

	<p><b>OPAALS PROJECT</b></p> <p>Contract n° IST-034824</p>
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## **WP8: Open Source and Open Knowledge**

### **Del8.3 - Review of Open Knowledge Initiatives**

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#### ***Successes and Failures.***

### **Evolving Characterization of the OSS 2.0 Phenomenon**

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This document aims to critically map out a number of open knowledge initiatives to abstract some core ideas that we believe are applicable to areas, issues and questions beyond software. These abstractions guide our understanding of what we term OSS 2.1.

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## Dependences:

<b>Work Packages</b>	This deliverable affects a number of work packages namely: WP-7 Community networks and digital ecosystems WP-10 Sustainable community building
<b>Partners</b>	This deliverable may be of interest to the following partners: CreateNet London School of Economics
<b>Domains</b>	The domains of Open Source Software, Open Knowledge, Issues taking us beyond software and Global Software Development are extensively discussed in this deliverable.
<b>Targets</b>	Targets of this deliverable include: Domain researchers OPAALS community



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## Executive Summary

*This document aims to critically map out a number of open knowledge initiatives to abstract some core ideas that we believe are applicable to areas, issues and questions beyond software. These abstractions guide our understanding of what we term OSS 2.1. In deliverable 8.1 a number of ideas emerged that helped make sense of how open source has moved away from a more ideological software development process to a more mainstream commercially viable approach to software creation. This evolution of open source was termed OSS 2.0. As mentioned by Fitzgerald and elaborated in this deliverable open source is no longer only about software – the core ideas of open source of sharing, collaboration, transparency community etc have been adopted by areas and disciplines other than software engineering. There is open content, open innovation, and open science to name a few. Our current work focuses on a number of such projects to understand this change in open source, open source adoption by companies and the manifestations of open source today.*

*The three cases we focus on include Wikipedia, Google Answers and SourceXchange. We chose the former because it is universally considered to be a successful example of open source beyond software. The latter two cases did not survive long but both cases give us insight into the issues that open source adoption can entail. We began in Milestone 8.1 with a simple definition of success (for open knowledge based initiatives) – a successful open knowledge initiative can be understood in terms of how dynamically and often it is used, accessed and receives contributions, and leads to different trajectories of research, interest – or any sort of growth. This deliverable, with its study of a number of open knowledge initiatives aims to focus and clarify this definition over the process of its unfolding. Our focus shifts from a purely open source software perspective to what characteristics of open source have travelled from software production to open knowledge initiatives.*

*Our study and implications from all three cases indicate the influence of business models that have been adopted by open initiatives. The number of innovative open business models has steadily increased. The deeper focus on the business models of company use, acceptance and adoption of open source and/or open source ideas is what we name OSS 2.1 (in keeping with Fitzgerald's OSS 2.0). OSS 2.1 develops the business models aspect of OSS 2.0 further to include the supply and process view that has emerged very strongly from the greater commercialization of open source. The more commercial application of open source ideas, software or process – open-sourcing – thus drew our attention. This phenomenon is explained in detail keeping in mind the innovative open business models appropriated by different companies. The final sections of this deliverable focus on characterizing open-sourcing but more specifically the OSS 2.1 aspect of open-sourcing (i.e. the purely process-oriented business models of open-sourcing) and very importantly, how they apply to OPAALS and its aim to create a Digital Ecosystem.*

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# 1 – Introduction

This document aims to critically map out a number of open knowledge (OK) initiatives to abstract some core ideas that we believe are applicable to areas, issues and questions beyond software. These abstractions guide our understanding of what we term OSS 2.1. In deliverable 8.1 a number of ideas emerged that helped make sense of how open source has moved away from a more ideological software development process to a more mainstream commercially viable approach to software creation. This evolution of open source was termed OSS 2.0 (Fitzgerald, 2006). As mentioned by Fitzgerald and elaborated in this deliverable open source is no longer only about software – the core ideas of open source of sharing, collaboration, transparency community etc have been adopted by areas and disciplines other than software engineering. There is open content (Bezroukov, 1999; Cedergren, 2003; Keats, 2003; Pfaffenberger, 2001), open innovation (Chesbrough, 2003; Chesbrough *et al.*, 2007; Gallagher and West, 2006; West, 2007; West and Gallagher, 2006a; West and Gallagher, 2006b; West and Lakhani, 2008 (forthcoming)), and open science (David, 1998; David, 2003; David, 2004) to name a few. Our current work focuses on a number of such projects to understand this change in open source, open source adoption by companies and the manifestations of open source today.

The three cases we focus on include Wikipedia, Google Answers and SourceXchange. We chose the former because it is universally considered to be a successful example of open source beyond software. The latter two cases did not survive long but both cases give us insight into the issues that open source adoption can entail. We began in Milestone 8.1 with a simple definition of success (for open knowledge based initiatives) – a successful open knowledge initiative can be understood in terms of how dynamically and often it is used, accessed and receives contributions, and leads to different trajectories of research, interest – or any sort of growth<sup>1</sup>. This deliverable, with its study of a number of OK initiatives aims to focus and clarify this definition over the process of its unfolding. Our focus shifts from a purely open source software perspective to what characteristics of open source have travelled from software production to OK initiatives.

Our study and implications from all three cases indicate the influence of business models that have been adopted by open initiatives. The number of innovative open business models has steadily increased. The deeper focus on the business models of company use, acceptance and adoption of open source and/or open source ideas is what we name OSS 2.1 (in keeping with Fitzgerald's (2006) OSS 2.0). OSS 2.1 develops the business models aspect of OSS 2.0 further to include the supply and process view that has emerged very strongly from the greater commercialization of open source. The more commercial application of open source ideas, software or process – open-sourcing (Ågerfalk *et al.*, 2006b) – thus drew our attention. This phenomenon is explained in detail keeping in mind the innovative open business models appropriated by different companies. The final sections of this deliverable focus on characterizing open-sourcing but more specifically the OSS 2.1 aspect of open-sourcing (ie the purely process-oriented business models of open-sourcing)<sup>2</sup>.

The strategies employed by commercial companies towards open source adoption or adoption of open source ideas are, in our opinion, very useful for OPAALS. OPAALS, with part of its focus on regional and community development can potentially use ideas of open source, and especially OSS 2.0, and OSS 2.1 to build a more effective digital ecosystem which relies on collaboration rather than competition. Collaborative competition as a model of adoption of

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<sup>1</sup> An understanding of a failed project for us would imply the opposite of most, if not all, of the key points in our definition of successful.

<sup>2</sup> We thus refer to the idea of the process view of open business models in open-sourcing as open-sourcing: OSS 2.1 where OSS 2.1 is one aspect of open-sourcing and does not imply the two words are synonyms.

open source or open source ideas is a trend that is beginning to become very acceptable by SME's and larger companies and has relatively recently become the focus of some attention (Ågerfalk and Fitzgerald, 2008; Ågerfalk *et al.*, 2006b). The conclusion of this deliverable ties together the implications of this work on open knowledge initiatives and OSS 2.1 for OPAALS.

### **1.1 - Relevance of this Research for OPAALS**

This area of research is in its infancy because academics are just beginning to explore how open source ideas are useful for questions that explore something other than software development (the idea of open source beyond software). Large businesses are leading the way in exploring open source and open ideas. Global companies such as IBM, HP and Sun Microsystems (to name a few high profile ones) were the first to step into this unknown terrain. Many such companies use, adopt or co-create open source software, however their adoption of open source is more than software. Large companies are improvising with new and very innovative business models that borrow much from the open source movement. Our current research develops this theme in greater detail in the latter sections of the deliverable.

It needs to be reiterated that this research is treading on new ground and that OPAALS and its funding can indeed in this and other deliverables lead to much ground-breaking research. Our work on open source has real potential application for OPAALS and our deliverable makes strong indications towards this idea. It will however, be deliverable 12.6 which intends to carry out real empirical data collection in a number of firms that will indicate more conclusively just how open source ideas can be manipulated for greater effectiveness in building a digital ecosystem. In order to do follow-up research we need to build a strong base and the current deliverable is the result of much study of various kinds of literature that helped us to garner the needed background in this area.

The aim of this work is build on what is already known about open business models and to then seek an overlap or possible application for OPAALS. Interestingly enough, though most companies that originally moved towards open ideas were global and very large firms a more recent trend has been in the area of SME adoption of the same. We often find in such a case that SME's group together and collaborate and thus in our understanding begin to operate as one large firm in order to reap the benefits of open and innovative business models and ideas. This in a very natural way is beginning to lead to business ecosystems. Our follow-up study will focus on both large companies and small to medium start-ups that have adopted, create or employ some open source ideas. This will then help to strengthen our understanding and framework for open-sourcing (explained in Section 5). The point of the current deliverable is to build a framework to understand open-sourcing. As Section 7.5 indicates there is early and strong indication that such ideas and their application can help create a self-sustaining digital ecosystem where SME's are better able to survive and compete with larger organizations.

### **1.2 - Definition and Typology of Open Knowledge Initiatives**

This section aims to develop a working definition and typology of OK initiatives. The working definition will help clarify some of the key concepts developed in this deliverable. The main challenge of the typology is to convey a sense of the variety of OK initiatives while identifying and characterising some of their basic dimensions. The proposed framework will help contextualize the discussion on the two aspects of the sustainability of OK initiatives which are developed in the next section.

### **1.3 - Working Definition of Open Knowledge Initiatives**

All communities are knowledge communities. Meaningful participation in all types of communities requires and generates tacit and explicit knowledge about processes, people, rules and ideas, tools and artifacts. The term 'initiative' refers in this deliverable to an identifiable project which is built around the pursuit of a specific enterprise. The term 'open' refers to the open character of participation, the fact that in principle anyone can participate,

regardless of their gender, professional credentials, ethnicity, or age, and the willingness to produce and share knowledge freely.

These two characteristics of OK initiatives have been associated with the emergence of peer-to-peer modes of production, where the use of information and communication technologies (ICTs) supports new distributed ways of collaboration which usually rely on a modular model of organizing tasks and take place in the context of a gift economy, where participation is predominantly volunteer. This novel, according to many, form of collaboration results in highly complex goods, which are more than the sum of their parts.

The distributed character of collaboration refers a) to the specificity of a framework of coordination and governance that does not rely on top-down managerial control, or market and price mechanisms b) the geographical dispersion of the participants. Benkler (2006:100) defines “modularity” as the “property of a project that describes the extent to which it can be broken down into smaller components, or modules, that can be independently produced before they are assembled into a whole”.

The gift economy underlying novel forms of collaboration has been predominantly associated with the values and norms of the hacker culture, namely reciprocity, peer-review and the free flow of information (Himanen, 2001). In addition to an ethical, normative framework for collaboration, however, the gift economy also represents a system of economic transactions. In contrast to the market economy, where commodity and monetary exchanges are driven by the pursuit of gain and take place within a space shaped by scarcity and impersonal efficiency, the high tech gift economy is seen to be characterized by redundancy and to constitute a system of transactions among individuals who give unconditionally in order to freely benefit from the collective effort.

For the purposes of this deliverable, therefore, ‘open knowledge initiatives’ refer to a wide range of, predominantly, volunteer online communities that use the communicative and collaborative potential of ICTs to organize the production and dissemination of complex goods. In the course of our investigation goods may include outputs characterized by a high degree of overall coherence such as software, scientific outputs and more generally, content or may consist of distributed infrastructures that are emerging through the sharing of hardware and software resources. These communities have been described in various terms in the prevailing literature. Von Hippel (2005b), for example, described the model underlying F/OS development as ‘user-led innovation’. Benkler (2004; Benkler, 2006) talks more broadly about ‘commons based peer-production’ and ‘social production’ and more recently Bruns (2008) coined the term ‘produsage’.

Because collaboration represents a fundamental characteristic of OK initiatives, the terms OK initiative and open knowledge community are often used interchangeably. However, the many failed efforts to mobilize volunteer participation and create communities around specific projects, as indicated, for example, by the hundreds of projects on SourceForge Net<sup>1</sup> that have failed to take off, prove that an open initiative does not necessarily lead to the creation of a thriving community.

The concept of community adopted here is an instrumental one and draws from the communities of practice perspective (Lave and Wenger, 1991; Wenger, 1998). A community of practice is a community which is built around an enterprise that its members pursue by engaging mutually in actions that they negotiate with each other on the basis of a shared repertoire of vocabularies, practices, tools and processes.

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<sup>1</sup> SourceForge Net (<http://sourceforge.net/>, last accessed 22/03/08) is an online repository that hosts thousands F/OS projects.



## 1.4 - Typology of Open Knowledge Initiatives

The proposed typology is based on four dimensions of OK initiatives. The first dimension concerns project size and community profile. The second considers the different types of knowledge domain around which open knowledge communities are built, the outputs that they generated and their demand for overall coherence. The third dimension focuses on the types of skills required in different projects and the opportunities for learning that are provided to potential contributors. Finally, the fourth dimension examines the governance and institutional framework underlying different types of communities. The suggested typology is not intended to be exhaustive, but aims to provide a framework for understanding some of the key characteristics of OK initiatives.

## 1.5 - Project Metrics and Community Profile and Demographics

This aspect of OK initiatives concerns their profile in terms of size, dynamism, maturity and patterns of cooperation. At a very basic level such a profile can be built through the compilation and analysis of some key project metrics such as the number of active contributors, the life-span of the community, the level of activity observed in its various phases, and the completeness of its outputs. The widespread availability of publicly archived data which are generated through commons based peer production projects makes this task easier. Free/Open Source software projects and initiatives like Wikipedia leave behind them a complex trail of different types of data which are generated from the different types of tools used within the context of development. These include mailing lists, forums, wikis, repositories where the contributions are submitted, and other types of databases. In many cases, project statistics are generated by the communities, as this allows them to track progress and coordinate their actions.

The analysis obtained through data mining, the technique from obtaining and cleaning data from online public archives, and the use of innovative visualization techniques can lead to significant insights on the dynamics of collaboration and participation in OK initiatives and the way that these evolve over time. In an examination of the profile on projects on SourceForge, an online repository that hosts thousands F/OS projects, Krishnamurti (2002) discovered that only 19 out of 100 projects had more than 10 developers. This led him to argue that the community-based model of development should be revised as a general descriptor of F/OS development. In an early study of cooperation in the GNOME project, for example, Koch and Schneider (2002) demonstrated that individuals work in relative isolation on the different parts of the project, with only a small number of developers working together on the same file. The same study also indicated that the GNOME project has a stable core group of developers. Similar studies in other types of projects, like, for instance, in Wikipedia (Priedhorsky *et al.*, 2007), have observed similar patterns, whereby a very small number of individuals is responsible for the majority of contributions.

The availability of the data does not ensure, however, that the view of the community that emerges through their analysis is complete. For example, changes in membership criteria can have an impact on the way a community's boundaries are drawn (O'Mahony and Ferraro, 2004), and on defining who counts as a contributor. Consequently this dimension of open knowledge communities needs always to be viewed in connection with the others.

## 1.6 - Knowledge Domain, Focus and Demands for Overall Coherence

Commons-based peer production communities' domains range from well-established fields of knowledge, such as science and technology, to emerging areas of expertise such as the cultural creations produced in the context of online gaming environments. Equally diversified are peer production's outputs based on the degree of coherence that characterizes them. For example, in some cases the products of collaboration are not distinctive artifacts but the pooling together of computational resources or the generation of metadata. The following classification builds on the one developed by Benkler (2006).

## 1. Software

The F/OS software movement represents the most characteristic example and, in many ways, the template for peer based production. The reasons for this are the movement's numerous successes, which have demonstrated that this model provides a viable alternative to proprietary based, market driven production, its clearly articulated values, collaborative practices and tools and the fact that it has been widely studied.

## 2. Uttering content

This category is very broad and covers many different forms of content. The most well-known and widely documented example of user driven content production is Wikipedia, which is examined in depth in subsequent sections. Another type of content is the one generated by volunteers performing seemingly mundane tasks which cannot be easily automated. In recent years several initiatives have organized such contributions in the science domain. Stardust@home<sup>1</sup>, an initiative hosted by the university of Berkeley, that pulls together volunteer efforts to spot interstellar dust is an example of this type of initiative that has been labelled 'crowdsourcing'. NASA's Clickworkers was another, older, initiative that aimed to organize efforts to survey and catalogue Mars' craters. A more substantive form of content production in terms of skills and commitment is the one generated in the context of online games and media environments. Second life<sup>2</sup> an online virtual world, has been largely developed by its users who are using the tools and the platform provided by the company behind the project, Linden labs, in order to construct their own environment and interact with the other users of the system. Another well documented example of peer content production is fan art and fiction (Jenkins, 1992).

## 3. Relevance and accreditation: the generation of metadata

This form of peer-production involves user generated assessments, rankings, and accreditation of people, products, services and different types of content. Benkler (2006) gives as an example Amazon's users who write up book reviews, assess them, create reading lists and evaluate the level of service of third-party booksellers. Two other, well known examples of this type of peer-production in is Slashdot, a technology oriented news website that is co-produced by thousands of users posting stories from other sites and Digg, a community-based news article popularity website. These websites employ a comprehensive platform for facilitating commentary and the ranking stories according to their interestedness and accuracy by combining [social bookmarking](#)<sup>3</sup>, [blogging](#), and [syndication](#)<sup>4</sup>.

## 4. Value added distribution

This type of peer-production involves the repackaging and consolidation of information and cultural goods that belong in the Commons in order to facilitate their distribution. One of the earliest examples of this type of initiative is Project Gutenberg<sup>5</sup> a volunteer effort to digitize, archive and distribute cultural works. Open content alliance<sup>6</sup>, another project of this category, is a consortium of non-profit and for-profit groups dedicated to building a free archive of digital text and multimedia as is wikisource<sup>7</sup>, a Wikipedia initiative that aims to build a free wiki library of source texts.

<sup>1</sup> <http://stardustathome.ssl.berkeley.edu/>

<sup>2</sup> <http://secondlife.com/>

<sup>3</sup> Social bookmarking is a method for Internet users to store, organize, search, and manage bookmarks of web pages on the Internet with the help of metadata (Wikipedia, [http://en.wikipedia.org/wiki/Social\\_bookmarking](http://en.wikipedia.org/wiki/Social_bookmarking), last accessed 04/04/2008).

<sup>4</sup> Web syndication is a form of syndication in which a section of a website is made available for other sites to use (Wikipedia, [http://en.wikipedia.org/wiki/Web\\_syndication](http://en.wikipedia.org/wiki/Web_syndication), last accessed 04/04/2008P).

<sup>5</sup> [http://www.gutenberg.org/wiki/Main\\_Page](http://www.gutenberg.org/wiki/Main_Page)

<sup>6</sup> <http://www.opencontentalliance.org>

<sup>7</sup> [http://wikisource.org/wiki/Main\\_Page](http://wikisource.org/wiki/Main_Page)

## 5. Sharing of processing, storage and communication platforms

This form of peer-production concerns distributed computing projects that pool together volunteer resources, by making use of the contributors' computers' idle cycles, in order to build supercomputers and massive data storage and retrieval systems. These include projects like FightAids@home<sup>1</sup>, a biomedical distributed computing that uses biomedical software simulation techniques in order to search for ways to cure or prevent the spread of [AIDS](#) and [HIV](#), and Folding@home<sup>2</sup>, an initiative focusing on the understanding of protein folding and how this is linked to disease.

### 1.7 - Skills, Recruitment and Learning

This aspect of OK initiatives concerns their profile in terms of the skill sets that they encompass, the knowledge required in order to be able to participate, and the learning opportunities and support afforded for new members.

The variety of OK initiatives presented in the previous subsection gave a sense of the wide spectrum of skills that their members need to possess. In some instances, as in case of distributed computer projects, it appears that the only prerequisites for participation is ownership of the necessary material resources, a computer and an Internet connection, and the willingness to participate. In others, for example, in open source software communities, the skills normally required, namely programming, are more demanding and specialized.

Besides possessing the right kind of skills, however, participation in some OK initiatives generally involves an understanding of the communities' social norms, and of the tools, the processes and practices underlying development. In the case of F/OS software communities, for example, new programmers need to:

- Learn how to use specialized tools, like version control systems,
- build an understanding of the overall architecture of the projects, of how its different parts fit and work together,
- conform to the specific style and requirements for code contributions,
- learn how to receive and respond to criticism,
- familiarize themselves with how the release process of new versions of the software is organized,
- develop a sense of the division of labour in the community, of who is responsible for what,
- learn how to go about searching for information,
- learn how express themselves on mailing lists in order to elicit a positive response

In addition, there is a distinction to be made with regard to the breadth of skills and the types of expertise employed within the context of OK initiatives otherwise known as boundary spanning (Dube *et al.*, 2006). The more interdisciplinary a project is, the greater the degree of its boundary spanning. Moreover, some projects offer more diverse opportunities for participation than others. In Wikipedia, for example, contributors can be engaged in a wider variety of tasks, such as those contributing to a distributed computing project.

For these reasons, learning, especially in the case of communities focusing on the production of complex goods, where quality is an important issue, is crucial for renewing and broadening the basis of participation and sustaining the momentum of development. Stardust@home offers, for example, tutorials in order to train volunteer to discern and correctly identify impacts of interstellar dust. Wikipedia provides extensive documentation on the meaning of the different terms, on how to get started, on what counts as an acceptable link, etc. The

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<sup>1</sup> <http://fightaidsathome.scripps.edu/>

<sup>2</sup> <http://folding.stanford.edu/>

availability and comprehensiveness of learning resources forms then another important dimension of OK initiatives.

## **1.8 - Governance and Institutional Framework**

The success of OK initiatives hinges upon how successfully they can harness and integrate contributions of different scale, complexity and consistency: from sporadic or one-off to regular and sustained over time. The notion of governance refers here to the processes, rules and norms that are employed in order to achieve this. These include the contractual framework, the norms and principles of participation and cooperation, informal and formal rules of decision making, processes of quality control, how membership is defined and how the community is represented to the outside world, where such a need exists. The governance framework needs to be viewed in connection with the communities' institutional framework which is shaped by the various stakeholders that participate in the process of development (volunteers, firms, universities, research institutes etc.) and the balance of power between them.

Since the significance of commons copyright licenses has been the subject of extensive study (Bonaccorsi and Rossi, 2003; Demil and Lecocq, 2006; Fitzgerald and Bassett, 2004; O'Mahony, 2003), attention will be drawn to the other elements of the governance framework.

Even though in many cases the high level of skills requirements precludes some individuals from taking part in certain types of projects, the non-exclusive principle of participation usually attracts large numbers of potential contributors. The variety of their aptitude and the variance of their commitment create the need to specify criteria for accepting contributions and to establish rules and processes for quality control. The rigorousness of such processes will be largely defined by the character of the project and the types of tasks that it involves. For example, in projects requiring a higher level of overall coherence, one should expect to find explicit criteria for acceptance and levels of quality control for different levels of integration: from the assessment of individual contributions, to the testing of the specific software modules, the cross-checking of the references in a specific Wikipedia article, to the testing of the entire software program.

In the context of most peer production projects contributions and individuals are, therefore, weighted against each other according to specific conceptions of merit. In F/OS this is translated into technical excellence in programming, the ability to provide solutions to difficult technical problems. At a basic level an individual's performance can be crudely measured according to their number of contributions. However, the concept of merit, which will be discussed in more depth in the following section, is a much more complex one and needs to be defined on the basis of the particular demands of each project.

Another further distinction can be drawn regards the different types of membership and the opportunities for engagement offered at different levels of decision making and policy formulation. Some peer-production projects have elaborate organizational structures involving a wide array of gatekeeper and leadership roles that contributors may attain according to their merit. In others, leadership is centralized and there are few or no opportunities for contributors to become involved in the decision making process. This category includes F/OS projects that are being closely controlled by their initiators, projects organized by specific organizations, such as those designed to pool together amateur scientific contributions, and commercial initiatives such as Second Life.

It is interesting to note that although the company behind Second Life, Linden Labs Inc, has agreed that individuals hold the copyright over their avatars and other creations, the platform that simulates the virtual environment remains proprietary. This raises significant governance issues since contributors have no control over the terms of use that underlie their creations

and highlights the complexity of the licensing and legal framework that underlie such environments.

This brings us to the final dimension of this aspect of OK initiatives: their institutional profile in terms of their stakeholders and the division of rights and responsibilities between them. The question of how a project is initiated and by whom has important implications for its development and the supporting community O'Mahony and West (2005) examined the differences between grassroots F/OS projects and spin-out F/OS projects created by corporations and public organizations and highlighted a range of issues that emerged as a result of their provenance. The term spin-out refers in this scenario to a project that is released by a commercial or public actor under an open source license with the intension of forming a community of volunteers around it that would continue its development. In the case of grassroots projects the main problem concerns the high start-up costs that need to be born by the community, which include mainly the development of the aforementioned governance and membership framework. At the same time spin-out projects face the challenge of introducing volunteers to an already developed code base, which increases substantially the barriers to entry. In addition, for these projects, volunteers may have difficulty in developing a sense of ownership, especially if the sponsors and the emerging community have different visions and goals.

The following table summarizes the four basic dimensions of the typology and their subdivisions.

Typology and Dimensions of Open Knowledge Initiatives			
Dimensions	Elements	Indicators	Examples
Project metrics and community demographics	Size and dynamism of the community	Number of members, rate of contributions, level of other associated activities (i.e. postings at mailing lists, activity in forums, etc, frequency of offline meetings	
	Maturity of the output	No of releases, different versions, lifespan of the project	
	Patterns of cooperation	Degree of centralization/decentralization of cooperative patterns	Highly centralized structure, decentralized structure, core-periphery organization
Knowledge domain, focus and demands for overall coherence	Type of expertise	Well established field of knowledge or emergent area of expertise	Software and fan fiction, writing articles on Wikipedia and constructing an avatar
	Classification based on projects' output	1. Software	Free/Open Source Software Projects
		2. Uttering Content	Amateur scientific contributions, Wikipedia, fan art and fiction, artifacts produced for online gaming environments
		3. Relevance and Accreditation: generating metadata	Digg, Slashdot, Amazon ratings and book reviews
		4. Value added distribution	Project Gutenberg, Wikisource, Open Content Alliance
		5. Sharing of processing, storage and communication platforms	Distributed computing projects
		Demands for overall coherence of the produced work	To what extent does generated main outputs of collaboration constitute an coherent artifact?
Skills and Learning	Type of expertise required to participate	Specialized, non-specialized	
	Community and process related	What do the participants need to know about the community's social norms, and	

	knowledge	the tools and processes underlying development?	
	Boundary spanning	Project's disciplinary profile (single discipline, interdisciplinary)	
	Breadth of tasks	Variety of tasks that participants can perform	
	Learning opportunities and support afforded to newcomers	Does the community provide documentation, or other training materials for newcomers? Are these supported in other ways (forums, mailing lists). How responsive is the community to newcomers' queries?	
<b>Governance and Institutional Framework</b>	Legal framework	Types of licenses used to protect the output(s)	
	Degree of institutional formalization	Are there any specific organizational form(s) that responsible for any aspects of the governance framework?	
	Criteria and norms for weighting members and their contributions	How is merit defined? How is quality defined?	
	Criteria for accepting contributions and processes for conflict resolutions	Are there clearly stated criteria/requirements for accepting contributions? What processes are there in place for conflict resolution?	Explicit rules for accepting contributions, gatekeeper requirements
	Quality control	Rules and processes set in place for quality control	Peer-review, testing, releases
	Membership	Is membership formally defined? How is it controlled? What types of membership are there?	
	Opportunities for higher-level engagement	What opportunities for higher level engagement are there? Are there clearly defined leadership and gatekeeper roles? Can anyone assume these?	
	Stakeholders	Who are the stakeholders of the project? What's the balance of power between them?	
	Project provenance and control	Who initiated the project? Who has the ultimate say?	

## 2 – Two Key Aspects of the Sustainability and Future of Open Knowledge Initiatives

This section will highlight two key debates regarding the sustainability, scalability and the future of OK initiatives. Sustainability<sup>1</sup> refers in this context to OK initiatives' ability to reach a level of maturity both in terms of their outputs and in terms of the community built around them, whilst retaining their drive and dynamism. Scalability defers to their ability of OK initiatives to reach the critical point that allow them to demonstrate the emergent characteristics of peer-production and to continue to grow beyond this point

This discussion is organized around two areas of debate. The first focuses on internal aspects of cooperation and examines the relation between the principle of equal opportunity for participation, the requirements of a meritocracy and the need for governance. These relations

<sup>1</sup> Broadly speaking sustainability is predicated upon the continuity of economic, social and environmental aspects of society. Prevalent economic tradition has associated sustainability with the notion of intergenerational allocation, the idea that development should take into account the needs of future generations by preserving our natural and social capital (Anand and Sen, 2000) Amartya Sen couples the idea of sustainability with that of human development, more specifically, the effort to enhance "people's ability to generate for themselves the real opportunities for good living" (Ibid: 2039). In practical terms sustainability connotes self-renewing development.

are crucial because they address the question of how volunteer communities maintain their momentum while they develop, and legitimize, the structures that are necessary to manage themselves. The second debate addresses the issue of the commercialization of the peer production communities and the relationship between the gift and exchange economies. These debates do not concern all OK initiatives to the same degree, but they address some key aspects of the sustainability of volunteer communities focusing on the production of goods with a high requirement for overall coherence.

## 2.1 - Equality, Meritocracy and Governance

In the previous section attention was drawn to the principle of open access and the meritocratic basis for organization as part of the governance framework of OK initiatives. This section will explore in more depth the relationship between these three elements of collaboration and highlight some of the tensions that arise when self-governing volunteer communities scale.

The prevalent conception of many peer-to-peer production communities is that of an emergent, social order, a meritocracy formed on the basis of proven competence and talent. For example, the meritocracy of F/OS is one of craftsmanship, where merit is defined as the ability to deliver results and to create art and beauty through programming. In this egalitarian scheme, age, gender, ethnicity, and any other distinguishing social or economic characteristics are irrelevant and it is the quantity, quality and nature of an individual's contributions which dictate their position in the community. The preservation of this egalitarian basis of participation is critical in recruitment, that is, attracting new volunteers, in motivating existing contributors and in ensuring the integrity of peer-review and of other processes of debate and consensus.

An individual's position in the emergent meritocratic hierarchy is reflected in the esteem in which a person is held by their peers and, as indicated in the previous section, can translate in formal membership in the communities' administrative bodies and in easier access to capital and resources. The meritocratic structure of F/OS projects, for example, has often been interpreted as a core-periphery scheme, in which the more active programmers form the core, the elite of the community and less active ones the periphery. Evidence of this structure has been presented not only in studies focusing on F/OS software (Fielding, 1999; Gallivan, 2001; Koch and Schneider, 2002; Mockus, et al., 2002; von Krogh, et al., 2003), but also in examinations of dynamics of cooperation in Wikipedia (Priedhorsky *et al.*, 2007) and in peer-to-peer music distribution networks (Carey and Wall, 2001).

The rise of a such an elite has some interesting implications for the legitimization of the more formal aspects governance of OK initiatives. In her PhD thesis '*The Social Construction of Freedom in Free and Open Source Software*' Coleman (2005) drew attention to developers' anxiety about the corruptibility of meritocracy by individuals in positions of power. The perceived threat in this case was that the technical guardians of the project could foreclose the neutral technical debate and use their authority to implement their choices without consulting with the community. In his essay 'Cathedrals, Bazaars and the Town Council' Cox (1998), who has for a long time been regarded as Linux's second-in-command, describes how the developers of Linux 8086 walled themselves off the mailing list by setting up filters that would essentially discard messages from people outside their selected circle. This was done in order to minimize what they regarded as 'noise', in essence what some developers regarded as non constructive interventions from individuals who had, according to them, a lot to say, but nothing to contribute.

These examples demonstrate the tension between the need for coordination and the corresponding emergent and designed governance structures and the demands of a meritocracy, which requires a degree of open-endedness and the assurance of mobility in terms of who rises in a position of power and authority. This relationship becomes more



complex when one views the issue from the point of view of the non-profit organizations volunteer communities often set up in order to legally represent themselves and mediate their relationship with firms and other organizations. This process of incorporation was studied extensively by O'Mahony (2002) who, in her examination of the process of the creation of foundations in four different F/OS projects, describes the different concerns that were voiced and taken into account in designing this new organizational form. One of the fears was that incorporation would require far more processes that community members were accustomed to, such as defining membership criteria, determining board selection procedures, holding regular meetings, publishing meeting minutes, obtaining legal counsel, opening a bank account.

O'Mahony adds that (2002:97): "Members recognized that instilling the foundation with too much power might impose other changes with the spectre of rationalistic controls such as: defined roles, fixed deadlines, and a directed as opposed to evolving development path. To avoid this, project members wanted to bound the foundation's role and authority over technical aspects of the project." This was eventually achieved by: a) clearly specifying in the foundations' organizational chart that it was the maintainers and not the Foundation who have authority over technical matters and b) limiting employment, which was intended: "to safeguard Foundations from becoming too professional, formal, and concerned with their own survival" (O'Mahony, 2002: 108).

The issues underpinning the complex relationship between equality, governance and meritocracy in volunteer driven peer production communities are connected with some of the most fundamental issues of democracy and civil society, such as transparency, accountability, trust, participation, authority, and the legitimization of different levels of governance. However, due to their distinctive aims and priorities, the relationship between these three aspects of participation and coordination in peer production communities is different from that of civil society and democratic institutions.

## **2.2 - Gift and Market Economies: The Commercialization of Peer-to-Peer Communities**

This section explores two aspects of relationship between the gift and market economies that are related with the question of sustainability of peer-to-peer production communities with regards to their position in existing economic structures. The first aspect of this relationship is encapsulated by the Carr-Benkler wager, which captures the key regarding the transformative potential of the gift economy. The second aspect focuses on the aspects of the gift economy which are embedded in the market system. This is illustrated by the strong corporate presence in F/OS software and by wider efforts to appropriate the work conducted by volunteer communities for commercial purposes.

One aspect of the debate over how volunteer communities shape labour and the economy is reflected in the Carr-Benkler wager. In *The Wealth of Networks* Benkler argues that social production systems leveraging the potential of ICTs, like F/OS, are leading to radical economic transformation. He argues that these communities have no hierarchical structures and operate exclusively within the domain of the gift economy. His views have been challenged by Nicholas Carr who argues that online amateur collectives cannot supplant professional structures as the engines of cultural production and technological innovation<sup>1</sup>. Similar arguments, albeit in a more polemic tone, have been made by Andrew Keen (2007) in his book *The Cult of the Amateur: How Today's Internet is Killing our Culture*. The debate between Carr and Benkler resulted in a wager in which it has been agreed that in 2008 an evaluation of the most influential peer-production sites will take place to examine whether they are volunteer or whether they are price-incentivized. Benkler specified that: "While it is

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<sup>1</sup> [http://www.rough.type.com/archives/2006/07/benkler\\_on\\_cala.php](http://www.rough.type.com/archives/2006/07/benkler_on_cala.php), last accessed 01/12/2007.



possible that there will be a price-based player here, I predict that the major systems will be primarily peer-based”<sup>1</sup>.

The Carr-Benkler wager can be misleading in that it presents the relationship between gift and the exchange economies, between emerging and established structures as mutually exclusive possibilities, when there is increasing evidence that in some domains of peer-to-peer production the two spheres of economic activity and governance can and do combine. Lerner and Tirole (2002), for example, suggested that economic incentives, either in the form of direct remuneration or in the form of access to venture capital and global corporate networks, do play an important role in F/OS development. Similarly, the results of a large scale survey on F/OS developers (David *et al.*, 2003) show that 27.4% of the respondents worked on F/OS as part of their employment.

More crucially perhaps the greatest fallacy of the Carr-Benkler wager is it envisages the relationship between volunteer communities and firms as the dominance of one set of motives over others: of the profit-seeking logic of capitalism versus gift culture’s drive for the accumulation of cultural and social capital and the willingness to participate in order to receive from the collective effort. This issue is sometimes recast in terms of the various motivations that underlie participation in OK initiatives.

One of the prevalent assumptions in the prevailing literature is that the success of peer-to-peer production communities hinges upon the balance between extrinsic and intrinsic rewards (Krishnamurthy, 2006; Lakhani and Wolf, 2005; Roberts, et al., 2006). Intrinsic rewards have been associated with activities that satisfy basic psychological needs, such as enjoyment, competence and control. In the case of F/OS developers intrinsic rewards are said to include the joy derived from problem-solving and learning, and the satisfaction that derives from contributing to a public good (Lakhani and Wolf, 2005a). In contrast, extrinsic rewards are said to be needs, such as peer-recognition and material and monetary rewards. One of the important questions of this debate is whether extrinsic motivations can crowd-out, i.e. undermine intrinsic motivations. Although Roberts et al (2006) suggest that extrinsic motivations do not diminish intrinsic ones, other evidence (Enjolras, 2002; Lakhani and Wolf, 2005a) including contributor accounts (Hill, 2005) favour intrinsic rewards.

However, things are more complicated and recent studies are starting to highlight the complex interdependencies that develop between the gift and exchange economies, intrinsic and extrinsic rewards. Dahlander and Wallin (2006), for example, performed a social network analysis which reveals that some software firms sponsor individuals to act strategically within a free and open source software (FOSS) community. These sponsored individuals interact with more individuals than interact with them, and also they seek to interact with central individuals in the community. In another investigation of the role of sponsored individuals in the GNOME and KDE projects, Berdou (2007) showed that these individuals maintain most of the two communities’ critical, infrastructural modules.

So the question is not only how and to what degree firms participate in F/OS projects, but also exactly what they are doing, namely what aspects of projects sponsored individuals are contributing to. The more crucial question, however, is if and how corporate involvement affects the dynamics of cooperation and participation. If sponsored contributors are consistently part of the core group of developers that repeatedly emerges in studies on the organization of volunteer communities, this means that, as a result of their employees contributions, firms can substantially influence the projects’ development agenda. This raises the question of communities’ ability and willingness to counteract these de facto forms of intervention, which brings us back to the issue of regulation and governance.

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<sup>1</sup> Benkler at: [http://www.rough.type.com/archives/2006/07/jason\\_calacanis.php](http://www.rough.type.com/archives/2006/07/jason_calacanis.php), last accessed 01/12/2007.

### 3 – Methodology

We took a two phased approach for this research. Phase I included focusing on a few OK initiatives which included a number of successful cases and some not-so-successful. The methodology in Phase I focused on choosing a handful of such projects to use as cases that helped make sense of how they sustained themselves over time or otherwise. We compared initiatives with different institutional origins (grassroots-corporate initiated) and aims (commercial, non-commercial). This selection allowed us to provide a richer characterization of the different instantiations of open source. We then abstracted elements that emerged from all the cases to create an overall framework of their practices and choices. Their decisions and business models that we saw evolve have consequences for both corporations and open source collectives. We noticed a strong shift in focus away from an either corporate or collective view but rather we saw a strong trend of mutual dependence and need materialize. Thus Phase II focused on understanding the ways in which such mutual dependence between companies and collectives was taking shape in the world today and what could OPAALS appropriate from such a move in its aim to create a sustainable digital business ecosystem.

As this research is exploring some rather unknown territory our aim in this deliverable is to develop the appropriate background knowledge which will then allow us to study in more detail how commercial organizations adopt open source ideas. Building on research from a number of disciplines we have created a detailed framework to better understand this trend. Our framework is based on an in depth examination of secondary literature. We had to resort to secondary material because firstly there are few academic studies in this area to date and secondly, an investigation of diverse literature in related areas helped us build a more solid and methodical understanding.

Below we outline our methodology and as part of this section we first define the criteria for what we mean by successful and not so successful OK initiatives. Drawing on literature we found a number of criteria mentioned for success (Atkinson, 1999; DeLone and McLean, 2002; DeLone and McLean, 2003; DeLone and McLean., 1992; Feitelson *et al.*, 2006; Mishra *et al.*, 2002; Rai *et al.*, 2002; Seddon, 1997; Seddon *et al.*, 1999; Shenhar *et al.*, 2001; Stamelos *et al.*, 2002) but most related specifically to software where factors such as code quality, quality of system documentation, user ratings, opinions expressed on forum mailing lists, number of downloads, inclusion in distributions etc have been discussed in detail (Crowston *et al.*, 2003).

Rather than refer to a project as unsuccessful we decided to rename them as not-so-successful. Our decision was based on literature of real cases that clearly indicated how some projects had failed at first but for various reasons had turned around into more successful ventures. However, in order to understand the term failure we looked at some literature on this topic (Gardiner and Stewart, 2000; Pinto and Mantel, 1990) but at the same time realized that many categories that were considered as success criteria could be reversed to understand not-so-successful.

#### 3.1 - Phase I Approach

Crowston *et al* (2003) discussed success with a more process view of open source using a measure of success that includes *project output* (movement from alpha to beta stable, achieved identified goals, developer satisfaction), *process* (number of developers, level of activity, time between releases, time to close bugs), and *outcomes for project members* (individual job opportunities, individual reputation, knowledge creation). We adopted the process, product, community approach which resembled Crowston *et al* but we attempted a more elaborate characterization that included issues of license, organizational sponsorship (Stewart *et al.*, 2005) and a benefit to the organization adopting open source ideas perspective

(Shenhar *et al.*, 2001) amongst others in order to understand what we termed OSS 2.1 (see Table 5).

Our criteria of success included:

- Projects were ‘alive’ for five years or more
- Had a ‘healthy’ level of contribution (at least once daily)
- Was accessed as a resource regularly
- Project that had managed to gain community, public and academic interest. The focus thus was the question whether we could locate academic literature on a project. However, this condition was not sufficient on its own.

Our criteria of a not-so-successful project included:

- Projects that were unable to sustain a life span of five years
- Projects where contributions began to dwindle (less than one a day)
- Access level and interest diminished

Keeping our criteria in mind we chose to better understand three different projects. We decided that Wikipedia had all the necessary criteria to be considered a successful OK initiative, and for the not-so-successful category we researched academic literature on Google Answers and SourceXchange. The decision to study two different projects for the not-so-successful category was based on the rather slim nature of academic literature available for projects that were considered failures. In comparison the academic papers available that focused on Wikipedia were numerous, published in legitimate peer-reviewed journals and the studies carried out on this OK initiative had covered various aspects of Wikipedia including governance, contribution level, coordination etc and not just a failed business model as was the case for Google Answers and SourceXchange. We intended, through the course of this research, to refine our criteria which would then help create a characterization of the various innovative business models that have grown around the open source phenomenon.

### 3.2 - Phase II Approach

The aim of Phase II was to abstract ideas from literature that helped us to understand the mutual dependence of companies and collectives. We loosely followed Swanson and Ramiller (1993) and Schwarz *et al.* (2007) in our collection and organizing of the literature available on this area. There were a number of steps we took in order to map the literature in a rigorous manner.

We began the search with a choice of phrases that were used to yield academic research from online electronic libraries such as EBSCO, Swetswise, Mimas etc in this area. The phrases included:

- open source AND outsourcing
- open source AND offshoring
- open-sourcing
- sourcing
- global sourcing

The papers we filtered needed to contain one of the above phrases in the abstract to be considered for inclusion. As we filtered through more papers our search phrases evolved into different trajectories though we tried to keep the number under ten (for practical reasons) in order to stay focused on one specific aspect of this large area known as global sourcing.

Due to a dearth of academic work in the area of open-sourcing we only found a handful of papers that qualified as specifically on open-sourcing so we then traced references in a historical manner. Most of the references that stemmed from the academic papers on the topic of open-sourcing originated in online magazines. Other phrases such as global sourcing and

open source business models provided us with a number of academic papers but they were not all directly applicable for our current research as they only alluded to this area in the abstract but were then not detailed in the paper. This involved another level of filtering where the papers with the search phrases in the abstract were read to check for deeper relevance. At this level we searched for the research question of the paper to gather only those papers where the question revolved around key ideas of open source ideology, process, and licence adoption by commercial companies or public sector organizations. This process helped us to narrow down our search.

Alongside searching academic material we also searched online magazines, blogs, and websites. This was done because our initial study of the few academic papers found on open-sourcing drew our attention to such literature. This is a new area where most of the material discussed and written can only be found online thus we make no apology for relying on such information. The more focused key phrases were then searched across the web through Google and Google Scholar. The amount of hits were, not surprisingly, far greater through the online material search. Websites of mentioned companies that are or have adopted open source software or process were also searched more specifically for available white papers or other material on the strategy and purpose for open source adoption.

## 4 – Open Knowledge Initiatives: Case Studies

### 4.1 - Wikipedia

The largest public wiki is Wikipedia (Viégas *et al.*, 2004), a collaboratively produced online encyclopaedia which was created January 15<sup>th</sup> 2001 by Jimmy Wales and Larry Sanger (Völkel *et al.*, 2006). The term wiki was introduced by Ward Cunningham (Leuf and Cunningham, 2001) and means ‘fast’ in Hawaiian (Ebner *et al.*, 2006). Wikipedia was rather similar to another online encyclopaedia, Nupedia, also created by the authors of Wikipedia. Nupedia was the non-publicly editable predecessor (and it existed for a while during the time of Wikipedia) of Wikipedia which existed between March 2000-September 2003 (Aigrain, 2003). Another difference between Nupedia and Wikipedia was the intense peer-review of the former. It is claimed that during the period of October 2001 –April 2003 Nupedia only manage to peer-review and release two new articles in comparison the countless articles that Wikipedia releases weekly (Viégas *et al.*, 2004).

This growing encyclopaedia can boast of 2,328,394 articles in English but this “excludes redirects, discussion pages, image description pages, user profile pages, templates, help pages, portals, articles without links to other articles, and pages for Wikipedia administration. Including these, we have 12,735,088 pages” (WikipediaStatistics, 2008). The same site claims that users have made ‘215,512,837 edits, with an average of 16.92 per page, since July 2002’ and they also ‘have 775,890 media files’ (WikipediaStatistics, 2008). Many articles are available in different languages and though it has been through some crisis points (Knowledge@Wharton, 2006) Wikipedia continues to grow (Spoerri, 2007).

Wikipedia, perhaps because of its obvious success (frequent contribution and high, regular access) has been studied by academics in more detail than the other two projects discussed in this deliverable. There are coordination studies of Wikipedia (Duguid, 2006; Viegas *et al.*, 2007; Wilkinson and Huberman, 2007) an analysis of the most popular articles on Wikipedia (Spoerri, 2007) the voluntary nature of Wikipedians (Schroer and Hertel, 2007), technology of Wikipedia (Braun and Schmidt, 2007) motivation of Wikipedians (Nov, 2007) quality of Wikipedia (Stvilia *et al.*, 2008), different uses of Wikipedia (Ebner *et al.*, 2006; Rosenzweig, 2006) and collectivism versus individualism in Wikipedia (Kittur *et al.*, 2007; Tumlin *et al.*, 2007).

It is understood, in theory at least, that a direct transplant of open source ideas into a company will face many issues (Knowledge@Wharton, 2005) thus each firm will need to tailor the business model to suit its needs. However, the fact that this is happening and both large companies and SME's are adopting such ideas and business models (Knowledge@Wharton, 2007) (though often for very different reasons) reveals the pervasiveness of OSS 2.1 ideas. Many large corporations are taking over popular Internet ventures like AOL acquiring bebo.com in 2008; Google's taking over YouTube in 2006, and MySpace swapping control to News Corp in 2005, to mention a few high profile cases.

The key element in online knowledge creating sites is their collaborative nature and there is evidence that indicates that sites like Slashdot.org are not accessed as often as the more interactive rival Digg.com or Monster.com as much as Craigslist.org (Knowledge@Wharton, 2007). Experts at Knowledge@Wharton claim that 'Wiki-based collaboration' allows for a more distributed control which engenders trust in the community (Knowledge@Wharton, 2005) but this trust has been tested with cases such as the Seigenthaler<sup>1</sup> incident (Knowledge@Wharton, 2006). The trick for Wikipedia is to 'find the middle ground' between 'citizen-authored content and more expert edited information' (Knowledge@Wharton, 2006). However, is the answer a more peer-reviewed model? Would this not impede the growth and even interest in contributing to such sites (as we can understand from the Nupedia example)? These are questions that will find answers over time as projects such as Copyright take off and we are better able to judge the value of mixing a stronger peer-review system with an open collaboration environment.

Studies assessing the credibility of Wikipedia have been mostly quite positive (Chesney, 2006; Glaser, 2004; Leppik, 2004; Mayfield, 2004) and suggestions for strengthening it further have been offered (Cross, 2006; Gabrilovich and Markovitch, 2006) but the critics of Wikipedia continue to question the reliability and/or depth of Wikipedia articles (see (Scott, 2004; Wikipedia:Criticisms, 2006). The rather rosy image of Wikipedia and other such online shared collaborative spaces is provided in the book *Wikinomics* (Tapscott and Williams, 2006) which highlights the strengths that such an environment draws on but is a little dismissive of the various issues related to such a business model (Knowledge@Wharton, 2008). There is a debate on the professional versus the amateur contribution or interest on such shared knowledge sites as Wikipedia. It is difficult to distinguish between a professional and amateur on the Internet because the former can often disguise himself/herself as an amateur and provide higher quality output (though this is not always the case and Wikipedia and other such knowledge creating systems are testament to the reverse). This debate is a larger concern for online spaces which have a more competitive business model where all the 'prosumers' (Tapscott and Williams, 2006) are competing with each other to win something or make a profit (Knowledge@Wharton, 2008).

A number of other and perhaps more serious challenges for Wikipedia include inaccuracy of information, grey area of contributor motivation, questionable expertise of contributors, volatility of contributions and links on Wikipedia, patchy coverage of various topics and issues, and dubious or non-existent referencing of sources (Denning *et al.*, 2005). To this we also need to add the problem of vandalism where Wikipedia has experienced mass deletion of material, offensive versions, phoney copying, phoney redirection and idiosyncratic and inflammatory postings (Viégas *et al.*, 2004). Providing user ratings is one way to side-step some of these issues but it has also been argued that the future is not the professional or amateur individually but a hybrid of both (Knowledge@Wharton, 2008). The important element here is to achieve the 'best' business model for such a hybridisation to flourish.

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<sup>1</sup> An incident where a journalist, John Seigenthaler, was wrongly linked to the assassination of John and Bobby Kennedy on a Wikipedia entry and went unnoticed for more than four months. See [http://en.wikipedia.org/wiki/Seigenthaler\\_incident](http://en.wikipedia.org/wiki/Seigenthaler_incident) for more details.

## 4.2 - Google Answers

Google Answers<sup>1</sup> was a fee-based ‘information market’ (Calishain, 2002) initiated by Google as a natural extension of its information providing services in April 2002. The basic premise of Google Answers was to create a space to bring experts and information seekers together. People in need of answers posted questions on the Google Answers site listing a price. Experts, if they were familiar with the topic of the question and interested in the fee offered would then ‘lock’ (Rafaeli *et al.*, 2005; Regner, 2005) the question and begin working on an answer. Google Answers played an intermediary role or behaved as a knowledge brokering system (Rafaeli *et al.*, 2005). It would guarantee that the expert would be paid if the answer was deemed adequate by the asker. It would also arbitrate in any situation where either party was not happy with the situation or result.

The basic business model for Google Answers was to charge \$0.50 to any person who asked a question irrespective of whether it was ever answered. It was also guaranteed 25% of the fee paid by the asker so the expert would receive 75% of the total (Regner, 2005). Experts, in many cases were also given tips with an average tip being \$8.86 (Calishain, 2002; Kibbee, 2006; Kolbitsch and Maurer, 2005). The price for answers varied between \$2 to \$200 with at least 25% (Edelman, 2004) of all the questions answered being given a tip. This simple model was slightly complicated by the comments facility, where comments added were not eligible to be paid anything. People were allowed to write comments which often answered questions and if one looks at the statistics provided the number of comments is twice that of paid answers (Edelman, 2004; Rafaeli *et al.*, 2007). Some of the questions raised by academics on the existence of Google Answers concern why question-askers give tips when they don’t have to, why experts and other people provide comments/answers which are not eligible for a fee, what the role of tipping is in relation to asker rating and the same for comments and experts.

Researchers questioned what Google Answers was adding beyond the basic services of a librarian (Kibbee, 2006) and concluded that a librarian helps in educating first and foremost and answering questions is a secondary role whereas for Google Answers this was a business model to create another form of earning and at the same time a way to create an information repository. It was not clear what Google Answers would do with the repository but having one allowed them to think of various opportunities in the future to create different avenues of earning (Kibbee, 2006; Kolbitsch and Maurer, 2005).

The fact that Google Answers survived over four years (it closed down in December 2006) indicates that the business model had a number of strengths. Over the course of its existence (between April 2002-December 2004 rather than 2006 because there is no academic study that has data on the entire period of its existence) more than 77000 questions were posed with 37970 answers provided by 512 experts (Edelman, 2004; Rafaeli *et al.*, 2005; Rafaeli *et al.*, 2007; Regner, 2005). Its success began to erode when problems concerning unfair locking of questions arose (West, 2002). This issue was always problematic because it was found that some experts were able to write programs that would alert them and lock a question as soon as it was posted but was exacerbated when the number of questions posted on Google Answers began to wane. Question-askers also resisted taking their question offline because they were able to receive free comments in reply which only made the situation worse creating conflict. Google Answers was facing tough competition from Ask Yahoo and other free information and answer providing websites. The number of experts for Google Answers was also limited to about 500 whereas on the free sites anyone could provide an answer thus creating a much larger pool of experts and knowledge providers. The system lost the transparency that is so necessary in ventures that rely on an open source business model.

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<sup>1</sup> <http://answers.google.com/answers/>

A knowledge brokering system relies on a pool of strong experts that create a good reputation for not only Google Answers but also for individual experts. However, reputation on the basis of good ratings did not accrue any real benefits for experts or give them privileges, which only further undermined the desire of experts to contribute on this site. According to West (2002) experts were often insulted on Google Answers by question-askers and the former even felt obliged to concede to the rational or otherwise requirements of the question-askers from fear of getting a low rating which in turn would affect their ability to answer other questions, and could in extreme circumstances be reason enough for Google Answers to ask the expert to leave the community. All these and other issues eroded the transparency and thus trust in Google Answers. Thus Google Answers (and its fallible business model) was not able to face external competition from Ask Yahoo and others but at the same time it could not resolve issues arising internally in the community.

Challenged by competitors that did not require any fee to be paid for answers like Ask Yahoo, Answers.com and Wondir (Kibbee, 2006), amongst other reasons cited above, Google Answers was not able to sustain itself and was closed down by Google in early December 2006<sup>1</sup> (Fikes and Baugher, 2006).

### 4.3 - SourceXchange

SourceXchange came into existence in May 1999 (Laat, 2004) and was the initiative of Brian Behlendorf. Hewlett-Packard had approached O'Reilly Associates and showed interest in funding a few projects (Kulikauskas and Ellison-Bey, 2002), and it was then that Brian Behlendorf was asked to join to help the open source initiative. Behlendorf set up SourceXchange through CollabNet as an online 'marketplace' (Laat, 2004). This was a form of outsourcing (Laat, 2004) or what has since been renamed open-sourcing (Ågerfalk *et al.*, 2006b). SourceXchange behaved as an intermediary between buyers and sellers and it received an administrative fee for this work (Chweh, 1999). It would ensure that the buyers would pay and that the sellers of their service would deliver. They were the guarantee or the trusted third-party bridge (Laat, 2004; McMillan, 2000) between the buyers and the sellers. In Behlendorf's words the mechanics of SourceXchange are:

“Sponsor submits an RFP (request for program)-->Developers submit proposals/bids on that RFP-->Sponsor selects a proposal.-->Project begins.-->Developers work towards a milestone, then upload their code.->Sponsors review it and approve or disapprove.-->If they disapprove, developer keeps working until the sponsor is happy, or until a peer reviewer says the milestone is met.-->Repeat until all milestones are approved and project is completed.-->Sponsors, developers and peer reviewers rate each other. Repeat. =)” (Behlendorf, 2000).

This open-sourcing idea is an interesting one which has since emerged again in different forms but SourceXchange closed down a little under two years (in March 2001) due to a number of reasons. A key problem that plagued SourceXchange was a lack of developers to continue working on projects. Many open source developers or at least the core group of code authors for any project are very capable and brilliant but only the projects that gain critical mass survive over time. And when we look at SourceForge it becomes obvious just how few projects manage to interest or retain more than one or two developers. A lack of good developers is part of and perhaps the main reason why SourceXchange could not survive (Fitzgerald, 2004).

Another problem cited is the lack of marketing (Laat, 2004) which meant that neither buyers nor sellers were aware of the service being offered by SourceXchange. Such an online

<sup>1</sup> <http://googleblog.blogspot.com/2006/11/adieu-to-google-answers.html>

marketplace can only survive if it gains critical mass on both sides. Coupled with a dearth of developers, and lack of marketing SourceXchange was also not able to engender much belief in the idea of open-sourcing (Laat, 2004). It was quite early in the use and acceptance of open source by companies and they still needed convincing that this model would work. There was little trust between open source communities and companies. Indeed some believe that as the level of trust was so thin in 1999 perhaps an intermediary served to further miscommunication and a lack of understanding for both sides through doing away from a need to communicate directly (Laat, 2004). Saying that Behlendorf has been quoted as saying that a reason for SourceXchange not growing into a successful venture was the fact that companies were moving towards appropriating open source projects in-house which is another form of open-sourcing (and one which has seen healthy growth in recent years) (Linux Weekly News, 12 April 2001 cited within Laat, 2004).

#### 4.4 - Conclusion

All three cases are individual in their issues but the over-arching reason identified as the cause for the unsuccessful cases was the poor business model. Drawing from the material above we focused our attention on how open source inspired business models are in use today and how some are working effectively to produce not only a profit for companies concerned but also a way to distinguish itself from competitors. The trend of many large and small companies to be creative with open source ideas in order to create more opportunities for enhancement has been discussed by Ågerfalk *et al.* (2006a) as open-sourcing. There is a necessity to understand open-sourcing better to apply some of its useful ideas to the work happening in companies but more importantly to OPAALS because, as will be seen below, the business models that incorporate open source ideas could prove interesting to the ideas of regional development and SME's in OPAALS.

The following sections are organized to discuss open-sourcing in greater detail. We first define and put open-sourcing into context, then discuss the advantages, problems and some problem mitigation strategies and finally we characterize open-sourcing in relation to other forms of global sourcing to reflect how for OPAALS this could be (in some cases) a more viable model to follow.

## 5 – Introduction to Open-Sourcing: OSS 2.1

Open-sourcing, drawing on open source approaches as a sourcing strategy for software and other IT/IS services, is a relatively unexplored concept. The term, until very recently was usually referred to business or commercially controlled and created software which was formerly proprietary but which switched partially or fully to open source licenses. An example would be Netscape's decision in 1998 to open some of its browser code as Mozilla, a move that was the basis for the present day browser Firefox<sup>1</sup>. More recently open-sourcing has taken on a significantly different meaning (Ågerfalk *et al.*, 2006a; Anonymous, 2007), implying a deeper link with fundamental sourcing choices and decisions, and outsourcing strategies in particular. Thus open-sourcing is defined by Ågerfalk *et al.* (2006b) as 'outsourcing to a global but largely unknown workforce'. Open-sourcing in these terms has been initiated and become a potential option, in large part, due to change in attitude towards open source software by commercial organizations (Dickerson, 2004). At the same time the open source movement too has moved on from its original form (free software, counter cultural ideology, hacker ethics), through an increasing sophistication of business models and commercial interrelationships. Thus Fitzgerald (2006) speaks of a new area of OSS 2.0 to reflect the extent to which the software industry and commercial organizations have accepted

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<sup>1</sup> Debate at the time was divided as to whether this was a capitulation to Microsoft and its browser, or evidence of radical innovation in the software model. Subsequent history does not reveal a clear answer.



open source software methods, licenses, process, and even (to a degree) its ideology of open innovation (von Hippel, 2005a).

In this deliverable we seek to characterize the potential of open-sourcing through a careful investigation of academic literature (though this is fairly limited) and recent real world cases of companies adopting open-sourcing. This account is based on an understanding of both the client or sponsor's perspective as sourcing decisions are made, and the consequence for such developments on the wider open-source movement. Indeed, some authors (Anderson, 2005; Minoli, 2004) see the combination of open source and outsourcing as addressing some of the often identified issues of open source; for example, lack of documentation; feature-creep; achieving stability for nascent or bug-ridden products. However, in any discussion it is probably license issues that loom largest and pose the main challenge. Indeed, license issues are often proposed as the principle reason why companies are reluctant to experiment with open-sourcing, with a fear of lawsuits and/or losing control of their software.

Open-sourcing: OSS 2.1 certainly deserves to be reviewed in its 'global dimension'. Claiming a global character is not just to repeat a tired cliché, but does allow an understanding of some aspects of an open source scheme of production, and in some contrast to traditional outsourcing which, in the past, has been accomplished within a limited number of local contexts and situations – as in traditional software off-shoring. The open source and the outsourcing communities both acknowledge that the Internet 'moves' the parties closer together, making possible new styles of working across boundaries, be they political, spatial or temporal, and not least cultural. Thus through contemporary open-sourcing: OSS 2.1 it is, at least potentially, feasible to draw upon a truly global distributed community of software developers who *might* be able to collaborate, communicate and coordinate to achieve outstanding ends. We see open source scholarship as offering the best opportunity for understanding how a diffuse and culturally diverse collective of software developers might organize themselves, an issue of central importance to any understanding of the potential of open-sourcing: OSS 2.1.

## 5.1 - Global Sourcing

Phrases that include the term *sourcing* have proliferated in the past decade (see Table 1 and 2). Global sourcing itself has emerged as an umbrella term to encompass many other variants and innovations in providing knowledge based services, not least in IT/IS. Global sourcing is thus explained as “a term that includes all types of outsourcing, apart from onshore outsourcing. In other words, it refers to cases of nearshore, offshore and farshore outsourcing, when the responsibility for the delivery of IS/IT services resides in countries other than the country where the customer company is located, often overseas (Tsotra and Fitzgerald, 2007). Usually, it is characterized by the relocation of business processes to lower-cost locations outside national boundaries, assuming the perspective of the country of origin” (Erber and Sayed-Ahmed, 2005).

The origins of open source activity is traced back to the hacker culture of the 1960s when software was sold together with hardware, and code, macros and utilities were freely exchanged in user forums (Hars and Ou, 2000; Hars and Ou, 2002). However, from the 1970s software became more and more a separate and distinct business area, increasingly independent of hardware, with most substantial software being proprietary and closed, and sold in the market. This 'closing' of software frustrated many, particularly as it occurred in operating and systems software. One response in the early 1980s was when Richard Stallman, a researcher at MIT, started to write a free UNIX-like system called GNU, and in 1984 founded the Free Software Foundation (FSF)<sup>1</sup> (Ljungberg, 2000). Stallman's work is recognized as providing the primary conceptual foundation for open source software as we

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<sup>1</sup> <http://www.fsf.org/>

know it today. Stallman saw free software as not having to do with price but with rights and freedoms, thus Stallman is often quoted saying “think of ‘free’ as in ‘free speech’, not as in ‘free beer’” (Stallman, 1999a; Stallman, 1999b). His definition of free software is about the ability of a user to have the freedom to “run, copy, distribute, study, change and improve the software” (Stallman, 1999a). This definition incorporates four specific freedoms;

- The freedom to run the program, for any purpose.
- The freedom to study how the program works, and adapt it to your needs. Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help your neighbour.
- The freedom to improve the program, and release your improvements to the public, so that the whole community benefits. Access to the source code is a precondition for this<sup>1</sup>” (Stallman, 1999a).

These freedoms are embodied in the copyleft method (Moody *et al.*, 2006). Copyleft uses copyright law but “instead of using it as a means of privatizing software, it becomes a means of keeping software free” (Ljungberg, 2000). The copyleft method is embodied in particular in the GNU/FSF General Public License, usually referred to as the GPL. This is the license under which much (though not all) open source software is licensed, and which requires that source code is freely distributed. The GPL is a viral license (perhaps reciprocal is a less ethically charged term), otherwise termed a strong license, since the implication of its use is that, if a person uses any part of GPL-ed code in software, then the new code created is also automatically GPL-ed as well. This license scheme makes it possible to *legally* take the software of others and change and improve it, but not to own those innovations (Tuomi, 2002).

However in 1997 the word ‘free’ and its connotations led some people, including Eric Raymond and Bruce Perens to seek a new name for the movement (Perens, 1999). They felt that the ‘free’<sup>2</sup> in free software discouraged businesses from taking it up (Weber, 2004). Thus began the *open source* movement. Using the Debian Free Software guidelines, and adapted by Perens, they proposed the open source definition, and the name open source was registered as a trademark for the Open Source Initiative [OSI]. The OSI home page states its *raison d’être* in these terms, “Open source is a development method for software that harnesses the power of distributed peer review and transparency of process. The promise of open source is better quality, higher reliability, more flexibility, lower cost, and an end to predatory vendor lock-in<sup>3</sup>.”

Term	Definition	Authors
<b>Outsourcing</b>	“The handing over of assets, resources, activities and/or people to third party management to achieve agreed performance outcomes. This can be distinguished from the buying-in of external resources to work under in-house management, and in-house sourcing where internal management and operational resources are used almost exclusively” (Lacity and Willcocks, 2006).	(Lacity and Willcocks, 2006)
<b>Insourcing</b>	“The practice of evaluating the outsourcing option, but confirming the continued use of internal IT resources to achieve the same objectives of outsourcing” (Hirschheim and Lacity, 2000).	(Hirschheim and Lacity, 2000)
<b>CoSourcing</b>	“ <i>Cosourcing is when the vendor and client collaborate so closely that the vendor can replace or augment the client’s IT competencies.</i> Project teams are mixed. And leadership can come from either one. Effectively, both	(Kaiser and Hawk, 2004; Thomas and Parish, 1999)

<sup>1</sup> It is interesting to note how the basic freedoms are couched, in the terms of making changes to the source code. The source is an obligatory passage point for developers if they want to help develop *it* further.

<sup>2</sup> Libre is the European term for free software and has been adopted by many to avoid any confusion over the meaning of ‘free’. Some sticklers refer to FLOSS – free, libre and open source software (Anonymous, 2005).

<sup>3</sup> <http://opensource.org/>

	organizations' resources become part of a single team aimed at accomplishing the client's needs" (Kaiser and Hawk 2004).	
<b>Netsourcing</b>	"Is the practice of renting or "paying as you use" access to centrally managed business applications, made available to multiple users from a shared facility over the Internet or other networks via browser-enabled devices. Netsourcing allows customers to receive business applications as a service" (Kern <i>et al.</i> , 2002). Note that this is more often referred to as application service provision – (ASP)	(Kern <i>et al.</i> , 2002)
<b>Global Sourcing</b>	"A term that includes all types of outsourcing, apart from onshore outsourcing. In other words, it refers to cases of nearshore, offshore and farshore outsourcing, when the responsibility for the delivery of IS/IT services resides in countries other than the country where the customer company is located, often overseas (Tsotra and Fitzgerald 2007). Usually, it is characterized by the relocation of business processes to lower-cost locations outside national boundaries, assuming the perspective of the country of origin" (Erber and Sayed-Ahmed 2005).	(Erber and Sayed-Ahmed, 2005; Tsotra and Fitzgerald, 2007)
<b>Open-Sourcing</b>	"Outsourcing to a global but largely <i>unknown</i> workforce", or a "socioeconomic movement resulting from the marriage of the open source movement and the recent trend towards the international outsourcing of programming" (Ågerfalk <i>et.al.</i> 2006a).	(Ågerfalk <i>et al.</i> , 2006a) (Anderson, 2005)

Table 1: Sourcing – Where Something Comes From

## 5.2 - Linking Open Source and Outsourcing

Opinions on the relationship between open source and outsourcing vary. Certainly some believe that the outsourcing community could learn useful lessons from open source communities and practices (Babcock, 2007; Zellen, 2005). For example, Brian Behlendorf, prominent in the open source movement, suggests that outsourcing companies may find it useful to study how talent is treated in open source communities, helping outsourcing organizations "... to see themselves as talent brokers and pump up the individuals in their organizations as the key asset, rather than just saying 'Hey, we're ISO 9002 compliant'" (Udell, 2003). There is also some evidence that firms do use open source portals such as SourceForge to entice others to build the system they require (e.g. Allstream Corporation in Calgary<sup>1</sup>), and potentially the open source process may offer such companies a more transparent method of system creation (more transparent than normal outsourcing), if "code is no longer hidden in a black box that can't be inspected" (Fox, 2004). In a few specific cases, such as IBM's commitment to the LINUX operating systems, an open-sourcing strategy has been enacted on a huge scale. More generally, the use of open source software as a component part of outsourced activity, and of associated open source processes and methods, may also provide a greater atmosphere of trust and confidence in software since the source code is available and open to all, and the buyer may feel critical risks are addressed. A product that is 'open' is visible and capable of review, and if all does not go well then there will at least always be the source code available. In this way some have argued that the use of open source in any solution "provides a shorter path to confidence and trust in outsourced software developers.... [thus] open source plays a positive part in the risk management of the decision to outsource" (Anonymous, 2006a).

<sup>1</sup> [http://www.allstream.com/enterprise\\_home/](http://www.allstream.com/enterprise_home/)

Term	Definition	Authors
<b>Open Source</b>	An open source program must include source code, and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost preferably, downloading via the Internet without charge. The source code must be the preferred form in which a programmer would modify the program. Deliberately obfuscated source code is not allowed (Perens 1999).	(Perens, 1999)
<b>Inner Source/ Corporate Source</b>	Inner source refers to the development of software inside a bordered environment using open source ideas, process and ideology. It implies distributed ownership and control of code, early and frequent code releases, and numerous feedback channels. It makes use of organization mechanisms already in place, and enables flexible collaborations. Companies may use inner source development as an intermediate step towards the integration of open source in their products (Berreteaga 2005).	(Berreteaga, 2005; Gaughan, 2007a; Gaughan, 2007b)
<b>Crowdsourcing</b>	"Crowdsourcing represents the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call. This can take the form of peer production (when the job is performed collectively), but is also often undertaken by sole individuals. The crucial prerequisite is the use of the open call format and the large network of potential labourers... It is only crowdsourcing once a company takes that design, fabricates it in mass quantity and sells it" (Brabham 2007).	(Brabham, 2007; Howe, 2006a; Howe, 2006b; Howe, 2006c)
<b>Progressive Source</b>	Progressive open source requires a novel approach for large corporate software development. Instead of relying on a single-product, project-focused development method. With this method each employee of the corporation can potentially contribute to the development of any given software product. By restricting the openness of the software development to within the corporation or with select partners the corporation does not incur certain business costs of open source. If the corporation is large enough it can realize the main benefit of open source of a large tester base (Dinkelacker and Garg 2001).	(Dinkelacker and Garg, 2001; Dinkelacker <i>et al.</i> , 2001)
<b>Open-Sourcing</b>	"Socioeconomic movement resulting from the marriage of the open source movement and the recent trend towards the international outsourcing of programming". Or "Outsourcing to a global but largely <i>unknown</i> workforce" (Ågerfalk <i>et.al.</i> 2006a).	(Ågerfalk <i>et al.</i> , 2006a) (Anderson, 2005)

Table 2: Sourcing: Who has a say in it?

### 5.3 - Gains from Innovation of Sourcing

Software is a knowledge based activity, and thus it is sourcing talent and achieving access to knowledge communities that is one key to success. Doing this well may, indeed almost certainly will, require some innovation and challenge to the traditional means (Chesbrough, 2006; Chesbrough *et al.*, 2007). For example, Proctor & Gamble<sup>1</sup> have based their R&D strategy on a new open model, renamed as the "Connect and Develop" innovation model. Huston and Sakkab (2006) claim that P&G "leverage external assets and capabilities.... [in a] relationship of co-invention-based interaction with outside resources". The belief is that in order to "[leverage] people whom you don't have direct control over, you have to build relationships and trust... This is an R&D-building innovation capability based upon the connections model versus the invention model". This open model of innovation, with its connections focus, seeks to tap into multiple knowledgeable communities across the globe (Huston and Sakkab, 2006; Huston and Sakkab, 2007; Sakkab, 2002). The authors are clear that this is not a conventional method of outsourcing R&D, but rather "in-sourcing creativity", and just as in open source processes, the aim is to tap into a large pool of ideas,

<sup>1</sup> <http://pg.t2h.yet2.com/t2h/page/homepage>

developers and testers, suggesting that such communities offer a process that can be emulated for problem solving and development activity in areas other than software.

Woods and Guliani (2005) note that such approaches to innovation are not easy or rapid, but they suggest the organization that embraces them will be in a stronger position in the future to foster initiative and invention, and to steer clear of vendor lock-in. These authors suggest that open source, being in general built on open standards, can empower the firm to flexibly switch IT providers as needed. They also note that open source development, with its ideology of agile and iterative development, can help overcome the mindset that full and extensive requirements always are needed up front - a requirement often associated with the formal outsourcing contract. The result of the use of open source processes may be faster and more flexible production through the use of iterative development and prototyping.

Some recent analysis of the outsourcing trends indicates that companies that combine open source strategies with offshoring are able to cut costs, gain competitive advantage over their competitors, are better able to source talent globally, and because the developers are not in-house find it far easier to scale up and scale down when required (Harney, 2006). An example of a company engaged in a combination of open source and offshore outsourcing is Intalio<sup>1</sup>, a US based company which supports both an open source and commercial version of its Business Process Management Suite (BPMS). The CEO, Ismael Ghalimi, explains the motivation of the company to have two versions of its BPMS, “having an OS version of our product lures the buyer to adoption and requires training, support, and maintenance contracts and then software licenses for more advanced versions of the product that we charge for” (Harney, 2006). The benefit to Intalio includes the possibility to build a ‘user base at a very low marketing cost’ (Harney, 2006), and customers gain free software. Indeed, within the open source movement there are many firms that pursue a similar blend of open source development, and proprietary software and service provision. For example, Collabnet<sup>2</sup> support and promote the open source version control system Subversion, and sell their own associated corporate products and services

Open source is potentially effective as a strategy for global sourcing of software because of its ability to commoditize and standardize software (Asay, 2006). Asay’s (2006) opinion is that the commodification process squeezes out the market for the middle-sized firms as there ‘...is no room for middling and muddling. Open source will commodify from the bottom up while “upmarket” vendors will dominate “up the stack”. Everything else will be wasteland’ (Asay, 2006, p104). The specific open source principle of commodification is based on the claim that ‘good enough’ solutions suffice so if software is open, free (in many cases it is free as in free beer too) and good enough to solve a problem then alternative solutions which charge a premium price and lock you into their standard will be pushed out of the market. Commodification and standardization lead to lower market prices for software but also a drawing of attention to the code creator. Indeed, it may be the one who creates the code, rather than the code on its own, that holds value for customers. As in the standard model of open source, the creator (hacker) is building up reputation value, and this behaves as the ‘price mechanism’ rather than conventional intellectual property protection. If customers trust the creator to create code that works and is effective then she or he is the one that can be turned too for further work on the code, or services that complement the code, are required. ‘By virtue of her contribution, she builds influence in her chosen code community, and this influence translates into a new kind of intellectual property; reputation property instead of intellectual property’ (Asay, 2006, pp106).

Drawing from another strand in the literature of open source open-sourcing might be understood as a form of organizing – or building of a novel type of organization. Metiu and

<sup>1</sup> <http://bpms.intalio.com/index.pfhp>

<sup>2</sup> <http://www.collab.net/products/index.html>

Kogut (2001) studied a number of software companies in four different countries and found two distinct forms of organizing for global software development. The established model is the ‘global project model’, but they see a new model emerging – the ‘open development model’. Their analysis of both models focuses on organizing of innovation and creativity in globally distributed work, and is applicable to offshoring and open source development (Kogut and Metiu, 2001). The ‘global project model’ at the most basic level implies that companies are able to take advantage of lower cost of labour by passing work (routine tasks) to offshore sites. This model begins to translate into the ‘open development model’ as, over time, offshore firms and developers begin to not only follow requirements but also to build skills, innovate and create their own requirements for client companies. However, Kogut and Metiu (2001) question whether developers in offshore companies in developing countries are able to move very far away from simple specification following. The ‘open development model’ pushes at the boundaries of the ‘global project model’ when the motivation of contributors becomes rather different, seeking new experience, knowledge and skills. They suggest that open source projects (e.g. Linux) can be taken as ‘proof of the innovation-driven model’ noting that open development ‘does not eradicate the market, it builds it’ (Metiu and Kogut, 2001). This is not to deny that the ‘open development model’ brings its own challenges. Indeed the quality of software produced under such a process will at times be dubious (though of course as it is visible the issues are more transparent; this same opportunity is not offered by proprietary software).

Finally, we must consider a unique characteristic of the ‘open development model’ as exemplified by open source software, its governance style and hierarchy structure (Metiu and Kogut, 2001; Weber, 2004). Linux provides one (though many would argue rather exceptional) example of open development with a flatter but still hierarchical structure reminiscent of some aspects of the ‘global project model’. Linux has a well-defined structure of control at the higher level, but with a second and third level being comparatively larger than in the ‘global project model’. This has ramifications for how organizing of such development is played out and how innovation ‘bubbles up’ and how it materializes into tangible ‘approved’ code and products. A study by Metiu (2006) of the development of an innovative software product called Shield by the ‘global project model’ indicated how status was attached to ownership of design versus code. This study provides an ethnographic account of the governance of such an offshoring relationship and reveals how ‘interactions both shape and are shaped by the status and roles assigned to groups in a society, and that they function to maintain and justify the structure of intergroup relations and intergroup behaviour’ (Metiu, 2006). The design of the product was created by the Californian client and then sent to the offshore company in India for development. Some integration between the developers transpired over the project span, but this in itself was no real guarantee of acceptance of the product. Rather, the Indian developers were considered to be lower in status because they did not draw up the design and if any recommendations were made by them they were dismissed by the client. Open source ideology, that ‘the code decides’, and the personal status deriving directly from code production, suggests that an open development model might have revealed quite different outcomes.

## **6 – Business Models of Open-Sourcing: OSS 2.1 in Practice**

In this section we describe the four umbrella open-sourcing: OSS 2.1 models that are apparent from both literature and current company practice i.e. value-added service, loss leader /market creating, cultivation and expertise capture and value creation. We then elaborate each model further to find that each umbrella model reveals two or more sub-models that provide a more accurate understanding of the practices involved for the companies that have adopted them (see Table 3).



Anderson (2005) claims that small to medium sized firms hesitate to adopt open source software because the level of trust needed and the learning curve for the software is daunting. Instead, noting potential gains outsourcing firms have ventured into this area to provide the ‘trustworthy’ bridge between open source code and coders, and firms looking to offshore/outsource their IT. These mediating firms have a large pool of open source code at their disposal to customize and re-sell to other companies. They may also perform an important function when it comes to providing a better understanding of open source licenses to buying firms. As pointed out above, many companies find it simpler not to enter the labyrinth of open source licenses. This makes it more attractive for companies to use open source software and at the same time may benefit open source software communities through greater acceptance of their software and some revenue. It may also extend the life of an open source collective through increased business interest and adoption. It is also argued that the level of security of open source code is better than that of proprietary because harmful code is not easily hidden in open source code, however this conjecture of quality is still under study and has not been proven conclusively (Hoepman and Jacobs, 2007; Neumann, 2000).

Business experts are clear that both open source and offshoring outsourcing are phenomena that will prevail for some time to come but they tend to recommend a cautious approach. Netke (2005), when asked if he feels that open source software will play a large role in the offshoring marketplace replied that “I think it's going to become more popular, but the reality is that any kind of expertise in open source requires in-depth technical knowledge and engineering discipline, which not a lot of people have. So if you think about it, open source is not really about free software, it's about a sophisticated services model”. This cautious approach seems wise yet Oren (2004) adds that “Open source and IT offshoring are the products of the same driving forces, two faces of the same coin. And they are feeding off one another”. Thus the greater the degree of offshoring then the better the infrastructure to support it. Open source production and distribution can then free-load off the same infrastructure.

Fitzgerald (2006) mentions four dominant open source business models. The four models include value-added service, loss leader/market creating, leveraging community development, and leveraging the open source brand. However, with greater acceptance of open source and more definitive identity emerging for open-sourcing: OSS 2.1 we suggest two other models. Our research has also indicated that companies are not only keen to leverage open source collective knowledge but, as can be seen with examples of inner sourcing, that they are looking for ways to increase and improve access to knowledge within their own organization. Thus a broader term such as ‘expertise capture’ which describes harnessing knowledge no matter what the source is more applicable across the range of global sourcing methods. The fifth model we add is ‘value creation’. We define each of these models in more detail below.

## 6.1 - Open-Sourcing: OSS 2.1 Categorization

The characteristics of open source software in comparison to freeware and proprietary software have given rise, to the surprise of many, to a number of novel business models that utilize the openness of open source to their advantage. Keeping the four umbrella business models in mind we noticed some open-sourcing models emerge with a strong enough identity to be given a name. Some of the terms we use are appropriated from other academics and practitioners, like inner source and open outsourcing, but we have added the other seven models; charter-a-source, symbiotic source, strategic merger source, mature source, sourcing talent, portal source and hybrid source (see Table 3). We categorize open-sourcing: OSS 2.1 where each of the four models is explained with examples from real organizations that have appropriated them, some with mixed results.

**Value-added service:** The value-added service model (Fitzgerald 2006) focuses on the provision of services to customers that help them to install open source software and provide

other such service solutions e.g. RedHat. Within this model we find two sub-categories in use, charter-a-source and symbiotic source.

Charter-a-source is probably the least expensive model that companies can choose in order to create software or other product. Small companies have mushroomed on the Internet where developers clarify their different expertise and market their skills. In turn companies use the same sites to advertise problems that they need to have solved. This provides both parties with a space to come together where problems can be matched with potential solutions and solvers. This is a method of crowdsourcing and we have some interesting examples in the software industry such as Rent-A-Coder (Royce, 2006, 29th October) and Code-with-Coder<sup>1</sup>. The website is usually owned by a third party which makes a profit through a small commission charged to both the company in need of help and the developer who steps in with a solution.

Symbiotic source is a model that companies can be seen to adopt when compatibility concerns between various software arise and need to be resolved. Two similar but individually interesting examples include Gluecode (Gluecode was bought by IBM in mid 2005<sup>2</sup>) and Specifix. Gluecode is an 'an application server platform that encompasses several open source products and groups them together using a layered architecture, hence the name *Gluecode*' (Barcia, 2005). Gluecode allows customers to add their code to its CVS repository and it will make sure that the new code added by the customer is compatible with the rest of the software and does not break the build. In this way the customer becomes 'a development partner' (Asay, 2006).

**Loss leader/Market creating:** The loss-leader/market creating model (Fitzgerald 2006) distributes software for free and then relies on creating a market for complementary but closed source software for which a fee can be charged, e.g. Sendmail and Sendmail Pro. We understand two sub-categories in the loss leader/market creating model; strategic merger sourcing and mature source.

According to Hamm open source and offshore outsourcing are "two of the most disruptive forces in tech industry" (Hamm, 2007). Hamm relates the example of the American database company Ingres Corporation<sup>3</sup>, now with open source code, aligning itself strategically with an Indian outsourcing company Satyam<sup>4</sup>. This alliance is intended to be beneficial to both companies hence Strategic Merger Sourcing. Hamm's analysis indicates that Ingres can hope to secure a portion of Oracle's database market through such an open source comeback and alliance with Satyam, while Satyam can use an open source alliance to strategically distinguish itself. Such movements are fairly new, indeed too new for predictions to be based on hard facts (the alliance was announced on February 12<sup>th</sup>, 2007<sup>5</sup>).

One of the many open source business models includes what in 2004 was considered a 'weird form of outsourcing' (Greenemeier, 2004), and we term as Mature source, when Workbench became Open Workbench. Niku Corporation<sup>6</sup> released the source code for Workbench (under the Mozilla Public License)<sup>7</sup> and thus handed it over to an open source collective to take in any direction that was felt needed by users. Niku could thus 'cut the resources [it needed to] devote to developing and maintaining Workbench and provide Workbench customers with the ability to make enhancements to the software on an as-needed basis' (Greenemeier, 2004).

<sup>1</sup> <http://www.code-with-coder.com/>

<sup>2</sup> <http://weblog.infoworld.com/techwatch/archives/001370.html>

<sup>3</sup> <http://www.ingres.com/>

<sup>4</sup> <http://www.satyam.com/>

<sup>5</sup> [http://www.ingres.com/press/2007-02-12\\_Satyam.php](http://www.ingres.com/press/2007-02-12_Satyam.php)

<sup>6</sup> <http://www.niku.com/>

<sup>7</sup> <http://www.niku.com/products.asp?id=19>



(Greenemeier, 2004). Niku also released Open Workbench on SourceForge. It may not have had any updates since late December 2005 yet it can boast over 62000 downloads. Niku and other companies that have open sourced products release almost all of the code for their products but often retain some code which is patented or belongs to another company and is thus not their source code to give away.

	Open-sourcing Model (OSS 2.1)	Characteristics	Possible Problems	Company Examples
Value-added Service	<b>Charter-a-Source</b>	Relatively inexpensive software. Able to scale down quickly. Access to developers from world. Greater transparency and accountability. Agile development. Coders have access to repository of code. Not usually/always open source software. Form of crowdsourcing.	Limited loyalty to develop code further in future. Little of the open source code is contributed back to the collective. Commission of mediator is a deterrent to developers. Trend of undercutting bids by small amounts infuriating developers. Lower bids resulting in lower quality software. Little transparency in arbitration. Cultural and language difficulties with developers from different countries.	Rent-A-Coder <sup>1</sup> , Code-with-Coder <sup>2</sup> , FreelanceWebmarket <sup>3</sup> , GetaFreelancer <sup>4</sup> , LaunchPad Bounties <sup>5</sup>
	<b>Symbiotic Source</b>	Provides supporting/needed code. Keeps version control. Collaborates in actual development – co-development partnerships. Provides additional services for fee. Greater transparency and accountability. Agile development.	Dependence and possible lock-in to middle man. Complexities of licensing and license proliferation.	Gluecode <sup>6</sup> , Specifix <sup>7</sup> (Gluecode has been taken over by IBM)
Loss Leader/Market Creating	<b>Strategic Merger Sourcing</b>	Alliance of strategic convenience. Open source adoption used as marketing device. Cooperate to restrain competition. Access to larger pool of talented developers.	Could escalate organizational costs. Rising production costs. Cultural and language difficulties with developers from different countries.	Ingres <sup>8</sup> aligning with Satyam <sup>9</sup> (to restrain Oracle), IBM <sup>10</sup>

<sup>1</sup> <http://rentacoder.com/RentACoder/default.asp> and <http://www.mybids.net/>

<sup>2</sup> <http://www.code-with-coder.com/>

<sup>3</sup> <http://freelancewebmarket.com/>

<sup>4</sup> <http://www.getafreelancer.com/>

<sup>5</sup> <https://launchpad.net/bounties>

<sup>6</sup> [http://www.ibm.com/developerworks/websphere/techjournal/0509\\_barca/0509\\_barca.html](http://www.ibm.com/developerworks/websphere/techjournal/0509_barca/0509_barca.html)

<sup>7</sup> <http://www.specifix.com/>

<sup>8</sup> <http://www.ingres.com/>

<sup>9</sup> [http://www.ingres.com/press/2007-02-12\\_Satyam.php](http://www.ingres.com/press/2007-02-12_Satyam.php)

<sup>10</sup> <http://www.ibm.com/developerworks/opensource>

	<b>Mature Source</b>	Open source software. Commercially mature, established product. OSI approved license. Cut development costs. Provision of add-on services for fee. Build user base. Low marketing costs. Able to scale down quickly and inexpensively. Greater transparency and accountability.	Not all code is open source. Patented source is difficult to mix. Complexities of licensing and license proliferation. Limited need to develop code further. Quality of contributions often dubious.	Niku <sup>1</sup> (releasing Workbench as Open Workbench), Intalio <sup>2</sup>
Cultivation/ Expertise Capture	<b>Sourcing Talent</b>	Company adoption of OS collective ideology. Build relationship with external communities. Access to larger pool of talented developers. Agile development. Greater transparency and accountability.	Lose top management support. Unable to sustain enthusiasm beyond short-term. Complexities of licensing and license proliferation. Retaining community links is tricky. Quality of contributions often dubious.	Proctor and Gamble <sup>3</sup> (Connect & Develop strategy), HP <sup>4</sup> , IBM
	<b>Portal Alliance Source</b>	Access to large pool of talented developers. Exploits distributed intelligence of global collective. Cuts development and some organizational costs. Offers a collaborative platform for mediation. Portal offers real time monitor of status of project. Provision of version control and repository. Greater transparency and accountability.	Overheads in management of filtering poor contributions. Subject to both good and bad code updates. Over-reliance on external community can deteriorate in-house expertise.	Allstream <sup>5</sup> with SourceForge <sup>6</sup>
Value Creation	<b>Open Outsourcing</b>	Open source philosophy. Open standards. Customers free to own the source. Limited to no vendor lock-in. Exploits distributed intelligence of global community. Greater transparency and accountability.	Complexities of licensing and license proliferation. Little or no code contributed back into open source collective. Varying battle to gain acceptance for open source code for high security code like banking applications.	NatureSoft <sup>7</sup>

<sup>1</sup> <http://www.niku.com/>

<sup>2</sup> <http://www.intalio.com/>

<sup>3</sup> <https://secure3.verticali.net/pg-connection-portal/ctx/noauth/PortalHome.do>

<sup>4</sup> <http://opensource.hp.com/>

<sup>5</sup> <http://www.allstream.com/home/>

<sup>6</sup> <http://sourceforge.net/index.php>

<sup>7</sup> <http://www.nature-soft.com/index.html>

	<b>Inner Source</b>	Fosters in-house IT department. Greater transparency and accountability. Access to large pool of talented developers. Code releases and maturity more likely to match industry needs. Agile development. Keeps company-wide version control.	Need for restructuring in the organization can be onerous. Too many forks in the code and duplication of effort characteristic of open source projects. Free-riders on good code with little reciprocal contribution by all. Organizational acceptance for the change in mindset required for inner source to be successful. Complexities of licensing and license proliferation. Problem of all members abiding by standards set by industry.	Bell Labs <sup>1</sup> , IBM, HP, Sun Microsystems <sup>2</sup>
	<b>Hybrid Source</b>	Mix of in-house and community expertise. Provides for a mixed bag of tactics and methods that the company can choose. Greater flexibility in approach.	Complexities of licensing and license proliferation. Reliance on external community can deteriorate in-house expertise so it must be balanced. Patented source is difficult to mix.	IBM

Table 3: Categorization and Characterization of Open-sourcing: OSS 2.1 Models

*Expertise capture* brings the focus back to the source, not just the code but the resource that creates the code. Other models such as value added service and the loss leader/market creation concentrate on the distribution of the product, and ignore the process that makes the product happen. We can see firms now paying attention to the source and process, a change in mindset which can be quite profound. Open source experts and developers, as noted above, have reiterated this point and it appears that many companies are now taking the source of the resource quite seriously made obvious through multiple schemes and projects undertaken by the likes of HP, IBM, SUN etc.

The two sub-categories within *expertise capture* are sourcing talent and portal source. The focus for both sub-categories is on retaining and managing expertise in the organization, and attracting collective expertise through building some form of bridge or agreement between the company and a wider collective. Sourcing talent is when an organization explicitly tries to build a communication channel between itself and an open source collective. It thus acquires access to a much larger pool of experts and to new areas of expertise. Such a move inevitably entails a certain amount of organizational change and can challenge accepted ideas. As indicated in Table 3 such a change is not without its troubles such as (sometimes) questionable quality of code contributions, question of long-term sustainability of company-collective links, and dealing with license complexities.

In contrast, Portal source refers to companies reaching out to open source collectives through an established open source portal, such as SourceForge. In this way companies can potentially access an extremely large base of expert developers with open source experience. In general, one can expect that this type of sourcing will, if successful, draw in other potential uses of the code or service proposed. This one can assume is good both in that it validates the idea and refines it, but also because the community of users may, themselves, devote some effort to the development effort.

*Value creation* is the terms we use to summarise the last three categories of open-sourcing: OSS 2.1 we identify. Rather than speak of what the product can bring to the company it is about how the process can be used to create value that allows the company to sustain itself over time. The focus is on re-building (to a degree) the in-house IT department but by also

<sup>1</sup> <http://www.bell-labs.com/news/2000/june/7/2.html>

<sup>2</sup> <http://www.sun.com/software/opensource/>

fostering ideas across the organization and thus expanding the level of contributions. This approach can give rise to greater inter-departmental work and in some respects may offer more scope for learning and (re-)organizing. Interestingly, what is learned and how this learning is organized also changes and becomes more fluid as the number of participants increase.

Open outsourcing is a model that companies use when they want to adopt an open source philosophy and standards. As with open source this model relies on the transparency that is provided by most open source licenses. Vendor companies are bridging out to open source communities to get help in creating the product required by their client. This enables the vendor company to tap into a community of experts and as the source code is open and visible the client company benefits with a way to counter vendor lock-in. Vendor companies are in principle then able to build a long-term trusting relationship with both clients and the open source community because client companies are free to take their code and approach another company/community for upgrades, changes and maintenance should they be unsatisfied. A number of Indian outsourcing companies are using this model e.g. NatureSoft.

Inner source is a model that accepts certain rules of open source development which focus on building a community and product collectively (Gaughan *et al.*, 2007). But, unlike the other methods classifies as value creation, inner source does not branch outside the company limits for expertise. Instead it concentrates on building in-house expertise and creating a more collaborative environment *within* the entire company. The IT department or sponsoring department is expected to talk and work collaboratively with various other departments and individuals in the company thus generating more ideas with better critique and testing. A good example of a global company using inner source as a way to produce software for mobile phones is Nokia (Jaaksi, 2006; Jaaksi, 2007).

Finally, hybrid source is indicative of the approach taken by companies which do not clearly fall into any one of the categories above but adopt instead a mix of closed and open source methods. Coupling open source ideology and process with outsourcing and offshoring exploits the ‘distributed intelligence of Internet communities’ (Anonymous, 2006b). There are a number of companies that have taken this route because it allows for a more flexible choice of methods, and companies can pick and choose from various tactics that suit the company context and situation.

## 6.2 - Process, Product and Community

The business models that have emerged in response to organizational acceptance of open source ideas, and that are reviewed above, need to be considered with regard to their sustainability and comparative effectiveness. Developing that understanding in terms of process, product and community allows for a more nuanced analysis, and has been used before effectively (Fitzgerald, 2006; Shaikh, 2007). Using this categorization we first explore the advantages and problems that organizations face when open-sourcing: OSS 2.1 is adopted in any form (see Table 4), and second, create a comparative characterization relative to open source, outsourcing and proprietary source (Table 5). We discuss our three-level categorization and compare open-sourcing: OSS 2.1 to other sourcing methods.

The first column in Table 4 describes the main advantages at each level followed by the problems companies face when open-sourcing: OSS 2.1. The problems are in most cases are not insurmountable and mitigation strategies have been offered by academics and through company examples of involvement and problem-solving. Process considers all the issues that arise over the entire (reflexive) course of company involvement in open-sourcing: OSS 2.1 stemming from the idea of the product or service through the moments of translating the idea to a product and beyond (i.e. maintenance, evaluation and innovation). As indicated in Table 3 the advantages of open-sourcing: OSS 2.1 from a process perspective discuss innovation of

ideas, risk-based development approach, better and more effective testing, speeding up time to market and finally a reduction in R&D costs which completes the reflexive process.

### 6.3 - *Process*: Advantages and Problems of Open-Sourcing: OSS 2.1

Open-sourcing: OSS 2.1, as has been noted above has proved to be successful when used to mitigate problems of offshore outsourcing. More generally, the open source process, in which all code is reviewed and commented on by a larger community, where competing ideas are allowed even encouraged, and which parallels development with debate, can crack open some enduring software woes. Thus the natural iterative approach, the faster cycle from idea to use, and the ability to borrow and rework what already exists, and the better adherence to standards, can make such a sourcing strategy very attractive.

However, we have also seen that open-sourcing: OSS 2.1 is not without its own problems, not least of licenses (Clarke, 2007). Lawyers are not always well-versed in all the different open source licenses which are available noting that officially the Open Source Initiative (OSI) has approved 58 distinct licenses<sup>1</sup>. The problems that companies have endured from adopting any open-sourcing: OSS 2.1 model from a process perspective mostly focus on managerial and organizational change issues like continuity concerns with experts and module designers, to even make the idea of open-sourcing: OSS 2.1 acceptable to higher management and all employees alike, and maintaining a standard of development for their product that complies with industry standards. Mitigation strategies employed by companies to counter (to some degree at least) the problems respectively are supporting a championing scheme to groom module designers, management strategies to convince and enrol all levels of company employees to gather long-term support and to create a consortium of companies that create open standards that collaboratively create a new industry standard (long-term strategy) or a way to fit into the current industry standard (short-term strategy).

	Advantages of Open-Sourcing	Problems with Open-Sourcing	Problem Mitigation Strategies
Process	Bugs are made shallow by a large base of testers. In open-sourcing this testing takes the form of <i>continuous inspection</i> (Dinkelacker <i>et al.</i> , 2001).	Difficult to maintain a certain standard of coding with the introduction of inner source in a corporation that needs to work to a particular standard.	Short-term – this is problematic but in the long-run aim to form a consortium with other companies that create a new set of standards with which open source development is not incompatible.
	Speeds up time to market	Risk of losing module designers	Create a championing scheme in the management chain
	Development method resembles Boehm's risk driven spiral model. The open source model, rather than driven by risks is feature-driven (Anonymous, 2006a; Dinkelacker <i>et al.</i> , 2001).	Process of legitimizing the use of open source software, methods or process in an organization is difficult.	Various management strategies need to be employed that target both top-down and bottom-up change.
	Establishment of an embedded capability to innovate within an emerging standard platform (Grand <i>et al.</i> , 2004; Minoli, 2004).	Difficulty of grooming replacement module designers	Create a championing scheme in the management chain
	Reduction in exploration and R&D costs for new software development.		

<sup>1</sup> <http://www.opensource.org/licenses/category>

Product	Improved software reuse and code leveraged among several products.	Loss of Intellectual Property Rights. Traditional companies find it difficult to deal with the loss of IPR because they feel they will lose their competitive advantage.	Dual licensing scheme creates an opportunity to create the same or similar software and release it under different licenses according to company needs.
	Better code quality through greater scrutiny but also the author is now aware that he is building a reputation so will avoid releasing bad code.	Threatens the security of code produced concerning who can access it and thus who can contribute to it.	Again, perhaps a slow and steady adoption of open source ideas, methods etc would be appropriate to disprove the myth of insecurity surrounding open source software.
	Increased transparency and openness of code.		
Community/ Organization	Good for leveraging company relations with open source communities thus potentially giving the company access to a large pool of developers and testers. Possible close and continuous operational interaction with the user community (Grand <i>et al.</i> , 2004).	Shrinking of developer pool with inner source and other forms of corporate source (due to only members of the corporation having access) in comparison to the entire world of programmers potentially available to open source projects.	Use the introduction of inner source methods as a precursor to progressive source to eventually lead to fully open source methods, code and process.
	Greater focus on individual contributions thus allowing every contributor 'face' value through the electronic trail s/he leaves.	Progressive source can become difficult to navigate across an organization structure.	Use of some version control management software would mitigate such infrastructural issues.
	Access to sophisticated, scalable, reliable, cost effective software.	A shift of dependence from internal resources to nebulous communities with no contract to act as a safeguard.	To create a successful bridge of interaction and communication between the organizational members and the open source collective – process of building trust.
	Greater competitiveness of company product through higher quality product	Mismatch between hierarchical structure of organizations and open source project governance models.	Find an open source collective (if possible) whose governance structure is similar to the organization.
	Rapid redeployment of skilled developers across various projects.	Organizational challenges of creating code across company boundaries.	Use of some version control management software would mitigate such infrastructural issues.
	Reduced lock-in into particular commercial software	A change in mind-set for not only management staff but all employees of an organization.	Various managements strategies need to be employed that target both top-down and bottom-up change.
		Depending on the level of adoption of open source ideas in an organization the organizational costs can rise drastically at least in the short-term.	Brainstorming sessions and a need to find a more inclusive form of interaction to get all the employees on board.

Table 4: Advantages and Disadvantages of Open-sourcing: OSS 2.1

## 6.4 - Product : Advantages and Problems of Sourcing

Product level issues concentrate directly on what is delivered, regardless of how it is made and includes qualities of the product - what can the product do, be used for, or symbolize. In this category we include elements of the product that emerge from the license and the levels of transparency that stems from adherence to a license. In many areas open source software is recognised as of the highest quality. As a web server Apache is a match for it proprietary competitors, as arguably is LINUX in the operating systems market. However, beyond these top 20 open source products the quality of the product may be less easy to judge notwithstanding the availability of code.

Indeed, product-related challenges relate mainly to the openness of the source provided by an open source license. Companies fear losing intellectual property rights to their ideas and software because historically this is how companies have earned a profit. The switch to a different business model for software may not be accepted without effort or some desperate circumstance. Security of code and access to the code produced are key issues. On the other hand it is understood that open source software, because the code is visible, should be more secure through the scrutiny it allows from a larger body of testers (Schneider, 2000; Schneier, 1999, September 15th) but there is the counter argument that when code is visible then it can be manipulated in more subtle ways (Wheeler, 2003; Witten *et al.*, 2001).

### **6.5 - Community/Organization Advantages and Problems of Sourcing**

As indicated in Table 5 community and organizational matters play a strong role in open source and thus is relevant to open-sourcing: OSS 2.1 strategies. Is the emphasis that open source scholars place on community and the value it creates through knowledge creation and constant learning, as relevant in an open-sourcing model? How might a company that wants to use open sourced products and services be able to maintain successful links to the knowledge base afforded through the community around an open source product?

Sustained access to the community or organization-wide expertise is really a necessary condition for open-sourcing: OSS 2.1, but it is not straightforward to engineer and maintain long-term. Inner source does not allow for company employees to build links with outside communities so the pool of experts is not as large as possible with a more 'open' sourcing model. Inner source does reduce issues such as maintaining links with a wider workforce but brings with it organizational change issues which can be drastic for hierarchical companies to adopt quickly or easily. Other models of open-sourcing: OSS 2.1 such as open outsourcing don't have the latter problem but bring along other organizational concerns such as a mismatch between the hierarchical governance model with the more distributed and flat governing model of many open source communities. It can be understood that most of the problems that surface from the question of community revolve around organizational change and governance and thus the mitigation strategies need to focus on the same.

## **7 – Comparative Characterizing of Open-Sourcing: OSS 2.1 within Global Sourcing Types**

The section above outlined the main advantages and disadvantages of open-sourcing: OSS 2.1 that become apparent through examples of adoption that have begun to emerge. This seems to suggest that there are clear benefits and if we are optimistic that most of the problems of open-sourcing: OSS 2.1 can be resolved with patience, careful strategy and adoption of new practices. But companies need to be cautious before they take this route. In this section we delineate the criteria that companies may need to consider when thinking of adopting any of the four different sourcing models; proprietary, outsourcing, open source or open-sourcing: OSS 2.1.

It is encouraging that examples of open-sourcing: OSS 2.1 are beginning to spring up in many software related industries. In this section we then approach a comparison of four models in use including proprietary source/products, outsourcing, open source and open-sourcing: OSS 2.1 from the broader perspective of services, ideas products and software (Table 5).

	Criteria	Proprietary Source	Outsourcing	Open Source	Open-Sourcing (OSS 2.1)
Process	<b>Communication</b>	Face-to-face mostly.	Face-to-face, but also uses technology like email, telephone etc.	Mostly online, though limited face-to-face in conferences.	Combination of face-to-face and online.
	<b>Control</b>	Centralized, tight and rule based.	Centralized, tight and rule based – often implemented though the SLA.	Distributed, informal rules and norms.	Combination of control mechanisms used ranging from very centralized to quite distributed and informal.
	<b>Infrastructure</b>	Works on internal company infrastructure though this can be global.	Works on internal company infrastructure though this can be global.	Built on distributed OS structure and uses already in place Internet infrastructure.	Built on both global internal infrastructure and Internet.
	<b>Governance model</b>	Hierarchical, top down with strong management structure.	Hierarchical, top down with strong management structure, and often needs to consider governance model of client company.	Varies from OS project to project but often democratic and a combination of bottom up and top down.	Combination of hierarchical (and client based governance structure matching) and OS democratic style.
	<b>Maintenance</b>	Clear and distinct after sales phase with documentation.	Clear and distinct after sales phase with documentation.	Evolutionary and agile development that makes little distinction between phases of development.	Combination of clear phase and evolutionary type of development and after sales service.
	<b>Distribution model</b>	Software/product/service is often created for a large market so generalized product and then distributed widely through retail.	Made to measure software/product/service so distribution channel is closed and internal.	Distribution is carried out over the Internet as downloads (which are sometimes free of charge) but always with open access to product design and code. Internet provides large, cheap and effective distribution channel.	Mix of internal, closed channel with the use of the Internet (where companies often take from this latter channel but don't pour back their now copyright idea/product).
	<b>Total cost of ownership</b>	Clear methods to help quantify TCO in the company making decision making on this basis between products/services easier to compare.	Clear methods to help quantify TCO in the company making decision making on this basis between products/services easier to compare. Such factors have to be dealt with when creating the SLA and thus this is clear.	Too many factors that are hard to quantify thus making TCO difficult to measure in OS.	Depending on the open-sourcing route taken companies would face varying fuzziness of TCO. TCO is clearer in open-sourcing than OS as some elements must be quantified for a company wishing to sell its product/service.
	<b>Marketing</b>	Wide, open and global marketing strategy to pitch product/service at the largest audience.	More at the level of company ability and expertise to enrol other firms into long term contracts.	Via forums, word of mouth, use of product, and gaining critical mass of designers and developers in the community.	Global marketing strategy but also based on expertise of the company – however also rely on word-of-mouth and forums.



	<b>Transparency of process</b>	Limited transparency of process as proprietary license.	Limited transparency of process as proprietary license.	Greater transparency than other models and depends on the promiscuity of license.	Partly transparent – depends on license. If dual license then good level of transparency in process.
	<b>Development model</b>	Depends somewhat on size of project – large scale production usually entails clear phases and division of labour.	Depends somewhat on size of project – large scale production usually entails clear phases and division of labour.	Agile, evolutionary and more focused on parallel constant testing and building.	Combination of planned and clear phase production with agile methods and beta testing.
<b>Product</b>	<b>License</b>	Closed and proprietary	Closed and proprietary	Open source (with varying degrees of openness)	Dual licenses and some only OS or proprietary.
	<b>Application type</b>	Wide range of both products and services are covered.	Back-office and non-core applications/services.	Horizontal rather than vertical business applications and services. Mostly infrastructural and back-office.	Non-core applications and services but open-sourcing model used as a strategic device and propped up as strong PR for the company.
	<b>Code/product/idea quality</b>	Unable to reverse-engineer product or service so need to accept quality as provided by vendor.	Quality specifications somewhat written into SLA which ensures certain level of quality. Unable to reverse-engineer product or service.	Quality easier to test as large base of testers and bug fixers. Source and process are fairly transparent so if needed the product/service can be analyzed.	SLA specifies quality level so quite effective yet made even better when both product and process are transparent and open to scrutiny.
	<b>Ownership</b>	Owned solely by company or license holder.	Owned solely by company, license holder, or client company that pays for the product or service.	Owned by the collective and not by any one individual or company solely.	Partly owned by the collective and some strands of the product/service owned by a company.
	<b>Architecture</b>	Closed architecture.	Closed architecture.	Open architecture.	Early part of the product/service is open but the final product is often closed architecturally.
	<b>Level of documentation</b>	Detailed documentation is a requirement.	Detailed documentation is a requirement and specified in the SLA.	Often patchy or non-existent but sometimes this is mitigated by speedy help provided through discussion forums by experts.	Documentation of good quality and detail is a must and this counters a serious problem companies have with OS products/services.
	<b>After sales service</b>	Either part of the contract or non-existent.	Either part of the contract or non-existent – this can lead to issues of vendor lock-in just as the maintenance issue.	No real after sales service at all but discussion forums are often used to tap into community expertise and help.	Companies often bridge between the community and client and ensure that after sales services are provided through the company but tapping into community expertise.
	<b>Reusability of code/idea/product</b>	Reusability limited to development/designer of idea but often the company dictates what can be reused.	Reusability limited to client company as they pay for the product or service and thus own it. However they often don't have the expertise to reuse it so are locked into vendor company.	Great reusability of idea, code, product as the process and product is open and transparent – and available for anyone to reuse.	Good reusability level as company usually releases much of the design or product back into the community. Indeed this is encouraged as a way to build trust between company and community.

Community/Organization	<b>Motivation</b>	Mostly financial, promotion and job-related.	Mostly financial, promotion and job-related.	Learning from each other, reputation, ego, potential job-seeking and creativity.	Community and company link building to retain expertise over time, promotion of product and company, and sustaining the community and its members.
	<b>Contributor profile</b>	Company based and can be a global company. Paid employees.	Company based and can be a global company where outsourcing and offshoring implies mixed cultural background of developers and designers. Paid employees.	More truly global than any other model, mixed culturally and mostly male. Mostly working in their free time/while on another job and not usually paid.	Global as the OS community it links too is very global but the company members are often mostly from one country, paid employees.
	<b>Level of interest and contribution</b>	Paid to work on project so interest varies and contribution is expected and dictated by senior management.	Paid to work on project so interest varies and contribution is expected and dictated by senior management and client company.	High level of interest but most contributions are small and can take the form of using the application/service and providing feedback/bug reports.	Good level of interest and contribution may be small but is consistent.
	<b>Mobility of developers/ creators</b>	Mobility limited to company but company maybe global.	Mobility limited to company but also to client sites and often experts of the vendor are hired by the client.	Great mobility between projects and often we see the same person is a member of more than one community.	Very good mobility between company sites, client sites and OS community.
	<b>Access to learning/ training</b>	Companies' offer training options but learning from other colleagues is limited by the number of people you have communication with and access too.	Training is offered by companies. Learning is enhanced through access to a larger population of people from working on client sites.	Training (traditional form of it) is not usually available but learning from colleagues is a key reason why people contribute and belong to a community.	Employees/members have both training and collaborative learning resources. Training is provided by the company and all members have access to a global community of OS experts outside the company walls.
	<b>Size of community</b>	As large as the number of employees of the company.	As large as the number of company employees and often the client site too.	Varies from project to project but potentially this is a global and very large workforce.	A mix of both company employees and access to the global workforce accessible through the OS community.
	<b>Sanctions on rule breaking</b>	Companies have clear rules and enforcement strategies.	There are clear rules and enforcement techniques which stem from both the company of origin and client/vendor companies.	Informal but very effective enforcement techniques to control the community.	Mix of informal and legally enforceable sanctions.
	<b>Status of core developer/ creator group</b>	Position of authority but still answerable to manager.	Position of authority but still answerable to manager and client/vendor management.	Position of control and authority which is based on recognition of expertise and thus very influential.	It is a position of control and authority yet there is some measure of answerability to the company.
	<b>Global distribution</b>	Large companies have global offices which create a	Large companies have global offices which create a global	Internet as infrastructure provides few	Beneficial combination of resources which gives rise to a considerably

		global presence and workforce.	presence and workforce, and this is enhanced when outsourcing is done in the form of offshoring.	temporal or spatial boundaries to such communities thus creating a more globally distributed community/organization than possible in any one company.	globally distributed presence.
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Table 5: Comparative Characterizing of Open-sourcing: OSS 2.1 within Global Sourcing Types

### 7.1 - Process: Communication, Control and Governance

There are ten criteria that we found to be indicative of a process. The main aspects that require focus in process revolve around questions of communication, control and governance. The interesting elements arise when these three criteria are seen together. As can be noted from Table 4 there is a clear link between more online based communication, distributed control and a democratic governance structure to match, and this is possible because of the transparency afforded by the license of the product/service. Open source offers the most democratic governance structure but open-sourcing: OSS 2.1 is able, through its combination of offshoring and open source techniques and ideas to enjoy a variety of benefits. Often the problems that companies face with open source ideas/process or software adoption like lack of documentation, license problems etc can be countered by some level of company adoption thus making open-sourcing: OSS 2.1 a very attractive model financially and process-wise.

### 7.2 - Product: Ownership, License and Quality

Product concepts relate closely with the license of the product. As can be seen from Table 4 proprietary software has a very distinct license from open source products and services but open-sourcing is able to capitalize on a dual licensing scheme. Some open source software is also released under a dual license but that is because the company or community that has made such a decision is working on an open-sourcing: OSS 2.1 model. Ideas of ownership are laid down by and resolved by the license too. The General Public License (GPL) for instance, ensures that no one person or company owns the product. The GPL gives ownership of only his/her contribution to each individual, so each person owns what they create but no more. Individual owners then when they adopt the GPL give rights to others to use and amend their work creating the impression of collective ownership. Open-sourcing: OSS 2.1 is able, unlike the other approaches listed in Table 4 to take advantage of both proprietary licenses and rights of ownership and those of open source.

The reason why many consider open source products to be of better quality is because the source is open and visible to all. This draws back into our earlier point about how transparency of product is designed through the license adopted. Companies are interested in open-sourcing: OSS 2.1 because the source is visible which reduces vendor lock-in thus allowing companies to take their product/service to an alternative vendor if the original one begins to charge too much.

### 7.3 - Community/Organization: Strategies to Improve Contributions, Career Development, and Control through Sanctions

Companies wishing to take the open-sourcing: OSS 2.1 route may need to pay attention to the various tactics used by open source governance structures to intrigue, enrol and sustain the community over time. Open source development projects cannot expect contributions but can only encourage them by creating a product that will be useful to a large population of people. The more domain centric products have a much smaller community of people contributing to it. All open source projects have some form of governing body which is often comprised of the core development team. The core group tends to work more full-time on the project but other members of the community usually make very tiny contributions (Benkler, 2002)

however, this is an effective way of not burdening the community and scaring off contributions.

It is attractive for developers if they can contribute when they want and to whatever part of the product/service that interests them, however another reason why they contribute and play any part in such development is because of the access it gives them to cutting edge work, ideas and experts. A key motivation of OS developers to contribute to projects is what they can learn from each other as a community (Lakhani *et al.*, 2003; Lakhani and Wolf, 2005b). Open-sourcing: OSS 2.1 provides not only the community the same free access to good ideas and work but gives the same right of entry to its company employees as well.

The community and the company enjoy a great level of freedom in open-sourcing: OSS 2.1 yet this is not to imply that there is no control. Any behaviour that is counter to the open source way can and is punished heavily. Control mechanisms in open source projects may be informal but they are just as severe as those implemented by companies. Companies that practice open-sourcing: OSS 2.1 are able to exercise a mix of enforcements which are more effective when used together.

#### **7.4 - Conclusion: Open Source, OSS 2.1 and OPAALS**

In this deliverable we began with a typology of OK initiatives which helped guide our methodology and case selection. The three cases chosen – Wikipedia, Google Answers and SourceXchange – represented one quite successful and two less-so examples respectively. Our study found that the successful case of Wikipedia was not a business venture in the traditional sense of the word, but was rather an attempt to create a knowledge repository which was and is openly edited, contributed too, and created for access and use for all who have access to the Internet. The other two cases had a clear aim to be a profit making venture which adopted open source ideas and/or indulged in open source development. The latter two cases were created with innovative business models which were also inspired by open source ideas.

The business models were very interesting and we indicate in this deliverable how open-sourcing: OSS 2.1 is leading to a more process orientated inclination in companies and how business models to match are emerging. We add to the demand side models with two supply side ones which include expertise capture and value creation. The change in business models is reflected in how open-sourcing: OSS 2.1 is adopted in practice by companies. We then do a comparative characterization of open-sourcing in relation to the other forms of sourcing that are practiced by organizations. Finally, we conclude with some emphasis on how the trend, ideas and vision behind open-sourcing: OSS 2.1 can help nurture a digital business ecosystem (see Table 6) – a clear aim of the OPAALS project.

#### **7.5 - Open-Sourcing: OSS 2.1 and OPAALS**

Open-sourcing: OSS 2.1, if adopted and encouraged by OPAALS and the various distributed OPAALS members can help (see Table 6 below) cultivate:

- Regional development through fostering of SME growth in their own regions
- Greater expertise building and sharing to create collaborative knowledge networks which are open and accessible – thus extending the network metaphor in practice
- Cultivating and collaboratively building up regional knowledge with the effective reaching out of small and medium companies to local communities of open source development which foster home-grown talent and expertise making these companies less dependent on outside vendor lock-in.

Relevance of Open-Sourcing: OSS 2.1 for OPAALS	
Process	Open-sourcing: OSS 2.1 encourages consortium forming with other large and SME companies that can create a new set of standards with which open source software/service/idea development is compatible. The open source element engenders collaboration, transparency and sharing.
	Adoption of open-sourcing OSS 2.1 ideas can speed up time to market products and services thus benefiting any company that forms part of the ecosystem. SME's are better able to compete with large monopolistic firms by innovating with their business models to incorporate open source ideas.
	Open-sourcing: OSS 2.1 ideas can help cultivate both top-down and bottom-up innovations of products and services thus making adopting SME's more competitive..
	Open-sourcing: OSS 2.1 can help establish and innovate to create a standard platform for collaboration between companies and between companies and open source collectives thus enlarging the ecosystem.
	Open-sourcing: OSS 2.1 can help reduce exploration and R&D costs for new idea development and a more collaborative form of competition is encouraged which can help reduce wasteful duplication of work.
Product	Dual licensing schemes often adopted with open-sourcing: OSS 2.1 create an opportunity to build the same or similar software/product and release it under different licenses according to company needs thus ameliorating IPR issues.
	Better quality product/service through greater scrutiny but the author is now also aware that he is building a reputation so will avoid releasing bad code/or ideas. Perhaps a slow and steady adoption of open source ideas, methods etc would be appropriate to disprove the myth of insecurity, questionable quality and reliability surrounding open source software/ideas.
	With open-sourcing: OSS 2.1 there is increased transparency and openness of product/idea and process. This fact allows trust building in an ecosystem making an ecosystem possible and sustainable over time.
Community/Organization	Open-sourcing: OSS 2.1 is useful for leveraging company relations with open source communities thus potentially giving the company access to a large pool of developers and testers. Possible close and continuous operational interaction with the user community thus providing a constant pool of expertise to SME's who can often ill-afford expensive consultants on their payroll.
	Open-sourcing: OSS 2.1 fosters greater focus on individual contributions thus allowing every contributor 'face' value through the electronic trail s/he leaves.
	Open-sourcing: OSS 2.1 promotes innovation in not only open business models but also in methods that companies can use to reach out to open source communities which stress 'trust building bridges' between various communities – a more cohesive digital business ecosystem.
	Open-sourcing: OSS 2.1 indicates that companies would probably benefit from reaching out to an open source collective (if possible) whose governance structure is similar to the organization. Governance is a key issue in OPAALS and open-sourcing: OSS 2.1 provides strong indication of how to achieve some balance between distributed and centralized control and hierarchy.
	Open-sourcing: OSS 2.1 provides some relief to SME's (who are particularly vulnerable as they do not have the necessary influence) from lock-in into particular commercial software/product/service. It also promotes rapid redeployment of skilled developers across various projects and companies.
	Open-sourcing: OSS 2.1 fosters more inclusive forms of interaction and idea sharing not only encouraged but almost a must for OSS 2.1 and for cultivating a digital business ecosystem in OPAALS.

Table 6: Relevance of Open-sourcing: OSS 2.1 for OPAALS

As Table 6 indicates there are numerous possible areas of not only overlap but direct contribution of OSS 2.1 to building a digital ecosystem for OPAALS. The current research, as pointed out in the introduction, has laid the foundation for studying such a contribution.

In this research our aim was to learn from the lessons provided by a number of open knowledge initiatives. This process lead us to understand how the business models upon which the knowledge initiatives were constructed were of crucial importance (and along with the choice of license) lead to important implications for how the projects were governed, knowledge was handled and archived, and what sustained the project over time. The importance of business models directed our research to open innovation business ideas. Thus

this work has consolidated our understanding of how ideas of openness, sharing and collaboration borrowed from open source contribute to building a community around a shared interest (this links in well with WP10 of OPAALS). However, the focus of WP7 is equally relevant for this deliverable because our study complements and helps confirm the ideas of business models for regional development that WP7 gravitates around.

The next step in our research is to elaborate on Table 5 with empirical data to substantiate what we gathered from secondary data so that we can make a more significant contribution to understanding how we can generate and help a community of SME's to prosper through a digital ecosystem (in other words to elaborate Table 6). Task 12.8 and deliverable 12.6 will thus move this area forward into more concrete lessons and feedback for OPAALS concerning open innovation business models and regional development.

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