

Developing Innovation Networks and Communities of Practice - Project Report

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June 2008

CONTENTS

1. INTRODUCTION	3
1.1 Background and purpose.....	3
1.2 Project objectives	3
1.3 Document Structure.....	3
1.4 How the study was conducted.....	3
2. EXECUTIVE SUMMARY - CONCLUSIONS AND RECOMMENDATIONS	4
2.1 Key general concepts	4
2.2 Creating and developing communities.....	4
2.3 The technological framework.....	5
2.4 The Future and Next Steps	6
2.5 Recommendations for future work.....	6
3. THE EMERGE CoP – THE EXPERIENCE OF THE PLANET PROJECT	7
3.1 How the project came about.....	7
3.2 General views about Emerge – Strengths and opportunities.....	7
3.3 General views about Emerge – What could have been better.....	7
3.4 A View from outside the Community	7
3.5 The Support Structure	7
3.6 The UIDM (User Engagement Model)	8
3.7 The Project’s development of the UIDM model.....	8
4. GENERAL CASE STUDIES	9
4.1 Introduction	9
4.2 Advantage West Midlands – Innovation Clubs and other networks.....	10
4.3 European Framework Networks.....	10
4.4 International Collaborative Masters Programmes – the MINT network.....	11
4.5 Innovation networks within a large corporation	12
4.6 Communities of Practice in Local Government	14
4.7 The Institute of Knowledge Transfer - Global Innovation Network.....	15
4.8 Communities of Practice in the NHS	16
4.9 Other Networks and Communities.....	16
5. A UNIVERSITY INNOVATION NETWORK	18
5.1 Introduction	18
5.2 University case studies	19
5.3 Other experience of good practice	22
5.4 Requirements for an innovation community - and obstacles identified.....	23
6. THEORETICAL BACKGROUND – KEY IDEAS AND THINKERS	28
6.1 The business context for innovation.....	28
6.2 Collaborative networks and communities	29
6.3 Collective thinking	29
6.4 Communities and Networks of Practice.....	30
6.5 Innovation networks and new business models	30
7. SUMMARY AND CONCLUSIONS	32
7.1 General concepts	32
7.2 Creating communities to support collaborative innovation	33
7.3 ICT to support collaborative innovation	34

7.4 Communities of Communities - Towards the future..... 38

8. GUIDELINES AND RECOMMENDATIONS 41

8.1 Key general concepts 41

8.2 Creating and developing communities 42

8.3 The technological framework..... 44

8.4 The Future and Next Steps 45

8.5 Recommendations for future work..... 46

Appendix 1 – A Simple Web 2.0 Software Model 48

Acknowledgements 50

References 52

Developing Innovation Networks and Communities of Practice (DINCoP) Project Report

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June 2008

1. INTRODUCTION

1.1 Background and purpose

The Emerge Community of Practice was set up at the beginning of 2007, as part of the JISC Users and Innovation programme, and particularly to facilitate the generation of proposals for projects aimed to start at the beginning of 2008. At the end of the bidding process, the question of what the future of the community should be in the longer term was raised for discussion. The aim of the DINCoP project was to examine ways that the Emerge Community could be sustained and developed as a wider Community of Practice in the future. To do this, it looked at different Networks and Communities of Practice, especially those that aimed to stimulate and foster innovation in some way, to attempt to draw relevant lessons from these. Thus it is hoped that the work carried out and this report will have wider applicability, and be of use to anyone involved in developing innovation networks and Communities of Practice.

1.2 Project objectives

To provide as wide a perspective as possible, three different areas were selected for this investigation, with a different focus of analysis for each.

- The experience of the Planet Project, one of the projects that was later successful with its proposal, in putting the project together and using the Users and Innovation Development Model, within the Emerge Community (see Section 3).
- The experience of a variety of academic and business networks and communities; the key issues identified, problems and best practice (see Section 4).
- How an Innovation CoP could be developed at one institution (Coventry University), and how this could link into a wider CoP - conducting the introductory requirements analysis, based on the UIDM Stage 1 template (see Section 5).

The DINCoP project aimed to analyse these experiences, and together with a brief review of the literature dealing with this area, draw conclusions and make suggestions based on them.

1.3 Document Structure

The structure of this document is as follows. Each of the main areas that were investigated, is discussed in turn. Some of the theoretical background and wider studies of this area are then briefly looked at, to see how they relate to the evidence obtained as part of this investigation. The final sections attempt to integrate the findings from the various parts of the study. They include a thematic discussion of the main issues identified, summarising the information from the various case studies and interviews and attempting to draw conclusions from them, and then a set of guidelines and recommendations. An Executive Summary of conclusions and recommendations is provided in Section 2 below.

1.4 How the study was conducted

The primary means of gathering evidence for the project was by a series of interviews. Over 50 interviews were conducted in all during the course of the project, most of them face-to-face. Apart from these more formal interviews, many more informal discussions were carried out with a wide range of individuals and groups. In a few cases, ad hoc focus groups were set up. Where this was feasible, the authors participated in the networks and communities being analysed, to get first-hand experience of them. The authors also have considerable other experience in developing communities, and examples drawn from this were also used in the analysis.

2. EXECUTIVE SUMMARY - CONCLUSIONS AND RECOMMENDATIONS

2.1 Key general concepts

- Innovation in its widest sense is vital to economic social and technological development. However, to provide real benefit, innovation must be embedded within educational institutions, sector bodies, and other organisations, and taken from its initial conception through to its successful implementation and institutional integration.
- An interdisciplinary approach plays a very important part in innovation, and ways should be found to surmount the structural barriers and silos in institutions that hinder innovation and collaborative activity.
- New business models typified by the open source movement, have important lessons for how individual business benefit can be linked to an open community development approach, and are particularly relevant to the development of innovation communities.

2.2 Creating and developing communities

- Communities and networks of practice play an essential part in enabling innovation. They are also increasingly a necessity to support organisational structures which are increasingly devolved, and new working practices such as location independent working. Communities can be centrally facilitated, but must arise organically, and be driven by people at the grass roots.
- Communities of Practice must involve shared activity and practice, not just shared interests. Successful communities generally have a defined concrete purpose and fulfil real needs. Building personal relationships and trust among members is vital. A strict concentration on project outputs and aversion to taking risks are generally detrimental to the development of innovation communities. Space, time, and supporting resources for those involved are essential.
- Some physical interaction is important for communities, particularly at a formative stage. Benefits to people joining a community must be easily identifiable. Events should have a wide appeal and include social activities. Techniques such as speed networking/dating can be used to bring individuals with common interests together. A programme of events, “lab” type experimentation, development and demonstration environments, and specific projects, can facilitate longer term collaborative innovation.
- When building innovation communities, whether at an institutional or wider level, areas that naturally span other disciplines should be a priority, particularly at the early stages of a community, to act as catalysts for further activity.
- Champions and enthusiasts must be encouraged and supported.

- Communities are inevitably made up of other groups, networks, and communities. Being able to support these within the larger community is important.
- Continually interfacing with users and user requirements must be a key part of community development, and separate communities of users may be expressly initiated for this purpose.
- Individuals and communities can act to bring other communities together, through individuals being members of multiple communities, and communities being bridges between different groups.
- Innovation networks and communities should not be seen as entities independent of other networks and communities. As part of the embedding of innovation within an organisation, so should these networks be linked closely with existing networks, and existing systems themselves be adapted and developed to support innovation.

2.3 The technological framework

- Technology must not be the driver of networks and communities, but is an essential enabler.
- Several key factors were found to contribute to the success of tools that support communities. Users prefer tools to be part of a single framework that can integrate easily with their existing software environment. They want to maintain familiar work practices as far as possible, and have a consistency of interface, feel and functionality, so that there is generally one way of doing something, and one place that they can store and find information etc. Environments with restricted choices and formats are acceptable and found to be successful, if this contributes to consistency and ease of use. However, if this restricts ideas being easily and freely communicated, it can be a problem. It is important that issues with regard to security, confidentiality, intellectual property etc. are minimised. Where new tools replace or modify existing techniques and applications, experience shows that they will not be widely adopted unless they are seen as having significant advantages to, and are as easy to use as, what exists currently.
- Providing too much information for users, or requiring them to have to contribute more than they have time for, will be counter-productive.
- The provision of support, training, and other facilities centrally is important for a community, but the primary source of these must be on a peer-to-peer basis if the community is to be sustainable.
- Key functional requirements that emerged from discussions with users included: A searchable/ browsable database of interests/activities/requirements/capabilities; Lightweight discussion/chat facilities; Flexible electronic notice boards to display information, post requests and requirements etc.; Methods to find and filter information according to various criteria; Ways of matching requirements with availabilities of individuals and skills, and matching individuals for various purposes; Tools to help the structuring, classification and visualisation of complex data and relationships; Ways for users to rate and score a variety of items and entities – and have this reflected in how information is chosen and prioritised.
- Social networks and social networking tools - such as blogs and wikis, were found to be popular and useful. However, the general “hype” regarding some tools and systems on one hand, and their lack of flexibility on the other, sometimes leads to the inappropriate use of techniques.
- Virtual worlds provide a powerful way of representing collaborative activity, especially taken together with social networking tools, with which they can be integrated. However, technical requirements, that currently can act as a limitation on their general use, need to be taken into consideration.

- Sharing practice is central to developing communities, and is also one of the potential major benefits from a successful community. The pattern language methodology is a powerful way of facilitating the representation and use of good practice, and the description and mapping of expertise and development activity, and should be integrated into the community development process where possible.

2.4 The Future and Next Steps

- The general model for the future which is proposed is based on the principle of communities/networks of communities/networks. This allows each community/network to have its own drivers and fulfil its own requirements, while also helping to satisfy the requirements of the other communities/networks that it interacts with, and is part of.
- The conditions, processes and tools, that will allow these systems to emerge and evolve must be investigated and developed. This development itself can only be done as part of a community of practice that includes and interfaces with the communities that are part of its focus of investigation and activity.
- A pragmatic approach is required at one level, bringing diverse communities together to explore methods of working and practice that can help to interface and integrate them, and from a technical perspective, using mash ups and other ad hoc techniques to investigate how various software systems can interface. At other levels, the infrastructural and semantic methodologies and standards must also be developed over the longer term that will allow the fulfillment of a vision of truly interoperable services at every level of granularity and function.
- The Future of Emerge should be as a Community of Communities – a CoP in its own right, but also integrating other networks and CoPs. The unique position that the Users and Innovation Programme, and JISC as a wider entity, already occupy as the focus and centre of a wide variety of existing communities - and projects and groups of projects that are nascent communities, provides a real opportunity to take this agenda forward.

2.5 Recommendations for future work

- Based on the requirements identified, an Innovation Network/Community should be developed within Coventry University, involving events and other physical activities, as well as online systems. Other institutions may also consider setting up similar systems, and will have a number of commonalities with Coventry University, but will need to carry out their own requirements gathering exercise.
- The Coventry University community should work with other groups developing innovation communities of various kinds mentioned in this report, such as Advantage West Midlands and the Institute of Knowledge Transfer. This could provide direct benefit to the Coventry University community, but would also help to develop the methods, processes and tools to support interacting communities more generally. This community of communities would increasingly seek to work with and include other suitable innovation networks and communities as it develops.
- The Coventry development should work with the Emerge community and its constituent projects, to begin the parallel developments within Emerge, which would help the innovation aspects of it to develop. This could focus firstly on how innovative practice within projects that are part of the Emerge community could be shared within the community, using the Planet project as an intermediary. It could then also look at how this innovative practice could be linked and shared with the Coventry innovation community and the communities that it is working with, and similar institutionally based ones. This would thus help to

develop the model of Emerge as a hub for a community of communities, linking individual institutions and their wider innovation communities to each other.

- The importance of ensuring innovation communities are driven by user requirements, suggests the need for investigating the setting up of separate user networks, that could be linked to innovation communities as part of the general community of communities model.

3. THE EMERGE CoP – THE EXPERIENCE OF THE PLANET PROJECT

3.1 How the project came about

The project consortium members had never worked together before, and the Emerge community was instrumental in creating the project. The initial interest group came together at the first Emerge meeting in London, at a session using design patterns that Steve (Warburton) had organised for the event. Steve explained how this came about. "I was looking for something interesting to do with delegates about sharing practice. I didn't think anyone would be interested in patterns." Janet (Finlay) and Jim (Hensman) started discussing (critically!) with Steve after the session, and a community about design patterns was set up on the Emerge site by Jim, which helped to identify other interested individuals. Subsequent Emerge events, especially networking sessions and informal meetings that took place there, helped to get others involved, consolidate the team and develop the project idea. Although elements of the project concept were in a number of the original proposals of team members, the final submission was a substantial development from the initial ideas. The associated projects, which are a key part of Planet, were also heavily drawn from the Emerge community directly, or through other activities of Community members, such as Cristina (Costa). Yishay (Mor) from the London Knowledge Lab, is the only member of the project team who was from an institution not part of Emerge. Although he was actually a friend of Steve, he became involved completely by chance, when Jim met him when visiting the LKL to see Ken Kahn, part of the Emerge Community from OUCS, who also works at the LKL!

3.2 General views about Emerge – Strengths and opportunities

- "Providing the space to come together, especially face to face meetings, was critical. Communicating electronically wouldn't have been sufficient." "Another side that was good, was the ability to talk to other projects that were in the process of development." "There was more sharing than normal." "Emerge provided lots of little feedback loops." "The Emerge Community was not incredibly focused, but out of it very focused projects emerged." "The second Emerge session in Manchester, forced people to come together, as it was a big undertaking writing a bid." "The physical events, including the UIDM meeting after the ALT-C Conference and the Dragon's Den event, were all crucial for the project."

3.3 General views about Emerge – What could have been better

- "There could have been an earlier start – before the first meeting - to help people get to know each other's interests." "There was a sense of identity in the groups working on bids, but not in the whole community." "It was a Community of Interest, but not really a Community of Practice."

3.4 A View from outside the Community

- "It was fine to have an incubation period when the Community was closed, but then it should have been opened up more. There were no Open/Fuzzy boundaries like normal CoPs."

3.5 The Support Structure

- “Face to face and synchronous events were by far the most useful.” “The online system provided some connections and helped with general awareness. It was most effective when linked to the physical events.” “The virtual activities could complement events, but couldn’t substitute for them.” “More opportunities for peer to peer help would have been useful.” “People were not really talking to each other with the blogs. Its role was unclear, not individual, but not collective either.” “The system should have been complemented with something easier to use – perhaps mailing lists.” “The online system should have been a lot more coherent, single one.” “The platform has been a fight ... it doesn't really work with sub-communities.”

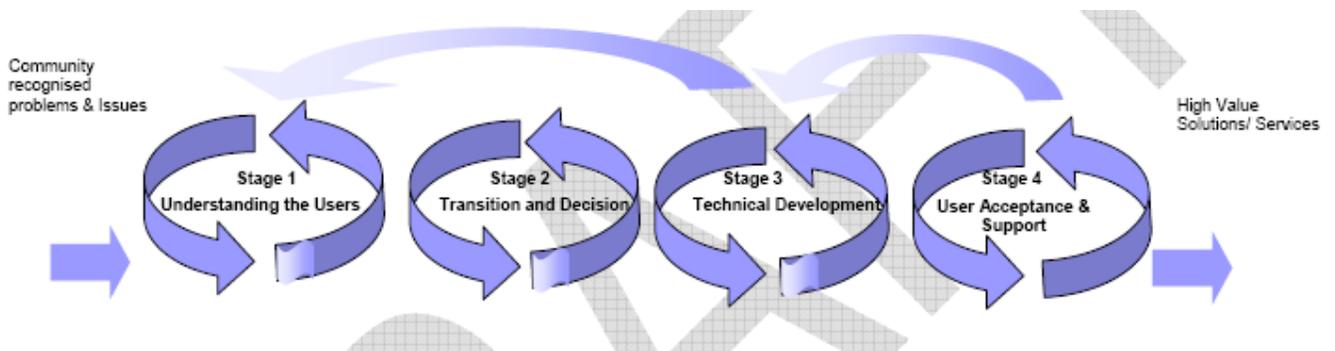
3.6 The UIDM (User Engagement Model)

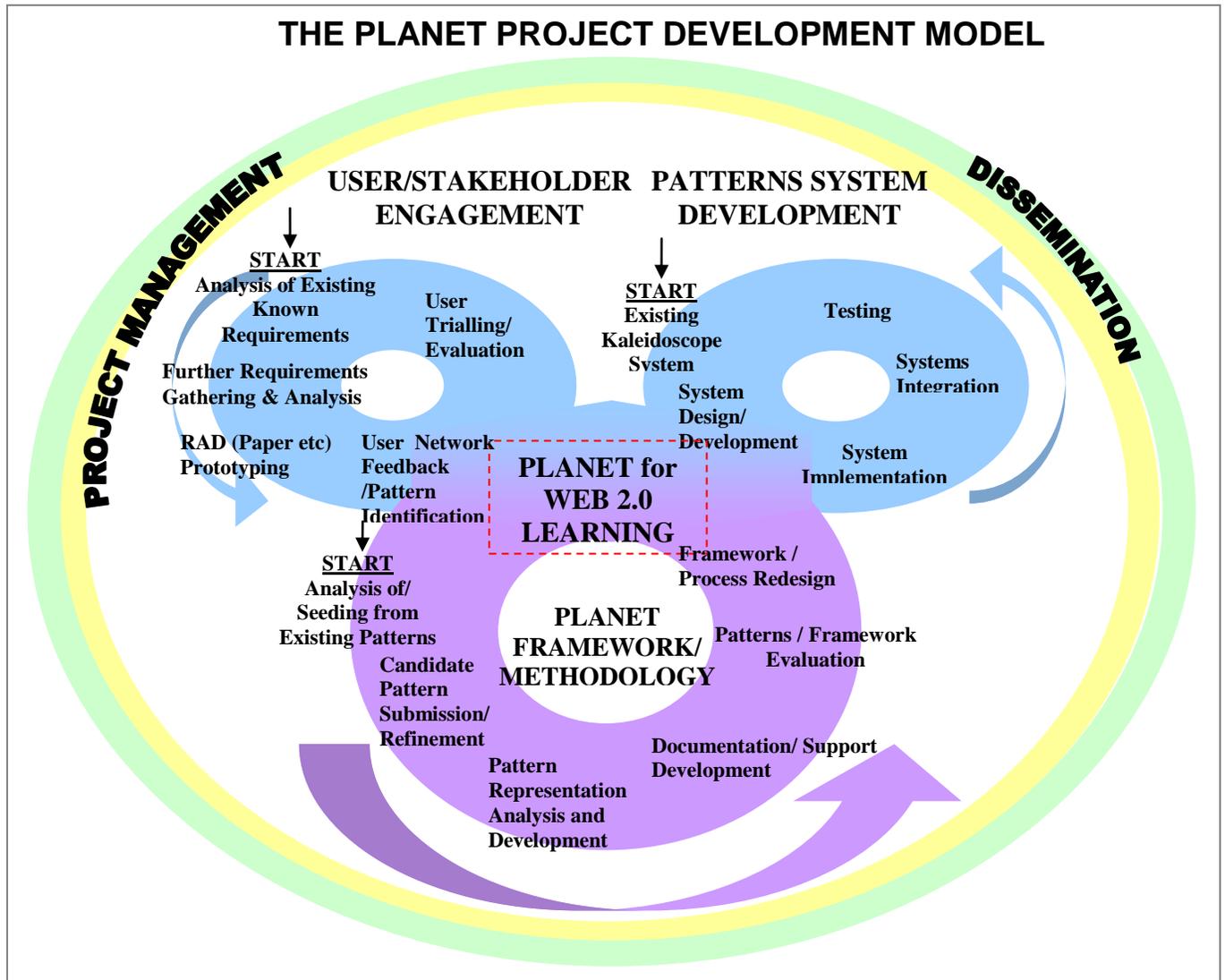
- “Brought into sharp focus user engagement and participation at all times.” “The UIDM reflected a certain value set and philosophy that was more important than the detail.” “A help, but as initially presented, too directional.” “Too much detail – it needed to be simplified a lot.” “One thing that was lacking was that the two sides of the model, building the community and the UIDM, weren’t linked.” “Information was needed earlier – especially examples and case studies.”

3.7 The Project’s development of the UIDM model

In discussions within the project team, it was felt that the UIDM model, even though it included feedback from later stages to earlier ones, was too linear for the Planet project. The final model that was part of the project proposal, modified the UIDM model to highlight the cyclical nature of the main work areas, and the continuous interactions throughout the course of the project between them, in particular with the User/Stakeholder Engagement work area. A more linear representation of the relationship between the different work packages was used for the detailed plan, but it was felt that the model depicted better showed the iterative nature of the project.

THE UIDM MODEL





4. GENERAL CASE STUDIES

4.1 Introduction

When this project was initially proposed, a set of case studies to be analysed was suggested. During the course of the project, particularly arising through recommendations from interviewees for the original studies, a number of further case studies were also undertaken. In some instances these provided better examples than the original ones, for the different areas that the project aimed to cover. Different facets of networks and communities were deliberately concentrated on in different studies, focusing on the organisational aspects in some, and technical aspects in others. To keep this report to a manageable size, only a few representative case studies are described in any detail. However findings and conclusions from some of the others are included in summary form.

CASE STUDY INDEX (including Coventry University case studies)	
Case Study	Section
Advantage West Midlands – Innovation Clubs and other networks	4.2
Business Enterprise Works – Coventry University	5.2

European Framework Networks	4.3
Glaxo-Smith-Kline	4.5
Health Design and Technology Institute – Coventry University	5.2
Institute of Knowledge Transfer - Global Innovation Network	4.7
International Collaborative Masters Programmes – the MINT network	4.4
Local Government	4.6
NHS	4.8
Serious Games Institute – Coventry University	5.2

4.2 Advantage West Midlands – Innovation Clubs and other networks

AWM is the Regional Development Association for the West Midlands, and has set up 8 Innovation Clubs to encourage technology innovation in the ICT industry cluster. This arose out of the need expressed by many businesses in the region for such a scheme, reflected in a report prepared for AWM which concluded that: “Companies found some current networking unsatisfactory in a number of respects, with many events considered to be too generic, too unfocused or too low-level. Several companies noted a need for more structured networking based on better profiling – i.e. so that the audience has common interests and expectations.”¹ Exemplifying this, the report quoted the Managing Director of a software company, who said, “We need a dating agency for IT companies.”

The project spoke to the Head of Innovation Clusters & ICT Policy, the Head of the ICT Cluster, and the ICT Cluster Innovation Manager, as well as co-ordinators for the clubs. Each club has a base at one or more universities, and covers a particular theme, such as E-business, Medical Technologies, and Open Source. Each club hosts events, usually quarterly, involving academics, IT companies, and businesses that may wish to use the particular technologies, possibly from outside the sector. As an example, a club meeting of the Wireless group had brief presentations from 3 speakers and attracted 45 attendees. Meetings of other clubs have had up to 80 attending. It is acknowledged that, "A lot of networking happens at the informal level", and so attempts are made to keep the atmosphere as informal as possible, and encourage networking. Another meeting of the club, for instance, was held in a restaurant, with speakers linked to the courses of the meal!

To help encourage cross-sectoral collaborations, the scheme is being developed to include common themes that involve different industry groups – such as security involving cybersecurity technical experts as well as legal services, and the environment involving the building industry as well as providers of environmental products and services. Mappings of ICT expertise at universities have been created that can help match expertise to business requirements. A requirement for “less structured environments”, to link academia and businesses, was identified.

An interesting aspect of communities like this, is how elements of good practice, not necessarily related to the focus of the community, can emerge. For instance, in the Interiors and Lifestyle cluster, one of the clothing design companies involved began using Facebook as a way of creating a network of people interested in their designs. After some time they found that they were getting most of their customers through this approach. Examples of practice like this, can then be shared within the cluster and wider.

4.3 European Framework Networks

The European Framework Programmes have a number of mechanisms for funding collaborative networks, including Specific Targeted Research Projects (STREPs) and Integrating Projects (IPs) – which cover smaller and larger research and collaborative activities respectively, and Networks of Excellence (NoEs) – which covers collaborative activities only. The project discussed with the UK National Contact Point for the EU, other EU officials based in Brussels, as well as project participants and co-ordinators, about the factors that

influenced the success or failure of networks and collaborative communities. As could be expected, networks which involved actual development, rather than purely information exchange and coordination as with NoEs, were more popular with businesses, as confirmed by an analysis carried out for the EU. “NoEs are more effective in connecting Higher Education organizations to each other and to public Research Organisations (REC) than to other kinds of organisations.”² There was a consensus that large networks as a single entity were not generally viable. “It is impossible to have any relationship within 80 projects.” One manager of a project involving 25 to 30 partners with a core team of 14, considered that only four or five of these were functional partners. This was particularly the case when small organisations, such as SMEs, were involved, as concluded by an EU evaluation. “The position and participation of SMEs in the New Instruments has not been satisfactory. SMEs have found it almost impossible to become involved in Networks of Excellence and SMEs have tended to be dominated by larger organisations and disadvantaged in Integrated Projects.”³

The consensus on how to make large collaborations work, was either to split these into separate free-standing projects, and then support collaboration through a separate instrument – the Co-ordination Action, or to have a single project with a strong decentralised structure. For the latter, this was possible in several ways. A management board representing relatively independent groups with devolved responsibilities was one. In many cases, larger projects worked because de-facto a few key partners drove the project, and others interfaced with the project mainly through them.

The project spoke to a participant in the project with the largest number of partners in FP6, the Intelcities project, which at one stage had an amazing 89 partners. This project was based around a set of themes relating to Intelligent Cities, such as sustainable transport, each assigned to a particular European city, with a number of partners working there. This vertical integration was meant to be complemented by a horizontal integration using common standards and processes across cities. The outcome was that the vertical integration, which was focused on a particular city, and was driven by specific outputs, worked relatively effectively, but the horizontal integration, which was less critical to the project, was not as successful. This meant that the wider aim of the project, to generalise the experience from each of the city pilots, was not as effective as hoped.

Another project found ways to counteract this tendency for larger projects to become effectively a number of smaller projects with little real integration. This was done by creating subgroups divided by theme, but which were not sector/discipline or output based. This allowed a devolution of activity into small enough units to operate effectively, but maintained sufficient incentive for the units to work together to ensure the success of the project. Communities that extend wider than the EU, but still utilise the EU framework, are possible, demonstrating how a community can extend its reach beyond its original remit by initially using the links of its partner organisations, and then consolidating these within other networks and with other funding sources. The Intelligent Manufacturing Systems Community was an example that included the US, Japan etc. This originated from the EU, but then endorsed and supported projects through communications and meetings which were funded separately within their particular regions.

An interesting observation from a participant in a successful large network, was that tension between partners did not necessarily weaken the project as a whole. In this case, the presence of one partner company, which was a major player in the field that the project covered, and thus had less incentive to collaborate than the others, actually helped to bring together and consolidate the other partners. “A degree of tension within a community is acceptable, and can enhance it if handled properly.”

4.4 International Collaborative Masters Programmes – the MINT network

One particular programme, the Masters in Innovative Technology (MINT) initiated by Edith Cowan University (ECU) in Perth, Australia, was looked at particularly, with reference made to other similar programmes. The project spoke to Associate Professor Joe Luca and Dr Mark McMahon, who originated the

scheme in Australia, and to Professor Helmut Dispert, who has been developing the scheme in Europe. The MINT model is that students can do the degree with different parts based in different universities worldwide. Modules and components for the course are selected based on specific requirements of the students – which are often project based and business sponsored, and on the specialist expertise available in different institutions. From an initial start in Australia and Germany, the programme is extending to institutions in Austria, the Baltic States, the UK and Canada.

The relevance of the programme to innovation networks was that it created a network of institutions participating in collaborative teaching and research in a very natural but directed way. Because it was based on specific student requirements, it was very focused. However, as the institutions involved saw the benefits of the collaborative network being created, they extended it to other areas, bringing in relevant partners. Thus the initial programme was mainly centred on ICT and the Media. However, because of the importance of environment related industries to some of the institutions in the consortium, it has extended to incorporate this area.

As with any new scheme, issues of accreditation, how the scheme is financed etc, had to be overcome. However, these have been tackled successfully, through developing a simple but flexible structure. The qualifications obtained, can appear to any institution as their own, if they so wish. Finance is arranged so that each institution receives remuneration with respect to the activities they carry out. The particular advantage of the system is that it can bring in expertise and capacity from anywhere in the world as is most appropriate for a particular research or teaching requirement. At the same time, because the partners are geographically distant from each other, issues about competing for students or resources don't arise.

The project looked at similar schemes, particularly at postgraduate level, which were based in several countries. Again, once the basic difficulties of accreditation and other organisational issues had been overcome, these appeared to work well. What was particularly significant about these schemes, was that they not only provided a student experience which was wider than could be provided in a single country and as part of a single culture, but that they are also facilitated the creation of a network and community among the different institutions and countries involved. Furthermore, because an institution in a particular country has special access to its national learning networks, this created an effective way of developing international networks on a wider scale.

4.5 Innovation networks within a large corporation

The project looked at how collaborative networks were facilitated within the pharmaceutical company, Glaxo-Smith-Kline, interviewing John Dalton, Vice President for Global IT Architecture, and Stephen Delusio, who supports the US pharmaceuticals R&D business. John manages a team of Enterprise Architects representing all of the global business units. They are essentially a virtual team, being based in the various regions of the world where the various GSK business units are headquartered. GSK has tried, since being formed through the merger of Glaxo, Wellcome and SmithKlineBeecham in 2001, to manage itself as a global organisation. Hence it has worked hard to achieve global processes supported by standard systems in every territory. They run a standard Windows based desktop throughout the world and are working hard to achieve global data standards. The architecture function has the responsibility for coordinating standards across the business for processes, application systems, data and technologies. Though the architecture team has the support of most business units, it cannot dictate standards. It achieves these by assisting the business teams weigh up the relative value of various candidate standards and helps promote the business case for adopting the most effective solution. In this way, the senior management team are presented with a financial case for adopting a standard rather than having to understand the technical reasons for its choice.

GSK has been very successful in utilising Lotus Notes as a collaborative platform in support of such business case development. A standard template called 'Connectware' is used by several hundred business teams in

the company, that helps them define projects, establish collaborative teams to run them, and manage the meetings, discussions and follow up actions that ultimately deliver solutions – whether they be agreement to a standard, the specification of a new pharmaceutical product, or the marketing plan for a new product. Key to the success of Connectware has been:

i) The very fact that it is a standard template. Like many software packages, Lotus Notes has a great deal of functionality and is quite complex to learn and become proficient in. The template incorporates the key collaboration features that teams need to support their teamwork, and it is quick and easy to set up a project in it and for team members to learn how to use its various features through a short (less than one hour) training course.

ii) No customisation is allowed. Teams operate the way the template dictates rather than adopting different working practices to suit themselves. Hence, once a team member has worked in one team using Connectware, they are able to move quickly and efficiently to other teams – important as many projects are only a few weeks or 2-3 months long. Over the period of use of Connectware (8 years +), there have only been 3 versions.

iii) Scope – all aspects of projects are well supported. Connectware has scheduling, meeting management, discussions, document management, integration with Lotus email (the company's email standard) and limited workflow.

Such was the success of Connectware, that in fact Lotus itself has adopted it, and it has become part of their service offering. Tony Ingall, formerly head of Messaging Standards at GSK, explained what had happened. “We developed the Connectware Template with Lotus' help. They have now deployed a version of it themselves as an Internet community service called Quickplace, which has achieved widespread use globally.”

Although Connectware is widely used in support of Communities of Practice in GSK, other tools are becoming increasingly important. Stephen Delusio's role in recent months has been to encourage wider knowledge exchange amongst the US research teams. Like the Architecture team already considered, Stephen's customer base was equally geographically distributed. They have research centres in the Delaware valley, Pennsylvania, in North Carolina and need to work closely with their counterparts in the UK, Italy, Japan and Australia. A critical factor for the research scientists is the strictly regulated world they live in. Any chemical entity that is getting anywhere close to being administered to a human patient is subject to regulation by the FDA in the US, the MCA in Europe and similar regulatory bodies in other parts of the world. This imposes a strict discipline on every participant in the drug discovery, development and manufacturing arenas. As a result, scientists in particular have become very used to not venturing an opinion unless it is backed up by sound scientific evidence that has been subject to peer and supervisor review. Whilst this is good for drug safety, it acts as a critical barrier to effective knowledge exchange. Even email between groups of scientists is controlled in case it becomes the subject of 'discovery' by a litigant in any future class action suit!

Despite the undoubted success of the Connectware template in facilitating the sharing of information, it also acted as an inhibiting factor at another level, because of the need for site administrators to support it. Stephen Delusio explained how this arose. “Their role as gatekeepers meant that scientists felt inhibited from joining discussion forums outside of their immediate functional specialism. This just served to maintain the team silos that existed prior to establishing the collaboration platform – just the opposite to what we wanted – an environment where specialists across a range of discipline areas would freely interact and share their knowledge.” This reluctance amongst scientists to engage in free and open discussion has been quite a challenge for Stephen who has been encouraging the use of wikis as a mechanism for knowledge exchange. A wiki platform has been chosen rather than Lotus Notes as it has a very low barrier to entry – participants

can quickly engage in a wiki based community and don't feel so threatened by the formal structure and integrated toolset that Lotus Notes brings to bear. Even so, persuading participants that it is OK to say what they think and they don't have to get permission first from their supervisor, is quite a challenge, and is limiting the effectiveness of the communities so far established.

4.6 Communities of Practice in Local Government

The project looked at the network of communities sponsored by the Improvement and Development Agency for Local Government (IDEA) - part of the Local Government Association, and The Government Exchange (GovXchange) - operated by SOCITM, the Society of IT Management for Local Government.

The IDEAs network was launched in September 2006, and aimed to create a social network, "a Web 2.0 for local government", around a broad theme linked to knowledge management in local government. The network provides a set of workspaces for sub-communities, with facilities such as blogs, wikis, discussion forums, document libraries, event diaries, the ability to conduct polls, and people finders. Another useful feature was the capability for communities to spawn sub-communities easily. Members of the community are also able to set up completely new communities as necessary. The infrastructure for this is provided on the LGA server network, and uses the IBM WebSphere Application Server and DB2 Database. To join a community, one has to apply and be accepted by the community co-ordinator. Communities cover everything from risk management and adult social care, to the Cornish language. Communities are encouraged to have facilitators, and specific training is provided for this purpose, but it is possible to have communities without facilitators.

One of the project members joined a community, the CoP for Innovation, in order to get a feel for the level of activity. Its stated aims were as follows: "We hope this Community will provide a space for inspiring conversations about innovation where we can provide a sounding board for the "burning issues" around innovation in local government." The project interviewed the community facilitator, Noel Hatch, who said that the community had taken off in 2008. It had over 300 members and many active areas of discussion. Most of the members were local government officers working in policy or HR – often connected with performance management. Our project member in the community was struck by its openness. There was a great deal of sharing going on – just as was intended. People didn't seem shy of putting forward their opinions and ideas, and undoubtedly there was a fund of knowledge being collected in the community. The community was well structured, with a wiki and some blogs in active use.

In all the network supports almost 300 communities, many of them with memberships of the order of the Innovation community, and it appears overall to be a very successful initiative in terms of attracting active membership. An evaluation by the company Semantix, which helped to develop the platform, showed that about 12% of members contributed actively, although only 1% created new content – figures that are consistent with evidence from other CoPs.⁴ Steve Dale of Semantix, summarised at a presentation the main lessons he felt could be learnt about what worked and didn't work. There was evidence of greater collaboration between councils and the beginnings of some new ways of thinking, and "continued and growing enthusiasm for community collaboration." On the negative side there was some duplication of roles between CoPs, and insufficient use of tagging.

GovXchange has a series of 'spaces' (49 in all) which interested parties may join and participate in. The stated aim of GovXchange is "to create, collate and disseminate knowledge from across the public sector, based on an active network of communities of practice and interest. GovXchange will not simply be about capturing what people know, it will enable you to make the most of what people know. The key objective is to create a viable and active collaborative network of communities to align policy, strategy and practice supported by case studies, success stories and knowledge sharing."

Some of the spaces are open and can be browsed and contributions submitted at will by participants who have completed a one-off registration. The 'closed' spaces involve registered details being passed to the 'space owner', who then grants access if the participant is judged to be a suitable member. One of the project members registered for a closed space, but had to wait several weeks for a response to be acknowledged, and eventually gave up as it was apparent that there had been no activity on the particular space for several months. In fact many of the spaces seem to have the characteristic of an initial flurry of interest, ongoing participation by a few enthusiasts, but a demise within a few months.

The project interviewed Dr Bernard Gudgin from Oxford Brookes University, who in his role as assessor of some of the government's Gateway projects was an active user of GovXchange. He said that the network is still at an early stage and the jury is out as to whether it will take off and deliver any value. The platform used by GovXchange, MailSpaces from Kinomi, is of interest because of some of the features it provides. MailSpaces is based around e-mail discussion groups. Users' e-mails are automatically analysed, and a topic map representation of them is created. Topic maps are a technique for organising and visualising information, based originally on a generalisation of the concept of an index for a printed work. Topic maps are an alternative and complementary form of knowledge representation to the RDF based systems used for the semantic web, and this general approach is an important one in finding ways to structure the content produced by communities in ways to make them accessible.

4.7 The Institute of Knowledge Transfer - Global Innovation Network

The IKT is a professional organisation for people involved in knowledge transfer activities. It has set up an online social network and Community of Practice, GInnN (<http://www.ginnn.com>), which states that its aims are: "Dedicated to facilitating innovation and business development by bringing together businesses, entrepreneurs, academics, researchers and investors in one place." A member of this project has joined the network and the project interviewed Brian McCaul, Chair of the IKT ICT sub-committee.

Brian explained that several factors had influenced the creation of the network. The Institute of Knowledge Transfer, had an "interest in increasing connectivity", and the network has the facility to have a sub-network directly accessed through the IKT website for its members. The network is also linked to AURIL, the Association for University Research and Industry Links. This originally used JISCmail, the UK academic mailing list service for its communications, and correspondence through this is also posted on GInnN. Another link is with I-techpartner, a collaborative innovation network, set up through the European Community.

GInnN has been implemented using Sossoon, a platform for creating social networks. This provides the typical features needed for an online community, and includes some very interesting facilities, such as VisualSpace, which provides a graphical representation of your place in the network in relation to others, using various criteria in people's profiles weighted according to your personal preferences. This also provides ways of visualising the members of the network as a whole, and "cloud" view of members' interests. GInnN has the ability to support groups with subgroups within them, so that it forms a network of networks in its own right. Groups can be open or restricted. GInnN had nearly 2500 members, and Brian believed that it was "reaching a critical mass."

In terms of future activity, Brian is intending to develop a network based at Leeds University, where he is director of Exploitation and Commercialisation, which would interface with the GInnN network. He plans to do this partly based on the example of a system called Knowledge Pool, which is based on sending e-mails to a group, using only a question of the form – Does anyone know....?, Does anyone have....?, Has anyone got....? Questions can be specific, or more general requests for knowledge, and are replied to directly. Starting as a system developed originally for Manchester University by Mark Thompson, and involving 40 people there, the system now has over 250 people involved from 80 universities in 15 countries. Related to

Knowledge Pool is the IP Pool, which creates a collective portfolio of several institutions' intellectual property, in a format which makes it easy for businesses, who may be interested, to digest the information. An extension of this uses a more continuous automated process, allowing searching and matching of information.

The project members hope to work with Brian and Mark in the future, exchanging experiences of developing innovation communities at individual institutions, but also looking at how these can interact with and be part of wider communities as well.

4.8 Communities of Practice in the NHS

There are a number of initiatives within the NHS aiming to create Communities of Practice. The project looked at one based in the East Midlands, 'The Improvement Network'(TIN). This is described thus: "TIN is for the NHS and its partner organisations, primarily within the East Midlands Health Area. It is for anyone, and everyone, with an interest in improving healthcare services for the benefit of patients, service users and carers."

TIN has a very extensive web site (<http://www.tin.nhs.uk/welcome>), that hosts news and information on a host of improvement initiatives, details of events, links to related material such as job vacancies, and a good deal of background on communities. It was clear that TIN was primarily a source of information, a collection of case histories, and links to yet other sources of information. There were references to a number of communities hosted through other web spaces and a number of these were active. Interestingly, most of these were run as a series of face to face meetings for registered participants.

One doctor interviewed believed there was considerable potential value in these networks, but outlined the main barriers he felt in participating himself. These were:

- i) His current clinical load (for face-to-face communities).
- ii) Difficulty in navigation and finding relevant and understandable topics in on-line communities.
- iii) Access to the necessary ICT services.
- iv) He was more comfortable with a real time discussion format, but teleconferencing or web conferencing facilities were not offered in any of the groups he was interested in.

Another initiative was led by the NHS Institute for Innovation and Improvement, which had sponsored a series of Communities of Practice as part of their service improvement strategy. An example was the 'No Delays Priority Programme', aimed at establishing a community of practice to examine and tackle current commissioning challenges. The plan for this stated that it would consist of 24 members, split into 3 action learning sets of 8. The whole community would meet together initially and then would meet in the smaller groups in 3 locations. It was interesting that this was primarily a face-to-face community, with 6 face to face meetings scheduled over a 9 month period, involving a significant amount of travelling for participants.

4.9 Other Networks and Communities

The project looked at a number of other networks and Communities of Practice and participated in some of them. In order to limit the size of this study, these are not described in detail, but a selection of them are briefly mentioned here. Some of the lessons learnt from these and other examples are included in the later analysis.

West Midlands Higher Education Association – HEART Network

The WMHEA is one of 9 regional higher education regional associations in the UK, and works to encourage collaboration between higher education institutions in the region and with business and government. The HEART (Higher Education Access to Research and Training) network being developed, is a portal to facilitate research and knowledge transfer interchange between business and the higher education community. HEART aims to link expertise to knowledge requirements, using a number of methods, including social networking. The project interviewed the Director of the WMHEA, Helen Brown, whose special area of interest is Communities of Practice, and who has considerable experience both researching and developing CoPs. In her experience, successful communities needed focus. “They falter when there isn't a purpose and timescale.” However, the constraints of projects, such as the concentration on outputs, often were not conducive to innovation, because they discouraged taking the risks that innovation often required. “Project culture doesn't help innovation... Projects are doomed to success.” The project is monitoring the development of the HEART network, and project members hope to be able to work with it in various ways in the future.

The 2Degrees Environment Network

This is a social network (<http://www.2degreesnetwork.com>) involving academics, researchers, and businesses involved in environmental issues. The project has interviewed the founder of the network, Martin Chilcott. A member of the DINCoP project team has joined the network, and is setting up a sub-group within this network for staff at Coventry University. The network provides facilities such as blogs and discussion groups, and has a keyword search system to help match members with similar interests.

Birmingham Science City Energy Challenge Club

This is a network which has been set up to engage businesses with universities in energy related issues. The project is working with the organisers, to look particularly at how different kinds of networking facilities can help the network. Discussions with the RDA, AWM, are also taking place to look at how bringing together of the ICT and Environmental agendas could be facilitated through creating interacting networks and communities from the two areas.

Expertise Transfer Networks in Engineering

Converteam (formerly Alstom Power Conversion), is an engineering company which works in the area of power conversion for the Marine, Oil & Gas, Energy and other industries, and is the world leader in certain market areas. The company has identified transfer of knowledge between experts brought within the company and outside as being a problem which needs addressing, and has set up a team to investigate this. The project is working with this group to look at how this process can be facilitated.

NESTA Crucible and Other Programmes

NESTA, the National Endowment for Science Technology and the Arts, runs a number of programmes aimed at encouraging collaborative innovation. One of these is the Crucible Programme, which brings together a group of researchers from a variety of disciplines for three weekends a year, to encourage interdisciplinary interaction. Feedback obtained from this has indicated that 70% of respondents feel that their experience has made them more likely to collaborate across disciplines in the future. Another programme taking place is Open Alchemy, which brings together, in various sessions, an assortment of non-competing companies linked by having a common supplier (Oracle), with the aim of sparking off innovative collaborations. Roland Harwood, who heads the Connect team at Nesta, refers to a project analysing interdisciplinary collaborations on his blog, and makes an interesting interim conclusion from this. “... Successful interdisciplinary

collaboration thrives in an environment with clear boundaries or controls around process and behaviours, but limited or no controls around the legitimacy or control of ideas.”

A project member has discussed with the project leaders for interdisciplinary and corporate research at NESTA. The aim is to continue working with NESTA to analyse the experience of these and related activities.

Enterprise Architects Anonymous

This is a closed network of IT professionals who all serve in the role of enterprise architects in a variety of private and public sector organisations. What is unique about this network is the solution they have come up with to deal with commercial confidentiality. In order to enable members to share ideas without any fear that they may be giving away valuable information to their employer’s competitors, only one company from any vertical industry sector is invited to nominate a member. The community meets about four times a year. A sophisticated collaborative workspace system, Mayetic, is used to provide online facilities for the network. This provides a wide range of facilities, including blogs, conferencing, polls and support of personal interest profiles. However, usage of this has been small. The group has been active for five years and is about to undertake a review of its achievements and plan how it should operate in the future. It is hoped to be able to look further at the experience of the network in the future.

The Information Authority

The Information Authority has been established as an independent body to set and regulate data and collection standards for all organisations involved in further education and training in England. The project met Dave Briggs, one of the Authority’s change managers, who has recently implemented an on-line community to act as the catalyst for bringing about changes in the way that data is collected from training organisations. Although the community was only launched recently, Dave said he had been surprised at how quickly it has got off the ground and the amount of content it had amassed. He felt that this was for two main reasons. Firstly that the community was the only place that concerns and requirements could be raised by members, and secondly the platform chosen, Community Server (which is the platform behind Myspace), which had been very intuitive and easy to use.

The Learning Support Network

This was a network that one of the authors of this report, Jim, was involved with developing for a SME learning project involving approximately 500 companies. The organisation of the project was complex, with employees in each company involved in a number of different courses, learning champions/mentors in each company, and learning tutors, support workers and administrators involved at a wider level. A key feature of the network which supported the community was the necessity to be able to support various sub-communities efficiently within the structure. Thus the learners, learning mentors, and learning and support staff, formed groups with distinguishable requirements, within the broader network, but it was also necessary to facilitate particular interrelationships between these groups. For instance, a learning mentor would need to be able to provide support for the learners in their particular company. Similarly, learning support workers would provide help to the learning mentors as a group. This model, of a community or network made up of other communities and networks, with various relationships and interactions defined between them, is a characteristic of many systems, which will be discussed later.

5. A UNIVERSITY INNOVATION NETWORK

5.1 Introduction

The aim of this part of the work, was to look at how an innovation network and community of practice could be created at a university. The intention was to draw lessons from this for creating such networks and communities in general, but also to consider how such local networks could interface with a wider community, such as Emerge. The UIDM (User Engagement Model) was used as the basis for this investigation, focusing on the Phase I, user requirements gathering stage. A number of interviews with key stakeholders at Coventry University were carried out, the format of which were broadly based on the methods of Appreciative Enquiry. The approach was thus to emphasise and build on the positive. However, it was also important to understand some of the negative factors as well, and so this was also discussed. Where the interviewees had experience outside the University, from previous employment, for instance, this was also noted and fed into the analysis. Although specific questions were asked about the background to particular networks and communities, depending on the specific topic and the interviewee, the general format of the discussion was around the following questions:

1. What do you feel is working, and what examples of good practice are you aware of?
2. What would you like to see, and what is your vision for how collaborative communities could develop?
3. What do you think are the barriers to innovation, and how can these be overcome?

As the beginnings of the next stage of the UIDM-based analysis, conceptual development of some of the tools and processes to fulfil the identified requirements was also started. This was done mainly as a mental exercise with individuals and groups, using simple paper prototyping and diagrams in appropriate cases.

This section is structured as follows. Through the interviews, a considerable number of examples of good practice which had aspects relevant to the investigation were identified. For reasons of space, only a few of these are described in the form of case studies, and some other examples of good practice are then summarised. This is followed by a synopsis of what requirements, issues and problems were identified from the discussions, as well as suggested solutions, arranged thematically. An emphasis on quoting what was actually said has been made, partly to minimise misinterpreting people's views, but also to give a more direct feel to the discussions and the issues raised.

To provide some brief background about research at Coventry University, the institution has a focus on applied research and a well supported structure for this, with schemes for Applied Research Groups (ARGs), larger scale Applied Research Centres (ARCs) and Institutes. There are over 30 ARGs, 12 ARCs, 4 Institutes, and in addition the University leads three Centres of Excellence in Teaching and Learning (CETLs).

5.2 University case studies

Health Design and Technology Institute

The Institute focuses on the development of new assistive technology products and services for self-management of health and well-being, and the project discussed with the Director of the HDTI, Simon Fielden. The Institute co-ordinates two groups to assist its collaborative activities with the rest of the University. The first of these is an Applied Research Management Group, which includes the leaders of the relevant research groups and centres in this area, facilitating the pooling of research calls and similar tasks. The second is an Applied Research Forum, a much looser grouping aiming to attract a wider layer of interested researchers, with opportunities for people to present their work and make contacts.

As an example of the networking activities that the HDTI has carried out, it organised an awayday for academics to come up with ideas for new projects. The aim was to come up with four ideas, and even though this was achieved, only one was considered realistic, with the others being too vague to pursue effectively. When another away-day was organised within the Institute itself, three viable ideas were generated through this, indicating the lower degree of market knowledge that academics possessed.

The Institute has been able to work effectively with external networks. As an example, a national network with strong regional groupings, called Medilink, exists in their area of interest. Medilink is a non-profit making organisation which brings together medical manufacturing and distribution companies, hospitals, and universities, to disseminate best practice, stimulate innovation, and represent its members at a regional and national level. One of the initiatives organised by Medilink in the West Midlands region is I-Health, which focuses on the use of technology to increase independence and quality of life for older people and for people with long term health conditions. The I-Health portal provides information on business opportunities, events and potential collaborations, and the HDTI has found it an effective network to be part of.

One of the types of activity that the Director of the HDTI considered most useful, were ones which allowed users to directly interact with a variety of service providers, generating valuable information about the gaps in services and facilities that existed, and possible ways that technology could be used to help. An example took place in Wales, and allowed old people directly to present their requirements to the medical and paramedical services, police etc.

In terms of what would help innovation, the underlying need was for ways to develop interaction between different groups and specialities, both within the academic and business areas, and across them. For instance, many of the businesses involved in health technology came from a mechanical engineering background. There was a need to be able to encourage interaction with researchers and businesses involved in areas of ICT, in which considerable new innovation was taking place. One idea was for a kind of laboratory which could encourage experimentation involving different specialisms. It was thought that this could be complemented at a virtual level, with a way for different groups and individuals to post up ideas and requirements, together with ways of bringing together complementary sets of skills and experience for new projects. Creating a version of the HDTI in a virtual world was also considered something that could be very useful in certain areas of work.

Barriers to innovation that were identified centred around the siloing of information within existing university structures. "One of the big problems, is the way faculties have their own objectives, from Deans and Associate Deans, down to lecturers." These "enclaves of objectives" were considered key obstacles, and building on people's "natural inclination to work together", through creating "shared collaborative objectives", was considered one of the key measures necessary to overcome them.

Business Enterprise Works

This is a scheme aimed particularly at new businesses and start-ups. It provides mentoring, training, flexible office facilities, and a network - which was the subject of our interest. The network consisted of over 200 businesses, and organised informal monthly events, as well as more formal events twice a year. The project interviewed several organisers of the scheme and participated in network events, discussing with a number of member businesses. Events typically included a speaker on a topic of interest to smaller businesses - such as funding opportunities or company legislation, a speed dating session - to allow businesses to meet each other and find points of mutual interest, and an informal networking session with refreshments. Academics and other staff from the University were also invited to events, so that possibilities, such as linking research to business activity, and providing student placements with businesses, could be explored.

The potential of a body like this as an "outward facing organisation ... acting to bridge the gap with the University, as an inward facing organisation", was recognised, both by the organisers, as well as participating businesses. The scheme had a website, but this did not support the network directly, and many ideas were suggested as to what could be usefully provided. Within the business community, apart from providing a basic website for each company if they required it, what was suggested was a way of cross advertising

services and requirements and arranging meetings and common interest groups, including organising virtual networking and similar sessions to complement the physical ones.

It was obviously important to exploit the possibilities of research – business connections, “introducing the research community to SMEs.” Linking businesses with the universities teaching and research expertise, could provide many mutual advantages. Some high tech businesses were interested in European and other funding opportunities for research projects, which could be carried out in collaboration with university researchers. The network could also be an ideal way of organising placements and possibly jobs for leaving students. Because the businesses involved were generally quite small, this could provide an opportunity to link to various entrepreneurship schemes within the University. The University has a strong student business focus, which includes a Student Enterprise Centre, Student Business Support Unit, and a Students in Business Society with a scheme providing for mentoring through the Institute of Directors, in addition to an established facility in teaching and research on entrepreneurship education. This potential role of a network as an “introducer” and “facilitator” for interaction between businesses, academics, and students, was considered a “massive opportunity.”

The Serious Games Institute

This Institute combines both a business development and research focus, in the area of applying games technologies for purposes that are not primarily about entertainment. The project discussed with the Director of the Institute, David Wortley, and the Director of Research, Sara de Freitas. A member of the project team is also an Associate of the Institute.

The SGI provides a good example of how networks and communities, which are independent and have different functions, can also be linked in a network of networks, providing a number of synergies and benefits to all parties. As an example, the SGI is the coordinator of a network, the Second Life Science City, which is sponsored by the Regional Development Association, AWM. This consists of a partnership mainly of businesses, which develop technologies, content and services for virtual worlds. The network engages other businesses with a potential interest in the area, providing a number of activities and demonstrators in the use of virtual worlds. The SGI also has a research presence, which is co-ordinated within the university through a Serious Games Applied Research Group, which has broad representation from all areas of the University.

A key role of the SGI is to coordinate a number of activities which allow different networks like these two, and businesses and academics more generally, to be able to interact and collaborate. For instance, it has organised sessions where businesses, such as those involved with the SL Science City network, can tell academics what they consider the research problems and areas are that they consider important. As another example, it operates a fellowship scheme, so that academics can work with businesses in research areas which have business benefit. By creating common interest groups in a number of specific areas, from e-business to new media and artificial intelligence, it is involving businesses and researchers locally together with a range of leading universities and businesses throughout the world.

David Wortley commented on what the main requirements were that needed to be met to foster an innovation community, and what activities and tools could facilitate this. “The key thing is getting people together from multiple disciplines. The SGI tries to do this to facilitate collaboration. When this happens, the whole is greater than the sum of its parts... What are necessary are the right kind of events, combining business, academic and other interests... Hold events that people can immediately see value to themselves from being there.” He also talked about Communities of Practice and the tools to support them. “It’s difficult to institutionalise them and they can’t be imposed. It must be driven by people at the grass roots. The key is building human relationships and trust ... Some tools provide a slick approach. But there is the problem of people being shoehorned into solutions.”

The SGI has done a considerable amount of work looking at using virtual worlds to help develop communities. Many physical events are streamed into Second Life, with parallel events and activities taking place there, such as speed networking sessions. Specific spaces have been created to facilitate this engagement and community building process, with investigation and development being carried out into areas such as the orientation and induction of new users into Second Life.

5.3 Other experience of good practice

A number of other examples of successful interdisciplinary communities had been part of the experience of those interviewed, both at the University and elsewhere. Having an organisational structure around which these could be based, with adequate funding and staff resources to maintain some kind of continuity, was considered an important element in making this work. This could be an Institute or "lab", or a smaller more specific type of unit. Well-known examples in the UK, such as the London Knowledge Lab, Futurelab, Smartlab, Ultralab, Learning Societies Lab, Learning Sciences Research Institute etc., were mentioned in conversation, as well as international examples like Stanford University and MIT. A local example given of the second type of unit, was one from the Business School, the Motor Industry Observatory, which carried out research, and was financed partly by the School, and partly by project work from development agencies.

Having well defined and focused objectives, but with themes that required work across disciplines, was considered an important indicator of successful collaborative networks. Many of the research groups at the University came from a single faculty, or even a single department. However, some naturally crossed disciplinary boundaries, and this helped to foster work across established university structures. An example was the Research Group for forensic psychology and law, which brought together specialists from the psychological and legal fields. Similarly, some research centres, such as the Centre for Media Arts and Performance (CEMAP), had worked with a diverse range of other disciplines, from ergonomics to history, through the range of expertise that it could provide that was of value in different areas. Specific events, and working groups based around a specific area, but where potential for wider involvement has been identified and encouraged, have also proved successful. For instance, a discussion event, organised around a centre based at the University, ACT-UK, which uses virtual reality techniques for construction industry training, was successful in bringing together a range of interested parties, who could see the relevance of the technology and systems used to their own areas. Again, as a slightly different example, the Centre for the Study of Higher Education had organised a series of round table discussion events with cross university representation.

One particular technique has potentially wide applicability, and was used for an event that was part of a collaborative project led by the University, looking at enterprise development within the performing arts. The technique is called Open Space, and proceeds broadly in this way. The session opens with a facilitator explaining the general theme of what is to be discussed by a group, and the ground rules that apply. Anybody can create a group, often done by posting up a topic or idea on an agenda board, or announcing it at an opening session. A large enough single space, or several breakout spaces, need to be provided for group discussions, with flipcharts or wall boards and post-it notes and writing implements etc. provided, so that what is discussed is recorded in some way. People can move freely between groups, and people are encouraged to be "bumble bees", cross-pollinating ideas between different groups. There is no pressure on people being involved in any group if they don't want to. In some variants, this is facilitated by having a bar or food area which can itself become the focus for discussion groups if these happen to arise there.

The system is dynamic, and people can create breakout groups from existing ones, or organise completely new groups, at any time. The outcomes of the discussions from groups as they proceed should be made available for people to look at, in order that commonalities, as well as possible new topics, can be suggested. The facilitator can reconvene the groups for a common session at certain stages if they feel that this would take the discussion forward, and all the participants come together at the end to sum up and reflect. Various

ICT facilities, such as blogs, wikis and social networking tools, can of course help to enable events like this both during and also before and after the event. Events in some cases can go on for several days, or can be linked up over a period of time. Discussions with participants in different events of this kind indicate that the success or otherwise of the technique depends on a number of factors, including the skills of the facilitator, the correct choosing of initial theme, and the general ability to create the right balance between structured discussion and informal and free contact and activity. Where the technique has been successfully applied, participants generally consider it as one of the best group events they have been involved in. Variants and related types of group activity exist, such as bar-camps and un-conferences, which have features suiting particular types of activity, such as software development, for example.

A number of ICT facilities exist to support activities of various communities at the university. The ones that were generally adjudged the most successful, were those where there were structured groups involved in working in relatively well-defined areas and types of activity. For instance, the university has set up Leadership Action Teams, which are involved in developing particular areas of work, such as course approval and review, and improving student retention. These teams, and others working in similar kinds of areas, have had Microsoft Sharepoint sites set up for them. These provide an integrated range of support tools, such as discussion groups, document sharing areas, and blogs, which have generally proved successful with users.

5.4 Requirements for an innovation community - and obstacles identified: What people said

General and cultural issues

There was a fairly widely expressed view, that a "culture of innovation" did not sufficiently exist, and needed to be developed. "Being innovative and enterprising is about the culture of a place. We need to shift the culture of the whole University." Some of those interviewed, with experience of working in the private sector, contrasted the business drivers for universities to those of companies. "One of the obstacles is that we are not market focused. The University doesn't have the same mentality. We don't have that agility, that adaptability." This was considered particularly the case with the organisational infrastructure of the institution. "Administration and finance are not built on enterprise." One of the key factors identified as necessary, was the institution identifying innovation, valuing it, and actively promoting and providing the opportunity for it to take place. "Establishments that have a reputation for innovation, have a way for people to easily innovate, and be supported in doing this."

As could be expected, a very common reason given by staff generally as to why they were not involved with innovation in some form, was the lack of time. This was identified as a problem generally but was particular highlighted by service departments. "It's difficult to do innovation when you have service demands.... People just get grabbed to support the system." Providing opportunities and establishing priorities for innovation were considered key responsibilities that institutions had to take on board. "Providing time for individuals is key." "Innovation must have to have an urgency about it. It has to be a business driver." "What the university doesn't do, is put its best people on the new stuff." "It has to find the right incentives for innovation, some way of harnessing the entrepreneurial spirit, which is visibly rewarded."

The need for support for taking risks came up on several occasions. "The University is a place of intellectual safety and protection. It offers safe exploration and experimentation... You have to have the freedom to do things that are crap... say the stupid things, as well as the sensible things." "It is necessary to have the right to fail ... the ability to test ideas, to be able to experiment to allow refinement before exposure." A view expressed was that this was a problem because of the nature of universities. "The University doesn't have the appetite for significant risk. It has no interest in being at the cutting edge. If you're at the cutting edge, you could bleed. As long as you're not part of the trailing edge, you're OK. If you tried something new and it went badly, you would be criticised. If you did it well, because of the way experience is shared among institutions, others would gain." However, the role of funding agencies, such as the JISC, in offsetting some

of the risk and making development possible that wouldn't otherwise be viable, was generally acknowledged. "We couldn't have done that without it being externally funded, but through it we benefited, but so did the sector."

An interesting model that was suggested, was based on the different individual skills and organisational phases needed to create innovation and embed it in an organisation. "Find people, good at being innovative, not just good at their subject. Spin off the innovators. When the initial work is complete, move them on... You also need to find who's best at startup, best at consolidation etc... The key is the link from the innovators and collaborative activity to the next tier. You need innovators, then those to develop the opportunities, then the consolidators."

Encouraging inter-disciplinary and multi-disciplinary working – and the barriers to it

The importance of developing research and other activity between existing disciplines was generally recognized as representing a key factor for the innovation vital to the Institution's future development. Distinction needs to be drawn between multidisciplinary and interdisciplinary activity. The first involves collaborative work from different disciplines that nevertheless maintains and works within existing disciplinary boundaries, while the second involves an integration of the different disciplines in some form. Although the latter generally holds out more potential for innovation, both of them are important, and a multidisciplinary approach in certain cases could encourage and possibly lead to an interdisciplinary one. One of those interviewed drew attention to a recent Design Council/HEFCE report which stated that, "The consensus of opinion was that multi-disciplinary teamwork organised around a creative, technical and business triangle provides a more robust way of thinking and is therefore more likely to produce innovative solutions to increasingly complex problems."⁵ This reinforced the conclusions expressed in the Cox Review on Creativity in Business, and was seen as applicable generally, not just to design and the creative industries. This was seen as particularly important for Coventry University as a new university, which could not rely on traditional research funding in the same way as longer established institutions. Entrenched general structural factors that inhibited multi-disciplinary working were mentioned by several people. Academic papers that crossed disciplines were often difficult to get placed in the top journals in any field, and different disciplines sometimes had different requirements for publishing. RAE based funding was based on existing discipline divisions, and again made it difficult to break out of conventional categorisations.

Institutional organisational factors were seen as a key barrier to working across disciplines. Up to a point, this was considered natural. "We have shared values, objectives, priorities with people with whom we're familiar... Moving out of this takes us out of our comfort zone." However, there was a consensus that it was a major obstacle when it became institutionalised. Textual analysis of interviews and discussions from the university investigation, showed the most heavily used expression in discussing barriers to cross disciplinary activities was the term "silos". "The biggest obstacle is the siloed mentality." "It's the devil's own job to create something that crosses boundaries." "There is no culture of sharing." This was widely attributed to existing faculty and departmental structures, with targets and finances linked to these. Some of these problems were caused by simple organisational factors, such as different faculties having different accounting methods, thus making it much easier not to cross faculty boundaries. However, many had a deeper rooted basis. "Individual responsibility for individual targets... a vested interest in saying it's mine, not yours." "Individuals may be interested in working with other areas to create new learning and research possibilities for students, but departments have no incentive to give full-time equivalents to one another." One memorable summing up of this was, "We start building bridges - and they send us an invoice." This was seen to be compounded even by measures to support collaboration. "There is an implied ethos of competition between research groups if they are bidding against each other for university resources."

A number of suggestions for ways of dealing with these issues were made. "Targets should be shared." "There is the need to protect ownership but encourage sharing." "You must reward sharing, and visibly show

that.” For a system like this to succeed, it would have to “demonstrate how collaboration would work, how income would be divided etc. Otherwise it is the practicalities that will scupper you.” Generally it was felt that encouraging interdisciplinary work required “a different way of managing it, ... much more subtle strategic management.” It was acknowledged that this was a difficult problem to solve. Based on the experience of other institutions, one of the interviewees remarked that the result of some of these attempts although useful, was nevertheless the “creation of different silos.” Other, more drastic measures, were suggested if all else failed. “Restructure, to remove the old alliances, if necessary.”

Starting off with particular areas which were most conducive to interdisciplinary work, and then using these as pilots to spread best practice, was suggested on several occasions. Games technologies were often mentioned in this regard, with even a suggestion that, “we need to clone the culture from the Serious Games Institute.” Together with this was the suggestion to “pick good potential areas, which need integration.” The environment and design were two areas mentioned several times. Specific projects, funding opportunities or events, were considered a good means of providing the initial focus necessary. “Kick things off via a project.” “Create events, space, then applaud them.” “Generally, funding brings people together.” It was also suggested that it was important to find people who were “natural boundary spanners” from different fields, to facilitate activities.

Looking for best practice, as well as developing it, was considered important, together with finding the institutional champions and mentors to propagate this through the organisation. “Not enough investigation and research is carried out on how other universities do it.” “Exposure to others would help. Visiting places that are innovating.” “Find champions ... to promote best practice.” “Leadership is very important.” Examples were given from interviewee’s experience at other institutions that highlighted key individuals who acted as champions to encourage and drive cross disciplinary activity. This was sometimes kicked off by appointing key individuals with a track record in collaboration. The issues raised in a more general context with regard to innovation, about valuing work carried out, were also raised here. “Serious recognition that you are contributing to knowledge is important.” “Getting credit for what you’re doing.” “Must value sharing and support that... must reward and applaud, not necessarily financially.” It was also believed however, that it was necessary to value other work taking place, and make sure these activities did not take place at the expense of others - “not at the expense of others being dumped on.”

It was accepted that the type of changes required could not happen immediately. “Breaking barriers takes a hell of a lot of time.” “Time, and a certain amount of stirring, are needed to break down barriers.” “The ripple effect is very important. Don’t expect it to work for everybody immediately.” “Culture change takes a long time. It needs space, encouragement and then to be rewarded and praised. A lot is about giving people confidence.” “You need at least four years, especially in the social sciences.” ““Green shoots” need to be nurtured and encouraged.”

Developing communities

Building communities and networks was seen as central to establishing innovation and collaborative working within an institution. A number of ideas were put forward, both on the general principles as well as on more specific practicalities. A member of what has been considered the most successful sustainable EU network believed the key lesson for its success was, “Communities must come together naturally and organically in the first place – not be imposed.” The need for communities to arise naturally was stressed by many of those interviewed. “Communities of Practice are often artificial... you can’t construct a community of practice you can only enable it.” “Communities that work need people who have been through a shared real experience, rooted in something concrete.”

Nevertheless, it was felt possible to encourage communities and create the right conditions for them. “There is a need to get new members of a community on board, and the need for a community building role to be

identified.” “You need facilitation and structure to make it happen.” “You mustn't give messages of control. Members must feel they have control. It must be able to change and adapt. If you don't let it change, it's going to die.” “A policy of openness needs to be built in.” “Real world organic networks are very fluid.”

The key part that the human and social element played, was stressed on several occasions by those who had been part of successful communities. “Lots of successful networks have a very strong social element.” In particular, the importance of "trust", that needed to be carefully fostered, both in the face-to-face and online aspects of the community, was highlighted. Within communities, champions and enthusiasts played an important role. “There needs to be core of people, willing to push hard. Sheer brute drive is sometimes necessary.”

Providing a conducive physical environment for innovation and collaborative activity was raised by many people. “A common place and common events to meet at. Space and time to talk.” “Provide time for people to find things out, to talk to some interesting people.” “Informal meetings and chats.” “Every area should have networking, presentation and other facilities.” More formal environments for ongoing projects and collaborations were also suggested. “What's required is a development laboratory environment. A fairly large open space to put developers, research students, etc., free to work on anything they like, do what they want.” “An innovation lab, where people could work collectively or otherwise as funding permitted. Basically about groups solving problems.” “A whole creativity suite.”

How events should be structured was suggested by several people. “Events need facilitation and structure to make them happen. They need enabling mechanisms.” “Short presentations, interactive group exercises - with a problem to solve. These need to be real problems that matter to them.” “Get the first exchange going. The group will then find ways to continue.” The need to make these sessions interactive was stressed. “Avoid just having experts standing up at the front.”

Supporting tools and resources

There was general agreement on the importance of technology in supporting, but not driving the development of innovation and innovation communities. “It is not technology driven, not about media. But the technology is important – it makes it easy.” “The technology needs to be invisible, supporting.” It was also felt that personal contact was necessary to make online facilities work satisfactorily. “Using virtual media works better after physical meetings.” There was a consensus that there was a lack of available mechanisms that could be used to facilitate collaborations and support communities generally. “You feel you have to invent everything yourself”, was a typical response. A general feeling existed that an infrastructure supporting collaboration - whether in the form of physical space, networking facilities and servers, or software tools – should be easily and universally available.

A key aim of the project was to look at the kinds of tools and services that users required. A number of general principles, as well as specific functional requirements, came out of this investigation. A key issue raised was that there were a multiplicity of different tools available to do most things. However, for a particular tool to be used, it had to fulfil a number of criteria. It had to fit in with people's work practices as seamlessly as possible. This was one reason, that for some well defined groups and requirements mentioned earlier, the use of Microsoft Sharepoint worked well, as it interfaced well with the Microsoft Office suite that most users were familiar with, and which the university software network was based around. An interesting principle, enunciated as the “principle of simplicity”, seemed to have broad support. This was that unless a new software tool was easier and better than an existing one, people wouldn't use it. This was described in a number of contexts with regard to systems that included features similar to existing tools, such as “Unless it is easier than Outlook, people won't use it”, and “It will be used when it's easier than Excel.”

Although common spaces and events for people to meet together were considered important, various systems could assist and complement these activities. “Common spaces are important – but how do you find the person you want to talk to?” Although general communication tools could assist in building communities and networks, there was a requirement for more specific ones as well. “We need something more than discussion forums and blogs.” The principal functionality required was for tools to support collaboration in a number of ways. At any particular time, people had skills and expertise they required to enable some collaborative work to take place. At the same time, they would have expertise they would be able to contribute to a collaboration. The key task was to find a way to bring these together. “A way to find people with points of connection and common ground.” “How do I find who's done something similar?” “A simple but useful mechanism for finding people.” This was considered particularly important for new staff, who would not have had the chance to build up connections outside their immediate area of work. “If you’re a newcomer, how do you find the people to talk to?”

At one level, the idea of having a kind of electronic notice board, for people to post up what was being offered and what was needed was expressed in various forms. An example was given in a non-work related context, of someone wanting to find others interested in playing table tennis. In relation to this, the importance of also supporting social and other contacts, that would feed back on and reinforce work communities, was mentioned on a number of occasions. The advantage of the notice board approach, in a case like this, would be that many people would have interests, including interests in collaborative work activities, that they would not necessarily be able to state explicitly. Browsing through what others had posted up could lead to an initial contact that, directly or indirectly, helped to establish collaborative activities.

However without some way of structuring and focusing information, it would be difficult to find what was relevant to any individual, with the risk of providing too much information to people. This, it was stated many times, would be counter-productive for people already overburdened with dealing with e-mails etc. “It wouldn’t be good enough for me to send out a general notice asking whether anyone knows about something or other.” “There should be a way for people to be alerted only of things that are relevant to them, so that they can then take a look.” A number of people suggested some kind of “database of University expertise.” The university already had a database of academic CVs, qualifications, publications and research activity, as well as a research network web site to support the various research groups, centres and institutes. However, these were generally considered to be more formal systems, mainly aimed at requirements such as the Research Assessment Exercise and external publicity, rather than at internal collaboration. However, the possibility of mining the information stored in these forms and repurposing it, was mentioned.

Several ideas and techniques that were felt could be useful, came up in discussion. The ability to be able to tag information and contacts, either manually or automatically, was mentioned in several contexts. “Have a tagline for each person, that they can create and add to.” The type of system used by Amazon and others, of being able to recommend books through analysing others who had bought similar books to yourself in the past, was referred to, suggesting an equivalent at the university to help filter and recommend potentially useful information, collaborative contacts, etc. The related notion of a friend of a friend network, also came up in discussion. People who had used some of the facilities provided by Innovation Relay Centres, which aimed to support technology transfer and collaboration relating to the EU, including tools to bring together potential partners for funding bids, was commented on, and the possibility of similar systems being made available for local use was suggested.

A way to be able to see the wider picture, and then drill down to whatever level of detail was required, was expressed for information, contacts etc. “A vaguer set of contacts that I can focus in on, as necessary.” The potential of social networks was mentioned on many occasions, and some of those interviewed were members of professional networks, such as LinkedIn. It was felt that creating a new network might not be the best way forward. “That would be a difficult job because of existing social networks.” However the concept of social networks generally, and some of the tools that were part of them, were considered relevant to the

requirements identified. Where this was feasible, augmenting systems that were already used, with additional applications, was considered a good approach. For instance the Research-Research alerting service, which is externally provided, was planning to introduce a feature allowing local information to be included in the database. Implementing this was considered a useful step.

The use of virtual worlds and games related technologies was raised on several occasions, particularly as the university is the base for the Serious Games Institute, and a number of projects associated with this are being carried out by staff in different areas. These were considered particularly important technologies, because they were being used in a variety of different disciplines, and were thus seen in themselves as a catalyst for creating collaborations and for interdisciplinary working more generally. Significant developments carried out with virtual worlds have been using them as social networking spaces, as mentioned earlier, and some work has also been done at the SGI on integrating virtual worlds and social networks. This aspect of combining the two areas was considered to have great potential in relation to developing innovation related Communities of Practice. Similarly, work in combining virtual and real worlds to create composite immersive environments was considered very promising for this area, and was part of work carried out at the SGI and at ACT-UK, the National Centre for Advanced Construction Technologies.

A number of more general issues were raised, which would be important in making any tools or systems implemented usable. It was considered important that these should fit in with how people currently worked, and be fit for purpose for each individual's requirements. Thus some kind of personalisation was considered important, and the fact that applications should be based on supporting the individual. "Self-support mechanisms, that's where technology can come in." The need for tools to be "light", and "light touch", was brought up in several contexts. They also had to be efficient and quick. Some existing systems, where "every screen takes minutes", were mentioned as examples of what would deter users. There was a perception that many existing systems were monolithic and inflexible. The ability to be able to adapt to the particular requirements of the institution, groups and individuals was considered important. Any systems, "must be able to evolve" – was a commonly expressed sentiment.

6. THEORETICAL BACKGROUND – KEY IDEAS AND THINKERS

6.1 The business context for innovation

Within the scope of this report, it will obviously only be possible to touch on some of the theory and background relevant to innovation and innovation communities. However it is necessary, even briefly, to set the context for what is being discussed here. When discussing innovation communities, even though this can be considered a topic in its own right, it also needs to be considered in relation to both innovation and Communities of Practice more generally. Firstly, it is worth considering what innovation itself means. A DTI report defined innovation as "the successful exploitation of ideas, into new products, processes, services or business practices ..."⁶ This emphasises the point, that innovation is not just about ideas, but about their application and productive use as well.

The well known innovation guru, Robert B. Tucker, famously described his view of the current situation when he said, "In most cases today, the practice of innovation can be likened to the mating of pandas: infrequent, clumsy, and often ineffective."⁷ One of Tucker's key ideas on how to remedy this, was the need to embed innovation in business practice. Ideas relating to this came out in our interviews, especially regarding the need to link innovation and innovators to other tiers within an organisation, the start-up developers and consolidators etc. Based on their analysis of how a number of innovative developments had taken place in major businesses, Maletz and Nohria, from the Harvard Business School, proposed the idea of a 'Whitespace' which existed on the edges of an organisation, "the large but mostly unoccupied territory in every company where rules are vague, authority is fuzzy, budgets are nonexistent, and strategy is unclear — and where, as a consequence, entrepreneurial activity that helps reinvent and renew an organization takes place."⁸ As a

general principle, what was suggested as a successful strategy for innovation, was to help create this freer and more flexible environment that could foster innovation, but ensure that it was linked to and embedded in the business processes of the organisation.

6.2 Collaborative networks and communities

Our interest was particularly in how collaborative networks and communities were involved in innovation, and a considerable body of literature has looked at this from a variety of viewpoints. A comprehensive review of the evidence regarding the link between networking and innovation in business, by Pittaway, Robertson and others, concluded that this link could be demonstrated at a number of levels. A number of excerpts from this analysis are quoted, because they give an indication of the variety of ways that networks facilitate and enhance innovative activities. “Indeed, the locus of innovation is no longer the individual or the firm but increasingly the network in which a firm is embedded... Many scientific and technological breakthroughs result from numerous contributions of many actors working in networks... Networking behaviour was identified as significantly boosting the innovation output and competitiveness of firms in a diverse range of industries... At an organisational level, the involvement of managers and lower level employees in professional, industry and cross-industry networks has been found to promote the diffusion of innovations... The more involvement individuals have in these forums the more likely it is that the firms in which they are employed will adopt new innovations... Networks are not only critical for accessing knowledge to create in-house innovations or for the diffusion of technological innovation but they are equally important for learning about innovative work practices that other organisations have developed or adopted... They influence this in a number of ways: firstly, by enhancing access to knowledge - promoting awareness and early adoption of innovations - and secondly, by promoting social interaction, generating trust and reciprocity that is conducive to knowledge transfer... To summarise, with regard to the relationship between networking and the diffusion of innovations, the majority of research highlights the role of individuals and more specifically the importance of interpersonal and informal networking for the diffusion of innovations.”⁹

6.3 Collective thinking

We look now at some of the theoretical underpinnings of collective activity and collaboration. The Russian psychologist, Lev Vygotsky, in his theory of cognitive development, proposed the principle that individual learning develops primarily through social interaction and mediation.¹⁰ Vygotsky’s ideas have contributed to many aspects of the theory of learning, but here we just wish to draw attention to the concept that when considering networks and communities of practice, these are not based on unfamiliar aspects of the human personality, but are in fact the "natural" ways of thinking and perceiving that have been part of our whole learning experience.

The concept of Distributed Cognition is most closely associated with the cognitive scientist, Edwin Hutchins. Hutchins 1995 work, *Cognition in the Wild*, analysed the processes that took place when naval crews navigated a ship. Together with later work looking at flight crews piloting aeroplanes and other studies, he developed a model of collective cognition, which could also include non-human intelligence, such as the autopilot in an aeroplane, for instance. This kind of model, based on the approach that thinking tasks can be distributed and viewed as a collective entity, has been considered particularly relevant in analysing Web 2.0 processes such as social tagging, and should be considered a key principle for innovation communities of the future.

A number of recent works have analysed how collective thinking operates and how it can generate more successful results than even experts. *The Wisdom of Crowds*¹¹ provides a compelling example by looking at the US version of the TV programme, “Who wants to be a millionaire”. This had an average success rate for “Ask the Audience” of 91% over a period of time, compared to 65% for “Phone a Friend.” The book provides

many examples of this principle at work, in cases from guessing the number of jelly beans in a jar, to trying to locate a missing submarine.

What is interesting about examples of this kind, is that although a few individual estimates may be better than the collective one in each case, if one looks at repeated cases, the individuals concerned are not the same, thus demonstrating that the collective opinion is better than any individual expert. What is also interesting is that collections of experts often perform worse than collections of ordinary people, often because of a particular “expert” bias. Even when considering individual experts, the data shows that whatever criterion of success is used, it also correlates with those who collaborate most. For instance, contrary to the popular view of the lone genius, this principle is demonstrated by Nobel prizewinners in comparison to other scientists.

6.4 Communities and Networks of Practice

One of the foremost theorists in this area has been Etienne Wenger, who has carried out extensive field research looking at the experience of Communities of Practice, ranging from midwives to insurance salesmen. Wenger suggested a number of characteristics that defined a CoP, which included:

- i) The Domain: “An “area” of knowledge that needs to be explored and developed.”
- ii) The Community: “People who interact and who develop relationships that enable them to address problems and share knowledge.”
- iii) Practice: “A community of practice is not merely a community of interest. It brings together practitioners who are involved in doing something. Over time, they accumulate practical knowledge in their domain, which makes a difference to their ability to act individually and collectively.”¹²

Very usefully, Wenger and his associates have also looked extensively at software tools that are used with CoPs, and proposed a number of design principles for effective tools. These are: Design for ease of use and learning, Design for evolution, Design for “closeness at hand” (“Solutions that are “one click away” from the tools that members use day-to-day are preferable to those that seem “farther away” from their working environment”), and Design from a user’s perspective.¹³

Some other aspects of Communities of Practice are worth mentioning here. The scientist and philosopher, Michael Polanyi, originated the concept of tacit knowing and tacit knowledge, to describe the concept of what people know, but cannot necessarily express, summed up in the phrase, “we know more than we can tell.” One important potential of CoPs, is as a way of eliciting this tacit knowledge through collective practice, either to make it explicit and documentable in some cases, but particularly to make this knowledge shareable as part of the CoP. Polanyi and others have conjectured that tacit knowledge is particularly important in innovation, where it is the hard-to-define approach and process, rather than information, which is the key to success.

The researchers John Seely Brown and Paul Duguid put forward the concept of Networks of Practice, to describe groupings wider than CoPs, which included more informal social knowledge networks.¹⁴ They suggested that CoPs were a subset of Networks of Practice, and the wider category was useful in defining a range of different groupings, which nevertheless had a number of useful common characteristics. They excluded from the definition groupings such as project teams, as these had more formal control mechanisms and requirements for those that participated. Some of the innovation groupings we are concerned with are better encompassed by the concept of Networks of Practice rather than CoPs, and therefore this is a useful categorisation for us to be aware of.

6.5 Innovation networks and new business models

A number of recent works have popularised the emerging business models, that have both reflected, and also increasingly are the drivers for the development of new kinds of networks and communities. *Wikinomics*¹⁵ describes what could be called the open source model of business, exemplified by open source software and Wikipedia. Although the Internet from its inception was an instrument that ideally suited collaborative communities, it is only relatively recently that it can be said that it has begun to transform the nature of knowledge and how it is controlled and organised. Thus with Wikipedia, for instance, its real significance is not that it is collaboratively created, which of course is the case for commercial encyclopaedias as well, but that it is done as part of a model which is largely peer regulated, rather than centrally controlled.

One of the first books to discuss the new approach was *The Cathedral and the Bazaar*¹⁶, by Eric Raymond, which contrasted the top-down and restricted approach of traditional software development (the Cathedral), to the bottom-up and public approach of open source software (the Bazaar), providing a powerful metaphor for the contrasting development approaches. Successful open source developments, such as Linux and Apache, have also not been significant just because of the scale of collaboration that they embody, but because of the major business input into projects like this which would not have seemed commercially feasible in the past. IBM, for instance, spends about \$100 million a year on Linux development which is available publicly under the open source license terms. Its business rationale is very simple, as it estimates that this would be just 20% of the cost of the development of a comparable proprietary platform. Nevertheless, it is significant that it is making this contribution to a development that it does not control.

This concept is demonstrated in another form, by the way a number of companies now augment their internal research and development efforts from external sources. For instance, the consumer goods manufacturer Procter and Gamble, has elements of over one-third of new products based on ideas from external sources, and aims to increase this to a half. This is facilitated by the type of community, perhaps best exemplified by the Innocentive Open Innovation Marketplace - <http://www.innocentive.com>. This is a community of over 140,000 scientists and technologists and other specialists, who propose solutions to problems posted by "seekers" - businesses and other organisations. Cash sums are available to those who have their solutions accepted.

Such developments are not confined to software or to ideas and research. MIT management professor, Eric Von Hippel, who has studied innovation networks, shows that this is a growing trend in many sectors, including manufacturing. He gives the example of the community involved in kite surfing (similar to surf boarding), where the user community set up a website and began developing their own designs. "The scale and quality of the collective user effort grew to exceed that of equipment manufacturers... As a result, some manufacturers began to shift to downloading and building user designs rather than designing their own. In other words, free user-developed designs began to drive out manufacturer-based development activities."¹⁷

The researcher, Peter Gloor, has termed this kind of activity "swarm creativity", calling the communities created Collaborative Innovation Networks - COINs. He described how they operate as follows: "Like an ant colony ... the entire COIN operates as a highly efficient self-organizing community... unified by a shared vision, shared goals, and a shared value system"¹⁸ These criteria for a CoP have interesting similarities to those given in an analysis of three CoPs, including Emerge, which identified shared goals, shared values and shared symbolic artifacts, as identifying features of CoPs.¹⁹ A key concept which comes out of Gloor's and similar analyses, is that networks like this don't just use the Internet to help the innovation process. It is rather that increasingly the model and ethos of the Internet, and its reflections in social networking and other developments, is also intrinsically the model for how innovation takes place. This is perhaps the most important concept to take from this work, and makes the parallel drawn with social insects very apposite. This is that if the correct conditions for individuals within the system and their relationship to each other can be created, then innovation will be a natural, emergent property of the network.

An interesting aside can be made to this discussion, based on the experience of one of the authors of this report. Peter was a co-author of *The Wikinomics Playbook*, which formed an extra chapter to *Wikinomics* as planned by the original authors, and which was created using a Wiki to embody the principles described in the book. However, the publishers, Portfolio, a member of the Penguin Group, were unwilling to support this, for instance refusing to allow the globe icon that had adorned the original book to be used on the Playbook cover, ironically demonstrating that the ideas expressed in the book were far from being generally accepted by business!

7. SUMMARY AND CONCLUSIONS

7.1 General concepts

Embedding innovation

The case studies and interviews provided a wealth of information on the detailed processes and technologies that were used by a variety of groups and institutions. However, they also brought out a number of general concepts and underlying principles, which need careful consideration. Innovation as a concept is undoubtedly vague, but at least in part, necessarily so, given the breadth that it has to cover, and its undoubted general importance in economic and social development. However defined, innovation has necessarily to be linked to the means of successfully exploiting the processes and technologies that arise from it, if it is to have real value. This requires its embedding in the business practice of an organisation, and this in turn requires looking at every level of how an organisation functions, from its culture and priorities, to the relationship between the different roles of individuals in an organisation, and how innovation comes together with the other components necessary for its successful adoption and implementation. JISC divides projects into different categories, such as Prototypes, Pilots and Exemplars, which reflect the different stages of development and adoption, and an analogous structure and set of processes are required generally for innovation at any level to be successful.

User Communities

One lesson that comes out of the experience of communities examined in this paper, is that successful ones are focused and based on real requirements. Part of this relates to the correct embedding of innovation within an organisation, as mentioned above. However, part of this also relates to the importance of innovation developments being closely linked to user requirements at all stages. This is undoubtedly an important precept in general, but is particularly important when considering innovation, because of the experience described in some examples here, that it is relatively easy to generate “good ideas”, but more difficult to filter and refine these so that they are both viable and generate real benefit. The refinement of the UIDM model, depicted earlier, that was suggested during the process of putting together the Planet project, called for a process of user engagement that was not confined to a particular stage, or even several stages of the project, but effectively needed to be continuous. This has led to the idea of establishing a specific user network and community, that can provide this ongoing contact and feedback, and which fits in with the idea of interacting communities and networks suggested generally here.

The human and organisational environment for innovation

Valuing and fostering innovation needs to be part of an organisation's ethos in a deep sense, with the necessary corollaries of providing time, facilities and freedom for experimentation. Awaydays are accepted as an important way of ensuring staff in some part of an organisation can take part in discussion without interruption and away from the atmosphere of routine work, and this could also be used for specific innovation related activity, focusing on particular problems and issues. An example that was mentioned during the project interviews was that of a Japanese marketing organisation, which hired a bullet train for a

return journey, to provide about five hours in a managed environment without distractions, for staff to work on different tasks that needed collective input. One of the authors of this report, was involved in a similar kind of event, which took place on a three-day journey on a cruise ship, the Aurora. Facilitating activity across organisational structure and discipline-based boundaries, is a key requirement for academic institutions wishing to further innovation. Therefore, removing barriers that form part of current financial and administrative business processes, and creating incentives in the widest sense to allow collaborative activities to thrive, are important measures which need to be taken.

The human side in encouraging collaboration and creating communities is an important theme, especially the need to reward, applaud and support. It has to be recognised that what is needed is a sustained change in approach, which in the main will require an extended period of time to demonstrate its true benefits. This not only relates to an institutional attitude, but also to collaborative skills and approaches which need to be developed among staff generally. The experience of an author of this report who worked on the *Wikinomics Playbook*, referred to elsewhere, bears this out. Those who had experience of using a wiki platform were easily identifiable and were generally more effective in their contributions. In addition, some authors were not willing to accept criticism of their contributions, and in fact left the project. The need to start off small with individual projects, picking areas of particular potential, and building expertise and good practice over a period, is probably the best way to proceed. Understanding the new business models, and how they affect and could potentially transform the academic community, is important. The key aim is to create the right conditions and facilities at the ground level within an institution, which will allow innovation to organically emerge and develop as an intrinsic part of the organisation.

(The illustration shows the Japanese Bullet Train – which one company chartered for its employees to have time and opportunity to come up with innovative solutions)



7.2 Creating communities to support collaborative innovation

Characteristics of successful communities

The importance of developing networks and communities to support innovation is important at many levels. Collaborative activity within communities has particular relevance to this area, where expertise and good practice is normally part of a complex process, and the tacit knowledge embodying this best made available through a Community of Practice. Developing communities is not an easy task. One of the conclusions that could be drawn from the case studies looked at, was that in most cases, on-line communities had not achieved the level of sharing and knowledge exchange that took place through face to face meetings. Part of this can be attributed to the need for more support and training, and a lack of awareness of individuals to the potential of

on-line communities. Greater familiarity with these in general, especially the increasingly widespread use of social networks, should help to make the process of acceptance easier. Cases like the NHS TIN network described earlier, which relied mainly on physical meetings, undoubtedly illustrated that the lack of sufficient online activity hampered and slowed down the development of the community. One conclusion that can be drawn, is the importance of combining physical and virtual activities flexibly. The experience of most of the communities looked at in this investigation showed that physical contact has played an essential part, whether through formal events specifically intended to encourage networking - for instance as organised as part of the JISC Emerge Community, or through informal contacts - as described in one case as enabled by the presence of a water cooler.

A key observation was that communities could be facilitated but not imposed, and that what was needed was to create the right conditions to allow the participants to be in control and develop at their own pace. A number of factors were identified as key elements in the successful development of communities. They had to be a real identified need that could act as a driver for involvement in the community. Champions, leaders and the existence of a social element were important, particularly in getting a community off the ground, but also in maintaining its growth. The need for flexibility and encouragement of informal networking, even as part of more formal activities, was expressed widely.

Many examples of specific environments and techniques to facilitate the development of communities have been described. Laboratory type environments, which can allow the interaction of different projects and groups of researchers, both within and across disciplines, is one example. The Open Space example demonstrates how innovative but simple principles can be used to facilitate a wide range of community building and networking activity.

Connecting communities together

Examples, such as those from European Framework projects, have shown the difficulty of coordinating a large number of partners. But some solutions to this have also been demonstrated, through creating the right kind of sub-structures and sub-communities. However, these solutions in turn had to ensure that effective ways of maintaining common goals across these smaller units were found to maintain the overall cohesion of these projects. As in these examples, a feature of many networks and communities encountered was the existence of distinct component groups within them, and how these interacted with each other and the main community was critical to success. Examples, such as the SGI at Coventry University, have shown that smaller groups with a particular rationale and focus, can coexist with and reinforce larger groups, to mutual benefit, if this relationship is correctly managed. This kind of model is clearly relevant to the future of the Emerge community, with networks and communities based around specific projects and other activities, coming together to maintain and develop a wider community for mutual benefit.

Another lesson from the experience of a number of the network and communities described, is how projects, services, and individuals, can act to connect different communities together, and thus help establish new communities of communities. The MINT network, for example, showed the way that individual Masters students could act as the link between different networks, in this case at different academic institutions, and then in turn help to connect up the other networks and communities that these institutions were part of. Individuals in general, can thus act as nodes to connect communities. Examples, like the Business Enterprise Works network, show that this process can happen at a more general level, so that, as in this case, a network set up to allow businesses to interact, can also be used for wider purposes to link the businesses concerned to the University, and through this potentially link up various business networks to university related ones.

7.3 ICT to support collaborative innovation

Characteristics of successful tools

As long as technology is not the driver, using ICT to complement and reinforce collaborative structures is clearly the correct approach to adopt. Of course, effectively any software tool can be used in some way by a community. However, Web 2.0 applications are intrinsically about collective activity, and thus feature prominently in what has been found particularly useful for communities and networks. The box below shows some of the tools used by the communities looked at in this report. An excellent overview of Web 2.0 tools is provided in a paper by Tom Franklin and Mark van Harmelen²⁰, and this paper will not seek to repeat general points about these tools, but concentrate on the particular aspects of these tools and specific needs that came out of this investigation. Several basic requirements emerged as a general consensus from the case studies examined and the interviews carried out, interestingly tallying very closely with the conclusions drawn by Wenger in his work – ease of use and learning, evolvable and adaptable, “closeness at hand” (close to day-to-day user experience), and designed from the user’s perspective. These principles could be considered ones applicable to software design in general, but in fact were particularly relevant to communities, because the tools created needed to be usable across a wide range of backgrounds and experience.

Tools used by Communities

- E-mail, Newsgroups, Discussion Groups – with capabilities to create subgroups
- Video/Audio conferencing, Chat
- Document and Information Repositories
- Collective Authoring tools/Wikis
- Diary, Scheduling and Meeting Management tools
- Content and Document Management, with workflow support
- Blogs (Personal and Collective), Podcasts/Vodcasts
- Electronic Notice Boards (including with “post-it” features)
- Interest/Activity/Expertise databases – with search/browse/matching tools and visual mapping capability for information and individuals – including tag and other “cloud” representation
- Information mining and analysis tools, including semantic analysis and tagging
- Polling and questionnaire tools
- Virtual Learning Environments
- Social Networking software – with embedded facilities (Social tagging and rating, FOAF, Personal Interest Profiles, Compatibility tests etc.)
- Virtual world meeting/collaboration spaces
- Tools linking other facilities (e.g., Virtual Worlds and Social Networking software)
- Real and Online/Virtual Dragon’s Den events
- Speed networking/dating. Examples of different detailed methods experienced included:
 - Standard (People move randomly after a certain time)
 - Assisted (e.g., People wear badges summarising their interests)
 - Group (Individuals in small circulating groups – everyone talks to everyone else)
 - Computer/Manual Paired/Grouped (The system suggests compatible pairings or groups based on entered information)
 - Computer/Manual Scheduled (People select their preferences based on entered profiles - the system schedules meetings)
 - Virtual (in Second Life or other virtual world)
 - Mixed Virtual/Real, as in the example illustrated below

(The illustration shows a speed networking event for businesses in Second Life organised by the Serious Games Institute, held in 3 physical and 7 virtual spaces concurrently)



Integration and familiarity

Particularly interesting was the principle relating to “closeness at hand.” Evidence from a variety of sources discussed here, including the case of GlaxoSmithKline and the use of Sharepoint at Coventry University referred to earlier, indicated that for most users, the consistency of interface, and close integration of these tools, as well as the seamless integration with other software available to users, offset the restricted and relatively inflexible nature of these products – especially in the case of the single Lotus Notes template used by GSK. This was also borne out by the negative experience of most users with wider suites of programmes that provided greater flexibility, but were not closely integrated. This was generally the experience, for instance, of the Planet project members with the Emerge platform. The overriding conclusion which seems to be suggested, is that users want a single consistent way of carrying out any particular operation, which has close integration and a consistent look and feel as far as possible with the other operations they carry out. This also links closely to the idea expressed by Roland Harwood of Nesta and quoted earlier, that “Successful interdisciplinary collaboration thrives in an environment with clear boundaries or controls around process and behaviours, but limited or no controls around the legitimacy or control of ideas.” This statement also brings up the wider issue of what a desirable environment should provide. Clearly this does not just relate to making the interface familiar and easy to use, but is also about facilitating the various process issues involved in collaborative engagement, such as security, confidentiality, intellectual property, etc.

New metaphors for interfaces

Although closeness to a familiar interface, and integration with other functionality is important, it is also important to consider the fact that the traditional desktop environment itself needs to evolve and develop to fully take advantage of new kinds of facilities. The traditional windows desktop metaphor, derived from the paper-based office desktop, is not adequate to represent information with an intrinsic time dimension and dynamic characteristics. Linked to this is the fact that in a network-centric ICT environment, it is not the location of information which is central, but its content. These insights were the basis for the concept of Lifestreams, proposed by the computer scientists, Eric Freeman and David Gelernter, in the 1990s, which is reflected in various ways in current work on user interfaces. The key conclusion we need to draw, is that ways to represent information which is part of collaborative activity of CoPs and networks must be based on what users are familiar with, but these representations must also be extended and developed, both conceptually and in practice.

Integrating different tools

Although the Glaxo SmithKline example demonstrated the advantages of using consistent and well-defined formats, it also showed at another level that this tying down of what was available acted to inhibit innovation. What this indicates therefore, is that new facilities and tools are required, but that they should ideally be able to integrate at a deep level with the existing environment being used. A common approach is to take a particular application that fulfils a significant part of the requirement and then integrate other tools and add-ons with it. The Planet project chose the wiki, XWiki, for this purpose, for instance, and other applications commonly chosen include WordPress and Elgg. Although it is beyond the scope of this discussion to look at this question in depth, it is worth briefly considering why this is often a problem. At one level, what is obviously suggested is the need for a service oriented approach in the creation and use of tools, that would allow this closer level of integration. This is undoubtedly important, but following this through often uncovers other problems. One is that the level of granularity of many applications, even if they were available as services, would not be appropriate. As an example, the Emerge platform integrates the Elgg social networking system with the Moodle VLE. One reason that this is not as effective from the user point of view as it should be, is that the integration is not very close and several facilities are in fact duplicated.

What one would prefer, would be the ability to merge elements from each application into a new application. Although in principle this could often be done, in practice this would involve onerous and time consuming programming development. This therefore raises the requirement of being able to disaggregate services to make them available at a smaller level of granularity. In practice what one also finds, is that even where services of this kind are available, they are not easy to re-aggregate. One reason for this is that tools and related web services tend to be defined from a viewpoint of technical solutions, not from a user requirements viewpoint. There are different ways of looking at the component services needed that can provide an alternative way of looking at this problem. An outline of this type of approach in rudimentary form is shown in Appendix 1. There are a number of deep issues involved in looking at this problem as a whole, which have relevance to the E-framework and other standards, and this requires further detailed consideration. However it is important to note some of these issues, because they are an important complicating factor when trying to connect communities, and their supporting software systems, to each other.

Limiting information

Several other general requirements can be drawn from the examples examined. One was the principle that providing too much information to a user was as unproductive as providing none at all, as it would be ignored under the conditions of information overload which universally applied. Thus any information made available has to be very focused, appropriate and timely. Using the system also needs to only require a minimum response from the user and the minimum input of information from them. One way that this could be facilitated, was by mining information that already existed, as some of the systems described were able to do. A few of the case studies looked at, also included mechanisms to assist the process of filtering and focusing information. For example, the GovXchange system had a powerful semantic tool that helped to automatically categorise discussions and help visualise them. Mechanisms like this are important, if they make the overall system more usable in any way. However, what was also important to realise, was that very sophisticated techniques involving artificial intelligence and similar methods, although undoubtedly useful, were rarely essential, because as long as the more mundane and routine functions could be very easily performed, the systems were in general intended to be used as part of communities of people who could carry out the more difficult processes required, with the appropriate means of inputting this made available. Therefore in many cases it was the efficiency and accessibility of the interface to the user that was critical, rather than advanced functionality.

Key user requirements

Several functional requirements also clearly emerged from the investigation. A key one was to do with linking and matching - bringing together requirements and their solutions, individuals with others with similar interests in some cases, and complimentary ones in others. As mentioned above, sophisticated techniques are not necessarily required. For instance, physical or virtual "speed dating" events could provide this functionality in many cases, with the supporting software systems playing an important, but auxiliary role. The success of these types of event, which can take a variety of forms, is attested to by their successful use in areas as diverse as business-to-business networking in Second Life, to encouraging creative partnerships in an artists' network, that one of the authors of this report is a member of. Again, as discussed earlier, in certain circumstances this functionality can be supplemented by a number of other techniques, for example, a kind of electronic notice board, leaving it to users of the system to find their own matches.

Social networking systems

The types of recently available system that were considered most relevant for the development of future innovation communities and aroused the most interest, were undoubtedly social networks, together with virtual worlds, especially when integrated together. The Emerge Bazaar, with the associated community radio show, is an excellent example of the concept of creating a combination of social networks and virtual worlds, and this approach can be built on in the longer term to create wider communities. One of the most successful of the networks analysed was the local government IDEAs Community of Practice. This demonstrated that a social network with integrated features that covered most of the requirements of its users, together with the flexibility to create new communities and sub-communities easily, could be very effective. The only significant counterargument to creating new social networks like this relate to the prevalence of existing social networks, and the question of the how a new system can fit into an already crowded space. What was undoubtedly considered best, and would obviously be the aim where feasible of any technical development in this area, would be the ability to be able to reuse the connections and other information embodied in social networks that people were part of, and to be able to flexibly interface different social networks together.

7.4 Communities of Communities - Towards the future

Supporting sub-communities

A feature of nearly all the networks and communities analysed was that they included combinations and collections of sub-communities and sub-networks within them. Therefore, the ability to be able to support these has to be powerful and easy, and the success of the overall community was dependent on how effectively this requirement was fulfilled. In many cases, as the example of the Learning Support Network mentioned earlier demonstrated, the structure of these sub-communities was not a simple hierarchical one, although this was one aspect of many of them. Many different dimensions and groupings of these subgroups had to be able to be supported. What this implies in terms of implementation, is that structures have to be flexible and information driven, for instance using user supplied (and where feasible automatic) tagging to create flexible levels of organisation, rather than being based on pre-defined hierarchies.

Interoperability requirements

When one extends this principle to looking at how these networks and communities as a whole can interact with other communities and networks, and perhaps be themselves part of wider networks and communities, this obviously raises further considerations. Some of the questions discussed earlier, about integrating different applications together, also apply here. One of the examples looked at in relation to the case study of European innovation networks discussed earlier, was the Framework 6 Interop project, which looked at this question from the standpoint of enterprise interoperability. This project concluded that issues of interoperability at many levels had to be considered. There was the question of the system and syntactic

interoperability - so that different networks can exchange information and interact with each other at an infrastructural level. There was semantic interoperability, so that different networks would be able to talk the same language and use terms consistently. This was the domain of tools such as ontologies, that could carry out the necessary translations and mappings. Perhaps most important and also most difficult, was pragmatic interoperability, so that what the interacting systems did was meaningful in the particular context that they were operating in.

Sharing practice – the pattern language approach

These are all complex problems, and it will only be over an extended period of time that general solutions to them will emerge. However, one of the strengths of the new developments taking place, is that they have created powerful economic, social and technological drivers, which continually bring these issues to the surface and attempt to find solutions to them, even if they are ad hoc ones, as with the case of mash-ups, for instance. An approach which could help towards the solution to one aspect of this, and which provides a powerful model for analysing this problem, will be mentioned briefly. This is the pattern language approach, which is the basis for the Planet project. The aim of a pattern language is to extract the key features from successful examples of practice in a particular domain, and represent it in a form so that this experience is reusable. A normal language embodies a set of rules that allows its users to generate sets of sentences that can represent what the users wish to convey over a very general area. A pattern language does the same for a more specific domain, allowing the intention of the user, for instance to build a house, to be translated into the component processes and parts necessary to carry this out. As with a normal language, this allows the creation of a very wide number of possible outcomes. But again, as with a normal language, it limits these outcomes to what is meaningful, which for a pattern language would be that it represents good design in its particular area. Furthermore, again in the same way that the grammar and semantics for a normal language allow it to be divided up and structured usefully, a pattern language allows a specific domain to be similarly partitioned and structured, allowing expertise and activity in the domain to be represented and mapped effectively.

The relevance of pattern languages for connecting communities and networks together is again a parallel with what happens with a normal languages - they allow communication to take place. This concept of pattern languages being a way of creating a “lingua franca”, for a particular domain, was suggested by the IBM researcher, Thomas Erickson²¹. A further analogy, which provides a model with powerful implications linking patterns and interconnecting communities, was suggested by the originator of the concept of pattern languages, Christopher Alexander. Alexander suggested that pattern languages had similarities to genes and gene pools for living species in the natural environment²². If we take a particular human, for instance, they have a particular genetic makeup. The human species as a whole consists of a huge number of variants of this in the total human population, that together form the gene pool for the human species. As evolution takes place, the composition of the gene pool will change, perhaps adapting to local conditions in a particular area, and possibly becoming generally more adapted to the environment. Alexander suggested that a similar process could take place with pattern languages, again allowing them to adapt to certain conditions when necessary, and also to improve.

We could take this analogy even further. Speciation means that individuals can only breed within the group of the same species. This could perhaps have the parallel that a pattern language would be restricted to a particular domain. However, it is also the case, that there is a significant genetic overlap between different species, even widely differing ones, as the estimated 40% of common genes in humans and plants demonstrates. Furthermore, as is now commonplace in genetic engineering laboratories, genes from widely different species can be combined to create new hybrids. The parallel that might be considered with pattern languages, is that interactions between communities of different disciplines could take place, and perhaps the higher level patterns that cross more than one discipline could be identified and developed through this process. Further discussion of these and related concepts is beyond the scope of this paper, but a pattern

language methodology holds out considerable potential for facilitating the interaction of different communities and the development of communities of communities, both within specific domains and across disciplines.

Communities of communities

In terms of the overall principles of what is required, what stands out relates to all aspects of the Web 2.0 approach, from the new social principles of Wikinomics, to the new technology of social networks. This is that what is necessary is to create the right conditions at a personal, organisational, and technical level, so that flexible, dynamic, and self-organising networks and communities interacting with each other, can emerge naturally, develop, and evolve as part of a total knowledge ecosystem. This approach, of communities/networks of communities/networks, bases itself on how individual communities naturally organise themselves, and extends this model to interfacing with other communities. It is very flexible and wide-ranging, covering everything from a specific project-based community, to the broadest interdisciplinary collaboration, and provides the means for these communities to interact and derive benefit from each other. As mentioned earlier, this raises a variety of issues at both a procedural and technical level which need to be solved over time. In terms of these tasks, the existing Emerge community, with the diverse set of networks and communities which are part of it or connected to it in various ways, could be a key focus to enable and drive some of the developments necessary.

At an event organised in October 2007 to look at the future of the Emerge community, one of the models that was discussed, was that of JISC and the central Emerge community organisation continuing to provide support for the individual projects and the members of the community. This was depicted using the traditional concept of the world resting on the back of a giant turtle. To the question as to what the turtle rested on, the answer based on the well-known anecdote was humorously suggested, that it was “turtles all the way down.” However, if we base ourselves on the type of model we have discussed, of mutually interacting and supporting communities and communities of communities, we see that we could have a sustainable model, whereby those doing the supporting, themselves could be supported as part of the overall community. So perhaps, it could be in fact “turtles all the way around” instead!

Turtles all the way around



8. GUIDELINES AND RECOMMENDATIONS

8.1 Key general concepts

- Innovation in its widest sense is vital to economic social and technological development, and must be an intrinsic part of the education system generally, and the HE sector in particular. However, to provide real benefit, innovation must be embedded within educational institutions, sector bodies, and other organisations, and form part of the culture in a meaningful sense. The concept of "whitespaces", and similar ideas, of parts of an organisation that are within it, but are also sufficiently detached and independent to allow them a free and flexible remit to innovate, needs to be considered.
- Innovation needs to be seen as covering a wide area, not just technology. Business process and procedures are a key candidate for innovative development, and innovation in an academic institution and the academic sector must involve not just academic and technical staff, but service staff and students as well.

- Multidisciplinary, and particularly interdisciplinary approaches, play a very important part in innovation. Even when innovation takes place within a single discipline, the methods and techniques that interdisciplinarity stimulates can be beneficial.
- Fostering innovation requires looking at the structures and roles in an organisation to ensure innovation is taken from its initial conception through to its successful implementation and institutional integration. Innovation needs to be organisationally supported, and ways found to surmount the structural barriers and silos that hinder innovation and collaborative activity. Providing opportunities and incentives in the widest sense are key to this process. Shared output targets and similar measures are needed to mitigate the financial restrictions that work against interdisciplinary collaboration.
- Being willing to take risks and make mistakes are important parts of the innovative approach. This needs to be supported and explicit funded as necessary. This does not mean that successful outcomes are not valued or expected. Evaluation of results, and the consequent improvements in the processes of innovation, are possibly even more important than in other areas.
- New business models typified by the open source movement, have important lessons for how individual business benefit can be linked to an open community development approach and are particularly relevant to the development of innovation communities. These models need to be used where appropriate and also examined to see how aspects of them can be incorporated into existing business models.

8.2 Creating and developing communities

- Communities and networks of practice play an essential part in enabling innovation. They can enable processes, such as the eliciting of tacit knowledge, that are difficult or impossible by other means. They are also increasingly a necessity to support organisational structures which are increasingly devolved, and working practices such as location independent working.
- Communities of Practice must arise organically, and be driven by people at the grass roots. They can be centrally facilitated and supported, but not centrally controlled.
- Communities of Practice do not just involve having shared interests. They must include shared activity and practice. Working as part of a community itself requires individuals and groups learning and developing particular skills and methods of working which themselves will be significant beneficial outputs of the community, and which will feed into other communities that those individuals are involved with.
- A number of key factors have been identified as contributors to the development of successful networks and communities, including: Being based on concrete shared issues and expectations; Fulfilling a real need; Having a defined purpose and identified timescales within this. With individuals involved in communities, the building of personal relationships and trust are vital. Factors detrimental to the development of communities that have been identified include a strict concentration on outputs and attendant discouragement in taking risks.
- Space, time, and supporting resources for the individuals and groups involved, are essential conditions for communities to develop.
- Some physical interaction is important for communities, particularly at a formative stage. People need to be attracted to events by ensuring that the benefits to them are easily identifiable, and by providing a variety of activities that will appeal to different people. A range of different methods should be used to

facilitate physical events and meetings, concentrating on ways of encouraging people to network outside their existing friendship groups and helping to bring together individuals with common or complementary interests. Apart from general encouragements for this through the provision of food and drink, entertainment, games and other social activity, techniques such as speed dating and Open Space can be used. Virtual systems, including virtual world representations, can facilitate and complement this, both before, during, and after events.

- Longer term opportunities for collaborative activity are required as the next stage. This can be through a programme of events supported by virtual networking activities between them, or by providing continuity through a general “lab” type of environment, or through specific projects, with the capability of people being able to flexibly come in and interact with these.
- When building innovation communities whether at an institutional or wider level, areas that naturally span other disciplines should be chosen, particularly at the early stages of a community, to act as catalysts for further activity.
- Community building must be seen as a role and set of skills in its own right. Champions and enthusiasts play a vital part in this, and must be identified, encouraged and supported. Innovation will also not be adopted across the board and in a linear fashion. Early adopters, enthusiasts and evangelists must be supported and encouraged.
- Communities are inevitably made up of other groups, networks, and communities. Being able to support subgroups as separate entities, as well as facilitate cross group organisation and the integration of groups with the larger community, are critical factors for success. Flexible facilities, so that groups can be open or closed as appropriate, moderated or not etc., should be provided. This applies to both physical and virtual groups and their combination.
- Where a large numbers of individuals or groups are involved in a community, creating subgroups within these, with different degrees of autonomy, are important to provide successful motivation and make project management effective. However, measures should be taken to maintain the cohesion of the wider community, by ensuring that sufficient project drivers and activities exist across subgroups.
- Continually interfacing with users and user requirements must be a key part of community development, and in general, the more direct this contact can be, the more effective and useful it is. This should be integrated into the processes of the Community of Practice, and how separate communities of users, which may be expressly initiated for this purpose, can interface with particular communities of practice, should also be considered.
- Individuals and communities can act to bring other communities together - individuals through their membership of multiple communities, and communities by being bridges between different groups, such as businesses and researchers. Furthermore, communities set up for one purpose, can develop and evolve to fulfil other purposes through this process. These developments should be actively supported and encouraged, and mechanisms built into communities so that they can flexibly accommodate these changes. The key community at a University, for example, is the student community. The development and use of existing student networks as an innovation asset is often ignored, and holds out great potential.
- Innovation networks and communities should not be seen as entities independent of other networks and communities. As part of the embedding of innovation within an organisation, so should these networks be linked in closely with existing networks, and existing systems themselves be adapted and developed to support innovation.

8.3 The technological framework

- Technology must not be the driver of networks and communities, but is an essential enabler, which can substantially assist and speed up the process of community building. Beware of fitting requirements to tools rather than the other way round.
- Several key factors were found to contribute to the success of tools that support communities. Users prefer tools to be part of a single framework that can integrate easily with their existing software environment. They want to maintain familiar work practices as far as possible, and have a consistency of interface, feel and functionality, so that there is generally one way of doing something, and one place that they can store and find information etc. Environments with restricted choices and formats are acceptable and found to be successful, if this contributes to consistency and ease of use. However, if this restricts ideas being easily and freely communicated, it can be a problem. It is important that issues with regard to security, confidentiality, intellectual property etc. are minimised. Where new tools replace or modify existing techniques and applications, experience shows that they will not be widely adopted unless they are seen as having significant advantages to, and are as easy to use as, what exists currently.
- Other factors that were found to be important were: Approach to problems from the users perspective and way of thinking; Flexibility, and the ability to adapt and evolve; Facilities for personalisation; General ease of use.
- Any new system must take into account existing conditions of information overload. Providing too much information for users, or requiring them to have to contribute more than they have time for, will be counter-productive. It is necessary to ensure that systems can accommodate and be adapted to the available human bandwidth, and developing systems that can optimise this should be prioritised.
- The provision of support, training, and other facilities centrally is important for a community, but the primary source of these must be on a peer-to-peer basis if the community is to be sustainable.
- Although familiarity with existing formats and methods of working is important, also be aware of, and seek to develop, new ways of representing and organising work activity that better support the new types of processes and information being used.
- Key functional requirements that emerged from the views expressed included: A searchable/browseable database of interests/activities/requirements/capabilities; Lightweight discussion/chat facilities; Flexible electronic notice boards to display information, post requests and requirements etc.; Methods to find and filter information according to various criteria; Ways of matching requirements with availabilities of individuals and skills, and matching individuals for various purposes; Tools to help the structuring, classification and visualisation of complex data and relationships. Semantic and AI-based techniques and tools, including methods for automatic and manual tagging, could be important to facilitate these processes. Techniques, such as those used by Amazon, to create affinity groups based on past activity, could also be very useful, together with ways for users to rate and score a variety of items and entities – and have this reflected in how information is chosen and prioritised.
- Intelligent techniques and technologies should be used where feasible. However, no automatic process can match the capabilities of the human brain, and therefore the interface to individual and collaborative human thinking should be facilitated. Automatic methods should be used where possible, to narrow down and limit information that can then be further refined and drilled down into by individuals.

- Virtual facilities that had familiar physical counterparts - such as notice boards, whiteboards, and real-time discussion areas, were useful and generally easy for users to understand because of their familiarity with their real equivalents.
- Social networks and the facilities that they include, such as blogs, wikis and discussion facilities, provide a number of the functional features required to support communities, and also demonstrate the kind of wider social and cultural interaction which could be a powerful component of an innovation community. However, the general “hype” regarding some tools and systems on one hand, and their lack of flexibility on the other, sometimes leads to the inappropriate use of techniques. When looking at creating new systems of this kind, be aware of the high degree of penetration among users that existing systems have. Creating add-ons, gateways and interfaces to existing networks is an option that is worth considering.
- Virtual worlds provide a powerful way of representing collaborative activity, especially taken together with social networking tools, with which they can be integrated. They can be used to provide an unstructured, ‘bazaar’ like, framework, which can encourage the free interaction of individuals and ideas. They can also be combined with live and recorded images from the real world, both for display in the virtual world and in physical spaces, providing powerful immersive environments particularly suited for innovation related activities. Virtual worlds can be particularly useful when reproducing familiar systems available in the physical world, as with some of the facilities to support collaboration mentioned above. However, technical requirements, that currently can act as a limitation on their general use, need to be taken into consideration.
- Collaborative tools and social networking facilities in their widest sense will provide the cornerstone of a system. It is important, however, to look beyond the plethora of different solutions to the underlying user requirement based processes which are needed, and consider the more flexible types of model that can be based on these.
- Sharing practice is central to developing communities, and is also one of the potential major benefits from a successful community. The pattern language methodology is a powerful way of facilitating the representation and use of good practice, and the representation and mapping of expertise and development activity, and should be integrated into the community development process where possible.

8.4 The Future and Next Steps

- Innovation networks and communities need to be seen as part of an emerging paradigm that incorporates new Web 2.0 techniques, but is also a deeper phenomenon. This includes the concepts of collective thinking and intelligence, and the idea of self-organising networks and communities that are defined by shared values, goals, and processes, which develop and evolve primarily through peer to peer mediation rather than central direction.
- The general model for the future which is proposed based on this, is that of communities/networks of communities/networks, with the differentiation of what is inside a community and outside it increasingly being determined by the particular requirement it is fulfilling, rather than any technical or organisational constraint.
- The key advantage this approach aims to provide, is that each community/network can have its own drivers and fulfil its own requirements, whether this is at an individual, group, institutional or wider level, but at the same time it can also help to satisfy the requirements of the other communities/networks that it interacts with and is part of. Thus personalisation and a focus on specific needs and demands can take place at any level, without compromising the benefit at others. In a sense the traditional concept of a

community/network, is replaced by a matrix of relationships which flexibly configure to achieve different objectives and optimise various criteria.

- What is needed therefore is to investigate and develop the conditions, processes and tools, at a personal, organisational, and technical level, that will allow these communities/networks and the knowledge ecosystems which they are part of, to emerge and evolve. This development itself can only be done as part of a Community of Practice that includes and interfaces with the communities that are part of its focus of investigation and activity.
- Work to further this will need to take place on many planes. A pragmatic approach is required at one level, bringing diverse communities together to explore methods of working and practice that can help to interface and integrate them, and from a technical perspective, using mash ups and other ad hoc techniques to investigate how various software systems can interface with each other. At other levels, the infrastructural and semantic methodologies and standards must also be developed over the longer term that will allow the fulfillment of a vision of truly interoperable services at every level of granularity and function.
- The Future of Emerge should be as a Community of Communities – a CoP in its own right, but also integrating other networks and CoPs. The unique position that the Users and Innovation Programme, and JISC as a wider entity, already occupy as the focus and centre of a wide variety of existing communities - and projects and groups of projects that are emerging communities, provides a real opportunity to take this agenda forward.

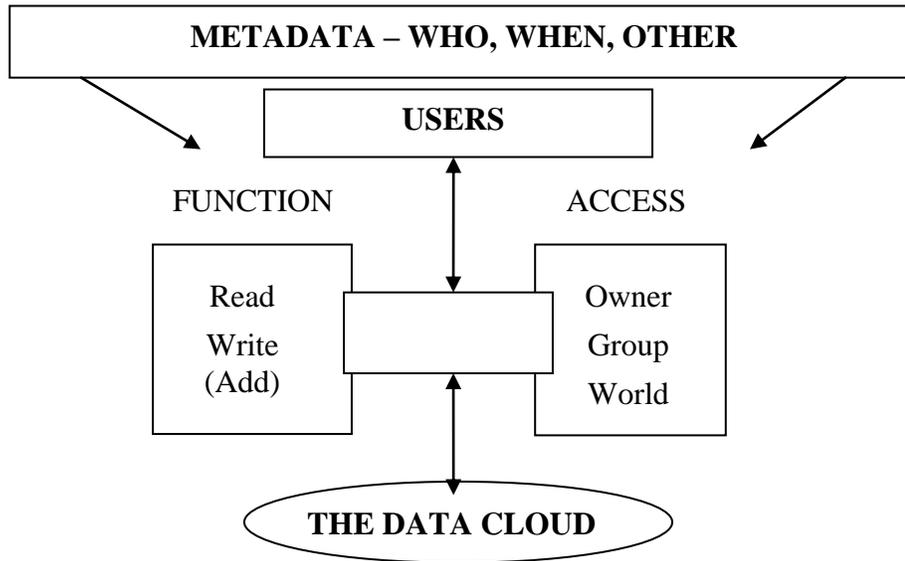
8.5 Recommendations for future work

- An Innovation Network/Community should be developed within Coventry University, involving events and other physical activities, as well as online systems. This should be based on the requirements identified from the interviews carried out, and should try out and develop some of the physical and virtual techniques described in this report. Other institutions may also consider setting up similar systems, and will have a number of commonalities with Coventry University, but will need to carry out their own requirements gathering exercise.
- The Coventry University community should work with other groups developing innovation communities of various kinds mentioned in this report, such as Advantage West Midlands and the Institute of Knowledge Transfer. This could provide direct benefit to the Coventry University community, but would also help to develop the methods, processes and tools to support interacting communities more generally. This community of communities would increasingly seek to work with and include other suitable innovation networks and communities as it develops.
- The Coventry development should work with the Emerge community and its constituent projects, to begin the parallel developments within Emerge, which would help the innovation aspects of it to develop. This could focus firstly on how innovative practice within projects that are part of the Emerge community could be shared within the community, using the Planet project as an intermediary. It could then also look at how this innovative practice could be linked and shared with the Coventry innovation community and the communities that it is working with, and similar institutionally based ones. This would thus help to develop the model of Emerge as a hub for a community of communities, linking individual institutions and their wider innovation communities to each other.

- The importance of ensuring innovation communities are driven by user requirements, suggests the need for investigating the setting up of separate user networks that could be linked to innovation communities as part of the general community of communities model.

Version 1.0

Appendix 1 – A Simple Web 2.0 Software Model



The idea behind this is that we start from an application familiar to users, that of a word processor, and consider a simple system model based on this functionality in a network-centric environment.

The system consists of two blocks, one which determines the functions that are performed, and one which controls who can carry these out. In the “language” that the system implements, any combination of terms from each block is possible. As an example, a word processor in this model allows the owner of some data to read it and write to it. Some of the possibilities are listed below:

Owner - Read & Write	= Word Processor
Owner - Read & Write (Add)	= Diary
Group - Read & Write	= Collaborative Editor
Group - Read & Write (Add)	= Collaborative Diary
Owner/Group - Write, World - Read	= Web Site
Owner - Write (Add), World - Read	= Blog
Group - Write (Add), World - Read	= Collaborative Blog
World – Write, World - Read,	= Wiki
World – Write (Add), World - Read,	= “Bliki”

The advantage of an approach like this, is that firstly it looks at the things in terms of familiar components of the user requirement, not in terms of pre-made solutions, such as blogs, wikis etc. But more importantly, regardless of whether a system based on a model like this were implemented, it suggests experimentation with different approaches and ways to look at solutions that could flexibly adapt to changing requirements. To take an example scenario, individuals could start work on sections of a document separately – as if they were using a stand-alone word processor. At some stage they could collaboratively work on selected documents by changing the access control attributes for them, at the same time as they created a group diary to document what they were collectively doing. Later, as and when they saw fit, they could change the access on selected documents to become parts of a Web Site and a Wiki, and change individual diaries and/or the Collaborative Diary into Blogs. This approach also encourages looking at new types of tool. Listed, for

instance, is the idea of a “bliki”, which combines aspects of a blog and a wiki. Taken with some of the metadata features mentioned below, such as keyword tagging, this would be an interesting tool to consider.

A simple metadata block is shown, and introducing this refinement and ways that this information could be represented, creates a new range of possibilities. By linking time and person related information to the data, a wide range of extra functionality can be provided. For instance, an e-mail thread can be considered to consist of a sequence of reads and appends to a piece of data, with who has access changing over time. A more sophisticated version of this would implement a threaded discussion group. By using this functionality with documents being edited, we have a simple workflow system. If we consider the time dimension as flexible, and able to be both synchronous and asynchronous, we have instant messaging facilities, and so on. It only requires the addition of a few more features, to this model, such as more general metadata/tagging, for it to be able to include the functionality of a more general social networking system.

Note that although this approach provides an effective functional model, useful for understanding and developing features of social networking environments, it is nevertheless limited, and a fuller model must incorporate the more intangible cultural and other features that are part of these systems.

Acknowledgements

The work that this report was based on was funded by the JISC Users and Innovation Programme, and thanks are given to the programme and Emerge support staff for their help and financial assistance. The authors wish to acknowledge the help of the following people who were interviewed for the Project, as well as many others, who provided useful help and information:

Mark Abrams, Director, Business Development Support Office, Coventry University
William Barron, Coventry University
Mike Barton, Interiors and Lifestyle Cluster Manager, AWM
Sally Bean, Independent Consultant, Enterprise Architects Anonymous
Dr Rachel Brazil, NESTA
Dave Briggs, Information Authority for Further Education in England and Wales
Dr. Helen Brown, Director, WMHEA
Dr. Laurie Burrow, Converteam
Roberto Cencioni, European Commission, Information Society and Media Directorate, Head of Unit
Martin Chilcott, CEO, 2Degrees
Cristina Costa, Salford University
Pat Costello, ICT Cluster Innovation Manager, AWM
John Dalton, Vice President for Global IT Architecture, Glaxo-Smith-Kline
Frances Deepwell, Centre for the Study of Higher Education, Coventry University
Dr. Sara de Freitas, Director of Research, Serious Games Institute, Coventry University
Stephen Delusio, R&D US Division, Glaxo-Smith-Kline
Dr Paul Dimmer, Director, IT Services, Coventry University
Prof. Helmut Dispert, Kiel University of Applied Sciences, Germany.
Dr Lorna Everall, Business Development Manager, Coventry University
Dr. Isobel Falconer, Glasgow Caledonian University
Simon Fielden, Director, Health Design and Technology Institute, Coventry University
Prof. Janet Finlay, Leeds Metropolitan University
Prof. David Gillingham, Coventry University
John Gray, Project Manager, Planet Project
Dr Bernard Gudgin, Oxford Brookes University
Christine Hamilton, Director, Institute of Creative Enterprise, Coventry University
Noel Hatch, Community Facilitator, Improvement and Development Agency for Local Government
Peter Hudson, Assistant Director Information Systems, IT Services, Coventry University
Tony Ingall, (former) Head of Messaging Standards, Glaxo-Smith-Kline
Tim Luft, ICT Programmes Manager, Coventry University
Prof. Joe Luca, Edith Cowan University, Australia
Dr. Gideon Maas, Coventry University
Prof. Malcolm Macintosh, Coventry University
Louise Marjoram, Coventry University
Prof. Ian Marshall, Pro-Vice-Chancellor (Research) , Coventry University
Brian McCaul, Chair of ICT Sub-committee, Institute of Knowledge Transfer
Dr Mark McMahan, Edith Cowan University, Australia
Yishay Mor, London Knowledge Lab
Dr Sue Moron-Garcia, Centre for the Study of Higher Education, Coventry University
Prof. David Morris, Coventry University
Patrick O'Neill, Energy Challenge Clubs, Birmingham University
Prof. Keith Popplewell, Coventry University
Mark Schneider, Business Development Manager, Coventry University
David Simoes-Brown, NESTA

Prof. Denise Skinner, Coventry University
Prof. Mike Tovey, Coventry University
Dr Nigel Trodd, Coventry University
Peter Walters, UK National Contact Point, EU FP7
Dr. Steve Warburton, Kings College, London
Stuart Webb, Head of Innovation Clusters & ICT Policy, AWM
Phil Wells, Head of ICT Cluster, AWM
Anthony Williams, 'The Wikinomics PlayBook' contributor
David Wortley, Director, Serious Games Institute, Coventry University
Peter Yeadon, Director, CRM and Portal Development Unit, Coventry University

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