we create flexibility? How can people be empowered to undermine the designed limitations of things, what tools can be created to do this? All such questions relate to the potential approach taken in the technological system related to IoT, how much can be emergent, flexible and user driven, how much will be technologically driven and corporately controlled.

There were other issues related to the robustness, and life of the technology and the data arising from the IoT, such as how long lived is the technology, should we allow it to decay and die, what happens then? Does it matter if we lose data?

Response

Technology experts were able to deliver current knowledge on IoT systems and solutions, and in response to the specific questions, again saw them as opening up new insights and challenges.





Research Challenges

Opportunities / Themes

CONNECTING THE DISCONNECT WITH THE BODY IN IOT

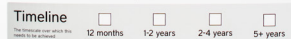
High-level Challenge

WE REQUIRE STREAM WITHIN WHICH TO UNDERSTAND DIFFERENT MODELS OF BODIES (ATHLETE, CUMH POTATO, ETC)

Specific Research Challenge(s)

HOW DO WE CHALLENGE

- 1) INGRAINED BEHAVIOUR (DRAUGHT INSTITUTIONAL LOGIC)
- 2) LIAISE TO ROBOTIC TO ENGAGE END USER NEED NEW MODEL OF DISTRIBUTED ROBOTS
- 3) CREATIVE INDUSTRY APPLICATIONS TO CONNECT PEOPLE/BODIES IN FUN, VARIED + DESIRED WAYS.



Skills

- 4) IOT AS PROSTHETIC OF THE BODY. ARCHITECTURE, CYBERS + ROBOTS.
- 5) BETTER UNDERSTANDING OF 'FLOW' AND DIFFERENCES (PEOPLE, NETWORKS, SPACE) CONNECT TO SOCIAL + HUMAN GEOGRAPHY.

Opportunities / Themes

MAKING DATA TANGIBLE - PHYSICAL OR VIRTUAL

High-level Challenge

FOSTERING TRUST. OBFUSCATION OF DATA IMPEDES DEVELOPMENT OF... TRUST, OPPORTUNITIES, NEW MARKETS MANAGING/CURATING REIFICATION OF DATA

Specific Research Challenge(s)

- 1) SHARING METHODS OF REPRESENTATION + MAKING TANGIBLE / ACROSS DISCIPLINES
- 2) HOW DO WE FOSTER TRANSDISCIPLINARY RESEARCH?
- 3) ROLE OF THE MODEL/THING ACROSS DISCIPLINES
- 4) ENGAGEMENT ACROSS COMMUNITIES TO BETTER UNDERSTAND THE TANGIBLE



Skills

- INTERDISCIPLINARY UNDERSTANDING PRECEDENTS
- ANTHROPOLOGICAL STUDY
- CO-DESIGN/ PARTICIPATORY DESIGN
- ETHNOGRAPHIC STS

Opportunities / Themes

UNINTENDED & UNWANTED LIFE'S CONSEQUENCES - AWARENESS - DATA - DESIGN - RESEARCH - REINFORCEMENT

IDENTIFY UNWANTED PARTNER - 0 BODIES SOCIAL SPACE

HERITAGE THE EMOTIONAL RELATIONSHIP WITH LOT. 0 IMPASSANCE 7 OF IT.

GRAB YOUR OWN LOT.

High-level Challenge

OWNERSHIP OF 'THE SELF' AND 'THIS' - HOW CAN STEPS 'INTENTIONAL' RELATIONSHIP BE MANAGED? HOLD OPT - BACK HOLE - FAILURE MANAGING THE CONSEQUENCE - eg 02

REAL VS UNREAL PEOPLE - WHO'S VS LEADERSHIP

WHO OWNS & CONTROLS OUR DIGI - ATTITUDES

Specific Research Challenge(s)

- HOW DO WE RELATE TO AND MANAGE OBJECTS & THINGS AS 'OWNERS' AND 'SPACE'
- SHORT LOOPS
- EXCLUSION VS INCLUSION
- TRUTH & LIES - WHAT IS REAL?



Skills

Opportunities / Themes

HACKER/TINKER AS ILE DEVELOPMENT WITH END USER

High-level Challenge

THE TECHNICAL AGENDA MAY BE OBSCURING IDEAS THAT ARE NOT... USERS CANNOT CLEARLY ARTICULATE THEIR NEED NO CLEAR EXISTING GOOD PRACTICE & METHODS NEED TO CAPITALISE UPON THE VALUES/VALUES/USER CULTURE

Specific Research Challenge(s)

- CREATING A FRAMEWORK TO INVOLVE CREATIVES, HACKERS, MAKERS, DEVELOPERS, END USERS... THAT ALLOW AGILE CO-CREATION OF IDEAS, CONCEPTS, PROTOTYPES, WITHOUT IT BEING OVERBUDGET & BUREAUCRATIC.
- Trial different models
- Feedback/Share good practice
- Build communities of practice



Skills Resources

- new Technologists, hackers, makers, creatives, sociologists
- Materials, components, software frameworks, library
- Technical expertise + social understanding - encourage
- Access to various environments eg schools, hospitals
- Brokers, conversations

Opportunities / Themes

NO WINNING CULTURE - NO LIVING ESSENTIALS - HUNTER SEEKER - SOLVING VS REJECTION - IDENTIFY AFTER ECO AVATAR - THE NEW CLASS SYSTEM! - WORK CRUC FRIENDSHIPS

High-level Challenge

24/7/365 BURN OUT WHO'S MONITORING WHO - FOR WHAT & HOW IN THE NEW SPACE WHO OPERATES

Specific Research Challenge(s)

HOW DO WE DEFINE THE WORKFORCE / SCENARIOS FOR NEW WAYS OF WORKING? WHAT ARE 'NEW JOBS' GOING TO LOOK LIKE? HOW DO WE MANAGE WORK-LIFE?

HOW DO WE MANAGE DIGI-IDENT & PERSONAS? DIGITAL ETIQUETTE - HIERARCHY - NEW BEHAVIOURS - CULTURAL NORMS

SHORT ↑ LONG ↓

FAMILY LIFE PERSONAL LIFE SOCIAL CAPITAL

Timeline

12 months 1-2 years 2-4 years 5+ years

Skills

Opportunities / Themes

EMPH TO FAIL / EMPH TO SUCCEED IN MARKET & SU DEVELOPMENT SPACE - CROWDS - SLAMMER - CI HIERARCHY & BEHAVIOUR NORMS - PREDICTING TRENDS TO MARKET - SETTING LINES - OR INFORMATION - A TEAM GOES - BOMETIC DATA OWNERSHIP

High-level Challenge

HOW CONCEPTION SPACE ORGANIZATION IDENTIFICATION OBJECT OF INTEREST/INTEREST & MANAGEMENT & OWNERSHIP

Specific Research Challenge(s)

WHO OR WHAT HAS TRUE POWER? WHAT IS 'DEFAULT' - WHAT IS OPEN?

SHORT LONG

IF I DO CHANGE WHEN DOES AN OBJECT HAVE RIGHTS? HOW IS IT MANAGED? HOW DO WE NEGOTIATE LIFE WHEN OBJECTS SUPPORT OUR CHOICE?

Timeline

12 months 1-2 years 2-4 years 5+ years

Skills

Opportunities / Themes

Post Disciplinary (creative, central communication) interdisciplinary

High-level Challenge

How to turn TSB into Kickstarter 'Crowd Funding' - Funding models/mechanisms - Building bridges - Maintaining bridges

OPENNESS CONNECTIVITY SERENDIPITY SYNCHRONICITY

Specific Research Challenge(s)

Research environment as an Internet of People and Things MODELS TO/FOR: -> EXPLORE SPACES BETWEEN DISCIPLINES -> FLUIDITY + SHARING OF PEOPLE POWER / RESOURCES

Timeline

12 months 1-2 years 2-4 years 5+ years

Skills

Openness and ability to recognise + interpret connections
Intuition

Opportunities / Themes

CRITICAL CREATIVITY

High-level Challenge

BRINGING CRITICAL & CREATIVE THINKING TO IOT DISCOURSE

Specific Research Challenge(s)

MAKE VISIBLE WHAT IS ALREADY HAPPENING TO GET OTHERS UP TO SPEED

EMBED CRITICAL PERSPECTIVES IN RESEARCH AGENDAS (ADVOCATE FOR) EMBED CREATIVE PRACTICES

MAKE VISIBLE BOTTOM UP, OPEN-ENDED POTENTIAL - OPPORTUNITIES

MAKE VISIBLE NEW PARADIGMS OF

- CONTENT PROVISION
- OWNERSHIP
- ECONOMIC MODELS
- PUBLIC / PRIVATE
- NEW FORMS OF RELATIONSHIPS
- NEW FORMS OF RESOURCE USE

Timeline

12 months 1-2 years 2-4 years 5+ years

Skills

BOLSHYNESS
STORYTELLING - VISUALISATION
INTERPRETATION

Opportunities / Themes

PLAY
(#behaviour, Technology, Motion)

High-level Challenge

Extracting / developing value from Play.

Specific Research Challenge(s)

ISB
Play + business value (ontology feature)

RCUK
PLAY as simulation of motion

- Culture sector contribution to play
- Explore without historic baggage?
- How do we keep the IoT as an asset (avoid over regulation) (low - availability)
- Value failure.
- Rapid funding



Skills

Opportunities / Themes

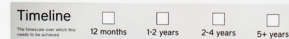
- INTERDISCIPLINARY WORKING -
- LEARNING TO PLAY
- POWER & CONTROL
- UNDERSTANDING BEHAVIOURS
- NEW BUSINESS MODELS - IP PROTOCOLS FOR CREATIVE INDUSTRY
- KNOWLEDGE OF WHAT'S HAPPENING - ECONOMIC, SOCIAL DESIGN FOR COMMERCIAL OUTPUT

High-level Challenge

ENVIRONMENT & SUSTAINABILITY

Specific Research Challenge(s)

- PROVISION OF SERVICE -
- CONSUMPTION OF POWER - LACK OF EFFICIENCY
- PHYSICALITY OF IOT
- PHYSICAL COST - TAGGING & LOCATION
- NETWORKING - ROBUST TECH
- EMPOWERING END USER - SMART CLOTHING
- NEGOTIATING THE HIERARCHIES
- OWNERSHIP ACCESS - INFRASTRUCTURE
- IP
- WHO OWNS THE DATA OVER SPACE & TIME (STORAGE, TIMING)
- PERSONALISING TO EMPOWER
- LOCALISING - FLEXIBILITY & FORMAT - HEALTHCARE
- 12 MONTHS
- WHO OWNS WHAT?
- WHAT IS COMMERCIAL VALUE?
- WHAT DOES IT MEAN?
- HOW CAN WE COMMUNICATE
- CHANGING TO ENAGE IN IOT IN A PRACTICAL WAY



Skills

- UNDERSTANDING 'FUTURE GAZING' OF IMPACT NOT JUST READY-MARKET - OPTIMISM TO SCALABILITY
- MANAGING EXPECTATIONS - RELATIONSHIP BETWEEN WHOSE PROVIDING & WHOSE RECEIVING
- INTERDISCIPLINARY - COLLABS BET. SOCIAL/LEGAL & TECH..
- UNDERSTANDING STANDARDS.
- KNOWING WHAT'S VISIBLE - SHARING THROUGH INCORPORATED OPEN SOURCE

Opportunities / Themes

PHYSICAL, VISIBLE, SENSORY THINGS

High-level Challenge

- WHAT CREATIVES CAN DO - INNOVATION - PERSONALISE - MAKING & DOING - PROMPTING CREATIVITY
- PERMISSION TO PLAY - DESIGNING & DELIVERING TO CO-COOPERATION, CO-INVENTION OF AUTOMATION
- MAKE VISIBLE THROUGH REPAIR & FREEDOM

Specific Research Challenge(s)

- IT PROTOCOLS - IP PROTOCOLS FOR DESIGN INDUSTRIES
- REVEALING DATA IN USEFUL WAYS - PHYSICAL & VISIBLE
- PEDAGOGIC APPROACHES TO LEARNING STYLES - EXISTING + ALTERNATIVE
- INVESTIGATE SOCIAL SHAPING FOR IOT
- DEVELOPING CREATIVE & INNOVATIVE ENVIRONMENTS - ARCHITECTED & IMMERSIVE
- IMAGINING!
- CONCEIVING THE IOT CHALLENGES - WHAT'S COMING NEXT
- EVOLUTIONARY VIEWPOINTS OF TECH
- EMPOWERMENT TO PLAY - KEY TAKEAWAYS TO ACCESS



Skills

- CO-CREATE STANDARDS - FLEXIBILITY, ADAPTIVE
- INTERDISCIPLINARY COLLABORATION FOR SHAPING - MESHING COMPELLING IDEAS WITH COMMERCIALLY VIABLE
- DESIGN EMPATHY - FLEXIBLE, ADAPTIVE
- KNOWING WHAT'S VISIBLE - SEAMLESS DESIGN CHALLENGES
- MANAGING EXPECTATION - RELATIONSHIP BETWEEN THOSE PROVIDING / RECEIVING

Opportunities / Themes

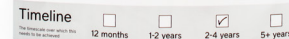
- GIVING OBJECTS AN EMBEDDED VOICE
- TEST BED FOR EXPERIMENTATION & LEARNING.

High-level Challenge

GATHERING DATA FROM COMPLEX OBJECTS...

Specific Research Challenge(s)

- RESEARCHING HOW DATA CAN BE GENERATED & HARVESTED FROM OBJECTS THAT HAVE MULTIPLE PROPERTIES & DON'T EASILY FALL INTO CATEGORIES
- USING THE STATE COLLECTION OF ART WORKS AS THE BASIS FOR INVESTIGATION
- UNDERSTANDING OBJECTS WITHIN MULTIPLE CONTEXTS
- WHAT IS THE GAME CHANGER FOR DIFF COMMUNITIES OF PRACTICE TO MAKE IT WORTH WHILE



Skills

- DESIGN.

Outcomes

High-level Research Challenges

1. Meaningful frameworks that enable play, making and adaption in an agile co-development and co-evaluation research process.

The emergence of hacking, tinkering and play in the cultural and creative community is obviously a source of innovation and a potential for economic growth and social benefit. It emerged as a major opportunity area in the cultural, creative and design theme. It needs to involve designers, artists, hackers, makers, developers, and users, and we need to explore different operating models, feedback and share best practice, and build communities of expertise. It should not be overburdened and bureaucratic but participants recognized it can be disruptive and risky and so the need to co-create a fiscal environment (i.e. one in which investment is available), an operating and technological and legal environment in which knowledge and technology can be shared in a commonly agreed manner.

2. Making data tangible - all types of data.

We are aware of the explosion of data. The cultural, creative and design sector, see the challenge and opportunity to undertake far more work on the translation, visualization, and access to data (cultural archives, organizational and personal archives, open source data, analytics) in order to make data manifest, reduce its obfuscation and improve trust.

3. Understanding and knowing bodies; interconnections, disconnections and flow (representation, agency & power).

IoT as a system and the human body as a 'thing' within it are not readily understood. How we sense the body through prosthetics or emerging technologies, design systems for and around the body (athletes and patients being possible extremes), represent the body and its agency and power embodied within the IoT system, whether that be in relation to social and cultural life (communities, games, cultural artifact etc) or general work and life, and the disconnections we create between our bodies and their environments, is a major area for research.

4. Working life in the future.

There is a huge area of unknown in terms of how we will work within the IoT system, what will it do to work, what will it mean to work, and indeed how we balance home life and work life. The design and creative community will develop new products and services built around the opportunities offered by the IoT, what and how to facilitate this, and ensure it contributes to improved quality of working and home life.

5. Digital life and death.

By creating digital artifacts, archives and data, we need to understand the life of this digital material, how it is used, who has access to what aspects, the “things” it is attached to, how it transitions between people and communities, how we manage reuse, decline and decay. How we signify and ensure death of data and who has the moral, ethical, legal authority to do this?

6. Individual, Social and Organisational response and drivers to and for the IoT.

The cultural, creative and design sector is engaging significantly with IoT and yet there is still very little coherent evidence in relation to what constitutes reliable driver for the development of IoT and what models or algorithms in response to it are emerging.

7. Environment & sustainability; bringing the IoT thought into the sustainability space.

Many of the constituent parts of IoT (sensors, data management, building and space manipulation) are being used in the endeavor to preserve the environment, reduce carbon and engender more sustainable forms of living. However, there are many more opportunities to bring a broader systemic approach to the challenges through IoT approaches that empower end users and negotiate hierarchies of ownership and access.

8. Narrative, storytelling & user experience.

Critically an essential contribution that can be made to the development and implementation of IoT, is communication, discourse and user engagement. The cultural, creative and design sectors are skilled in generating narrative, scenarios and audience engagement through theatre, film, literature, journalism etc as well as user centred design and development of the IoT experience.



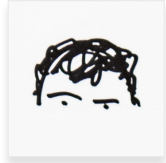
Conclusions

The cultural, creative and design theme mapped the current landscape relevant to Internet of Things and identified 8 research and R&D challenges that are important areas of focus going forward.

It was felt that within each of the challenges there were aspects that were short-term and long-term in our theme, so for example, though a technology may not be ready to exploit in the short-term, there is an opportunity to use cultural, design and technological interventions to explore the implications and impact in the short-term in order to feedback into shaping its long-term development.

There is a sense that that the consultation exercise has been fruitful and helpful to all those involved but policy and funding needs to show the impact of this exercise in the near future, partly as the landscape is changing and also to demonstrate its usefulness.

Participants



Philip Brook
Director, Hearts Heads Limited



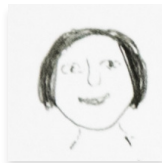
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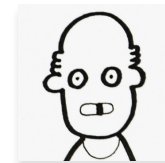
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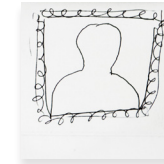
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University of Wales, Newport



Mike Phillips
Professor of Interdisciplinary
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Chris Speed
Reader, Edinburgh College of Art

Process

The workshop participants had four tasks;

1. to describe the current IoT landscape from their perspective;
2. to outline future opportunities;
3. to identify questions these opportunities posed for economics and business, social, legal and ethical, and technological perspectives and;
4. to express the research and R&D challenges for IoT.

Contributions

This workshop included special contributions from speakers to spark ideas and stimulate conversations:

- Chris Speed, Edinburgh College of Art
- Mike Philips, Plymouth University

Facilitation by Rachel Cooper, Rachel Jones, Chris Speed and Mike Philips with assistance from Jonnet Middleton, Natasha Carolan and Roger Whitham.

We would like to thank all the participants for their engagement.

