

Open Source & The Irish Software Industry?

*An investigation of the Open Source Software (OSS) Movement
and it's impact on the Indigenous Irish Software Industry*

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Abstract

The open source software movement is a global phenomenon that is having a significant impact on the global software industry. It is changing the way in which software companies and people view the software development process. It is changing the way in which software companies capture value. It is commoditizing segments of the software market and is creating new business models and new ways of capturing value. It is lauded by some and vilified by others. It is often painted in a biblical light – David taking on Goliath. Yet, many of the Goliaths’ are also benefiting from this movement. This dissertation explores this - How can companies manage the impacts of the open source software movement to their advantage?

This research examines the phenomenon in the context of the Irish Industry. Through a review of the existing literature this dissertation develops and exploratory framework for investigating different factors that might be influential in looking at how Indigenous Irish Software firms might manage the impacts of open source software movement. It weaves facets of different research areas together to produce this framework. The framework is then tested using several techniques including a qualitative survey.

The dissertation includes several sections that apply the framework in order to analyze and develop profiles of several different firms. These profiles are then used to look at some of the different strategies and tactics available to firms. In many cases, examples are drawn from the global software industry to illustrate these approaches.

The research concludes that there are factors that influence how a firm can manage the impact of the open source movement. It also builds on the initial framework to offer a more complete approach to understanding the factors that change the way in which firms manage the impacts of the open source software movement.

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1. Introduction

This section looks at the rationale for doing this research and provides some context for the research and the research questions. It provides a very high level background to the Open Source Movement and some key definitions relating to the open source movement.

1.1.Rationale for the Research

There are several reasons why this research was undertaken. Currently Open Source Software and the Open source software movement are very visible phenomena that have caught the imagination of people all over the world. Much of this commentary has focused on the ‘David and Goliath’ aspect and the quasi-social movement that has been spawned by people participating in open source projects like Linux and others. Articles appear frequently in the popular press commenting on the perceived competition between open source projects and proprietary products. In particular, the perceived battle between Open Source and Microsoft has garnered significant publicity. The article ‘*Open, but not as usual*’ published in the Economist (March, 2006) which outlines some of the pros and cons of open source software and the approach and its impacts on commercial organizations. It is typical of the type of commentary around open source and the impact that it is having.

The number of different perspectives and the freshness of the topic makes it a very interesting although complex and broad area to research. Investigating the impact on Irish firms narrowed research area and made it easier to directly observe the impacts within a business framework.

The research was made even more relevant by recent policy decisions by the Irish Government to emphasise the knowledge economy. The software industry in Ireland is often used as an example of a knowledge based industry,

where the value add comes from the expertise and knowledge of the participants rather than from cheap labour.

The Open source software movement has led to the establishment of a number of European software firms with global reach including JBOSS¹, MySQL², Trolltech³ and others. A Study by Dempsey et al (1999, p.10) also shows that a large number of open source projects have a significant number of European based developers (37%) contributing to them.

The outcome of this research might provide useful insights as to how the open source movement could contribute to Ireland's quest for more knowledge-based employment.

1.2.The Open Source Phenomenon

"We reject kings, presidents and voting, we believe in rough consensus and running code" David Clark (1992)

The quote above encapsulates some of the principles that make open source what it is and acts as a quick introduction to some of things that make open source different. This section is a very high level review of the open source software movement It introduces the phenomenon. Some suggested places to look for additional information include the Free Software Foundation's website⁴ and *'Open Sources – Voices from the open source revolution'*⁵ published by O'Reilly publishing in 1999.

1.2.1.Early Days

There are various phases and milestones in the history of the open source movement. Most commentators link the origins of the open source movement with technology advances in the late 1960's. These include the US defence

¹ JBOSS provides an open source J2EE application server – www.jboss.org

² MySQL provides a dual licensed database server – www.mysql.com

³ Trolltech provides a set of 'user interface widgets' that are used by the KDE Linux desktop www.trolltech.com

⁴ www.fsf.org

⁵ <http://safari.oreilly.com/1565925823>

funded ARPANET (the predecessor to the Internet) and the work done in Bell Labs by Thompson and Richie on UNIX and the C programming language. These were all research projects designed to make mainframe computers more useful. Many different institutions and people collaborated in these research projects. At the time, software was not considered as a separate entity, it was there purely to complement the hardware.

UNIX was one of the first operating systems that supported multi-platforms and as such, software developed for UNIX could be easily ported to different hardware architectures. This is mirrored in the Irish Software Industry's early roots where a number of the early software companies (System Dynamics, Mentac) started by supporting early hardware platforms. Note that much of the initial impetus for this software community came from individuals working in research institutions and the ethos was an academic research one where results were shared through the community. This community idea is still given as a core reason as to why people contribute to open source projects.

1.2.2. “Free Software as in Free Speech not Free Beer”

The success of UNIX resulted in AT&T trying to capitalize on its intellectual property by trying to make UNIX proprietary and then licensing the operating system. This resulted in the UNIX wars of the 1980's where many different variants of UNIX were developed. The move by AT&T was very negatively viewed by some members of the academic community who had been involved in creating UNIX. Richard Stallman, one of the researchers working on the original UNIX O/S, left MIT and decided to build a 'free' version of the operating system. As part of this process, he setup the Free Software Foundation (FSF). Its mission has been to develop free software and is chiefly responsible for a series of public projects to develop core tools and utilities for the operating system. These all bear the GNU name – (GNU is Not Unix). Stallman famously coined the phrase “*Free software as in free Speech not free Beer*”.

1.2.3. The Gnu Public License & Linux

The success of the free software movement resulted in a number of significant breakthroughs and the creation of a number of important standards. At the

same time, it was not without controversy. The Free Software Foundation was built around a philosophy that encouraged the sharing of ideas and code, however it was clear that a number of people were appropriating ‘free code’ and incorporating it in their own proprietary software and not releasing modifications back into the community. To combat this and to remain true to the aims of the FSF, Stallman created a new class of license – The GNU Public License (GPL). It is this license that Linus Torvalds used when he released his UNIX derivative - Linux. Linux is one of the most influential free software projects and certainly the one that has brought the GPL and open source into the public’s awareness. The key to the GPL license is its viral nature, if a developer uses code that is licensed under the GPL; the developer is obliged to release their code under the GPL.

1.2.4. Open Source and the OSI

During the 1990s, commercial organizations took notice of, used and commercialized ‘free software’. A number of companies proposed business models based on ‘free software’. These included VA Linux, Netscape, Redhat and others. For many people the name ‘free software’ did not really represent what they were doing. In 1998⁶, the phrase ‘Open Source’ was coined to describe the software model – it was felt that this made it more business friendly. At the same time, the Open Source Initiative (OSI) was formed to promote the idea of open source. OSI promotes and monitors different open source licenses; it does not see its role as defending the free software philosophy. The OSI provides a series of guidelines that help define whether a license is open source or not. It is interesting that IBM (2005a) in its patent pledge specifically linked the definition of open source to the list of licenses approved by the OSI.

1.2.5. Recent Developments

Open source and the open source software movement continue to evolve. In the 1990’s Open source software was frequently seen as a threat by commercial companies. A lot of effort was spent on trying to derail the

⁶ History of the Open Source Initiative, [On line] <http://www.opensource.org/docs/history.php>

movement through different business strategies and through legal actions including the on-going SCO vs. IBM action. Current events seem to indicate that commercial organizations have accepted the validity of the model and are trying to replicate some of the advantages. Many companies including Microsoft have some sort of shared source license and many companies have open source products within their portfolio. It seems that some aspects of the open source model are definitely being embraced. At the same time, the commercialization of the open source model appears to contradict some of the theories given for why people contribute. Raymond (1998), Fitzgerald and Feller (2002), Stallman (2000) and other have argued that the incentives for people to contribute tend to be linked to the social environment and the signalling motive. Recent activities in the market must test that rationale. Many moves in the market seem to benefit companies associated with open source projects rather than the contributors to those projects – whether this is Redhat⁷'s success, or the take over of SleepyCat⁸ software by Oracle in 2006.

1.3. Terms & Definitions

The section defines some of the terms used in this dissertation; this is done to help make the dissertation consistent. It is also done to avoid confusion where terms might be used differently in other situations and other studies.

Open Source and *Open Source Software* are terms used to generically refer to all forms of free software. Strictly speaking, there are different categorizations available – these include Libre Software, Free Software, Open Source software and others.

The phrase *Open Source Software Movement* is used to refer collectively to people participating in open source software projects, the approaches and concepts included in open source. A catchall construct that captures all of the different aspects of open source. Sometimes this can be referred to as the Open Source Phenomenon.

Open Source Communities is used to refer to the people associated with a particular open source project. Many people would categorize their

⁷ Redhat is one of the first companies to provide a linux distribution on a commercial basis – www.redhat.com

participation in relation to the communities that they belong to.

Indigenous Irish Software Industry refers to Irish Software firms that have the corporate headquarters in Ireland or carry out the majority of their development work in Ireland. These firms may have public listings and offices outside of Ireland. The study is limited to Irish software companies that develop and create software code rather than those who install, support or service other peoples software. Under this definition, it is possible to include Irish companies who package and distribute existing open source solutions providing they have contributed to the open source project.

1.4.Objectives

This research has several objectives. It aims to demonstrate that the open source software movement is relevant to the Irish software market and that companies need to ‘manage’ the impacts of the open source software market in some way. It also aims to pull together ideas from many different areas and meld them into a useable framework that could potentially be developed into a commercial toolset. This toolset could be used by companies to analyse their own position in relation to the market or analyze their competitors positions in relation potential open source impacts. This analysis, can help companies make decisions about strategies and tactics to pursue. It could also be used by external consultants to analyze firms and provide advice on the most appropriate directions for the firm to take.

An important aspect of this research is the opportunity for the author to take some of his experience, learning and observations from the global software industry context and look at them in relation to a local market.

The research questions have been design around these ideas and the need to identify the factors and then to use them in some way. The questions are shown below.

- Can these influential factors be identified?
- Can they provide useful strategies and tactics that can be used in the context of the indigenous Irish software industry?

This research does not seek to make any judgement in regards to the validity

of the open source software movement or open source software and approach. It takes the view that they exist and therefore may have some impact. This research attempts to look at why the impact differs for different firms and what actions a firm could take to manage the impacts. It does not research whether open source is good or bad. It tries to avoid the political debate and philosophy surrounding open source, while focusing on the commercial implications.

1.5.Context

This research examines and explores a very dynamic and fast moving industry. The literature relating to the topic is often playing catch up. The dissertation uses information that is current at the time of writing (April, 2006). As the industry, changes so do the approaches and strategies that are appropriate. Factors that were influential may no longer be as influential. Open source and the principles associated with the movement may become part of the industries DNA rather than an alien idea. As it stands, Open Source has become more accepted by organizations as a valid solution. Proprietary solutions have failed to live up to their promise and more and more people are looking for different ways of implementing and using software. It is a good to live in interesting times.

1.6.Dissertation Organization

This dissertation is organized along the following chapters.

Chapter One – This chapter introduces the thesis and provides some introductory materials relating to the dissertation and research. It also outlines some of the objectives of the research and rationale for why the research area is interesting.

Chapter Two – The chapter focuses on the literature surrounding this topic and summarizes and discusses some of the areas that I found to be relevant to the research. This chapter includes the areas that have helped develop the understanding required to explore the research areas adequately and to identify a framework and factors that could be useful.

Chapter Three – This chapter focuses on developing an exploratory framework

based on the information gathered from the literature review and the experience of the author. It discusses some of the factors demonstrating how the factors were arrived at. This section also presents the entire framework and explores how the framework was tested using a discursive approach.

Chapter Four – This chapter outlines the research methodology, it also clarifies the research questions and details how the two research tools were arrived at. Part of this chapter discusses some of the lessons learnt during this research.

Chapter Five – This chapter records the results. This includes the results from two research approaches. The first results are based on the attempt to test the framework of factors using a theoretical approach. The second results set focuses on the result received back from the questionnaire and interviews. It discusses these results and highlights any interesting points or comments.

Chapter Six – This chapter takes some of the data received back from the results, analyzes it in more detail comparing local and global scenarios and uses it to propose several different strategies and tactics that might be applicable, given the data received from the interviews and questionnaires.

Chapter Seven – This takes some of the ideas from the research and from the results and develops some tools and techniques based on the framework and the research results. These provide a basis for further fieldwork and practical applications for the framework.

Chapter Eight – This chapter presents the conclusions reached in relation to the research questions. It discusses whether the hypothesis is valid and whether the open source software movement has impacted the Irish software industry and whether it is something that needs to be managed. It also summarizes and discusses some of the areas that could be of interest for further research.

2. Literature Review

The following section reviews several perspectives on the open source software movement and explores the literature surrounding the open source movement, the Irish software industry and Business Strategy. This review will help to highlight some of the factors that could be influential and to understand the range of strategies and tactics that are available.

The result of this broad review is a basis for designing an exploratory framework of influential factors. The literature review is extensive and covers a large number of areas. This was necessary to build an understanding of the areas in question and to build background knowledge for the creation of the exploratory framework. Not all the material in the literature review is directly used in the exploratory framework but does provide additional context for the framework.

2.1. Understanding the Competitive Landscape

“Competitive strategy is the search for a favourable competitive position in an industry, the fundamental arena in which competition occurs.” Michael Porter (1985)

As the above quote from Michael Porter outlines - at it's most basic a firm's strategy is its approach for achieving business success and maintaining this success. By it's nature it implies some form of competition. In order to succeed, compete and adopt successful strategies the firm must understand the competitive landscape. Thus in order to investigate influential factors that relate to how a firm can be successful it is important to look at business strategy and the competitive landscape. The following section looks at some of the theories around strategy and some of the different schools of thought that exist. It also looks at some software business models that have been proposed.

The nature of business strategy, frameworks for business strategy analysis and business models is a relatively modern field with a number of different views, opinion and theories. This section looks at some of the theories and concepts, in order to identify the most appropriate framework for this analysis. There are many different schools of thought about strategy – a more recent approach has been Gary Hamel (1996, p 71) idea of ‘rule-makers’, ‘rule-takers’ and ‘rule breakers’.

2.1.1. Business Strategy

Michael Porter proposed his theory of competitive advantage in 1985 – in this he introduced the idea of two strategies *differentiation* and *cost*. In his writings, Porter has emphasized the need of firms to understand the market and play by the rules of the market. In this regard, firms are ‘rule takers’. By careful analysis of the market and industry, a firm can design and develop a strategy for success.

PORTERS FIVE FORCES

Porter introduced a framework for industry analysis, the five forces model. This gave a firm a framework to understand its situation within the market. It has been used in many situations and scenarios, including Porter’s own analysis “Strategy and the Internet” (2001). In this he shows how the ‘new economy’ did not rewrite the rules but that the five forces model was still applicable.

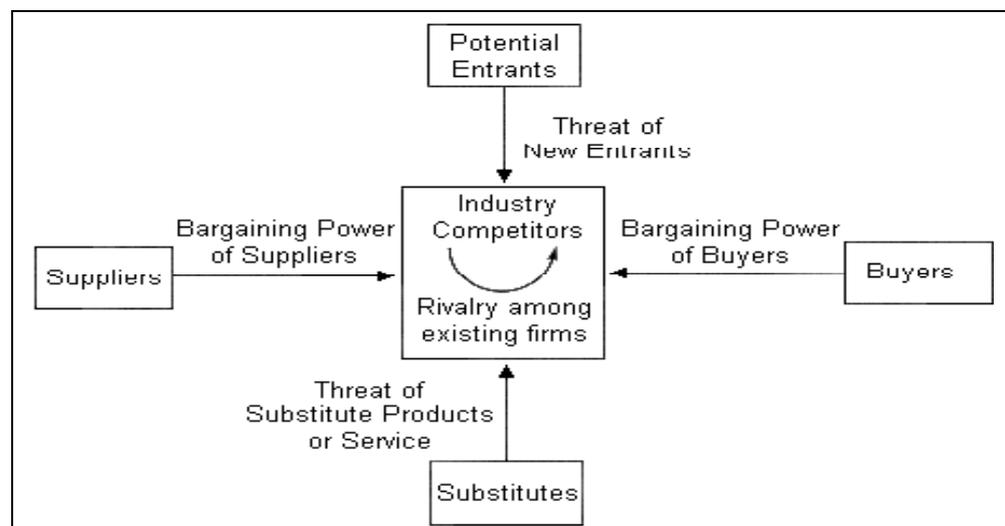


Figure 1 - Five forces model taken from Porter (1985)

The figure 1 shows Porter's five forces model. Each of the arrows represents one of the forces.

An important part of Porter's theories is the idea that a discontinuous change can happen in an industry and that this can change the rules of competition. There are several examples of this, the most well known example is the approach of the railways to competition by air – where a new technology – air travel changed the shape of the 'transport' industry – railways failed to understand the new technology and hence failed to react to the rule of the game changing. This emphasises one of the key recommendations from Porter's model. It is important to maintain barriers of entry to prevent new firms joining the market.

The five forces model has been criticised for being too static and attempts have been made to make it more dynamic. D'Aveni (1994) has tried to include additional qualifiers that help show why the five forces vary over time. This helps to understand how industry rivalries impact the five forces and how collusion and cooperation become important for creating barriers of entry.

THE PARTS MODEL

Another approach that has been developed that complements and builds on Porter's five forces model is the PARTS model. This uses game theory to understand some of the dynamism of the industry and to understand how cooperation⁹ occurs. The PARTS model was developed by Brandenburger and Nalebuff (1995) – at its heart is the question "*Is the firm playing the right game?*" In this, model firms look at the value of the ecosystem in which they exist rather than purely their value system. This ecosystem includes the following parameters - *Players, Added Value, Rules, Tactics and Scope*. The firm gains advantage by tweaking these parameters. The players in this ecosystem include the Firm, Substitutes, Customers, Complementors and Suppliers. The goal is to continuously optimize the game so that it is played to your strengths and others weaknesses.

⁹ Coopetition is a term first used by Ray Noorda of Novell to describe how a firm can cooperate and compete at the same time

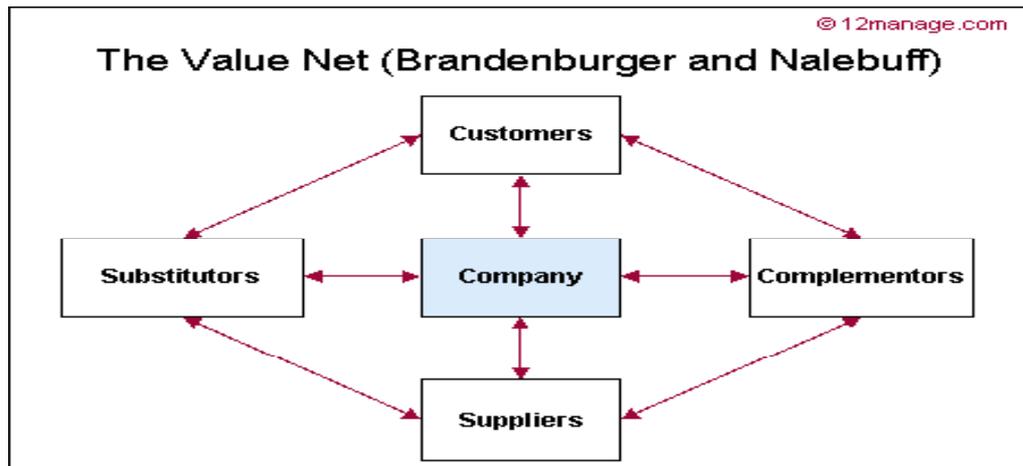


Figure 2 - The Value Net from www.12manage.com (2006)

Often products are complementors to other products. Firms collaborate to ‘blunt’ the competitive advantage of other players. There are clear examples of gamesmanship to manipulate the rules of the game. For example Microsoft & IBM’s involvement in W3C / Open Standards bodies where both have worked together to ‘slow’ down the adoption of open standards or to promote their own versions of open standards Or the liberty alliance grouping that was developed to blunt Microsoft’s passport initiative.

‘STRATEGY AS REVOLUTION’

Gary Hamel (1996) introduces the idea of ‘*Strategy as Revolution*’. This is different from Porter’s approach, which focuses on the idea that the industry determines how the firm should compete. This school of thought focuses on identifying the strengths of the firm and looking at how they can best be used to gain competitive advantage. This is sometimes referred to as the resource based view (RBV) of the organization. This view says that a firm must understand it’s own capabilities and resources and then use this to seek opportunities to fulfil market opportunities. In this type of view, industry is not the defining factor, what the firm is best at is the defining factor. Google has demonstrated this view by leveraging its core competency; search, across many businesses¹⁰ rather than feeling restricted to the more traditional search market.

Mintzberg et al (1998) discuss and analyze various different schools of

¹⁰ Google Maps, Adwords, Google Toolbar, Google Groups

strategy formation and propose that the learning or emergent school is one of the more effective – a firm cannot consciously choose a strategy, it must start with a direction and then make frequent course corrections as conditions require. Gary Hamel proposes the idea that strategy is a quest. It is not a detailed programme of steps to achieve the quest, it is about imagining what the quest is or should be. To quote from his article Strategy should be “*Inquisitive, Expansive, Prescient, Inventing, Inclusive, Demanding*” rather than “*Ritualistic, Reductionist, Extrapolative, Elitist, Easy*”

2.1.2. Business Models and the Software Industry

The phrase ‘Business Model’ seems to be a relatively new descriptor for something that has always been known. It is best defined as the business configuration that a firm adopts in order to make money. It is not the same as a strategy – this is clarified by Joan Magretta (2002) - “*a business model is not the same as strategy. Business Model are concerned only with the underlying concept – they don’t take into consideration competition*”

Lindman (2004) in a dissertation on open source also uses the word business pattern. From a software context, this is a very interesting way of looking at business models. A software pattern is an algorithm to solve a particular ‘type’ of problem and can be implemented in many different ways depending on the skills and abilities of the developer. A business model corresponds to this concept. Magretta links the advent of the business model to the idea of the ‘*new economy*’. People used the business model concept to show how they proposed to make money from their business ideas. However, she still argues strongly and using examples that a business model is only as good as the implementation and that it is the resources and capabilities of the firm that dictate the firms success.

The open source movement and writers on the open source phenomenon pay a lot of attention to the business models, this could link to the fact that open source software really came into its prime along side the growth of the new economy. Influential writers such as Raymond (1998), Perens (2005), Lerner and Tirole (2002) have all talked about different business models and systems that try to justify the economic rational for the success of the open source

movement. Others are still opposed to what they see as the commercialization of the ‘free software movement’. This view is represented by Stallman (2002) who argues that the free software movement is a social movement, driven by altruism and not by economics.

These paragraphs below look at available literature in an attempt to understand the different perspectives and theories that exist relating to this theme. This section take a high level view of the different business models or configurations, although it is possible to find detailed case studies that look at specific companies. An example would be Onetti et al’s (2005) research into the Funambol Case.

At the core of this discussion are ways in which software companies capture value and how they play in a competitive landscape. Fundamentally, there are two software models, sell a commodity or sell a service. In the case of software this has always been complicated by the difficulty in categorizing software – In his essay, the Magic Cauldron, Raymond (1998a) argues that software is a service industry using simple empirical evidence. However, a look through some commercial software companies published accounts¹¹ demonstrates the ‘*commodity*’ argument. In fact the argument is much more complex, business models are configurations designed to capture maximum value for the business and depend on the capabilities and resources of the firm. If a firm can capture direct or sales value effectively then it makes sense to do so, if a firm can also capture indirect or use value then it should also do this. The PARTS model of business strategy is useful in this context since it relates the business model (more tactical), the business strategy, the firm’s capabilities and the way in which the firm plays the ‘value-net’.

CAPTURING DIRECT / SALE VALUE – RETAIL MODEL

Most of the literature reviewed by the author walks quite quickly through this model, it maybe because it is too obvious, or it maybe that it is a very established approach. Another possibility is that the companies using this approach developed their approach before the term ‘business model’ was

¹¹ Microsoft revenues in 2005 were 2,448 Million \$ (This is mainly license revenue)

coined. This model hinges on the ability of a firm to protect its intellectual property rights and is seen by some open source writers as anti-software and anti-society. The view is best epitomized by Stallman and the Free Software Foundation.

The Model is simple. With IPR (Intellectual Property Rights) Protection, the company can then sell a license to its intellectual property in the form of software packages. Due to the nature of software, this model becomes very profitable if the market is big enough. Once the initial development cost has been recouped, the cost for re-producing software is very low and the margins increase directly with the size of the market. However, the low reproduction cost does cause other issues. The main one is piracy, where end-users copy the software without paying anything to the software publisher. An additional way of harvesting revenue from this model is by lock-in. Users become familiar and locked into a particular software package and thus there is a cost to switching to a different provider, so users continue to buy upgrades to the same package. This area is a rich area for research from many perspectives, including the Microsoft anti-trust cases and other examples. However, it is outside of the scope of this research to delve deeper into the retail model and the whole idea of 'lock in' and the complex nature of software.

In a later section (2.4.2) on IPR, the concept of **dual or multiple licenses** is discussed. Certain companies (MySQL, Trolltech) have used this dual license approach to capture direct value by selling licenses to their technology, while at the same time promoting an alternative model that provides open source access to their products providing they are used in an open source context.

CAPTURING INDIRECT / USE VALUE

This is an area that most of the literature appears to focus; it looks at software as a service rather than as a commodity. It also seems to be the future direction of the software industry. Successful companies in this arena include companies such as Symantec, Salesforce, IBM Global Services. These are all companies that sell a service, whether the service is directly creating software, or whether it is selling a subscription to content. Most open source software models fall into these types of categories.

These types of model depend very much on the firms reputation as to the value placed on the service and support cost. Some firms also provide consultancy services around their software solutions. For example, Novell¹² emphasises that they solve ‘business problems’ they don’t just sell software. IBM Global Services division is one of the largest software implementers and consultants in the world in the world. The majority of IBM’s revenues come from this division (IBM 2005b). Microsoft has a whole ecosystem to support the implementation of their products and solutions and emphasise again in their financial report how important services and solutions are to their business.

SUBSCRIPTION & CONTENT MODELS

An example of this is the anti-virus software companies (Symantec, McAfee) that sell their software but include a subscription to the anti-virus updates. Users then renew their subscription at regular intervals. A newer example of this is content services like iTunes¹³. In this case the software client is distributed free of charge but the development costs are covered by the revenue coming in from selling content. This corresponds with Raymond’s open source business model – “*Free the software Sell the Content*”.

MIXED MODEL – SOFTWARE LICENSES AND SERVICES

This model captures value from the license costs but also from the service and support infrastructure. In this case, the firm tries to profit from the entire ecosystem or value chain. The more power the firm has the bigger slice of the pie it can take. This type of model is common for enterprise software, where large development costs may not be covered from the direct sales cost. These correspond closely the ideas proposed by Raymond’s “*Give away the Recipe, Open a Restaurant*”. Although commercial software companies probably try to use the McDonalds approach – “perfect the recipe, keep the recipe secret and open lots of restaurants”.

Perens (2005) also refers to this model as the ‘*Proprietary Model*’ and proposes an open source equivalent ‘Proprietary Open Source Model’ – an extension to the recipe / restaurant model proposed by Raymond but differs in

¹² www.novell.com

¹³ Apple Computer’s Music Site www.itunes.com

one factor. Perens, emphasises that the distribution companies ‘*appropriate*’ other peoples work and package it in a proprietary way in order to create a closed ecosystem that companies can buy into. Perens believes that this is unsustainable, in that it will antagonize voluntary contributors due to it’s proprietary ecosystem.

COMPLEMENTOR MODELS

These are another set of models that are introduced by various writers including Joel Spolsky (2004) in his essay “*Strategy Letter V – The economics of open source*”. These models all rely on the firm manipulating the value-net to gain additional added value. Many commercial companies forays in to the open source world are aimed at this. IBM contributes to open source development in order to sell more hardware. Novell contributes to open source development to sell additional services. Microsoft publishes hardware abstraction layers¹⁴, to make it easier to sell additional software. This model can be used positively to increase the size of the business ecosystem and hence the value of the whole, or negatively to increase the value of the firms share of the existing ecosystem. These models tend to best explain why firms contribute to open source projects. They correspond with Raymond’s “*Widget Frosting*” & “*Loss-Leader/Market Positioner*” models.

OPEN SOURCE BUSINESS MODELS

Are there any business models that are only applicable to open source software? People have written extensively on this topic as part of an effort to justify the economic validity of an open source approach, this would help explain why people contribute to open source projects. The section above describes some broad business model categories. These categories can be used to cover business models based on an open source development approach or a proprietary approach. Onetti et Al (2005), when discussing the Funambol case, hint at the same conclusion – the business models and sources of value may not differ hugely from commercial models but the configuration of the business does. In the Funambol case, the authors introduce the idea of a ‘*pull*’ rather than a ‘*push*’ approach to sales for example, even though the sources of

¹⁴ DirectX – removes the need to program directly to the graphics card

value are broadly similar to a mixed mode or service model.

Importantly the term ‘business model’ is used to mean different things in different contexts. Raymond uses it in the context of different ways of getting value. Perens focuses on the economic value and the different development models when talking about business models. This research will not resolve these different views, they are all valid within the definition given earlier “*the specific configuration of resources, value-adding activities and product/service offerings directed at creating value for the customers*”¹⁵

Readers interested in finding out more about different open source business models should read Perens, Raymond and Lerner’s papers that discuss these business models in more detail. Stephen Koch (2006) also provides a very complete online open source bibliography which provides references to many papers discussing different models.

2.1.3. Summary – Themes, Ideas and potential factors

This section highlights and summarizes some of the important ideas and themes from the previous section.

- Firms looking to manage the impacts of the open source movement, need to look at **a number of factors** in relation to the competitive landscape and the internal configuration in order to pick a strategy and model that best suits them.
- The **PARTS** framework provides a mechanism for analyzing the competitive landscape and for identifying influential factors relating to business strategy and models. It can be used to understand the implications of a new approach (open source); new competitors and complementors.
- The **Resource Based View (RBV)** of the firm is an alternative way of looking at the firm - Different configurations of resources and capabilities impact the effectiveness and success of the firm. It could thus be an interesting way to looking for influential factors

¹⁵ From Strategy, process, content, context and international perspective, Bob de Wit and Ron Meyer but quote is un-attributed

- The **Business Model** and The **Business Strategy** is not the same thing. A number of generic business models exist. From the author's experience, firms adopt aspects from many of the different models to create their own unique approach depending on their circumstances.
- **Software as a Service** (SaaS) appears to be a trend for all software. This is confirmed by checking commercial journals, many corporate websites or even a view of the top ten software companies¹⁶. Open source business models often rely on indirect revenue streams.

¹⁶ Fortune 100 – Apple, SAP, IBM, Microsoft, Oracle, Adobe, Symantec

2.2.Economics and Open Source

Much of the literature relating to Open Source discusses the economic implications of open source. Is open-source economically viable? Why would companies choose to contribute to open source projects? Why do companies make their software available as open source. There is some overlap here between the discussion on business models and business strategy. There is a continuing debate as to why companies and individuals contribute their time and resources to open source projects for no obvious economic gain.

2.2.1.Why do Individuals Contribute?

Lerner & Tirole's (2002) Paper on the '*Some Simple Economics of Open Source*' uses existing and new research to look for valid economic arguments as to why people and corporations contribute to open source projects. There is an alternative view based around the idea of the Gift Economy and Altruism, this stems from the initial Free Software Foundation, and its core proponent Richard Stallman. Lerner & Tirole's analysis points mainly to why individuals choose to contribute time to open source projects. They sum up their research into the idea of the '*signalling incentive*'. Individuals are motivated to contribute because of the '*career concern incentive*' and the '*ego-gratification incentive*'. Perens (2005) offers the view that these individuals are '*Volunteers*' who contribute to projects almost as a hobby but later acknowledges the '*signalling incentive*'. Raymond (1999b) offers a slight different view in his essay on "*Homesteading the Noosphere*" and hacker communities. In this, he proposes the theory that part of the attraction and incentive is a need to be part of something and the ego boost that comes from this involvement.

A more altruistic view comes from the free software foundation; the need to contribute is part of a social phenomenon rather than an economic one. Software code, like ideas wants to be free and needs to be shared. This agrees with Bezrovkov (1999) who parallels the open source software movement with the academic research community. This is often the view portrayed by the media – the open source volunteers coding for the good of humanity and fighting large corporations. Tirole and Lerner do refer to the importance of a

competitive environment where projects gain momentum from a battle against a dominant firm – the ‘David and Goliath’ effect.

2.2.2. Why to firms contribute?

If one takes the view that Firms are economic entities that try to maximise revenues, why would they contribute time and resources to projects they can’t sell? This question is very relevant to researching open source in a business context. This overlaps with all of the sections of this review, firms are economic entities, why does open source impact them and why would firms be motivated to be involved in something that seems to offer no immediate economic reward. The mechanisms for gaining economic returns are covered in the section on business models. In conjunction with that section, it is interesting to look at the economic incentives proposed by different writers on open source. It can be argued that these economic incentives provide the rational for choosing or changing a business model. Joel Spolsky (2004) informally makes the point that sometimes economics and business get detached. He gives the example of Sun and its apparent attempt to commoditize both the hardware and the software for no obvious economic benefit. Lerner and Tirole comment on much the same thing in their paper on Open source economics. They go on to define three broad categories of economic incentives why software publishers might contribute to open source projects:- “*Living Symbiotically off an open source project*”, “*Code Release*”, “*Intermediaries*”. Perens (2005) gives another incentive by outlining the economic rational for companies to contribute to ‘*non-differentiating*’ open source projects. Where software is a non-differentiating enabler it makes sense to contribute to open source projects to reduce the spend on this cost-centre

2.2.3. Summary – Themes, Ideas and possible factors

This review attempts to cover the two questions, why do people contribute and why to firms contribute. From the point of view of this piece of research, the question of why people contribute is less interesting than the incentives given for why companies contribute.

- Several **competitive incentives** for Firms to contribute are introduced. Some of these depend on the firm’s competitive landscape and the firm’s

internal configuration.

- Usurping another firm's dominant position by encouraging the uptake of an open source solution and then benefiting from increased service revenues.
- Reducing costs from 'non-differentiating' development efforts. For example shared work on a common toolset or framework.
- The '**Signalling**' motive is highlighted as an important reason for individuals to contribute. Getting noticed by the community provides career opportunities and ego gratification. Potentially this is something that firms can take advantage of to motivate its own employees and also scout for new talent.
- **Productivity** gains might also be achieved from the use of open source solutions but a firm must be aware of the opportunity cost of their developers contributing
- Firms need to make sure that the **economic rationale** for their contribution is valid. A firm is a commercial entity designed to generate economic rents; any open source strategy has to ensure that this still happens.

2.3. Innovation and Open Source

“Because changes in information technology are becoming so rapid and unforgiving, and the consequences of falling behind are so irreversible, companies will either master the technology or die... Think of it as a technology treadmill. Companies will have to run harder and harder just to stay in place.” Attributed to Max Hopper, Former CIO Bank of America (1985)

As the quote above points out, just holding ground when dealing with Information technology requires innovation. When reviewing the literature on Open Source, Software and Business, there is a lot of discussion on Innovation. This section looks at innovation and attempts to identify influential factors or strategies that might relate to the research area. Firms continuously look to enhance their competitive advantage; one of the ways of doing this is by innovating. Many studies investigate the process of innovation; the definition of innovation and the innovation lifecycle. Tornatsky and Fleischer (1990) cover this very comprehensively in their book *‘The process of technological Innovation’*. They identified four strategic approaches to innovation: *‘Defensive Imitators’*, *‘Process developers’*, *‘Aggressive Specialists’*, *‘Aggressive Innovators’*. It is probably due to these different strategic stances that the question of innovation comes up so frequently when discussing open source. Traditionally Software firms have belonged to the Aggressive Specialists and Aggressive Innovators approaches, whereas Open Source would seem to be in the other quadrant or even in a new category altogether – one that merges defensive imitation with aggressive innovation – to become the *‘aggressive imitator’*. There are two distinct schools of thought on this. The following section presents the two main schools of thought in relation to open source and innovation.

2.3.1. The Anti-Innovation Perspective

One school of thought is that Open Source software and free software stifles innovation. People argue that open source projects and products are copies of

existing products and have no innovative merit of their own. An extreme viewpoint would be that Open source developers are magpies; they see something shiny and then steal it. There is some truth in this view most open source projects are not unique and do meld aspects of existing products and innovations.

The other argument as to why open source stifles innovation is the value argument. Firms and people innovate to gain financial reward and competitive advantage. In an open source model, there is no ownership and no intellectual property protection. The result of this is that there appears to be no financial reward for innovating in the open source community and thus no incentive to innovate.

In the past Microsoft has characterised open source as a virus, which was gradually tainting the software industry, leading to mediocre solutions with high costs of ownership. A sort of ‘grey goo’¹⁷ coating the software development industry. Microsoft has traditionally been one of the more outspoken critics of the open source community and movement. This attitude has changed, a review of Microsoft’s website¹⁸ reveals a more inclusive position.

2.3.2.Pro-Innovation

The other school of thought emphasises that innovation that is possible within the open source ecosystem. The projects may provide equivalent functionality to commercially available products but they do so at a lower cost and with fewer defects.

One of the strongest arguments for innovation through open source communities comes from Von Hippel (2002), his paper on Horizontal innovation networks emphasises the idea that in certain types of communities, users of the product are also developers of the product. In this type of environment, innovation comes from users trying to ‘*scratch an itch*’. In open source communities, instead of waiting for product release cycle, the user can

¹⁷ Attributed to Eric Drexler - used the term while writing about Nanotechnology in his 1986 book – Engines of Creation

¹⁸ www.microsoft.com/sharedsource

access the code and add the feature or fix the feature as they need it. The examples given by Von Hippel include the community of wind surfers who developed innovations around the sport to create high performance wind surfers. In this sort of case, the innovations may be incremental,

Von Hippel argues that it is very rare for a company to involve end-users in the development cycle and that in traditional life cycle innovation is vertical – product designers see people ‘doing stuff’ and then try to incorporate this into the product. This has been characterised by Nadeau (1999):

“In every release cycle Microsoft always listens to its most ignorant customers. This is the key to dumbing down each release cycle of software for further assaulting the non personal-computing population. Linux and OS/2 developers, on the other hand, tend to listen to their smartest customers.... The good that Microsoft does bringing computers to the non-users is outdone by the curse that bring on experienced users”

In the open source community, according to Raymond (1999a), Lerner and Tirole (2002) the incentive for innovation comes from various sources. Firms may contribute in order to boost complementary products sales; developers may contribute from a reputational motive or from an altruistic motive. Some of the economic rationales are discussed in the previous section of the economics and open source.

Using Tornatsky and Flesicher’s categorizations – it seems that the schools of thought grow up around two different types of innovation. The first school of thought focuses on “*product innovation*”, while the second is maybe more around “*process innovation*”.

2.3.3.Recent Developments

In practice the two schools of thought are beginning to merge, proprietary software companies are adopting open source process innovations and open source projects are becoming less imitative and increasingly innovative in the product sense of the word. “Open, but not as Usual’ a report in the Economist (2006) includes the quote from Microsoft’s Bill Hilf - “*We have quite a few programs in Microsoft where we take software and distribute it to the community in an open source way*”.

All of these point towards a new approach to innovation – a ‘live and let live’ approach. This is described by Henry Chesbrough (2003) in his paper ‘The Era of Open Innovation’. This paper points to a model that may best describes how open source and innovation fit together. The Open source approach should be seen as another process by which research from many sources can be used and brought to the market. These open innovation principles have been expressed as follows:

2.3.4.Open Innovation Principles

- *Not all of the smart people work for us so we must find and tap into knowledge and expertise of bright individuals outside our company*
- *External R&D can create significant value; internal R&D is needed to claim some portion of that value*
- *We don't have to originate the research in order to profit from it*
- *Building a better business model is better than getting to the market first*
- *If we make the best use of internal and external ideas, we will win*
- *We should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model.*

2.3.5.Summary – Themes, Ideas and possible factors

This is a rich and complex area of research. The concept of the learning organization is a modern phenomenon, which is gaining traction. The views and theories presented above include factors that influence the impacts of the open source software movement on a firm. Hamel et al (2003) point to the idea of pockets of innovation spread across the company. This theme is carried up in the ambidextrous organization which looks to avoid big-bang innovation and recommends a two stream approach – one focusing more on process innovation – keep doing what you do better, and another stream which emphasises product innovation, look for new things to do.

- **Innovation Capacity** – the concept of innovation capacity is important. There is no clear way of measuring innovation capacity or

of the innovation capability of a firm. Some of the firms that may be least impacted maybe the least innovative, especially if their business resolves around a well-established formula. Potentially the open source approach could jump-start their innovation strategies and thus gain competitive advantage.

- **Process Innovation and Product Innovation** – Innovation is not limited to creating new products, it can also be about creating new and improved processes. Open Source can be linked to Process Innovation
- **Horizontal Innovation** - The open source software movement could be seen as process innovation rather than product innovation. It is innovative in that it encourages users to contribute to the products being designed.
- **Innovation, protecting IP and Open Source Awareness** are closely tied. A firm needs to be aware of the open source approach. Although a firm can benefit from shared innovation process, it must be aware of the risks associated with this.
 - For example a firm with a dominant position but be wary of competitors trying to ‘hijack’ it’s innovation.
 - A firm must be aware of the risk it takes in assuming a community will establish it’s self around it’s innovation
 - A firm also needs to be aware of it’s employees’ contributions to open source projects and the corresponding risk or benefits to productivity.
- **Open Innovation Principles** outlined by Chesbrough provide a useful framework for rethinking innovation. For a firm to benefit from open innovation it must be able to take advantage of IP being developed outside the organization and enhance the value of IP developed within the organization. Partnership is one approach to this; open source participation is another approach. With it’s Celtix project, Iona¹⁹ has used an open source approach to gain innovative input into it’s existing

¹⁹ Iona Software – www.iona.com

product set.

2.4. Intellectual Property Rights & Licensing

A review of the current literature identifies that one of the important debates associated with open source software and the open source software movement is its approach to Intellectual Property Rights (IPR). One of the reasons for the strength of the open source movement and software development model is the community nature of the development process. The licensing schemes and IPR regimes proposed initially by Richard Stallman in his Free Software Manifesto resulted in the development of '*copyleft*' and the '*free speech not free beer model*'.

These ideas are further explored by Eric Raymond (1998) in his treatise on open source software development '*the Cathedral and the Bazaar*'. At the core of Stallman's argument is the belief that programming and software development is at its heart a social system. The '*the Cathedral and the Bazaar*' is one of the most influential books written on the open source movement. It attempts to show how the open source development approach works and why it works.

Programmers and developers like to share ideas and approaches and gain their utility from doing this. This is at odds with the commercial approach, which tries to profit from these ideas by keeping them proprietary. Whereas Stallman's arguments are almost anti-commercial, later writers on free software have tried to demonstrate and argue that there is a commercial basis for sharing ideas openly and that the value of software is not the actual software but how it is used as a business enabler. In fact, the term 'open source' was coined by the Open Source Initiative (OSI) in 1998 to make this distinction.

This area of the open source debate is often closely linked to the debate on the economics of open source. Eric Raymond's work in particular has focused on linking open source licensing, open source economics and the 'bazaar' approach to software development. Many of his points have been argued against by various writers. In particular, Nikolai Bezroukov (1999) in a paper that tries to demonstrate the fallacies in Eric Raymond's work. Commercial Organizations argue that it is their ability to patent and copyright software that

gives them the incentive to innovate and produce software. This section presents an overview of both proprietary licensing schemes and open source-licensing schemes. It also highlights some of the arguments and for both approaches using available literature, industry examples and the author's experience.

2.4.1. Copyrights & Patents

In the 1980's, software became a commodity that had inherent value. To protect this value, companies started copyrighting software to create barriers to entry that preserved this value. According to Porter (1985) and other strategists, this approach allowed software companies to sustain their competitive advantage. Depending on the school of thought – the ability of a firm to compete depends how well it can manage the five forces or how well it can manage it's resources and capabilities. In either case, the obvious mechanisms for sustaining advantage became increasingly complex, whether through secrecy, copyright or other activities. The three tools for protecting Intellectual Property Rights have been *secrecy*, *copyrights* and *patents*. Software, secrecy and copyrights have not been huge barriers, however when combined with patents they have provided a significant protective mechanism (P.B de Laat, 2005, pg. 1513).

Both commercial and open source bodies recognize the importance of copyright. They do however differ on their approach to software patents. The stance of the majority of open source bodies including the Open Source Development Labs (OSDL) and Free Software Foundation (FSF) is that patenting software is a negative action that results in less innovation. Commercial software companies and the bodies that represent them, including the Irish Software Association (ISA²⁰), focus on the fact that patents are a major part of the tool set available to companies to protect their intellectual assets and thus encourage innovation. Innovation in software is discussed in the previous section of this literature review.

2.4.2.A brief overview of Software Licensing

Once software has been developed it has no real cost of production or

²⁰ Irish Software Association

duplication, the costs are all associated with the cost of development. Selling software as a commodity made little sense. Software companies turned to licensing, that is selling a license to use the software rather than selling the software. Commercial Software Licenses are complex documents that try to limit and restrict users of the software and thus maintain a protective shield for the intellectual property that makes up the software, open source software license try to allow free use of the ideas incorporated in the software. It is important to note that open source software is not economically free, it is just the ideas incorporated that are free.

The commercial software industry and the open source movement both promote licensing to protect intellectual property – one approach is about protecting its ownership, the other approach focuses on protecting its freedom. The different licensing regimes are discussed briefly below along with some of the key attributes.

OPEN SOURCE LICENSING MODELS

There is a common misconception that open source software is in the public domain, this is not the case. The copyright for software belongs to the inventor or original writer. The inventor or writer that licenses the source code using an open source licensing scheme. To be classified as open source, open source software will be licensed with a licensing scheme that conforms to the rules set out by the OSI (Open Source Initiative)²¹.

There are several different FLOSS²² licenses, all of which contain slightly different conditions. The number keeps growing as different firms develop and extend the licenses available. The three most important open source licenses are the Berkeley Software Distribution (BSD) License, the GPL and the Mozilla license. This literature review, does not deal in detail with the terms of each of these licenses, this has been done in many publications. A very good overview can be found in “*Open Source Software Licenses: Perspectives of the End User and the software developer*” by Arne and Yates (2005). Kennedy (2004) provides another overview but this focuses more on the legal aspects of

²¹ These can be found on www.opensource.org

²² Free / Libre / Open Source Software – an inclusive definition

the licensing schemes. The purpose here is to introduce the different families and the implications of these licenses.

KEY DIFFERENCES BETWEEN OPEN SOURCE LICENSE FAMILIES

Paul de Laat (2004) analysed several popular open source repositories – Sourceforge and Freshmeat. Through this analysis he identified two broad ‘families’ GPL licenses and BSD – GPL type licenses make up about **79%** of the packages, BSD makes up **14%**. He excluded commercial open source licenses from this study. One other special case of the GPL license is the Mozilla/Netscape Public License which was developed by Netscape and which gave special rights to Netscape.

The BSD license is compatible with GPL and can be thought of as a subset of GPL license rights. The only stipulation the BSD license makes is that the original inventor’s name and copyright must be included in all subsequent versions. This has led to BSD code being used in numerous commercial products including Apple OS/X and even in Microsoft Windows without needing to disclose any of the source code. The GPL introduces one important difference:

“If you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have.”

This clause means that the reuse and modification of code is encouraged but it also means that any changes or modifications remain publicly open and licensed in the same way as the original source code. Microsoft has argued against the GPL, and in particular, this clause saying that it’s viral nature²³ is harmful to business and harmful to innovation. Mozilla type licenses are an attempt to get the best of both worlds by preserving the original owners rights to incorporate future changes whilst enforcing all contributions from outside the firm to be made public.

COMMERCIAL LICENSING MODELS

For commercial software companies, their business model has typically revolved around selling ‘access’ to their proprietary software products and

²³ Attributed to Steve Ballmer, CEO of Microsoft

solutions. The revenues generated from selling access go into developing the software. Their core asset is thus their source code and ideas. It is no surprise then that software companies have spend much time and money in developing strategies to protect their copyright and intellectual property. Software is unique in that it uses both patents and copyrights to try to protect against infringements.

There are no clear families of licenses and no set of guidelines for licenses. Different companies will all have different approaches. Although there is no clear model, most companies 'lease' the software and the cost is for this lease. This model has been challenged by many bodies, including consumer rights organizations. Some of these challenges have resulted in a hybrid lease/commodity approach. The contract varies from product to product but usually includes a series of condition that restrict usage of the software to the purchaser and prevent redistribution of the software, reengineering of the software, reverse engineering of the software and restrict the software publishers liability for any damage caused by the software.

DUAL OR MULTIPLE LICENSES

It is common for open source packages and especially open source project that have a commercial sponsor to have multiple licenses. A user can thus choose the most appropriate license for their intended use. This allows an organization to offer a commercial license for use for closed source development. MySQL²⁴ typifies this approach. Their dual-license allows companies to embed and distribute the MySQL database in their product. If they release their source code and modification back into the community, they can abide by the GPL license. If they would prefer to keep everything closed source they can pay MySQL to use a commercial license. This model is becoming increasingly common as companies try to commercialize open source packages.

SHARED SOURCE LICENSES

This is a relatively new form of license adopted by some proprietary software product. This gives restricted access to some of the source code contained in proprietary products. The purpose is to enable better compatibility and a better

²⁴ www.mysql.com/license

understanding of the software. This allows developers writing code for the platform to write better code, and also allows organizations to develop more understand of the product and hence have more trust when deploying the product or solution. Examples of this include the Microsoft shared source license and some of the Sun ‘commons’ licenses. These licenses are still designed to protect the ownership of patents and copyrights. They also try to protect against redistribution or reuse by parties agreeing to the license.

2.4.3. Copyright Infringement and Liability

From the literature, it appears that this is an important sub area of the section on IPR. What happens when someone infringes on a patent or copyright? The complex nature of software means that a number of industry scenarios that should be examined. It is outside the scope of this research and the authors expertise to look at all of these scenarios in detail. However, given recent events it cannot be ignored and different perspectives need to be examined. This is done by looking at some industry examples.

SCO UNIX vs. IBM AND END USERS

SCO Unix, a small software company, acquired ownership of various UNIX copyrights. It has sued IBM and some large corporations for copyright infringements. This case is still in court, but SCO has argued that code that it owns the copyright for has been used illegally in the Linux operating system. Reading up about this case on Groklaw²⁵, provides an interesting insight into the IPR issues associated with Linux and open source licensing. Put simply, the onus and liability for any copyright or patent infringement rests with the user of the open source solution. In the case of commercial software, the software publisher will usually provide warranties to the end user that protects them from this type of suit. The outcome of this case will have big implications for the open source movement. It has already had big implications, in that large open source distributors are now offering warranties to their customers. And also that several large software companies have made their patent banks available for use in defending infringement lawsuits.

²⁵ www.groklaw.org

MICROSOFT vs. EOLAS²⁶

In this recent case, Microsoft was sued by a very small company for infringing on a patent that covered opening links directly in Internet Explorer. In this case, due to the licensing model no end-users were liable. However, Microsoft had to change its software to avoid having to license the patent.

JPG IMAGE FORMAT ENCODING & FORGENT²⁷

In this case, a small company that went patent mining acquired a patent that covered the Joint Photographic Experts Group (JPEG) image format. This format was very prevalent in open source projects; the response of the community was to develop a patent free image-encoding format called the Portable Network Graphics (PNG) format to avoid any issues. Interestingly, Forgent did manage to license use of its patent to several camera makers.

These are all examples of patent infringement and copyright infringement cases in action. There are many other examples. However, these examples offer some key points and tactics available to firms.

2.4.4. Summary – Themes, Ideas and possible factors

It can be seen from the literature and examples that IPR and a firm's approach to IPR should be an influential factor in being successful in this changing environment.

- The debate on IPR can be summarized as to whether intellectual property rights should be used to protect the privacy of software or whether they should protect the freedom of software. There seem to be three rationales to look at when choosing either path:
 - *The Philosophical and Social Rationale*, ideas benefit society and that the reward is from sharing these ideas. This is proposed by Stallman in the free software manifesto. In this case, IPR should be used to ensure that the ideas remain free.
 - *The Separation of Knowledge and Ideas*, that ideas should be free, so that individuals can profit from their knowledge in applying

²⁶ www.microsoft.com/presspass/press/2003/oct03/10-06eolaspr.msp

those ideas. This is paraphrases Perens and Raymond's view.

- *The Privacy of Ideas and knowledge*, that ideas and knowledge should be secret so that the owners can benefit from selling the ideas and knowledge as a commodity. This takes the approach that competitive advantage is gained by excluding others from your ideas and intellectual property.
- **Licensing strategy** is important. A firm needs to understand the different strategies and pick the most appropriate strategy whether this is a dual license, commercial license, GPL, or BSD approach.
- **Liabilities, Warranties and Infringements** – These are handled differently in open source software and proprietary software. In Open source software, the risk often resides with the end user, unless a company offers some sort of indemnity.
- **Patents** are important even to open source projects. Patents and copyrights can be used to protect the freedom of IP as well as lock up IP. Patents and Copyrights can be used by firms to prevent abuse of sponsored open source projects

2.5.OSS Project Communities & Structures

The Cathedral and the Bazaar – a term coined by Eric Raymond in an essay written in 1998 is often used to describe the differences between the open source development approach and more traditional development approaches. The essay goes on to explore in more detail why the open source software development model works. It is at the source of a large body of literature that discusses the differences between open source approaches and traditional approaches. This paper is often referred to especially in the context of exploring ways of 'harnessing' the principles involved for commercial benefit.

Whereas Raymond emphasises the newness of the paradigm, an alternate view from Nikolai Bezroukov (1999) focuses on the similarities between the open source approach and the academic research tradition. Bezroukov has published at least two papers arguing his point of view and criticizing Raymond's

simplification of the open source movement and the some of the key points he makes. He argues that the Cathedral and the Bazaar is flawed and contradicts itself. It also includes several factual errors. Although the points made by Bezroukov maybe valid, rather than join in this argument, the author will take the view that the core of the cathedral and the bazaar and the social aspects mentioned are valid. A number of other papers and essays seem to validate the ideas in the cathedral and the bazaar.

Appendix 1 has a more detailed look at the technical aspects of the open source development approach. This section of the literature review concentrates on reviewing some of the different perspectives on the social and community reasons for why the open source software movement exists. It complements the previous sections by introducing some of the ideas that make the open source software movement what it is. It looks at some of community and social factors that facilitate the open source software movement.

2.5.1.Circles of Trust – The governance structure

One concept that is embedded in the open source community is the idea of meritocracy. People in open source projects have different roles and earn their positions through contributing to projects. In a way these are best represented by four concentric circles – at the core are community members who manage the source tree and accept or reject contributions. These people have usually gained admittance from one of the other circles due to the quality of their contributions and their commitment. At the outer-most circles are the people who *'free-ride'* that is use the software without any contribution back to the community. The next outer layers are the people who contribute feedback on defects and other issues. The circle next to the core is made up of people who contribute fixes and code modifications to the project. This is represented graphically in the diagram below. The differing sizes of the circles correspond to the numbers of people belonging to each category.

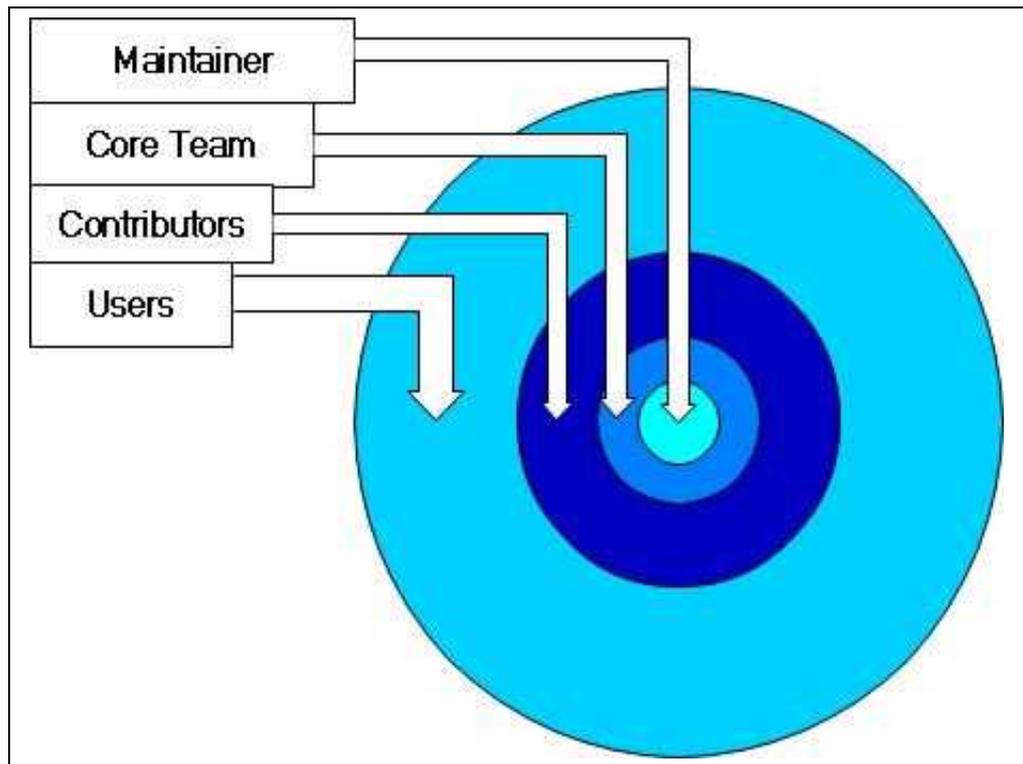


Figure 3 - Diagram showing the circles of influence

This generic model varies from project to project. In some projects, the core remains relatively consistent. In others, it changes frequently. This idea is outlined by Raymond (1999) when he describes the Linux development approach and the Fetchmail approach. It is also mentioned by other writers on the subject including Fitzgerald and Feller (2000) who use it as part of the framework they develop to look at OSS. Bonaccorsi and Rossi mention it in their 2003 paper on *'Why open source software can succeed'*. Conversely, Bezroukov uses it as an example of how some open source projects are actually closer to the 'Cathedral' model, the inner circle is controlling the project and doing all the work.

It is an important part of what makes open source open source and the ability to understand the significance is an important factor for organizations contributing to open source projects. There are no short cuts to the centre of the circle. Joel West (2003) talks about different approaches for businesses comparing IBM's approach, Apple's approach and Sun's approach. IBM's approach was much more focused on establishing a presence in the community. Apple and Sun assumed that they could take control of their own

communities. This worked for Apple but was less successful for Sun. The importance of the social infrastructure is also discussed by Ågerfalk et al (2005, pg 85). They make the point that firms have to take care when working with established communities but also point to the benefits of this type of collaboration.

2.5.2. Foundations and Organizations

These are introduced by Fitzgerald and Feller (2000) as one of the mechanisms that allow semi-commercial projects to exist. As such, they play an important role in open source project and open source communities. They provide a no-mans land where all contributors can share safely. These are common features of open source projects that have been started initially by commercial organizations. This ensures that the open source project remains independent of the original company. Examples of this include Openoffice.org, Eclipse.org and Mozilla.Org – these are originally projects coming from Sun, IBM and Netscape (AOL) respectively. These foundations will often sponsor open source developers to work on the project and to act as maintainers of the project. Frequently commercial users of the open source products will contribute in several ways to the foundation. In some cases, they may be represented on the board of the foundation.

Several independent organizations exist that promote open source projects and co-operation. Some of these also sponsor developers work on key open source products. Examples of these types of organizations include the OSDL, OSI, FreeDesktop.org, Apache Foundation and Free Software Foundation (FSF). OSDL in particular is a very important organization that plays a role in coordinating various open source efforts and also provides support to open source projects financially and legally. These tend to be different from foundations in that they tend to have social and philosophical basis rather than a base around a particular open source project. They also exist at a more fundamental level. For example, when IBM (2005a) decided to pledge certain patents to the open source community, it did so by tying it's pledge to the OSI's definition of Open Source Licenses.

In summary, these provide a very useful neutral ground that acts as a buffer

between the different interests that might make up and open source community.

2.5.3. Project Politics – Forking and Merging

As mentioned in the introduction to this section, projects will often have a level of politics involved. This can sometimes cause issues especially in regards to the direction of the open source project. Part of being a good maintainer is being able to do deal with these politics and to coordinate the efforts. The most drastic reaction to these disagreements is for a project to fork. That is some one will take a snapshot of the code base at a point in time and start a rival open source effort to develop the project. The most high profile occurrence has been the forking of the X11 project. In this case, the maintainer, XFREE86,²⁸ of the project wanted to change the licensing conditions of the project, many of the contributors felt unhappy with this proposal and created an alternative implementation X.Org²⁹. There have also been numerous cases where a project has merged with another similar project in order to create a synergy between communities.

The forking and merging option is usually a last resort, but is an effective safety valve – it also acts a mechanism to prevent any abuse of the open source system. For example a commercial organization might release a product as open source and then fail to maintain it, if this happens interested users could ‘fork’ the code and create an alternative project using the original source code as the base.

2.5.4. The Internet, Virtual Communities and Shared Source Repositories

Many writers on open source including Lerner & Tirole (2002), Raymond (1999), Perens (2005) acknowledge that one of the mechanisms that allowed open source to become a phenomenon was the Internet. The Internet provided the mechanisms for setting up virtual communities and for sharing information and source code. It also provides easy access to compiled programs and up-to-

²⁸ www.xfree86.org

²⁹ www.x.org

date releases of software. The success of the Linux operating system has often been linked to the growth of the Internet and the ability for people from different locations both to contribute to the code base and to access the code base.

Open Source projects depend on a centralized source code repository around which the community grows. This code repository is at the corner stone of any open source project. The virtual communities grow up around these repositories. The open source development approach is discussed in more detail in Appendix 1. The most important source code repositories are Sourceforge³⁰ and Freshmeat³¹. Some commercial companies will also provide storage and access to shared code repositories in order to facilitate their open source projects. Project distribution is also supported by different organizations. For example, HEANET in Ireland keeps a download mirror of many important open source projects. Without this easy access to source code and binaries, the open source community would not be able to function in the way that it does. These virtual communities and the ease of exchange of information is one of the reasons that Von Hippel (2002) uses open source projects as an example of horizontal user networks in his paper on innovation.

2.5.5. Summary – Themes, Ideas and possible factors

This section introduced some of the structures that are important to the functioning of the open source software movement. This review of some of the literature surrounding the open source movement provided some useful insights into what factors might be influential and the different strategies or tactics that might be available.

- **Open Source Awareness.** For any firm looking to work with the open source community, it must build awareness of the community and establish itself within the community. Gathering awareness takes time.
- **Virtual Organizations** – open source communities are virtual communities – A firm's familiar with using virtual terms or working with virtual organizations might find it easier to take advantage of

³⁰ www.sourceforge.net

³¹ www.freshmeat.net

existing open source projects.

- **Foundations and external Organizations** - These can prove very useful in getting open source projects accepted and in providing a ‘neutral’ zone where competitors can cooperate.
- **Distributed Control Systems and Processes** - A firm might also have distributed control systems and processes. This would that again support a firm in managing some of the different approaches required to work with open source communities.
- **Meritocracy** – This is a key concept for firms contributing to open source communities, individuals earn their right to contribute. A firm needs to build up it’s reputation and the reputation of it’s employees into to get accepted within established communities and also to gain respect for it’s own open source projects.
- **Risk Factors** – Creating open source projects and joining open source projects is not risk free. Some risks are mentioned in the section below
 - The risk of losing representation in an open source project either through **project forking** or through competition within a foundation or other mechanisms
 - **Competitive Manoeuvring** – A competitor might use an open source standard or body to slow down adoption of the standard and tie up competitors organizational resources. An example of this is Microsoft’s alleged behaviour in the ODF (Open Document Format) ratification process³².
 - **Employee Marketability** – Employees become visible as individuals – it may make it easier for people to poach a firm’s top contributors

³² www.linux-watch.com/news/NS2741539029.html

2.6.Perspectives on the Irish Software Industry

This research is framed within the context of the Irish Software industry; this section of the literature review looks at the Irish Software Industry from several perspectives and tries to place the Irish Industry in the context of the Global Software Industry. Software development is a very dynamic business, which changes frequently according to demand. In the case of Ireland, this is complicated by the role of large Multi-national companies play in the economy.

2.6.1.Development and Background

An interesting view of the development of the software industry is presented by Sterne, in *Adventures in Code* (2004). Sterne is a journalist who covered the Software Industry in Ireland for many years. He proposes that the industry can be looked at in terms of five generations:

1. Generation One – Just Another Service
2. Generation Two – Pack it and See
3. Generation Three – Focus and Differentiate
4. Generation Four – Spend Someone Else’s Money
5. Generation Five – Return to the Vertical Markets

The book is written for readability and although the tone of the book is not academic, it gives a very useful understanding of how the current landscape developed. This understanding is required, in order to present context to the debate on what the impacts or factors could be. The section on generation five companies is especially relevant – in this, Sterne mentions some key technology areas that Irish companies are involved in:

- Telecommunications
- Financial
- Courseware

More importantly Sterne identifies several themes relating to the industry – including a reluctance to seek venture capital and partnerships – Sterne’s view

contrasts with that of Cusmano (2005), in that Sterne holds the view that it has to do with bad experiences in the past, Cumanso on the other hand puts it down to the 'lifestyle' aspirations of Irish Entrepreneurs. Another theme, which is important, is the role of serial entrepreneurs, those people who keep building and investing in new companies.

Sterne also helps track the development of the niche areas that exist in the current Irish Industry. This includes for example the influence that Aldiscon has had on developing a cluster of firms specializing in telecommunications solutions, and the influence that various finance software companies such as ACT Kindle had in developing a niche around financial solutions.

2.6.2.Key Factors

Some key factors can be identified in relation to the Irish Indigenous software business. According to Enterprise Ireland (2005), Cusumano and Sterne – The Irish software industry is predominantly product based. Many companies provide consulting services with the product.

The Irish Indigenous Software industry has benefited from the large number of MNCs (Multinational Companies) in Ireland. There have been reputational benefits, technology transfer benefits and partnership benefits (Eontec and Siebel). However, This has come at the expense of driving up labour costs and competing with MNCs for talent.

The industry focuses on vertical markets and avoids direct competition with any of the major software players. There are a large number of players in a few relatively specialized niches. These niches include telecommunications, finance and courseware. Examples of companies in these areas include Fineos³³, ChangingWorlds³⁴ and ElectricPaper³⁵.

Another key factor identified by Sterne, by the ISA and by other commentators on the area is the scale of Irish software companies. Very few large Irish software companies compete on a global scale. It seems that

³³ www.fineos.ie

³⁴ www.changingworlds.ie

³⁵ www.electricpaper.ie

Indigenous Irish companies have trouble growing beyond a certain size and often become take over targets or over extend themselves. Comments by Sterne on the use of venture capital and from HotOrigin³⁶ both agree on this point. Often companies will seek venture capital to grow, if the growth is unsuccessful, the venture capital firm will try to recoup its equity by selling on the firm. This has also led to some wariness in the industry about venture capital. This is validated in the ISA's 2004 Annual Review, which points to the unwillingness of companies (30%) to seek venture capital.

The Irish Software industry is made up of over 900³⁷ small firms. The average firm size is 15 employees and 2 million dollars in revenue. The ISA feels there is benefit in growing these firms and facilitates these efforts. The ISA's current theme is that of '*companies of scale*' and how to build these companies.

Due to the economic success Ireland has enjoyed over the last ten years, the cost of doing business has increased for software firms. In the past Ireland attracted software work due to its cheap highly educated workforce, the workforce unfortunately is no longer cheap. It is still highly educated. Government Policy is focusing on promoting Ireland as a knowledge economy. It is doing this through increased funding and by encouraging more linkages between industry and academia. This push is also part of increased European funding in this area following the recommitment to the Lisbon Treaty of 2000

2.6.3. Government Policy & Industry Bodies

The software industry is important to Ireland and this is recognized by policies in place that try to strength the indigenous industry. These policies are working to push Ireland toward a knowledge-based economy. Although much has been made of Ireland being the 'largest software exporter' in the world, this has been primarily down to US Multinationals using Ireland as a hub for their European distribution operations due to Ireland's fiscal environment. Recently the Irish Government has set up some state funding venture capital

³⁶ An Irish Venture Capital Firm – www.hotorigin.com

³⁷ Enterprise Ireland Statistics, 2004

funds to increase the funding available to software start-ups.

Several organizations in Ireland support and represent the Irish Software Industry. The three most important organizations include Enterprise Ireland, The National Software Directorate (NSD) and The Irish Software Association (ISA). There are other organizations involved including the Centre for Software Engineering (CSE) which supports the development of best practice in Ireland. These organizations aim to promote Irish Software interests within the state and outside the state. Enterprise Ireland and the IDA have played a big role in attracting foreign investment in Ireland.

2.6.4. Industry Trends

Two graphs are included below; both are based on data from the National Software Directorate. They show clearly that the indigenous Irish Software industry has grown significantly over the last ten years. It is interesting to note that although the revenues associated with the indigenous industry are far lower than those associated with the multi-nationals, the headcounts employed are very similar. Further research could be carried out here to understand whether have more small companies would provide more employment, that several 'large' companies and what the implications of the ISA's 'building companies of scale' policy will be.

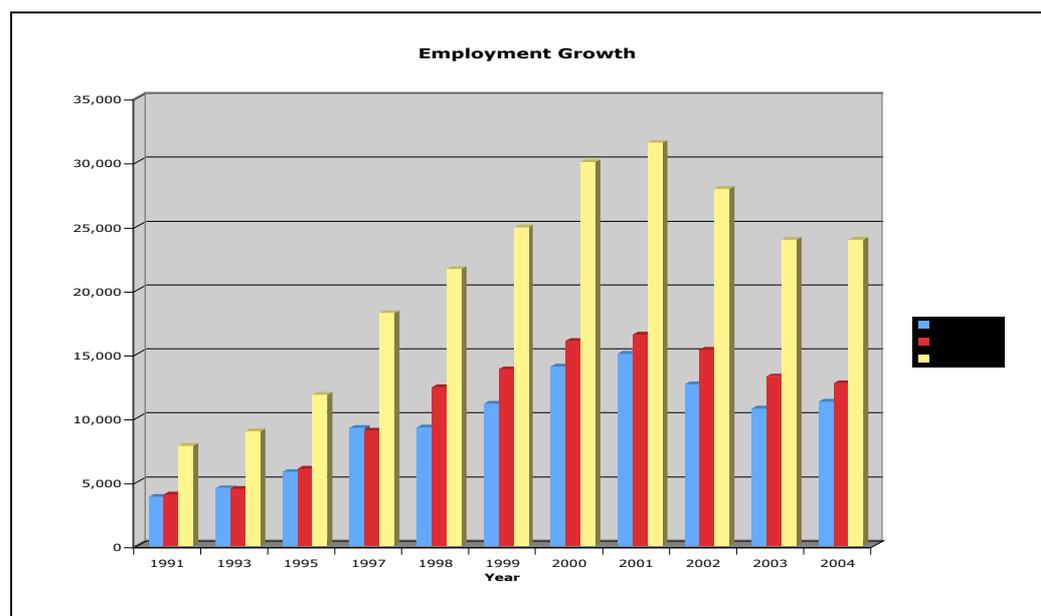


Figure 4 - Numbers Employed in the Irish Software Industry (From

Enterprise Ireland Statistics)

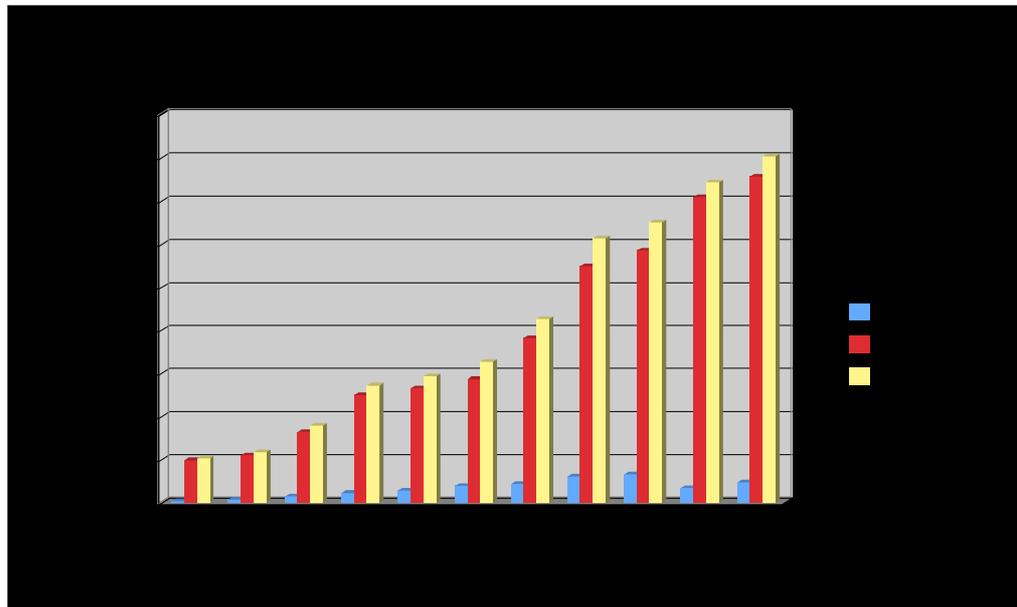


Figure 5 - Exports from the Irish Software Industry from Enterprise Ireland Statistics

It is important to note that Ireland is vulnerable to technology issues, the timing maybe delayed or may lag but the ending of the ‘dotcom’ bubble had a major impact on the numbers employed in software in Ireland. It also seriously impacted exports from indigenous Irish software firms.

The ISA conducts an annual survey, which measures the outlook of the software industry in Ireland. This is based on the results of a short survey sent out to the ISA’s members. The survey includes similar questions from year to year. This outlook for the year is then based on the compilation of these opinions. The focus tends to be very commercial, for example highlights from the last three documents have included a position on venture capital, a position on M&A activity and so on. The 2004 outlook was interesting in that it raised a concern as to the awareness in the industry about the research and development funding available through academic initiatives.

2.6.5. Summary – Themes, Ideas and possible factors

If one were to take the Industry as the unit of analysis, it looks as if the Irish Indigenous Software Industry is quite well insulated from some of the negative impacts that can be associated with the open source movement. The

focus on niche markets and on vertical solutions makes it unlikely that open source projects are will take business away from established companies.

- **Companies of Scale** – This theme runs through much of the literature. Ireland does not seem to generate software companies of scale. Does this in itself limit the impacts of the open source software movement? Or does it mean that Ireland should look to a more Scandinavian model where a number of small high tech companies exist that have benefited from their involvement in global open source initiatives.
- **Competitive Landscape and the ValueNET** - Is it possible that a firm's **customers** will start collaborating on open source solutions? Could Irish companies start spinning off IP (Intellectual Property) to open source foundations? Currently a number of Irish software firms owe their existence to spin-offs from their parent company.
- **Political and Academic Environment** - There could be cases where government or academic involvement in open source projects might weaken an incumbents hand (i.e. government support of Open source rather than Microsoft). The reverse is also true a company might be able to use their academic or government connections to their advantage.
- **Partnership and Collaboration** - There are a number of hotspots (Courseware, Telecoms, Software Development) in the Irish Software Landscape – A firms ability to collaborate and build partnerships might allow it to benefit from these local hotspots either by blocking open source initiatives or by using local expertise to grow global influence.
- **Industry Perspective** -It does seem that a firm seeking to benefit from the impacts of open source, could look to leverage industry bodies to support their effort or prevent an open source threat. A firm may also be able to use the open source movement to step outside of the industry norms and break the rules. This could be achieved by leveraging the expertise of the existing industry bodies.
- Existing **Open Source Awareness** - Currently there are a number of companies in Ireland that are involved in the open source community and that have chosen this strategic approach. A good example of the different

approaches is found by looking at three companies in a similar sphere.

- **Iona** – has chosen to open source some existing technologies to attract people to it's enterprise solutions
- **CapeClear** – has chosen to build it's tool solution on an existing open source framework (Eclipse)
- **Wilde Technologies** – has chosen to completely open source it's technology

3. Identifying Influential Factors – An exploratory Framework

The literature review took a broad view of a number of areas and theories that may be relevant to understanding the impact of the open source movement to a software firm. It is a very wide field of literature with material and ideas coming from many different sources. This section attempts to integrate and synthesis the themes and ideas from the literature review to build a framework and model that helps to answer the research question:

- *Can influential factors be identified? And can they provide useful strategies and tactics that can be used in the context of the indigenous Irish software industry?*

It took several iterations to produce an exploratory framework that pulled together different areas. The initial framework consisted of a number of factors taken from the literature and the author's experience and grouped these in to several logical categories. The framework included some possible indicators that might be used to measure each factor. Although this iteration produced many influential factors, it was very unwieldy. Additional iterations and further analysis made it possible to narrow the number of factors in the exploratory framework. The need to operationalize the factors for use with the survey questionnaire provided further focus. There is a trade-off between completeness and usability. In the sections below each of the areas and the factors associated are discussed. The process of operationalizing the framework is discussed later in this section. The questionnaire that was used for the survey is based on this framework but was simplified to make it easier to administer.

3.1. Building the Framework

The section shows how the framework was constructed. It focuses on demonstrating the process of arriving at some of the factors and discusses some of the factors in detail. It does not discuss all of the factors in the framework. It is sub-divided in to several areas to make it easier to follow and to show the inter-linkages between aspects of the framework. In certain cases, both the factor and potential indicators might be discussed to demonstrate how a factor was arrived at. Examples are also given of the use of the factor and why it may be influential. Section 3.5 contains a complete copy of the framework in tabular form.

3.1.1. Firm Classification

It is clear from the review that being able to place the firm is very important. There are numerous ways of categorizing software firms. Potentially these are all factors that could be important to what type of impact the open source movement could have. The classification of a firm is very important it showing the different options that a firm might have. Many of the ideas for this part of the framework link to the PARTS model and the importance of understanding how to establish an initial static view of the firm.

FIRM SIZE (REVENUES / STAFF / LOCATIONS)

There are many examples of the relevance of this – a large enough firm can ‘force’ a result, a small firm maybe more nimble but may be forced to react. A large firm maybe able to play on multiple fronts, a small firm might only be able to focus on one front. A firm with cash reserves maybe able to manipulate the market. A current wave of consolidation in the software industry is all ready showing how dominant large companies can become and how they can use open source to their advantage.

FIRM’S GEOGRAPHICAL TARGET MARKETS

This is another area that impacts open source. In Asian markets – open source is heavily promoted by government, yet due to lax piracy laws proprietary software is dominant. As discussed in the literature review one of the challenges surrounding business models depending on proprietary licensing is

the ease of duplicating software.

In European markets, there has also been much government and academic support and bias towards the open source movement. Some of this has been leveraged effectively by firms in these markets. IBM's bid for the contract with the Munich³⁸ government depended on open source, the French government's support of the Mandriva³⁹ Linux distribution at the expense of Microsoft

FIRM TARGET MARKETS BY SECTOR

Market Sector is very important – this is linked to Perens (2005) ideas around differentiating software and non-differentiating software and the enabling impact of software technologies. In finance houses, reliability, predictability and stability of trading systems are essential – in this cases established solutions are often preferred (Solaris). This is also true in the pharmaceuticals industry. However, in education and some other sectors – the software is less of a differentiating factor and they may be more open to trying new solutions.

PRODUCT TYPES / SCOPE / DEGREE OF SPECIALIZATION

It is possible to look at where the products the firm works on fit in the software landscape. This factor appears to be relevant to the competition a firm might expect and the scope of the firm – if the scope of the firm overlaps with the open source community then this could impact the firm. This concept is taken from much of the literature available on business models and the development of open source projects. Those open source projects that have been most successful or proved to be a threat to proprietary products have tended to focus on the core platform and service areas of the software stack.

3.1.2. Competitive Landscape

This grouping of factors looks at where the firm is positioned in the market and how this affects the way that the open source movement can impact the firm and how the firm can use the open source movement to impact the market. Many of these factors are linked to the PARTS (*players, added value,*

³⁸ <http://www.desktoplinux.com/news/NS3199247984.html>

³⁹ <http://software.silicon.com/os/0,39024651,39121536,00.htm>

rules, tactics and scope) model discussed in the literature review and the analysis of the Market that can be done using the PARTS model and the value-net. It also links to the different business models that have been proposed by Perens and Raymond. A complete version of the factors can be found in section 3.5. These factors are those that are most relevant.

PLAYERS

Who is in the market? What products are competing against your products? Are there any substitutes that could sideswipe you? These are all included in this factor. Are there complementors in the market that you could work with this – could an open source strategy facilitate this?

ECOSYSTEM MEMBERSHIP (MICROSOFT, ORACLE, ETC.)

In software, a number of ecosystems and partnership approaches have grown up around different technologies. For example Microsoft has a dominant role in it's ecosystem and can use it to extract additional added value for it's self. It is important to understand what ecosystems a firm is a member of in order to understand the impacts of the open source movement, a firm in the Oracle ecosystem needs to think carefully before doing anything that might upset its position. On the other hand, a firm could potentially establish a niche in another ecosystem by adopting an open source approach. It is important to recognize the importance of these technical and business networks in changing the options that a firm has available to it. A firm that is a member of the IBM business network may have more options to pursue open source goals that one that is a member of a Microsoft Business Network

BUSINESS MODEL

From the literature review, this is a factor. Depending on the business model the impacts may change. The business models identified in the review can be used to understand the potential impacts. Using the PARTS framework – the business model corresponds to the firm's tactics and how the firm chooses to compete and add value.

POSITION IN MARKET

This factor is important. As pointed out by Perens (2005), a firm in a dominant

position has much less to gain from an open source approach. It also applies to how a firm might leverage a position in one market to support a position in a complementary market.

3.1.3. Internal Resources and Capabilities

The literature review touched on the Resource based view (RBV) of the firm. This analysis approach is more concerned with the internal configuration of the firm and evaluates its options of this basis. This category of indicators ties into this view and looks at the internal resources and capabilities that a firm might possess that could affect the way that the open source movement impacts on the firm. There is a pattern in these factors, the indicators in this category seem to link to the flexibility of the firm and how the firm can adapt to changing situations. This is a complex area and has been the subject of much research. This dissertation does not seek to duplicate this research and uses existing theories where possible. It also highlights specific parts of existing theories that might be useful in relation to the research question and context. One suggested way to do more in depth analysis is to use value chain analysis as demonstrated by Porter (1985). The figure below is a graphical representation of Porter's value chain.

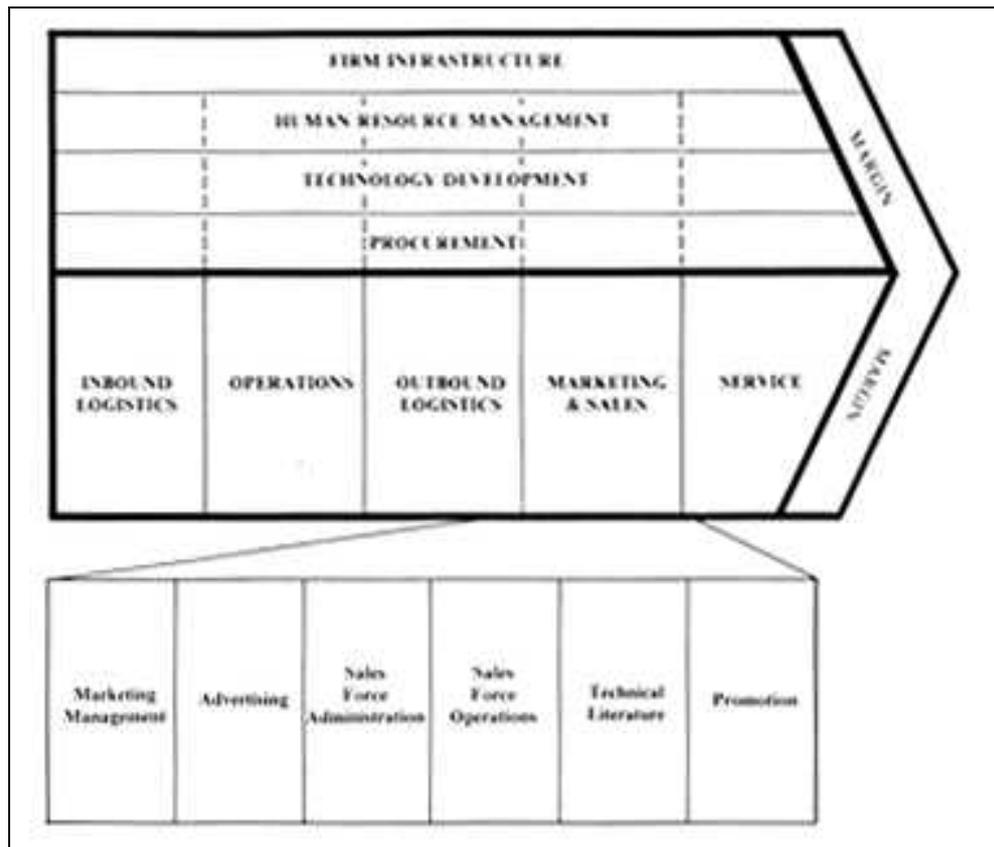


Figure 6 - Porter's Value Chain - Taken from Competitive Strategy, 1985

The section looks at some of the key capabilities identified through the literature review and by value chain analysis. In Appendix 4 some of the other factors in this category are discussed. These include factors and indicators that relate to a firm's resources and organizational structure.

DEVELOPMENT APPROACH

This is a straightforward factor, a software development department or organization that is dynamic, flexible and multi-talented may be better able to react to the open source movement. A software development department that is primarily responsible for software maintenance may not have the mindset to react appropriately. How is the software development organization structured? – Is it by component, are people working across the software product, are there ‘component’ experts – are software component teams permanent or assembled on demand? Does the software development organization work to spec? How large is the software development organization, in relation to the rest of the organization.

INTELLECTUAL PROPERTY APPROACH

Firms need to have an awareness of the different options applying to them in relation to Intellectual Property. This is a factor for firms using any type of licensing approach whether proprietary or open-source. Looking at this factor identifies the options that a firm has available to it. This includes the expertise that the firm has available to it. The type of IP regime it currently operates and the firms stance when it comes to intellectual property. This is a key area for any research into open source. It is the approach that the open source community takes to intellectual property that makes it so different from established approaches.

PARTNERSHIP & FUNDING APPROACH

The ability of a firm to build partnerships is an important factor in how a firm might manage the impacts of open source. A firm with a strong partnership capability might be able to build business alliances to manage the impact of open source projects on it's segment. Alternatively, it might be able to build partnerships with open source foundation or academic institutions to share the costs of development. It's approach to funding is also important – if it is venture capital funded there may be an imperative to keep technology proprietary in order to protect and package the firms intellectual property. On the other hand funding from certain research bodies might encourage approaches that are more open.

3.1.4.Open Source Awareness

These are all factors that can be used to understand the impact of the open source movement on the firm. Having an understanding of the open source phenomenon, allows the firm much more opportunities to react appropriately and to see a positive impact from the open source movement. All of these could be categorized as part of the resource and capabilities section. However, because they are specific to open source, it makes logical sense to include them in their own section.

CURRENT AND PLANNED OPEN SOURCE INITIATIVES, CONTRIBUTIONS AND PARTICIPATION.

A firm that is involved and contributing to the open source community has an understanding of the community and the movement. This gives it an understanding of the open source software approach and gives it leverage within the movement. A firm that is planning to participate also has an advantage in terms of understanding the potential impacts on its own business.

USE OR SUPPORT OF EXISTING OPEN SOURCE PRODUCTS, LIBRARIES OR PACKAGES

A firm that has already experience of the open source world may manage the impacts of the open source software movement in different ways. It may also understand the possibilities available to the firm to either manage or exploit the impact of the open source software movement. The use of open source by the firm also points to a firm's understanding of the risks involved in open source.

3.1.5.Firm Purpose and Ethos

The literature review brought up a number of intangible factors that change the way in which the open source software movement can impact a firm. Many of these seem to be linked to the firm ethos and purpose. Just as firms struggled to deal with political correctness, affirmative action and diversity, so they can struggle with the concept of the open source movement. These factors make up the DNA of the organization and influence the lens that the firm views the open source movement through. To explore this area and to build this in to the framework a number of polar opposites have been used. These give a quick view into the company. These are explored more in Appendix 3

INNOVATOR OR KNOWLEDGE HARVESTER

A firm may see itself as an innovator or a harvester. An innovator may believe that its own research and innovations are the lifeblood of the firm, a harvester may look at ways to reuse existing knowledge and innovations – This could impact the way in which a firm uses open source technologies or its attitude to open source technologies. This also leads back to the literature review and the

discussion on open source and innovation. In the opinion of the author, open innovation is the model for the future, thus innovative firms will tend to benefit from the impacts of open source.

NOT INVENTED HERE (NIH) SYNDROME OR TECHNOLOGY ADOPTER

This was mentioned by Lerner and Tirole (2002) and by Perens as an important factor in the adoption of open source software. A firm that was a technology adopter might look to exploit open source technologies to save on its development requirements. On the other hand a firm from the NIH school might believe inherently in the superiority of software developed internally by the firm or at least from a known and well understood source.

LEADER OR FOLLOWER

This influential factor tries to identify the firm's approach to the market. Does the firm look to extend itself and continuously identify new positions and new markets for its products and solutions. Alternatively, does the firm look to the industry to see what trends to follow? This links to Hamel's concept of strategy as revolution and the idea that a firm can play within the industry or seek to change the industry to its strengths. Many successful software companies are followers, taking an idea, elaborating, and building on the existing market. Microsoft has been very successful in this approach, rarely being first to market with new product concepts but successfully leveraging existing ones. Open Source tends to suit follower firms who wish to contribute to existing projects rather than trailblazers who wish to redefine a product space.

MARKET DRIVEN OR PRODUCT DRIVEN

This is not an obvious concept. Most firms think of themselves as Market Driven rather than Product Driven. However, some of the most successful innovations and products have come from firms looking to exploit innovations. A famous example is 3M's success with the POSTIT™ note as a way to harness a new type of glue. Google allows its employees one day a week to work on their pet projects and then looks to see if there are markets for these products. Open source products and initiatives allow firms to easily

test the water to understand whether product innovations could be successful and to build up viral support for these innovations. On the other hand, Market driven firms can quickly understand the market and get very quick feedback from the market in relation to open source products.

3.2. Operationalizing the Factors

The previous paragraphs dealt with the ideas about what the factors could be and the sources of those ideas and concepts. This section takes a more pragmatic look at these factors to see how they can be developed into a useable model. This process simplifies the model and starts to formulate a practical way of using the factors. Part of this process involves paring back some of the factors of the model and concentrating and focusing on those factors that the author feels are most relevant. As mentioned in the previous section, many of the ideas and concepts come from established frameworks. The model the author proposes tries to highlight particular areas of these frameworks that are relevant to the research question being answered. It could be argued that this selectivity limits the effectiveness of using the framework in the first place. However, in the opinion of the author, it is necessary to be selective in order to propose a model that can be used and in order to seek answers for the research questions proposed. It is important to remember, a framework is not a definitive approach to solving a problem or an issue. It is a set of constructs that helps to frame the topic so that it can be more easily investigated.

3.2.1. Approach used in operationalising the factors

- Factors have been picked that can be measured, using reasonably accessible indicators. The goal of the model is to be practical, not purely conceptual.
- The level of granularity varies from factor to factor, this is again designed to facilitate measurement and to avoid the temptation to ‘dig too deep’ in one area at the expense of others.
- In some cases, rather than using or applying a full framework, certain key factors or indicators from the framework have been used. This is a

pragmatic decision taken to make the application of the model less time consuming.

- Sometimes proxy indicators / factors are used to measure or represent less quantifiable factors. This is done to improve the user friendliness of the model.
- Not all factors are measurable quantitatively; some are factors that can be investigated using a qualitative approach.

The goal of this approach is to design a model that is user friendly and can be used in the real world to produce data that can be used in different ways.

3.3. Testing the Exploratory Framework (Sample Profiles)

In order to test the model, profiles of three different types of sample company have been created. These fictional companies have been designed using some of the factors and information derived from the literature review. These companies represent a small fraction of different types of software companies. By looking at each company and looking at the framework of factors it is possible to further hone the model and explore the factors in more depth.

The use of sample company profiles and the examples in Appendix 3 show how the author used the framework to explore influential factors and to look at their validity. The results from this research approach are discussed in Chapter 5 along with the results from the questionnaire.

There are limitations to the amount of time available to pursue this research. This theoretical approach makes it possible to explore a complex and multi-faceted framework in a shorter time frame. The exploratory framework developed in this dissertation depends very much on how it is used and the knowledge and perspective of the people using it.

3.3.1. Sample Company Profiles

These company profiles have been developed by the author by blending together different facets of actual companies and by using industry statistics and other data. The idea of using stereotypes to test the model against comes

from Alan Cooper (1999). He proposed the idea of using fictional personas to analyze and test product requirements, concepts and implementations. This concept is discussed in more detail in the methodology chapter.

COMPANY ONE

This is a small company, possible owner managed, with a very narrow product scope. It has one much customized solution that it sells predominantly into one vertical market. The value-add comes of the customization of base applications and frameworks for use in this vertical market. These applications and frameworks will tend to come from the same technical and partner ecosystems. For example, the company maybe a Microsoft preferred partner that builds custom solutions using the .NET platform and Microsoft Office. The skills in the company are mainly around the development platform and product. In many cases the company may be an IT department that was ‘spun-out’ of it’s parent company in an attempt to gain some sort of economies of scale or a return on an internal cost.

For example a company producing a financial product that helps manage foreign exchange transactions between branches of a bank, might have been originally developed in house but then spun out with the intention of selling the ‘expertise’ to other banks. Small companies like this are relatively common in Ireland, The NSD statistics show that the average size of an Irish company is about 15 employees and 2 million dollars of revenue

COMPANY TWO

This medium sized established company has been operating in the same space for a relatively long period. It has a fixed range of products that have been developing iteratively over time. It is justifiably proud of its reputation for quality and has a strong process mentality. In the mid 90’s, Enterprise Ireland and the NSD encouraged the company to get ISO and CMM certifications and the company has maintained these. Although it was involved in the ‘e-commerce’ and the .DOT com boom, it never fully committed to an on-line business model and as such weathered this storm, although times were tough in 2001 and 2002, the company managed to continue to maintain it’s position. It works across several sectors with an order to cash product and recently has

built several variations of the core product (for example a version for Construction, Manufacturing). It is built primarily around a Microsoft platform, but some of the functionality has been implemented using third party software products. There is a consumer version of the product that was developed at some point, it has some sales still but these are dying out. The most recent product innovation was a link to an on-line service that provides updated business rules for accounting practices and currency data.

It has a sales network across the globe, with offices in Asia Pac, the US and the UK. These are really just sales offices, although occasionally a consulting job will be run out of the UK office. The professional service business has been an important driver for the company and this has been growing recently, especially after the deal with Oracle's business alliance group to include support for the product on Oracle platforms. Now, in fact it is hard to really get development done, because the technical resources are often supporting implementations rather than working on new features.

From the NSD statistics and literature review of the Irish industry, these types of firms exists but they are not that common

COMPANY THREE

This is a large multi-national firm with several product lines. These product lines cater to different segments of the market. Within each product line, the firm offers different levels of product, for example, there is an enterprise version of the product that is more scaleable and uses a CPU style licensing view. This type of product differentiation has been something that developed over time to keep large enterprises interested in the product line.

The company still does the product design and architecture in Ireland but most of the corporate roles have moved to the US along with the need to work more with US Partners. The company has also acquired several small technology companies around the globe. This has left it with small development groups scattered around Europe, the Middle East and Africa (EMEA) and the US. There have been efforts to try to amalgamate these but this could only happen at the expense of losing the technical gurus still based in these offices. There are also a number of different systems in place to manage different products

and product lines. An attempt to standardize these failed, primarily because no one dared touch the legacy code. Some of the products have been migrated onto multiple platforms or at least the database and gateways are multi-platform. The client software is all Windows based a part from the simple web client.

Recently some of the maintenance and coding has been moved to a new facility in India. This has included the companies original product, a document storage and retrieval platform, which although not really selling any more is still being used by several government departments around the world. Some of the ideas from this product have been used to develop a retail solution that works with different types of Media – in fact; this is a promising area due to the boom in TIVO type devices. A recent technology licensing deal with a large home electronics firm has been very lucrative, although hammering out the details was an issue that the legal department worked on for a long time.

The company has also released products based on the same technology that help home users manage information on their home PCs. Recently there has been a lot of competition from ‘free’ products whether these are open source or from companies like Microsoft and Google. The company still has huge patent chest around various technologies and is prepared to use these to defend it’s position, in fact it has already won some major legal battles with companies who infringed on it’s patents.

The company has sponsored an open source project and open standard that deals with the way information indexes can be transferred from product to product. The hope is that this will improve compatibility between different applications. It should also help the company develop products for other hardware platforms.

Very few companies meet this profile in the Irish context. This profile tends to represent a second tier global software company.

3.4. Summary

Developing the framework was something that took a number of iterations. The framework presented in this section includes the benefit of these iterations

and the lessons learnt through the course of the research. One of the key areas of the improvement between the different iterations was the narrowing down of the exploratory framework to build something that was more manageable and potentially more useful. This was at the expense of detail and of the exclusion of some factors that could also be influential.

In particular, the area on the resources and capabilities of the firm was significantly trimmed down. The scope and context of the research meant that those areas most relevant were examined. Other areas that could also be included could be the Firms market competency or financial capability and so on. It is expected that if this framework is used in a practical context that additional time will be spent on analyzing the firm in more detail and on analyzing the industry situation in more detail. Frameworks and models exist that could be used for this analysis in parallel with looking at the influential factors. In the author’s opinion the PARTS model as discussed in the literature review could definitely play a role in providing deeper analysis.

The results from testing with sample profiles are discussed in Chapter 5. The complete table of factors is given in the next section of this chapter.

3.5.Exploratory Framework of Factors

A complete list of the factors used is given below in a tabular format. It is followed by a simplified graphical representation of the main areas.

FIRM CLASSIFICATION

| Factor | Measures, Indicators, Areas for Investigation |
|------------------------------|--|
| Firm Size | Revenues, Number of Employees, Locations |
| Firm Geographical Foot Print | Sales into Geographical Markets (EMEA, ASIA Pac, Americas) |
| Firm Industry Foot Print | Sales into Industry Sectors |
| Customer Profile | Customer Segments (Enterprise, SME, Consumer) |
| Product Diversity | Number of Product Lines Product Categorization |

RESOURCES & CAPABILITIES

Capabilities Factors

| Factor | Measures, Indicators, Areas for Investigation |
|--------------------------|---|
| Development Approach | Release Cycles, Process Compliance, Corporate Standards, Virtual Teams |
| IPR & Licensing Approach | Licenses Used, Alternative Licensing Schemes, legal support /competence, compliance approaches, patent process, legal cases pursued |
| Partnership Approach | Business alliances Research partnerships Academic Partnerships Venture Capital and Funding Approach |
| Outsourcing Approach | Functions outsourced, Contractors |
| Organizational Structure | Names of functions, numbers employed in each function, locations of functions |

Firm Resources

| Factor | Measures, Indicators, Areas for Investigation |
|-----------------------|---|
| Reputational Factors | No of Brands, Branding, Industry Presence, Standards Bodies Participation, |
| Intellectual Property | Number of Patents Copyrights Number of Licensing Agreements / Access to Patents |
| Employees | Numbers, Distribution across functions, |
| R&D spending | % of Revenue, employees in research functions, Internal vs. External Expertise |

COMPETITIVE LANDSCAPE

| Factor | Measures, Indicators, Areas for Investigation |
|----------------|--|
| Players | Substitutes, Complementors, Customers, Suppliers, The Firm |
| Ecosystem | Technology Ecosystem, Partner Ecosystem |
| Market | Vertical Market Focus (Specialisation), Horizontal Market Focus (Differentiation) Market Size, % Market held |
| Business Model | Indirect Sales Approach, Direct Sales Approach, Revenue Split (Licensing, Services & Support) |

OPEN SOURCE AWARENESS

| Factor | Measure, Indicators, Areas for Investigation |
|-----------------------------------|---|
| Current Open Source Contributions | No. of Projects, Role in Projects (Sponsor, Owner, Contributor) Contributions (Code, Developers, Financial, IP) Rational for Activity |
| Planned Open Source Contributions | Type of Contribution (Code, Developers, Financial, IP) Rational for Contribution |
| Open Source & Standards | Representation on Open Standards Boards Representation on Open Source Foundations |
| Open Source Product Support | Support for Open Source Products & Platforms (Linux, MySQL, JBOSS etc) |
| Internal Open Source Use | Development Tools, Productivity Tools, Other |
| Open Source Licensing Expertise | Products using Open Source Licenses Familiarity with Open Source Licenses & Implications |
| Open Source Risks | Free Riding, Accidental Use, Hijacking, Commodization |

FIRM ETHOS & PURPOSE

| Factor | Measure, Indicators, Areas for Investigation |
|--|---|
| Firm's Perspective A number of opposites that could be used to profile the firm | Innovator or Knowledge Harvester Not Invented Here or Technology Adopter Stability vs. Dynamism Market Driven or Product Driven Follower or Leader People or Process Risk Taker or Risk Adverse |
| Vision & Mission Is there anything here that changes the view of the firm | Clarity of Vision & Mission, Conflicts between vision and open source ethos. Firm could become a 'target' for open source communities |
| Firm Tradition The firms 'story' and | Development of the Firm, Academic Tradition, Important of Innovation (HP – 'Invent'). |

| | |
|--------------------------------------|--|
| history influences the way it thinks | Attractiveness of firm to potential contributors / developers |
| Corporate Purpose/Responsibility | Does the firm 'give' back to the community? In what ways is this apparent. |

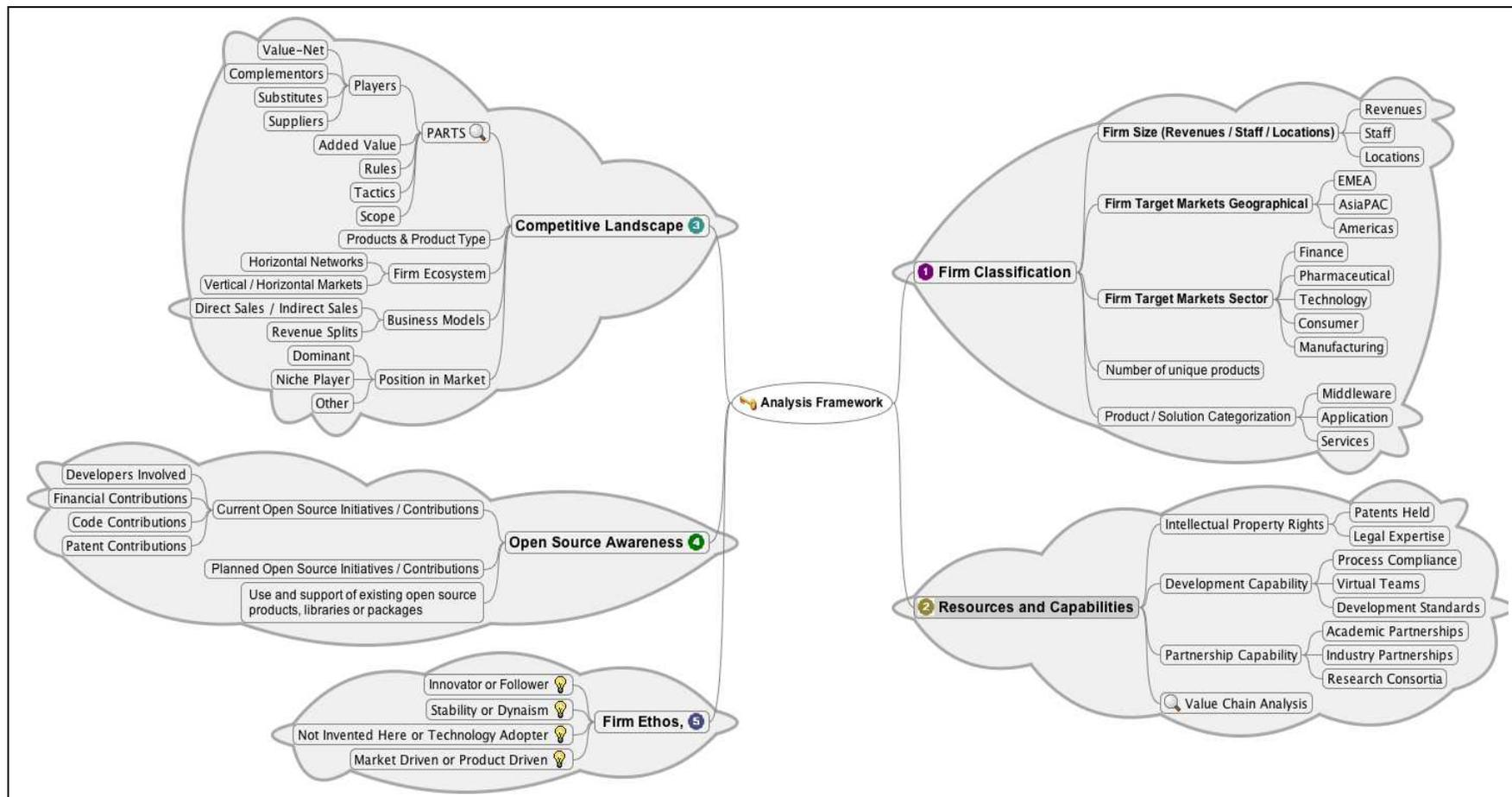


Figure 7 - Graphical Representation of Exploratory Framework

Methodology

3.6.Introduction

This section discusses the research approaches and methodology that used to carry out the research. It also talks about of some of the issues encountered while carrying out the research and the research findings.

3.7.Research Question

When I started thinking about my dissertation I was working for a global software company that was changing its model because of the open source movement. What I saw was that firms, even established firms, were being forced to react to the open source phenomenon. My observation was that global firms seemed to have reacted in a number of different ways. I thought that it would be interesting to look at this phenomenon in the context of the Irish Software Industry. Effectively the research was to look at why these firms reacted in the way that they did. This lead to the Hypothesis.

‘The Open Source Software Development movement is impacting the software industry globally, the increasing commodization of software products has reduced product margins and encouraged proprietary software publishers to focus more and more on service and support revenues and alternative business models. However even during this change, software companies are succeeding in leveraging the open source software movement to gain competitive advantage. These firms are successful for a number of reasons and factors.’

The primary research question was whether it was possible to identify the factors that prompt a firm to react in a certain a way. The secondary research question is really an extension of the question; it provides a mechanism for validating the factors that have been identified. The validation in this case

looked at whether knowing these factors could help profile companies and thus suggest strategies and tactics that could be prescribed.

- Can these influential factors be identified?
- Can they provide useful strategies and tactics that can be used in the context of the indigenous Irish software industry?

The research was made more manageable by breaking it down and focusing on several research areas:

- How does the choice business Model or Strategy contribute?
- How does the approach to Intellectual Property Rights (IPR) contribute?
- What are factors associated with open source change the firms perspective?
- Is there anything specific to the Irish Software Industry?
- Are the factors contingent on the firms situation and the firm or are they generic?

3.8. Research Objectives

The research objective was to build a deeper understanding of the factors that influence a firms ability to manage the impact of the open source software movement. This was done by building an exploratory framework of factors and using this framework to profile a number of Irish firms. These profiles were then used to suggest strategies and tactics that could be used by these firms.

3.9. Research Strategy & Design

Selecting a research strategy and approach is a critical part of any research project. The research approach was **qualitative** or **interpretivist**. An alternative quantitative research strategy was considered but rejected on the basis that the hypothesis and the factors being proposed were tentative conjecture rather than theoretically derived. Future research could focus on a quantitative research strategy that aims to prove the validity of the proposed framework using quantitative methods.

Remenyi and Money (2004) provide a number of bullet points that help to characterize the interpretivist or qualitative approach. These are given below:

- *The researcher is not objective and cannot be;*
- *The aim is to provide an in-depth understanding of the world of the research subjects;*
- *Generally uses small samples that are deliberately selected for their particular criteria i.e. not random;*
- *Evidence collection methods which typically involve close contact between the researcher and the subjects being studied;*
- *Evidence which is detailed, information rich and extensive;*
- *Analysis which is generally open to emergent concepts and ideas*

These ideas are echoed in a number of other books on research strategy including Denscombe's (1998) book. Denscombe proscribes a more formulaic approach and tends to associate specific instruments with specific approaches. Remenyi and Money are more inclusive and appear to focus more specifically on business and management research. The other valid approach that is mentioned in the literature is the **eclectic** approach. This uses a number of different research strategies and strategies to reach the conclusion. In some ways, this research uses an eclectic approach – framework is validated using several approaches to come to a useable model.

This type of research model appeared to be the best research approach for a number of reasons:

- As researcher, I have been involved in various open source initiatives and my own biases or ideas influenced my thinking and my

interpretation of the research approach.

- Part of the research objective was to build a deep understanding of the research areas. I used a set of research subjects who I had access to and who represented different segments of the software industry.
- My approach was to try to collect extensive information from a small sample set rather than limited information from a large sample set. I also included a large number of other sources in gathering data and building an understanding of the research area and research topics.
- Open Source is a rapidly evolving and changing phenomenon model, as I researched the area – the boundaries remained very dynamic. A number of ideas and changes occurred through out the duration of the research, also a number of viewpoints were important to include.
- As with typical qualitative approaches, My research strategy was deductive. As Creswell (1998) pointed out, I started by offering a tentative conceptual framework based on my literature review and then continued to test, extend and refine this framework of factors through the course of the project using qualitative data.

To conclude the section I highlight the work of Harry Wolcott (1999)

“There is no longer a call for each researcher to discover and defend [qualitative methods] a new, nor a need to provide an exhaustive review of the literature about such standard procedures as participant observation and interviewing. Instead of having to describe and defend qualitative approaches, as we once felt obligated to do, it is often difficult to say anything new or startling about them.”

As Wolcott points out the key is to get the message across and to communicate with the reader about the reliability and validity of the research carried out.

3.10.Scope of Research

The scope of research was limited to indigenous Irish firms and the research focused on the firm in general rather than the industry or any specific organization. The nature of the research was broad and included ideas and concepts from many different academic areas. These include Business

Strategy, Economics, Sociology, Innovation and Software Development and Engineering.

3.11. Research Approach

The details of the research approach are given in the following sections. As discussed in the previous section the approach was qualitative and my research approaches are based around techniques to gain a rich understanding of the issues and explore the issues surrounding the research questions.

3.11.1. Developing a Exploratory Framework and Model

In order to answer the research questions, I developed a tentative conceptual framework based around the factors identified through the literature and using my own experience of working in the software industry. The framework pulls the factors together and categorizes them in a logical order. It also posits a rationale as to why the factor may be relevant or important.

3.11.2. Research Approach 1 - Using Company Profiles to test the framework

In order to better understand and simplify the model I created several company profiles of personas based on information from the literature review and from my experience. I then tested the model against these stereotypes. This software development technique is described by Alan Cooper (1999) in “*The inmates are running the asylum*”. In this technique, part of the initial software specification requires the development of a number of user personas. These represent the different users of the system. Different requirements and implementations can then be tested and explored in relation to these user personas. The approach is described in some more detail below.

SOFTWARE DEVELOPMENT AND USER PERSONA

This approach is relatively common in software development. As part of the software development process and series of stereotypes are created that represent the various different types of users of the system. These stereotypes are often developed in a humorous way. A typical persona would include details about the expertise of the user, the attitudes of the user, the results that

the user expects and so on. These personas are thus based on the actors who will eventually use the software solution.

The use of personas facilitates every step of the software process – but is especially helpful at the design and analysis phases. Each requirement can be tested against the personas to see whether the requirement meets their need. They can also be used as part of testing software designs for usability.

Ideally, everyone working on the software solution will have an idea of these personas and the persona will influence their everyday decisions. It is an effective way of bringing the customer into the design and development process.

COMPANY PROFILES AND THE FRAMEWORK

In order to test the initial framework, an approach based on the above technique was used. Instead of creating user persona, a number of company personas were developed. These personas are based on information from the Irish Industry review and from other source. They represent a pastiche of different factors that are relevant to the Irish Software Industry.

By looking at the framework in relation to each of these profiles or personas, it was possible to evaluate the validity of the factor or indicator and to understand how it could potentially be influential in their approach to managing the impacts of the open source movement.

3.11.3. Research Approach 2 - Primary Research

The initial research approach used a theoretical and discursive approach to evaluate the factors and understand the impacts. The second research approach used primary research methods to try to validate the factors that I had identified. This validation took the shape of using the factors to profile a sample of Irish firms from different segments of the industry and to see whether they could be used to suggest appropriate strategies or tactics.

DEVELOPING THE QUESTIONNAIRE

To profile the firms, a questionnaire based on the factors and indicators from the framework was designed. The questionnaire was originally designed using

MS Word. It consisted of a number of specific questions organized into different sections. At the end of each section of questions, additional feedback was encouraged. There were a number of optional questions. I tested this questionnaire with some colleagues who were able to give me feedback on the questionnaire and suggest changes that would make the questionnaire more useful. The colleagues who reviewed the questionnaire had experience of working with open source software at a large global software firm.

ON-LINE SURVEY

Following initial feedback, the MS Word questionnaire was updated and re-categorized. Several factors from the resources and open source awareness categories of the framework were removed to make the survey easier to complete. The final survey included sections on:

- Firm Classification
- Competitive Landscape
- Firm Capabilities (Development, IPR and Partnership)
- Open Source Awareness
- Firm Ethos

The MS Word document was then coded for the Internet using an on-line questionnaire tool⁴⁰. A copy of the on-line questionnaire can be found in Appendix 4. Using a network of contacts in the Irish Software Industry I distributed an on-line link to the survey to fifteen candidates (A list of companies can be found in the Appendix 2). These candidates were all senior members of Indigenous Irish Software Firms. It was not a random sample of candidates. The purpose of the questionnaire was to explore and capture rich and detailed information that could be queried and analyzed. For this reason, I picked candidates who I had easy access to and whom I could easily follow up with in order to clarify any issues. In the case of certain candidates, not all of the sections were applicable. This is commented on in the results chapter. The research timescale meant that certain candidates were time constrained and were not able to complete all sections of the survey. The feedback from these

⁴⁰ www.surveymonkey.com

candidates was included in the results and in the analysis.

3.11.4. Secondary Research and other sources

A number of secondary sources were used to explore the question in more detail and to build up a complete understanding of the research question. As is made clear in Brannick and Roche's (1997) book, secondary sources are useful sources of information but it is important to be careful when repurposing data for other uses. In particular, I made use of on-line websites publishing news stories relevant to Irish Software Firms, the Enterprise Ireland site and The National Software Directorate (NSD). I also had access to several people working in the legal industry who were familiar with Intellectual Property Rights. The web was particularly important when researching the open source software movement. Many of the materials available originated on the web and the phenomenon has always been closely tied to the Internet and the web.

3.12. Reporting on Research & Analysis

Two research approaches were used. One of these was based around company profiles; the other used primary research methods to gather data. The results from these processes were handled differently. The results from the first approach were tabulated and are contained in Appendix 4. These results are qualitative, a commentary was written for each section outlining facts that are interesting in relation to the research question and research approach. The goal of this approach was to demonstrate with the aid of sample companies and an exploratory framework that there were influential factors.

The questionnaires from the second research approach were all kept electronically and processed into a Microsoft Excel Spreadsheet. The surveys were categorized and classified. This was done by using several different parameters including sector, size and type. High-level analysis was carried out to examine common trends. This data was then used qualitatively to investigate the validity of the factors suggested in the framework. By examining the responses and the firm profiles it was possible to identify whether the factors were influential.

The data from the survey is confidential and available as an annex to this dissertation

3.13. Commenting on the Research Process

This section highlights issues encountered during the research process and some of the ways in which they were overcome.

3.13.1. Questionnaire Development

The questionnaire development involved multiple iterations. The initial iteration took the framework (See chapter 3) and created a question for each factor in the framework. This resulted in a very complex questionnaire. Testing this survey with some colleagues resulted in feedback that made it possible to develop a more usable questionnaire. This questionnaire could then be coded for use on-line.

Learning to code the questionnaire using surveymonkey.com required practice and plenty of testing with reviewers. The questionnaire was on-line which allowed the survey to be tweaked and fixed in real-time when errors were reported by users. During the process, it also became clear that some questions were not suited to an on-line approach and needed follow up.

3.13.2. Selecting Candidates & Access

A number of different approaches were considered to develop a suitable sample for the survey. The initial approach was to work with one of the industries representative bodies to develop a large-scale quantitative sample set. This approach was discarded as impractical given the timescale. Currently, there is an ongoing effort by Forfas to conduct a large-scale survey on the Implications of Open source and these results could be very interesting to follow up on and check for parallels.

The solution to these access issues was to take advantage of a network of colleagues to gain access to a number of senior managers in a variety of software companies. This was supplemented by some e-mails requests to specific companies. The response rate speaks to the success of this approach.

3.13.3. Interpreting and formatting Survey results

Some of the results from the survey came back in a numerical format. There was a temptation to present these as quantitative results that had statistical relevance to the whole software industry. In results section, results are presented numerically where it makes sense. However, no statistical analysis is carried out on these results. The primary approach to interpreting the survey results is qualitatively through discourse.

The fact that a number of results could be collected numerically might allow for future quantitative research using the proposed framework.

3.13.4. Focusing the Research

The research topic was broad and contained many interesting areas that could have been developed further. By focusing the research on the Irish context and on software and technology aspects, it was possible to narrow the research. Although it does mean that, some areas were not explored. For example, how the marketing capability of a firm might influence how it manages the impacts of open source.

3.13.5. Case Study Research Approach

All exploratory research creates additional avenues for future research. One avenue that might be particularly useful to this research topic would be to use the exploratory framework in conjunction with a case study approach. Using case studies to analyze several sample companies in depth could provide additional information that would help to build on the framework. This bottom up approach could profile additional information on how relevant certain factors are.

3.13.6. Maintaining the practicality of the research

A theme for the research project was to maintain the practicality of the research. This was an important goal for the thesis; a practitioner reading the dissertation should be able to get useful ideas that could be applied to his or her business context. This was done by illustrating the ideas with examples from current business practices and by including Appendix 3 where it is possible to see some results relating to the use of the framework.

4. Results

This section explores and records the results from both research approaches. It links these results with the conceptual framework. By doing this, it is possible to explore the framework in more detail and to validate the factors that make up the framework. Both research approaches were qualitative and aimed at establishing a deeper understanding of the research question.

The first research approach is discursive and theoretical as such the results require less explanation. The goal in this section is to demonstrate that the framework is realistic and that the factors included are influential. The results from the first approach are by their nature biased toward the experience of the researcher, both in the application of the framework and the design of the sample companies.

The second research approach was qualitative and exploratory. There are no statistical inferences drawn from the survey findings. Instead, the results provide a perspective of the realities faced by a number of Irish Firms in operating in different sectors and segments of the market. In this respect, the survey approach resulted in a number of mini case studies.

The Summary section of this chapter will review the results and reflect on whether they answer the primary research question – Can Influential Factors be identified? **Chapter 6** continues this analysis by looking at how the data gathered using the factors can be used by firms..

4.1. Company Persona Results

This approach required each of the factors to be tested against each of the company personas. The approach demonstrates the validity of the factors by showing how they could be used. The research focused on testing each of the factors against three fictional companies. This section includes samples taken from three sections of the framework.

- Resources and Capabilities
- Competitive Landscape
- Open Source Awareness

These illustrate why the factors are influential. The most useful results are in the commentary that follows each set of factors. Some of this commentary is included in this results section. Only a sample of the results from the first approach is included in this section. The full results of this exercise are available in Appendix 3.

The research approach is derived from an existing software requirements gathering method and is thus experimental in this context. The difference between the depth of the data collected between the live approach and the discursive approach is interesting.

4.1.1. Resources and Capabilities

The tables below look at a set of particular factors and looks at how the factor might indicate a firm's position and approach in this area. The comments are based on the company profiles developed in chapter 3.

Table 1 - Partnership Comments from Appendix 3

| | Firm 1 | Firm 2 | Firm 3 |
|------------------------------|--|---|--|
| <i>Academic Partnerships</i> | No direct involvement. Has occasionally offered roles to undergraduates | Has sponsored several projects in various institutions | Sponsors two labs - one in Ireland and one in the UK. Has been considering trying to pull out of this arrangement |
| <i>Venture Capital</i> | No seed funding, one of the ideas for future growth is to look for a capital injection at some point | Received seed funding and second round funding. Now trying to provide an exit route for investors | Received Venture Capital before going public. Now has a fund that it uses to invest in some promising technologies |
| <i>Research Consortia</i> | A member of an EU funded project on new banking regulations | Lead a research consortium several years ago but | In the early days it was involved in several research groups but |

| | | | |
|-------------------------------------|--|--|--|
| | | never provided any real value. Moved too slowly to be usable | gradually backed out as it developed more internal R&D expertise |
| <i>Other Funding / Partnerships</i> | | Has set up a joint venture with an organization in Japan | |

In Appendix 3, each of the factors that makes up the Resources and Capabilities section of the framework is demonstrated in relation to each company profile. The commentary shown in the table on the next page looks at the category of factors as a whole and analyzes how these factors might influence the ways in which a firm might react to the open source software movement.

Table 2 - Resource and Capabilities Commentary from Appendix 3

| Firm 1 | Firm 2 | Firm 3 |
|---|---|--|
| Small firm structure, everything relatively controlled due to single site location, still technically focused | Has developed some key capabilities and resources. Has the ability to develop partnerships but also needs to look at mechanisms for growth and ways of building additional expertise. The single brand focus and limited segments make it vulnerable to changes in this segment | A mature firm with various capabilities and resources. Has a large patent bank and a number of technologies that are exploitable. Has a good partnership capability and could invest in this to build a technology ecosystem |

4.1.2. Competitive Landscape

The follow section uses PARTS Analysis as a way of investigating factors that relate to the competitive situation of the firm.

Table 3 - Competitive Landscape Players Section from Appendix 3

| | Firm 1 | Firm 2 | Firm 3 |
|---------------------|--|---|---|
| <i>Substitutors</i> | Very Regional, a firm in Germany offers a very similar solution to German finance houses but trades on it's knowledge of German Finance Frameworks | Several global firms competing in our space, some regional focus, some competition for new entrants especially ASP providers. Biggest competitor is company X which has a very similar product line to us. We would monitor their actions very carefully and try to match their moves | We are the leader in our market space and own most of the market share; we do monitor some other firms and have taken over some of our small competitors to gain technology. We are always looking for ways to move into other market segments in order to grow our customer base. We are aware of increasing commodization in our segment, and recently we have noticed one or two open source projects that would seem to be aimed at our |

| | | | |
|----------------------|--|--|---|
| | | in the market | market |
| <i>Complementors</i> | Handheld Device Manufacturers | On-line data services, communication companies | Hardware companies, software add-ons and application companies, CSI |
| <i>Customers</i> | Mainly large MNC finance houses based in Ireland using international regulations | Primarily direct to consumers, with some enterprise sales. Product provides customer with a way of managing x and facilitates this through access to on-line functionality | Provides customers with multiple solutions based around it's family of products. These products include middleware used to connect different services and to provide access to legacy data, it also provides business intelligence solutions that can be used by CSIs to add value to their customized solutions. A version of the software is available directly to consumers that allows end users to do X. |
| <i>Suppliers</i> | N/a | Uses components from 2 small software companies to handle security and cryptography | Most components are in-house, does use a 3 rd party installer and also some 3 rd party libraries – however the tendency is to 'invent' and develop internally rather than use external solutions |
| <i>Company</i> | Small Software company trading for 5 years, starting to look for opportunities outside of EMEA | Medium sized software company that resulted as an off-shoot from another firm, experienced personal, many coming from the previous company. Very focused on growing business in the US and in Asia Pac | Large software company originally came about from an academic research project that was commercialized. Has grown organically and recently through several large purchases. Sees consolidation as inevitable. Still has a strong research ethic |

The table below uses the information from the analysis of the factors relating to the competitive landscape to build a picture of how the factors influence the ways in which a firm might react to the open source movement.

Table 4 - Competitive Landscape Commentary from Appendix 3

| Firm 1 | Firm 2 | Firm 3 |
|--|---|--|
| The company is still establishing itself in the market. It is looking for ways to increase its part of | This is a company that has an established presence in it's market place and has several different ways of | This is a large company that has a dependence on its complementors and it's ecosystem. It is very retail |

| | | |
|---|---|--|
| the pie, the fact that the product is very specialized and requires business expertise to implement makes it hard to sell off the shelf, the company is finding that the length of the sales cycle is increasing and that this quite often means that 'people are on the beach' | earning revenue, it has capitalized on it's exposure to vertical markets by creating products. It seems to be open to new business opportunities while remaining conservative in key areas. It is focused on it's market and is playing by the market rules. Might be exposed if the rules change, might be blinkered by technology approach and view of it's place in the ecosystem and market | focused and is trying to keep everything balanced. The rules are changing and it is looking at it's tactics and the scope of the firm. It has opportunities due to it's dominant position and market share. It is thinking about the scope of it's business and is looking for ways to expand what it is doing. it could benefit from an more in-depth look at the market it is playing in and a better understanding of this market |
|---|---|--|

4.1.3. Open Source Awareness

The table below highlights a number of risk factors that could be influential in how a firm manages the impacts of the open source software movement. It also indicates approaches for avoiding some of these risks.

Table 5 - Open source Awareness Risks from Appendix 3

| | <i>Firm 1</i> | <i>Firm 2</i> | <i>Firm 3</i> |
|----------------------|--|---|---|
| Free Riding | <i>Business Knowledge would prevent this</i> | <i>This would be a big risk for us, especially if our partners could choose different open source products</i> | <i>Since most of our revenue is from retail, this would be a big risk - if people could get our software at no cost we would have no revenue stream</i> |
| Hijacking | <i>Not considered a risk / too much business knowledge required</i> | <i>We would worry about this especially competitor X</i> | <i>Don't really understand this - we would fight any attempt by any one to hijack our code</i> |
| Security | <i>Security would be a concern - people could see algorithms used</i> | <i>We already use 3rd party security modules and components, we think that if anything our security would be improved by access to the code</i> | <i>We believe that we have a firm handle on this in our closed source model - open access to our security code would be a risk for our clients</i> |
| Open Source Tainting | <i>Worried about this</i> | <i>We have heard about this - it would be a concern that some how open source code would get into our product and thus make all of our product open source - not sure how realistic this process could be</i> | <i>Our legal process tries to prevent this but we are aware of this risk</i> |
| Liability | <i>This is a risk although the SCO case has shown this is very hard to prove</i> | <i>Not sure about this</i> | <i>We have considered this and we see this as an issue. The SCO case shows how important this areas is</i> |

| | | | |
|---------------|---|--|---|
| Commodization | <i>The specialized nature of the product should prevent this.</i> | <i>This a risk, we are already seeing it in our market, hence our push towards verticals and on-line content</i> | <i>We see this happening anyway, we try to avoid this by offering solutions on all levels, in certain cases we see open source products gaining market share, we try to avoid this by closely interlocking our stack of products but for us this is a very big risk</i> |
| Others | <i>Worried that the finance houses might take the work in house if the engine was available open source</i> | | <i>We also see ASP service provider as a risk especially those building on open source projects - this would be the type of hijacking we would be most wary of</i> |

The following table discusses the overall position of the firm in relation to its open source awareness and what this means to relation to the firm's approach and whether it is in a position to exploit or manage open source approaches and projects.

Table 6 - Open Source Awareness Commentary from Appendix 3

| Firm 1 | Firm 2 | Firm 3 |
|---|---|--|
| <i>The firm is not very open source aware but has been looking into open source, at the moment open source knowledge is mainly second hand. The firm has a good handle on where it stands in relation to open source and that currently because of the specialized nature of its solution, it is unlikely to find open source project competing against it.</i> | <i>This firm is open source aware but at the same time is very defensive in its attitude. It seems to feel forced to contribute to projects to be involved but there is no commitment. Open source is seen as a threat but not as much as the threat from competitors. Its attitude to developers could be worrying</i> | <i>This firm shows a good understanding of open source including the risks and consequences. It has built up a series of policies to minimise the impact of open source but is also starting to play in the open source arena in some areas. Its legal policies are interesting as is its approach to try to keep developers engaged. It seems to have learnt from some of the best practices shown by open source projects.</i> |

4.2. Survey Results

The design called for a detailed survey that would be filled by selected candidates rather than by a random population sample. Appendix 4 has a copy of the electronic survey. The objective of the survey and research was to build a better understanding of a conceptual framework using a qualitative approach. The survey was designed to be complete in some depth. The complete survey results are confidential and are not included in this dissertation but were made available as a separate annex.

Table 7 - Survey Response Information

| | Numbers | Comments |
|--------------------------------------|---------|--|
| Invited to take the survey by e-mail | 12 | |
| Responses - Accepted | 8 | |
| - Declined | 1 | |
| - No response | 3 | |
| Response Rate | 67% | This was not a completely random selection of people |
| Other Participants | 3 | From an invitation to the Irish Linux User group |
| Usable Surveys | 9 | 3 Surveys were empty |
| Company Sectors Represented | | |
| ➤ Financial Software | 1 | |
| ➤ Software development tools | 2 | |
| ➤ E-learning | 2 | |
| ➤ Telecommunications | 1 | |
| ➤ Life Sciences | 1 | |
| ➤ GIS | 1 | |

4.2.1. Section 1 – Firm Classification

There were eight questions in this section of the survey. The questions were designed primarily to gain a baseline for the firm and to categorize the firm. Some questions were directly related to factors in the framework.

The survey results agree with the statistics from Enterprise Ireland (Section 2.7). The sectors represented also reflect John Sterne's (2004) analysis of the state of the modern Irish Industry.

Table 8 - Firm Revenues in Millions of Dollars

| Firm revenues (M\$) | 0 to 4 | 5 to 24 | 25 to 99 | More |
|---------------------|--------|---------|----------|------|
| Number of Responses | 1 | 3 | | |

Table 9 - Firm Employees

| Firm Employees | 0 to 14 | 15 to 49 | 49 to 199 | 200 up |
|---------------------|---------|----------|-----------|--------|
| Number of responses | 1 | 2 | 1 | |

The graph below shows the types of products that companies were producing. This is relevant because it shows that most of the survey respondents were producing specialized or customized software. A number of respondents produced software in both these segments.

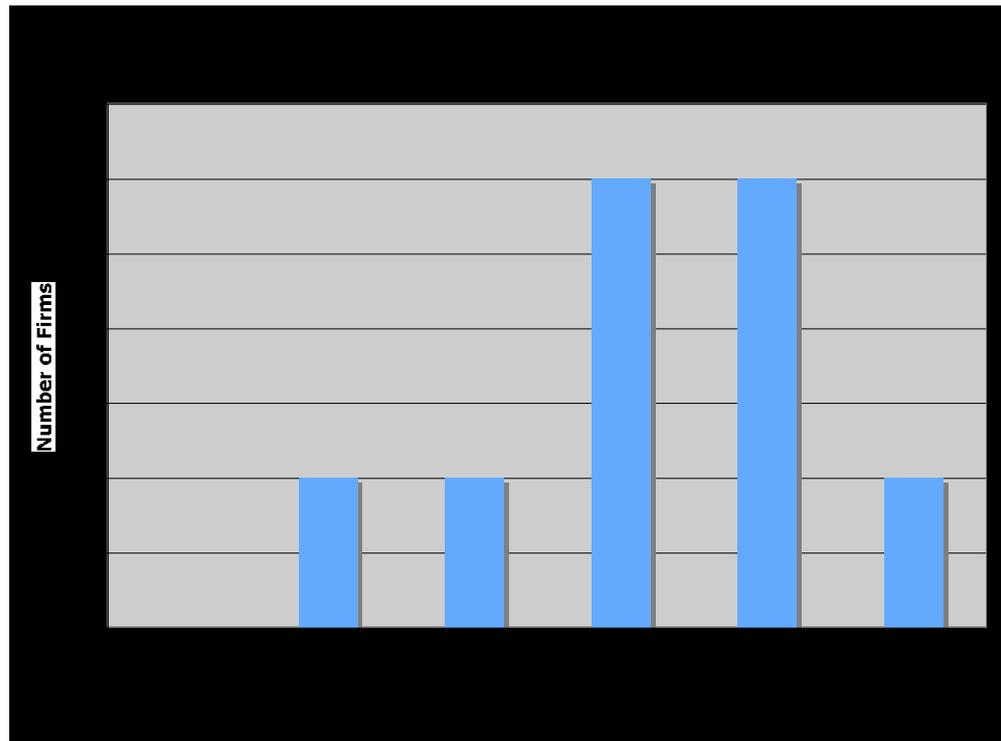


Figure 8 - Chart showing Product Categorization

4.2.2.Section 2 – Competitive Landscape

From the literature and secondary sources, the competitive landscape is one of the most influential groups of factors in looking at how companies manage the impact of the open source software movement.

There were six questions in this section. The questions were based around the PARTS industry analysis model. The questions asked about competitors, customers, technology ecosystems, business ecosystems and revenue models.

Many respondents did not complete this section. Competitive Landscape and Position can be sensitive information; it was made clear in the questions that if the respondent felt uncomfortable with the question it should be skipped.

COMPETITORS & CUSTOMERS

The purpose of the question was to identify the space that the firm was playing

in and to understand the constraints and opportunities that might exist. Of the 10 respondents to the survey, 6 completed this question and one of the responses criticised the question – *‘this is not a well framed question’*.

The picture that comes out is that companies who responded to the survey are dealing with several large customers rather than a number of smaller ones.

Sample quotes from the survey – *‘Competitors: Microsoft, Gamma, Firm Customers – BT, IBM, ESA, Tfl, Aviva Insurance’* and *‘competitors: saba sumtotal customers: 93arva, the world bank, smith and nephew, green consulting, bayer healthcare...’*.

This type of knowledge, taken with some of the other factors does provide a profile of the firm and does help understand the competitive position and the firm's position. This coupled with the question on industry position could provide some interesting options for the firm. This is examined in more detail in **Chapter 6**.

TECHNOLOGY ECOSYSTEM

The purpose of the question was to look at whether firms were tied into a particular technology ecosystem. This might impact the options available to them moving forward. For example, a firm heavily committed to the Microsoft Ecosystem may not be in a position to leverage other technology options, or may not gain advantage from working with different technologies.

The responses from the survey seem to indicate that the firms that responded to this question are usually involved in one or more technology partnerships. Of the firms that did respond, 3 of the organizations surveyed were members of both the Microsoft and Oracle developer programmes.

BUSINESS / PARTNER ECOSYSTEM

This question was designed to get a feel for whether firms were tied into any business alliances or alliance programmes. The framework of factors indicates that is a significant factor in the options and strategies that are available to a firm. Membership of a business grouping, alliance or value chain may give the firm a chance of a share of a bigger pie. This could be a lever towards adopting an open source business model, or vice versa seeking a tie in with a

proprietary alliance.

There was 1 response for this question and this indicates that this may not be relevant to Irish Industry, or alternatively might indicate that the question was badly phrased.

REVENUE DISTRIBUTIONS

An interesting result was around revenue distribution and the mix between licensing revenue and revenue from professional services and content. 4 respondents answered this question, emphasising the fact that professional services plays an important part of the revenue stream. The pie chart in figure 9 shows the distribution.

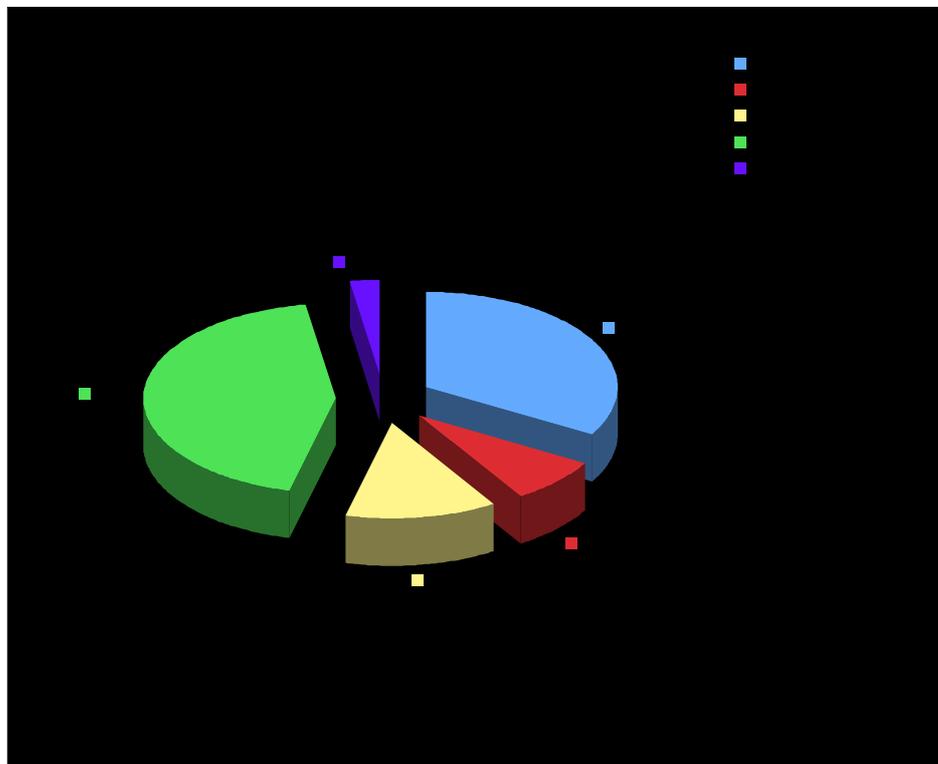


Figure 9 - Pie chart showing revenue distribution

4.2.3. Section 3 – Resources and Capabilities

For the survey, this was broken down into three sub sections Intellectual Property Approach, Development Approach and Partnership Approach. Intellectual Property Approach was considered a core area; Development Approach and Partnership Approach were both optional sections. These were all identified in the framework as potentially influential factors. The survey

thus sought to explore these factors and understand how they related to Irish Firms.

INTELLECTUAL PROPERTY APPROACH

The questions in this section concentrated on the how a firm handled its intellectual property and its understanding and legal competence. The literature indicated that this was an important area in terms of understanding how to approach open source software and the open source movement and in terms of protecting IP.

There were 7 respondents to this section. Unlike other Intellectual property regimes, the patent approach in Ireland seems limited, only 1 of the respondents had patented technology and only 2 had a formal patent process.

This question on the legal capacity and stance also provided an insight into Irish firms, with no respondents having on-site legal expertise and the others outsourcing the facility or using ad-hoc legal expertise. Notable in the responses are two comments, which help frame the situation in Ireland. Tax relief on patented technology is an incentive and option that the author had not come across before.

“License Agreements and IPR are merely tickets to enter the ring. We have agreements with our client to facilitate our business relationship; we avoid all other engagements/infringements, including the filing of patents unless we want to raise the profile of our work. We do not look to licenses or patents to secure value, this is an illusion for small businesses.”

“We’ve patented our gear to (a) protect its IPR and (b) to avail of tax-breaks for royalties earned from patented technology.”

DEVELOPMENT APPROACH

The section on the firm’s software development approach was framed as an optional section. A number of factors were explored in the section all of which could influence how a firm might manage the impacts of the open source movement. These included the firms use of standards, quality certifications, organization structure and experience with virtual teams.

5 respondents answered this section. Notable were the range of answers for the questions on the use of development standards and processes – ‘yes- *Agile process, scrum methodology*’ - ‘No. *With one developer, it’s not worth it*’ – ‘*managed by a team and VP Development*’. The **unanimous** negative response to the question on the use of quality standards was also interesting. In the past this has been an area that has been promoted by various organization in Ireland as a selling point and mechanism for selling globally. It is also something that Indian software companies, a strong competitor to Ireland, pride themselves on

The other questions focused on the type of team organization (permanent, temporary, ad-hoc) and the use of virtual teams. These could both be influential factors in how a firm might respond to the open source movement. They are both indicators of a firms adaptability and flexibility but also give an indicator of how ‘slack’ is managed in a firm.

From the survey, only 1 firm had permanent assignments, while 2 used a temporary approach, 1 used a ‘*scrum process*’. 3 of the firms were familiar with Virtual Teams, although one commented - ‘*yes, have seen it, but never seen it work very well*’

There was only one general comment for this section ‘*Haphazard – driven mostly by our solution culture. Although it’s inefficient – it is all profitable, with limited scale*’. This seems to be a very perceptive comment. It points to the importance of profitability and the fact that small firms can be profitable – maybe reflecting Michael Cusamno’s (2005) view of the Irish software firms as being lifestyle businesses.

PARTNERSHIP AND FUNDING APPROACH

This was an optional section. The intent of the questions was to understand the experience that the firm had in terms of building partnership agreements and to understand the firms experience with funding.

There were 4 respondents for this section. The two quotes below give very different perspectives of the approach taken.

‘Our partner strategy is to develop reseller partnerships in countries

that we do not have a physical presence in. We also develop complimentary partnerships with organisations that have products and services that add to our offering.'

'We've one international partner (in Dubai). Chosen for good regional contacts and ability to satisfy Saudi business, er, requirements.'

Funding approaches and research partnerships results were interesting –there were **3** respondents to these questions – all mentioned that they had received funding from Enterprise Ireland and also from Local Venture Capital Firms. Combined with data from the ISA software industry outlook 2004 (2004) – this paints an interesting picture of the industry and the lack of partnerships between academic and commercial organization.

The other aspect that seemed interesting was that out of the **5** respondents who completed this section, **2** were involved in European Research Consortia and thus taking advantage of European research funding. One of the respondents phrased their approach was '*opportunity driven*' rather than systematic and this could be an interesting area for further research on how to increase the opportunities for this type collaboration. This is analyzed in more detail in **Chapter 6**.

4.2.4. Section 4 – Open Source Awareness

This section included a number of questions designed to test factors relevant to a firm's open source awareness. These factors included the firm's contribution to existing projects and planned contribution to future projects.

6 respondents completed this section. The responses highlighted the awareness that firms have about open source software and the open source software movement – in terms of their contribution to projects but also importantly their ability to benefit from projects. The graphs below outline the results and show how prevalent open source is amongst the firms surveyed. Note, a number of firms contribute in several ways.

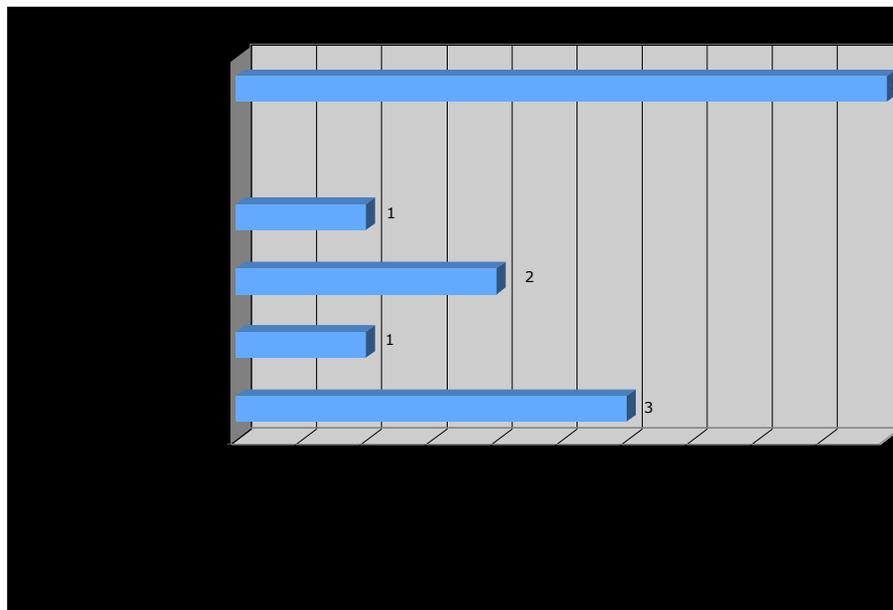


Figure 10 - Current Contribution to Open Source Projects

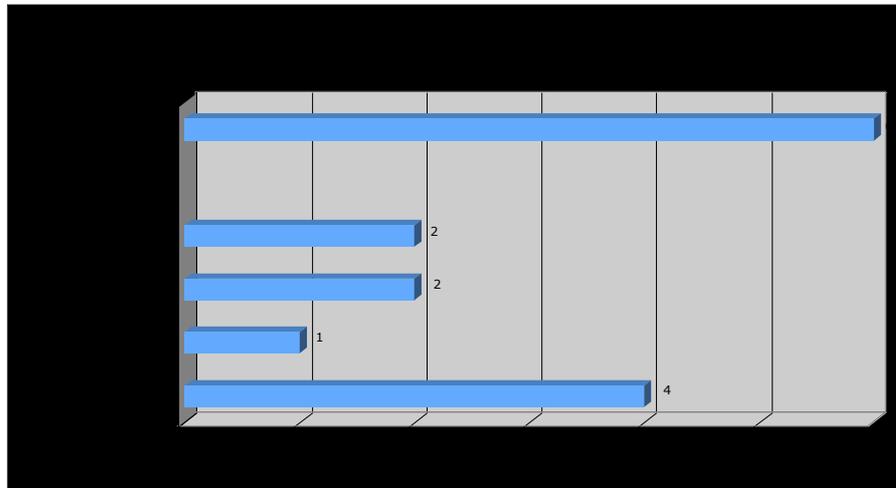


Figure 11 - Planned Contribution to Open Source Projects

This use of open source and general open source awareness links to the factors discussed earlier in this dissertation. Global firms have used their experience of the open source movement to improve their own processes and products with experience gained from their participation in open source communities. Contributing to and using open source solutions should indicate an understanding of the complexities and issues surrounding open source projects and open source communities. This in turn provides firms with a range of different approaches to manage the impacts of the open source software movement. There is also evidence from the survey pointing to the ‘gift economy’ that Eric Raymond and others promote as an economic rationale for the open source movement. One respondent commented – *‘Share and share alike. I’ve used code components from <http://www.codeproject.com> and have contributed from time to time. I’ve also made several industry-relevant contributions to wikipedia.’*

Some of these approaches are demonstrated in the responses to the question on the use of open source solutions:

- 5 respondents currently use open source components within their own products and solutions.
- 4 respondents use open source projects internally for IT solutions
- 3 respondents use open source projects as part of their development

approach

4.2.5. Section 5 – Firm Ethos & Purpose

This was the final question of the survey and was designed to get a perspective on the firm and to explore some of the characteristics that might influence the ‘lens’ through which a firm might view the open source movement. It was marked as an optional question. It was designed using a polar scale to explore different characteristics.

There were **3** respondents to this section of the survey, These three responses however do show the potential usefulness of considering this set of factors when looking at how a firm might approach the impacts of open source.

For example, **2** of the **3** respondents placed themselves firmly in the ‘innovator’ category and all **3** respondents placed themselves in the ‘leader’ category rather than the ‘follower’ category. All firms described themselves as Market Driven rather than Product driven. All of the respondents considered themselves Technology Adopters rather than taking a not invented here stance.

This section was not answered by all of the respondents; it provides information on why these factors could be influential in anticipating a firm’s approach. This is discussed in some additional detail in the analysis section of this dissertation. The data returned on these factors only scratches the surface of this very crucial and very interesting set of factors.

4.3. Results Summary & Validity

The data generated by the survey is useful for several reasons. It shows that the factors identified in the previous research have some validity. If the factors were invalid or irrelevant, the two research approaches would not have generated any usable data. The summary below reviews the results from each research approach and highlights how these results demonstrate the relevance of the factor or set of factors.

Chapter Six provides a second level of validation of the framework of factors. It answers the second research question by using the data gathered through the survey to profile some of the firms responding and by comparing the local and global industries.

4.3.1.Results from Sample Companies

The results from this approach are self-explanatory and require less interpretation. A full set of these results is available in Appendix 3. The approach used in this case was experimental and discursive. Each of the factors was reviewed in relation to the sample company profiles and a result was arrived at that reflected the position of the sample company. The commentary showed what implications a particular set of results might have.

This technique provided a rich way to explore and demonstrate the use of the framework and potentially why factors could be influential. The reliability of these results is dependant on the quality of the sample profiles and on the objectivity of the researcher.

4.3.2.Results from Survey

The results from the survey should be looked at in conjunction with the results from the first research approach.

FIRM CLASSIFICATION

The results from this section demonstrate that this factor is relevant. It provides a mechanism for Firm Category is an important factor in looking at how the firm manages the impacts of the open source movement. The results demonstrate why this set of factors is influential by showing the implications associated with different categories. This set of factors also provides a mechanism for comparing and benchmarking firms.

Note that the data gathered from the surveys reflects the statistics published by Enterprise Ireland. It also agreed with the comments made by John Sterne (2004).

COMPETITIVE LANDSCAPE

This section had a limited response rate. Potentially this is due to the sensitivity of the data. One of the recommendations from the dissertation is that a more detailed analysis is performed on the industry as a whole, many Irish firms have a similar profile and could benefit from a sector wide analysis that could help strengthen their position in the global market. It may also be

related to the phrasing of the questions. From the responses that were collected, several things can be noted:

- Revenue distribution – Biased towards professional services
- Customers & Competitors – A small number of large customers
- Competitive Position – Playing in several segments, dominant is some of these segments

The results from the sample companies used the PARTS model. These also demonstrated how influential the competitive landscape could be. The information derived from testing with company persona showed how these factors could be examined in more depth to give a richer picture of the firms situation.

RESOURCES AND CAPABILITIES

This set of data from the survey gives a view into the firm and the experiences of a firm, in regards to IPR, Development Approach and Partnership Approach. The results and profiles of the firms surveyed indicate that all have an understanding of the importance of IPR. Other capabilities are also explored – the development capability and organization and the partnering and funding capability. These are all factors that change the way in which a firm might manage the impacts of the open source movement. On a qualitative note, the following themes came through and these are helpful to bear in mind.

- IPR as a ‘ticket’ to gain entry
- The role of government policy in promoting software patents through tax relief’s
- The ‘non-aggressive’ legal stance of all the respondents
- The ‘solutions’ focus of the development approaches
- Partnering and Partnering Opportunities – Primarily commercial partnerships rather than research or academic partnerships

These results provided an interesting contrast to the profiles developed using sample companies. Especially in relation to the lack of partnerships and collaboration agreements.

OPEN SOURCE AWARENESS

It seems that there is a high level of open source awareness amongst the firms surveyed and a high level of participation. Some of this participation is around direct involvement in projects, others revolve around the use of open source projects internally or as part of the companies solution. A quote from one of the respondents provides a very pragmatic view '*Some of our markets are commoditizing – as a small vendor we're keen to embrace this trend*'. The results of the questions might indicate that this theme is representative of a number of the firms surveyed.

- Current & Planned Contributions – A number of the respondents were involved in open source projects on the periphery
- Use of Open Source Products in the Company – Many of the respondents use and exploit open source projects within the company

5. Analysis – Using firm profiles

5.1.Introduction

The previous section presented some of the results from both research approaches. This section analyses the results from the questionnaire to understand whether the factors identified in the framework are useful and thus whether they are influential. This analysis is organized around the same structure as the questionnaire. Each grouping of factors is looked at in the context of its usefulness in profiling firms and suggesting tactics and strategies that a firm might adopt contingent on its profile. This section also draws on the author's experiences and secondary sources to further explore these influential factors and their applicability in profiling software firms and in suggesting strategies and tactics that might be appropriate.

This chapter does not use the results from using company personas. In many cases, the commentary in Appendix 3 provides analysis of the results recorded by this research approach

5.2. Firm Classification

In the initial review of the literature, the author posited that the classification of the company included a number of factors that influenced how a firm might react. Joel West (2003) discusses the approaches taken by large companies Apple, IBM and Sun and presumably, their size was a factor in why they chose the approach that they did. However even for large companies, choosing the right approach to manage the impact of open source seems to be difficult – as demonstrated by Sun’s recent earnings report (2005). It also seemed to be relevant to the different approaches taken by other smaller companies. Examples that have been discussed previously include Microsoft, Oracle, MySQL, Red Hat, Trolltech, Adobe. All of these operate very different approaches to open source, these approaches maybe influenced by size.

What does this mean for the Irish Firms Surveyed and their approach? Firstly, the respondents to the survey were all small to medium sized companies and this agrees with the picture painted by Enterprise Ireland (2004). The majority of their sales were into the EMEA region, they mainly produced ‘Specialized Applications’. This profile agrees relatively well with the dummy profile one (See chapter 3) developed to test the framework. With these factors identified is it possible to make suggestions in relation to how firms might react. The literature from Raymond, Perens would suggest that a valid approach would be to focus development effort on the ‘value-add’ part – that is the business rules, and maximise the revenues coming from the service side of the business. However, while some firms have taken this approach many have not. The firm classification factors alone are not enough to understand the way a firm might manage the impacts of open source software.

5.3. Competitive Landscape

The literature is very clear about the impact that this has on the ways in which a firm might manage the impacts of the open source software movement. The author tried to distil a complex industry analysis framework in to a series of short questions that would give a high level view of the company’s competitive landscape. The PARTS analysis model was used to provide this high level view. Understanding where the company sits in relation to its

suppliers, competitors, complementors and customers seems an important factor. Looking to the industry examples this seems very true. Microsoft uses its ecosystem to keep people locked into its products and technologies, Microsoft partners also get locked into this ecosystem which limits their ability to choose different approaches. Profiling a firm using six or seven questions is optimistic but this area can't be excluded. Another factor that was looked at in this context was the firm's position in its markets. In the literature and in industry examples this is important. Novell adopted open source technologies as a mechanism to regain relevance and compete with a dominant player. Microsoft pays attention to the open source movement to make sure that it can maintain its dominant position. Firms with a niche position have used open source to reduce their costs by adopting open source components and focusing on their unique technologies. An example of this might be CapeClear who initially provided a complete IDE (Integrated Development Environment) for their integration technologies, but then switched to using and exploiting the open source Eclipse framework. A new entrant may wish to destabilize an existing market by open sourcing technology that competes with the existing players, and then pick-up the pieces. This is similar to what JBOSS did with their application server; they open sourced the application server and fundamentally changed the market. Prior to their entry into the market – licence revenues from 'application servers' was a profitable business. After their entry, the added value moved to the services sitting on top of the application server. Another business model that is referred to by Perens (2005) and Raymond (1998) – which depends on complementary products is based on the idea of a firm using its position in one segment of the market to enhance its position in another.

The survey data from the section on its own does not help to identify the options available for a firm. However, when coupled with the firm's classification data it does start to come together as a more complete profile and does start to suggest ideas for what the firm could be doing – A small firm with a niche position, should be protecting that niche but what options does a small firm, in the top five companies in its sector do? Should it experiment with open sourcing aspects of its product to try and disrupt the market?

Should it look to break out of its current technology ecosystem? The factors from firm classification and the competitive landscape are starting to provide a useful profile but there are still too many questions. In order, understand the options the firm can take to manage the impacts we still need more information. In fact, in the survey, many of the respondents were already grappling with different approaches and had adopted different strategies.

5.4.Resources and Capabilities

In the conceptual framework, it made sense to look at the internals of a firm. A resource-based view (RBV) of the firm looks at the firms internal configuration and how this might impact it's options. The survey looked at three capabilities:

- Intellectual property approach
- Partnership approach
- Development approach

These are only a small part of what makes a firm what it is. However, they seem to be important factors when profiling a firm and understanding what options it might have when dealing with open source impacts.

5.4.1.Intellectual Property Approach

The aspect of intellectual property is particularly relevant when looking at software and looking at open source. One of the threats to the open source movement is the SCO vs. IBM copyright infringement case. The approach taken by SCO is tied to the approach to IPR that SCO has. This seems to be influenced by a number of factors including the nature of the US software industry. In Ireland, the licensing approach is different. Software is difficult to patent and as such, the area of IP is viewed differently in Ireland. In 2006 attempts have been made to introduce a EU wide patent system that allows for some patent protection for software. Choosing a licensing regime, the firms legal experience and expertise are all factors in the types of strategy it can adopt. US firms tend to be very legally aware and adopt a very aggressive legal stance; this type of stance can give them additional options when handling and managing the impacts from open source.

Microsoft has tried to capitalize on its own IP approach by emphasising the legal protection it gave to customer's buying its software rather than open source software. Other large companies IBM, Novell and others have also tried to win customers by offering legal protection to their customers and thus differentiating themselves from other suppliers such as Red Hat. Legal expertise is also important in implementing the licensing regime picked – a dual license regime requires legal expertise to draft and to pursue non-compliance.

MySQL in its case⁴¹ against Progress Software in 2002 almost lost the case. If this had happened, MySQL would have lost an important revenue stream. The secondary data and sources for this are based on experiences from the US. The papers discussing the different licensing regimes and options tend to have US centric view point. In practice, the Irish Software Industry is less impacted by this whole area. One of the quotes from a respondent talks about IP as being a bargaining chip. It is something that gives a firm "admission to the table". This view is reflected in a discussion with an Irish Barrister⁴² – IP is important but is a safety net rather than a direct competence. It gives confidence to partners or venture capitalists without fundamentally changing the way firms do business.

So does approach to IP matter in profiling firms and identifying possible options. From the survey results, it would seem that the respondents have a very low-key legal competence and this might limit their options. Is the IPR capability important? Taken on its own it does not seem to be a factor that overly influences the options a firm might choose. Taken in conjunction with the firm classification and competitive landscape, it does seem to be relevant. For example, a small firm, with most of its revenue coming from product licensing in the US, may need to ensure it has a legal competence in place to ensure compliance – a small firm with revenue from EMEA might need to focus on other areas. One other point that came up from the survey which is an interesting point – the current tax regime in Ireland offers favourable tax treatment to royalties from patents, maybe this is an option that comes from a

⁴¹ <http://www.gnu.org/press/2002-03-01-pi-MySQL.html>

⁴² Paraphrasing a conversation with Daniel Simms, June 2006

firm's IP approach.

5.4.2. Development Approach

This was phrased as an optional question in the survey and there were few responses. However, development approach is an important factor in looking at a firm's options. One of the papers on the economics of open source (Tirole and Lerner, 2002) looks at how firms can use some of the motivators from the open source community in a proprietary development approach. However, a rigorous and structured approach may not be conducive to adopting open source development methods. This is an interesting point – how does a firm like IBM embrace open source projects? In fact its internal structures match well with the open source community – especially its research and development focus and the famous IBM labs. Novell contributed some developers to several open source initiatives, some these developers were based in Bangalore, India and coming from a very structured development environment. It took time to gradually break the structured habits of the development teams and thus make a useful contribution.

Looking at Red Hat Linux and SuSE Linux distributions is informative. Both companies have 'commercial quality' stable distributions as well as supporting 'bleeding edge' public distributions. This would indicate that a commercial development organization has a need for a different approach compared with the open source community. Open source communities are virtual teams with team members contributing from all over the world. Before getting involved in an open source community, it is necessary to understand the challenge of virtual teams and organizations (Section 2.5.4). Open source projects are based around a community of contributing members, who contribute over many versions of the software. Commercial development organizations tend to rotate developers from project to project depending on the requirements.

Does the development approach influence the options available to a firm in managing the impacts of open source? From some of the examples above it would seem that it does. The survey tried to use indicators to give a view of the development organization of the team. The results were interesting; the respondents tended towards structured development approaches with rotating

teams. Could small firms afford to assign resources to open source tasks? Alternatively, is there more value from using a proprietary approach? Does a structured approach better suit the needs of the customer? The comments from one contributor around his work with the financial industry points to how important it is for him to be able to demonstrate to his customers the process being used. This changes the impacts of open source software movement. He avoids commoditization of his market space and can maintain his product niche without needing to compete with open source technologies. In this case, the development approach is really dictated by the other factors – the firm size, and the market segment the firm is operating in.

So again to ask the question, does development approach play a role in how a firm manages the impact of the open source software movement? It does seem to be an influential factor especially when taken in conjunction with other factors. For a small dominant company in a niche area with a structured development approach – the impact of open source software movement seem to be minimal and yet depending on the company, it may still desire to leverage some of the positive aspects by using open source solutions internally.

5.4.3.Partnership Approach

This set of factors might be influential in looking at how firms seek to leverage the open source movement. It relates to one of the points raised by Perens (2005) who talks about industry consortiums and the similarity between closed industry consortiums and approaches that are more open. Having a partnership capability seems to give firms more options in either collaborating with open source projects, or collaborating with partners to lock out open source competition. It also ties into Von Hippel's ideas about Horizontal Networks and Innovation – in horizontal networks, one of the points made is how important it is to bring your users into the equation and how important the idea of partnership is to this concept. This set of factors also relates to how a firm can work with different bodies to encourage open innovation. Chesbrough (2003) introduces the idea of sharing research and then capitalizing on the research that has obvious application to the firm but

sharing the research that may not have direct value. In terms of the open source movement, it is interesting to see how much of the research and ideas and projects developed out of academic research projects and out of the research community. For example the Netscape browser was originally based on ideas developed in the NCSA (National Center for Supercomputing Applications). HotOrgin's 2004 report on the software industry also highlights the importance of partnership in growing companies and developing better access to market.

So a partnership capability seems to be important for a number reasons – it one of many factors that gives a firm options when managing the impact of the open source software movement. Whether the strategy is to avoid open source competition by aligning a firm with a more established partner; whether it is to share development costs by aligning with an academic institution or possible by benefiting from a EU funded research consortium. These are only options that a firm has if they have a partnership capability and can manage that partnership. The survey helps to profile the respondents by demonstrating the types of partnerships and business arrangements in place.

The profile then gives a hints as to type of strategies and tactics that are available – for example one response focused on the idea of '*opportunity driven*' - this implies that the firm is reactively looking for opportunities rather that proactively seeking opportunities. Maybe by changing this factor, and becoming opportunity seeking a firm could capitalize on it's position by working with the partners to exploit and embrace the open source opportunity – or vice versa working with partners to compete against and manage an open source threat. However, once again these factors only tell us a part of the picture. When coupled with other factors such as the market segment, the firm size, the firms competitive position it adds a useful view of the possibilities and options for the firm.

5.5. Open Source Awareness

This research is about how Irish firms manage the impact of the open source software movement and the factors that influence the types of options and strategies available to them. Open Source is not a new phenomenon and

companies have been dealing with its impacts for several years. Perhaps the most interesting firm to look at in this context is Microsoft, the initial reaction was an attempt to destroy and undermine open source and the ideas behind open source, as awareness and understanding developed about the benefits of the open source approach, Microsoft changed its approach. The current approach, as evidenced by Microsoft's web site, seems to support limited source code access. Other examples include the approach the IBM took when creating the Eclipse foundation – rather than try to persuade people to join an IBM owned open source project, IBM spun it out as a separate foundation. This encouraged IBM competitors to get involved. Oracle's recent purchase of SleepyCat Software is another indicator of a changing understanding of what open source is and isn't. Open Source Projects are now seen everyday alongside more proprietary solutions. This is due to a gradual understanding of the strengths and weaknesses of an open source approach. The initial panic and hype has died down and the 'philosophy' of open source software is better understood. The approach is being adopted by all sorts of software companies and even being experimented with by other companies.

Not every one is happy with this. In a 2006 interview with Richard Poynder⁴³, Stallman argues that the '*spirit*' of the philosophy has been lost. The awareness and understanding of the open source movement may have diluted the original intent.

This set of factors does not need too much analysis, the survey data showed that most of the respondents were familiar with open source projects and were either contributing or planning to contribute to projects. They were also adopting existing open source technologies. Therefore, as a factor it does appear to be influential. In fact it is probably one of the more influential factors – an awareness of open source – gives a firm a better perspective on what the approach should be and also helps exploit the opportunity or defend against the threat. A strategy for any firm whether pursuing a proprietary path or developing an open source solution is to build awareness about the open source movement. On reviewing the survey, one of the areas that should have been explored in more detail was the firm's awareness of open source

⁴³<http://poynder.blogspot.com/2006/03/interview-with-richard-stallman.html>

solutions that were competing or could potentially compete with their own products.

5.6. Firm Ethos and Purpose

The firm ethos and purpose must be a factor in how it chooses to manage the impacts of open source software. HP is an example of a firm that has always been famed for valuing partnership and for its innovative approach (The HP way), it was also one of the first big companies to jump on the open source bandwagon. IBM's history was strongly tied to hardware – software was traditionally a complementary product. This ethos must have influenced the decision to invest and continue to invest in open source software development that complemented hardware sales. It is difficult to imagine Microsoft open sourcing its key technologies. As a company, Microsoft has grown by exploiting and profiting directly from intellectual property. The firm ethos and purpose influences the way in which options are evaluated and the context in which strategy is developed. Whether open source is viewed as a threat or an opportunity while linked to other factors is also linked to the firms ethos. If the glass is half full, a certain strategy makes sense. If the glass is half-empty then alternative strategy might makes more sense.

The questions asked in the ethos and purpose section of the survey and framework tried to profile some important characteristics of firms that might change how it would seek to manage the impacts of open source. These characteristics were reduced to five key characteristics – although it would be interesting to study this in more depth. The characteristics were examined using a polar scale – for example, a firm that was a technology adopter would be more likely to manage the open source impact by assimilating technologies – and in fact, in the survey there is a correlation between the respondents who adopted open source technologies internally and this characteristic. Open source projects are by their definition market driven, and so firms with this characteristic would be more likely to feel comfortable dealing with the open source approach. Firms of the '*if you build it, they will come*'⁴⁴ school would obviously be less comfortable with the idea of collaborative working and

⁴⁴ Kevin Costner in the 1989 film, Field of Dreams

would in turn find it difficult to encourage people to collaborate.

So is firm ethos and purpose an influential factor? – by looking at industry examples, it seems possible to draw this conclusion. Is it easy to profile this and thus use it to understand the options available to the firm? This is less clear – the attempt in the survey was very high level. A more detailed study that investigated additional characteristics might be more useful. Having this in the profile would help narrow down the types of options or strategies that were suitable.

5.7. Profiling respondents & suggesting strategies

The sections above looked at each set of factors on their own. This section uses the factors together to build a profile and to look at how this helps suggest possible options. This meets the research objective of trying to not only identify influential factors but also use them. This analysis is not detailed. It aims to introduce the idea rather than to produce in-depth strategy and tactics. It aims to show on a high level that these influential factors do change the way in which the open source software movement impacts a firm. It also shows how these factors change the ways in which firms can manage these impacts. The table below takes a sample of two different types of firms that responded to the survey and uses some of the data to profile them. The firms have been kept anonymous and any information that would allow the firms to be identified has been removed.

Table 10 - Table comparing two firms

| Factors | Firm A | Firm B |
|----------------------------|---|--|
| Firm Classification | This is a small to medium sized firm by Irish Standards Revenue between 5 – 24 million Employees – 15-49 Producing software that fits in to several of the | This a small firm Revenue between 0 and 4 million Employees between 0 and 14 Producing specialized and customized software solutions. It occupies a software niche and does not |

| | | |
|-----------------------------------|---|---|
| | <p>categories. Its market is all in EMEA. It is interesting in that 66% of its workforce work in the professional services function. The firm is active in the GIS market</p> | <p>have any direct competitors. Its market is all in EMEA and it focused purely on software development. It is active in the financial sector</p> |
| Competitive Landscape | <p>It competes with some big global software companies and includes several large global companies as customers. It services several different markets and occupies a different position in different markets. It also has a business selling digital content</p> | <p>It occupies a niche of it's own and includes many major financial institutions as customers. It is aware of a number of companies working in similar space and the responses demonstrate a good awareness of the industry. In the sector it operates in it is a one of the top players and is the dominant player. It sees the market expanding for a number of reasons.</p> |
| Resources and Capabilities | <p>It has experience with IPR but has little time for patent protection. It uses external legal support on an ad hoc basis. Its partnership approach is opportunity driven and it has received funding from different sources including local venture capital firms</p> | <p>It has several patents and protects it's intellectual assets. It derives tax-free royalty payments from the patents the firm holds. It has access to legal expertise. It is a small organization and has one major partner. It's development approach is flexible – as a small company it benefits from this flexibility</p> |
| Open Source | <p>It currently plans to</p> | <p>The firm contributes to open</p> |

| | | |
|-------------------------------|---|---|
| Awareness | contribute to open source initiatives and uses open source components with its product line | source projects and is keen to continue this contribution. The firm uses open source components in it's own products and uses open source tools and solutions as part of it development process |
| Firm Ethos and Purpose | It is a technology adopter with a dynamic approach to the market. Aiming to innovate rather than follow trends. | The firm is set up as a lifestyle company rather than a growth company. The firm characteristics were not replied to. |

ANALYSING FIRM A

Given Firm A's profile, what sort of approach makes sense and how do the factors selected influence the approaches available to the firm. The factors suggest a number of possible approaches. The firm's classification is important; the fact that it is a small firm narrows the options available. The competitive position is also relevant – the firm is competing against several large global software firms. The approach to IP and experience with IP is also interesting. Especially when used in conjunction with the firm's functional make up, two thirds of the employees work in the professional services function, yet revenue derived from professional services is less than a third of the total with content adding another **30%**. All of this points to a firm that could be in a position to exploit the open source movement. There is a risk though; currently **20%** of the firms revenue comes from Product licensing. Potentially the loss of license revenue could be made up from increased content sales.

This firms situation ties in closely to the business models discussed earlier in this dissertation. The possibility of creating an open source community around a framework and then capitalizing on this though revenue from complementary activities – in this case there are complementary revenue

sources in both content and professional services – by establishing and promoting open source projects, the firm could strengthen its position relative to the global companies by making its products and frameworks ubiquitous. It has a base of large customers who might also be interested in the partnering opportunities that open source participation would allow. One area that the firm could develop would be its approach to partnership and collaboration – this factor seems to be important in benefiting from the open source movement.

The ethos questions indicate that the firm is market driven, dynamic and innovative. All of these traits point to a firm that might be able to benefit from the impact of the open source software movement. An important constraint in this case is the sources of funding. In the context of the Irish Software Industry, Venture capital has tended to dictate short-term approaches. An approach that diluted the intellectual property portfolio (a key asset) of the firm might not be supported by venture capital firms. In which case the firm would need to look at ways of maintaining its IP and avoiding commodization by competing open source initiatives. This might revolve around a strategy that moves the firm higher up the value chain and capitalizes more on specialized applications and add-ons to a common core. This is also a strategy suggested by Raymond (1998). It has been pursued by a number of companies including Novell and IBM.

This profile and these approaches are just scratching the surface of what the profile and factors could do. Deeper analysis of the firm, using the framework, would build a more comprehensive picture of the firm. This could be used to more accurately suggest strategies and tactics that might be effective.

ANALYSING FIRM B

Firm B is in a different position to Firm A – It is a small firm playing in a small niche, in which it is dominant. The niche is within the financial sector, which is famously conservative. Some follow up comments from Firm B added to the context that the firm operates in. These included comments on the type of software agreements and processes in place in the financial sector. The firm has an established niche position, it has patented intellectual property, it

does not have any direct competitors and it develops customized and specialized solutions. All of these factors come together to indicate a firm that is well shielded from any negative impacts from the open source software movement. The market is not becoming commoditized. The factors point to a company that needs to maintain the status quo and does not benefit from looking at some of the open source business models discussed early in this dissertation. This company does act as a reference point for one strategy for managing the impacts of the open source movement – in this case, the impacts are managed through avoidance. A company could move itself into a niche and then focus on customized and specialized applications and hence maintain a high margin proprietary business.

The company is interesting in that it continues to produce proprietary solutions while using open source products and tools internally. This seems like a contradiction but makes perfect sense – by reducing internal development costs through exploiting open source solutions the company increases its margins. Even though a firm's end product might be proprietary, it does not mean that the company shouldn't get involved in open source initiatives, especially where they can reduce internal costs. This case the open source awareness is an influential factor, in how the firm benefits internally from the impacts of the open source software movement.

Perens (2005) discusses the idea of firms sharing the cost of developing non-differentiating technologies. Maybe something that Firm B should be aware of would be a consortium of financial institutions supporting the development of shared technology platforms. In the past financial institutions have spun off their software ideas, to generate a return on their original investment. Potentially an open-source approach offers an alternative to this approach. This could be a very interesting research area. Although there are all sorts of factors that seem to work against this most importantly the security issues and the conservative nature of these institutions.

5.8. Summary

Each of the families of factors was analyzed above by looking at both secondary data and data from the survey. It is clear from analysis that some

factors are harder to profile and pin down than other. However, by taking the factors together, it is possible to get a good profile of a firm and this profile could be used to understand the approach a firm might take to manage the impacts of the open source movement. There are still areas of the framework that need some additional work. These include understanding the competitive landscape and the firm ethos and purpose.

Profiling two respondents demonstrated the use of the factors and showed why the factors are influential. This analysis was very high level and very speculative. It was designed to show how the different areas discussed in this dissertation could fit together. The awareness of open source projects and use of open source products was interesting. It demonstrates how many firms are benefiting from the impacts of the open source movement. However, these benefits tend to be the low-hanging fruit – reduced license costs, code reuse and so on. The next step would be to look at some of the more revolutionary strategies. Additional Comments from Firm A mentioned that the firm had explored the idea of creating an open source framework around its core technologies and around some of the open standards that were developing – however, its concerns around ownership and timeframe made this option unattractive

6. Developing an analysis toolkit

One of the aims of this research was to produce a complete toolkit that could be used to analyze firms and suggest particular approaches. The analysis in Chapter 6 provides the basis for a number of possible tools and techniques. Two of these are explored at a high level in this chapter. Given the limited timescale, it has not been possible to expand on these in detail. These techniques are based on existing analysis techniques. A continuation of this research could be used build a complete and very practical toolkit.

6.1.SWOT Analysis Technique

The framework provides a very good starting point to explore strengths, weaknesses, opportunities and threats using a SWOT Analysis. This analysis then acts as the basis for action and for developing a firm's strategy. This provides a useful technique for individual firms.

Using this technique the framework of factors could be used to look at the impacts of the open source software movement. A firm could then use this knowledge to create the most appropriate competitive position for itself. The table below provides an example of what this SWOT analysis could look like.

In some cases, one of the important threats will be competition from other open source solutions, in others the fact that open source solutions exist may provide leverage to unseat the dominant player.

Table 11 - An Example SWOT Analysis using the framework

| Strengths | Opportunities |
|--|---------------------------|
| Current Contribution to Open Source Projects | Expanded Market Space |
| Distributed Software development process | Reduced Development Costs |

| Weaknesses | Threats |
|----------------------------|--------------------------------|
| Revenue 90% licensed based | Competing Open Source Solution |
| Limited Legal Expertise | New Government Policy |

6.2. Scorecard Technique

The data and findings suggest an alternative way of analyzing and profiling the firm. This technique is to look at the factors and categories in relation to four indicators. The analysis of the factors helps to profile the firm using these four suggested quadrants.

- **‘Embrace’** – Factors that might be influential in ‘embracing’ the open source movement. These might include factors from the firm’s ethos or from a firm’s competitive position. They are factors about a firm that encourage it to adopt an open source philosophy
- **‘Exploit’** – Factors that suggest that a firm could exploit the open source movement to gain competitive advantage. These include adopting open source components to reduce development time, or promoting open source standards that benefit its existing products. It might also include building distributions and packaging open source products seeking to benefit from the open source movement without losing an existing position.
- **‘Manage’** – Factors that suggest the firm needs to carefully manage its position in relation to open source – for example managing the commodization of an existing product space by moving up the value chain. These factors tend to revolve around the loss of an existing position to the open source movement and having to manage the firm into a position of strength by managing these impacts.
- **‘Ignore’** – Factors that suggest that a firm can ignore the impacts of the open source movement. These should be far and few between. However, some factors suggest a firm can be in a position to ignore the impacts of the open source movement. Firm B, the financial software company, is a great example of this

Many of the factors from the framework can be examined and looked at in relation to these quadrants. This then facilitates the development of profiles and strategies using a scoring tools and graphical profiles. This scorecard has developed out of the research done in looking for influential factors. It has not been investigated fully in this dissertation and is proposed as an exploratory area rather than an answer. No objective scoring mechanism has been investigated or designed as part of this research. The scores used in the following table are used for illustrative purposes only. Additional work may be done on this scorecard approach to develop a toolkit that might more commercially useful.

Table 12 - Showing possible score card

| Firm 1 | Embrace | Exploit | Ignore | Manage |
|--------------------------|---------|---------|--------|--------|
| Firm Classification | 1 | 1 | 2 | 3 |
| Resources & Capabilities | 1 | 4 | 2 | 2 |
| Competitive Landscape | 5 | 2 | 5 | 2 |
| Open Source Awareness | 1 | 2 | 4 | 4 |
| Firm Ethos | 4 | 2 | 5 | 1 |

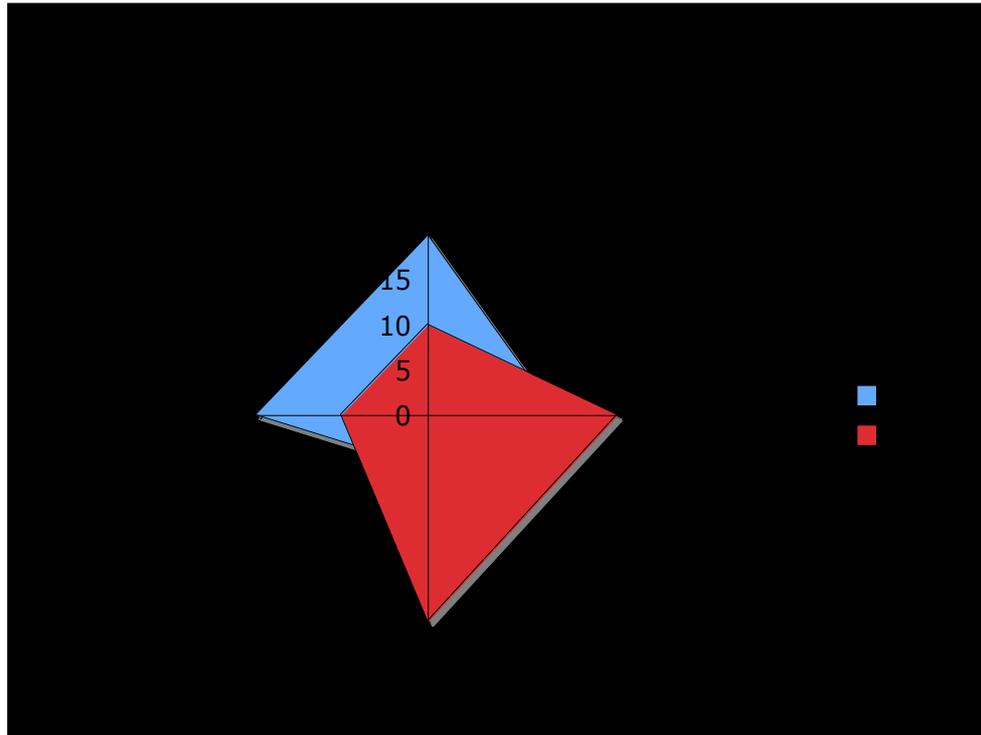


Figure 12 - Showing a graphic profile of two firms

The scores can then be charted and used to compare different firms. In the chart shown in Figure 12 – the analysis results from Firms A and B are used for purely illustrative purposes. Strategies can then be defined that balance the different quadrants and take advantage of the firm’s unique position. Tweaking different factors can change the profile – A firm with a strong ignore / exploit profile needs to do different things than a firm with a strong ‘Manage’ profile. It is also probably in a better position that the firm with the strong ‘Manage’ profile. Further research could suggest a number of optimal profiles for different business configurations and different companies.

A firm could also use the profile to benchmark itself against competing businesses. This could identify factors that it needed to work on or change in order to create an optimal profile. In this way, the scorecard could be used to tweak and change a firm’s configuration and look at factors that might need to be aligned in order for a firm to pursue a certain approach.

6.3.Implications – Using the Framework and Scorecard

This research is about exploring these ideas in an academic context, part of the

work arising out of this initial research effort is to take the framework and learning and to build a more business focused toolset. The two techniques mentioned above could be used in a variety of ways to analyze a firm and look at influential factors relating to the firm. Examples have been given as to how the author used the techniques and the framework to perform some high level analysis on some sample firms.

Some suggested uses of the framework and the techniques are given below:

- Companies could use the framework to explore their own position and also to analyze and benchmark their competitors. For example benchmarking specific companies in different industries could help the firm or organization develop marketing and strategic plans that could be used to shake up the industry segment and pursue vulnerabilities in existing firms.
- External consultants could use it to advise companies on the impacts that open source might have on a firm.
- Government agencies and support organizations could use aspects of the framework to look at the software industry in Ireland and to look at different ways in which to support the development of the software industry in Ireland.
- Industry segment analysis using the framework might also be useful. Using their knowledge of the segment, customers may be able to manipulate the rules of the game to gain a stronger relationship with their suppliers. For example finance houses and banks might have something to gain from sponsoring open source projects that develop 'common' non-differentiating platforms and thus reduce the banks IT costs. This would mirror the type of open source sponsorship that has happened in the software development sector where open source projects have been used to commoditize areas of the software stack.

7. Summary and Conclusions

7.1.Introduction

This dissertation aimed to examine whether factors could be identified that would influence the way in which Irish software firms managed or could manage the impact of the open source software movement. It is based on a hypothesis that the open source software movement is changing the way the software industry works globally, and thus changing the software industry in Ireland. The approach to the research was exploratory and qualitative. This involved seeking to understand the phenomenon and to link it to the Irish software industry. To do this required the research to weave together several different strands – the open source movement, business strategy and tactics and the Irish and Global software industries.

The explorative approach was based around constructing a conceptual framework based on the review of the existing literature, primary research, the author's experience and observations and from the Irish industry. This conclusion comments on whether the approach was successful and evaluates whether the results are useful, relevant and practical. This has been an interesting and rich topic to research. A number of questions and tangents have been explored. A number of new research opportunities have been uncovered.

7.2.The Framework – Can Influential factors be identified?

During the research, a framework of factors (Section 3.5) was developed which proposed a series of factors that might be influential. The Oxford English Dictionary (OED) defines the word factor as a '*circumstance, fact, or influence that contributes to a result*'. The literature review, research and

analysis show that factors can be identified and that they can be influential in how a firm manages the impact of the open source movement. This was done by observing examples from industry and through research. The use of the several techniques provided a rationale and an explanation for why the factors were influential. The techniques used included the following:

- Testing the framework using company personas
- Carrying out a qualitative on-line survey using selected candidates.

In each of the broad categories – factors were identified and analysis established them as influential. Amongst the most influential and most were:

- **Software Type (Firm classification)** – The type of software being produced by the firm influences the types of approaches it can take to either embrace or manage the opportunities or threats that come with the open source movement in the shorter term. It also provides approaches for the longer term.
- **Players (Competitive Landscape)** - This set of factors is particularly influential in profiling firms and seeing what the different options available are. Does the firm need to manage open source impacts because of a changing industry environment? Can the firm exploit open source opportunities without alienating customers?
- **Revenue Distribution (Competitive Landscape)** – Firms that have a large percentage of their revenues coming from professional services and implementations might be less impacted by adopting an open source development approach while at the same time would be able to lower their software development costs.
- **Open Source Adoption (Open Source Awareness)** – Whether a firm currently uses open source solutions internally or not is a factor in how it manages the impact of the open source movement. More and more firms are benefiting from the adoption of open source solutions internally.
- **Open Source Risks (Open Source Awareness)** – Being aware of the risk factors associated with different open source approaches is

important. Firms need to be able to appreciate the risks associated with certain approaches. At the same time, firms should not necessarily overestimate the risks associated with an open source approach and dismiss it.

- **Partnership Capability (Resources and Capabilities)** – The partnership ability of the firm allows it to manage the impacts of the open source movement. The ability of a firm to establish different types of partnerships and maintain these gives the firm different options in managing the impacts of open source. It can embrace open source by partnering with open source communities or it could ignore open source by embedding itself in a proprietary ecosystem.
- **Not Invented Here or Technology Adopter (Firm Ethos)** – A firm that is open to adopting new technologies and new approach might be more comfortable with embracing or exploiting open source solutions. Other firms might require more control of the technology adopted and might prefer their own solutions– as demonstrated by the software firms in the finance industry.

In the sample profiles in Appendix 3, additional sections are included in the resources and capabilities grouping that look at the firms capabilities and resources in more detail. The commentary in the results section shows how these could have a significant influence in how the firm approaches open source. For example a strong marketing capability might allow a firm to defend it's brand identity or the characteristics associated with its brand.

All of these point to the validity of the Hypothesis - Influential factors can be identified. This dissertation identified a number of factors and demonstrated that they could be influential in how firms manage the impact of the open source software movement.

7.3.Using Irish firm profiles to validate the framework

Additional research objectives, revolved around using the factors identified for useful purposes. One of these purposes was to profile firms and use the profiles to suggest potential approaches for firms based on these factors. As

part of the primary research, a questionnaire was designed and used to profile in some detail ten indigenous Irish software firms. These profiles are discussed in detail from two firms in the analysis section of this dissertation. The factors identified helped profile the firms and did indicate that factors could be influential in how the firm managed the impacts of the open source movement. However, as is often the case in exploratory research this investigation raised a number of additional questions and a number of issues

The nature of the Irish software industry is different from the Global industry. Many of the factors identified came from US centric research and from looking at Global companies. It was clear through profiling and secondary research that firms in Ireland do differ. They are not so aggressive about IP for a number of reasons; they tend to operate in clusters (finance, courseware and telecoms); they tend to be smaller in scale. Some of the factors identified appeared less relevant in this context – for example, a small firm will tend to have a dynamic development process and it is less relevant to profile the firms development process.

Another area that requires additional research is the prioritization of these factors. The initial research began as a quest looking for critical factors, this developed in research into influential factors. What was critical for one firm or segment might only be influential for another. An example of this might be the financial software industry that relied on product stability, as opposed to another firm that might rely on product innovation.

The research provides factors that can be used to profile firms. An approach that might be useful for future research would be a case study approach using the five areas and a more in depth interviewing and study.

7.4. Further Research and Future Application

This dissertation was a learning process. It sought to explore a relatively recent phenomenon. While writing up the dissertation, a number of ideas and concepts were explored in different sections. In many cases, these were closed off as not being outside the scope of the research question. Lessons learnt through the course of the research are addressed in the chapter on the research methodology (Section 3.13). This section also introduces some tangential

points that are relevant to the subject area and might provide interesting research topics.

7.4.1. Business and Operational Relevance - Developing Toolkits

This research was designed to develop tools that might be practical for people working in the field. Although the framework and the scorecard approach could have practical applications they are still unproven and still in a very raw state. In order to test the usefulness of these approaches it is necessary to use these approaches with companies and to evaluate the solutions suggested. As the approaches stand there is still much work to be done to 'operationalize' the frameworks and to capture the expertise and ideas in order to facilitate the transfer of knowledge.

7.4.2. Reactions associated with Open Source

During the course of this research, one of the views most encountered when discussing with open source was the idea that the research was biased and aimed only at promoting open source. The reaction was almost guilty, as if the firm needed to defend its proprietary position and explain why it wasn't embracing open source. There is a need for continued education within the Irish software industry to build awareness of open source and the implications it may have. Open source is a new approach, it does not invalidate existing approaches. The scorecard from Chapter 7 could provide a useful tool for framing open source in a commercial context.

7.4.3. Open Source, Companies of Scale and the ISA

This is a tangential idea that is interesting in conjunction with this dissertation and the development of the Irish Software Industry. Currently the approach from the ISA is to push for large companies and help companies develop and grow. One of the results of this is a fair amount of consolidation in the space with Irish companies being absorbed by Global multi-nationals. Potentially open source projects and the open source movement provide a different answer the scale issue. The fact that open source communities can be large distributed bodies can allow smaller companies to have the benefits of scale

without the associated costs. This approach could also take into consideration the Lisbon agenda and the encouragement of Small to Medium sized companies collaborating with academic research institutions to create innovative products and a knowledge economy.

7.4.4. Competitive Landscape & the Irish Software Industry

One future research area that ties in with previous point is to research the competitive landscape for the Irish Software Industry. This research could look at different open source projects and communities that could benefit the Irish Industry as whole. This is especially valid in sectors where there is a predominant Irish position. Part of this maybe covered by research that FORFAS is doing on the implications of open source.

7.5. The Final Word

Encapsulating the factors and indicators that will influence strategic and tactical decision making by Indigenous Irish Software Firms and reducing them to a practical manageable framework is a complex task. This research, carried out in a limited timescale, has started this process. Further research, using a case based approach, will yield a richer understanding of the influential factors and indicators. While further research, using a broader quantitative approach could be used to statistically validate some of the research findings.

In the author's opinion, practical testing of the framework in the field will offer additional insights in to the applicability of the framework. It will also offer the additional data required to develop the framework in to a comprehensive tool set that could be used by firms, consultants and other interested parties to investigate the impacts of the open source software movement on indigenous Irish Software Firms.

This toolkit will provide a basis for organizations to develop short and medium term strategies to leverage the open source software movement to their best advantage. It will, it is believed, do this in the following ways:

- Benchmarking a firm's open source position in relation other firms

- Profiling strengths, weaknesses, opportunities and threats (SWOT Analysis) in relation to Open Source Projects
- Performing GAP analysis between existing and desired positions
- Identifying appropriate external strategies & tactics in relation to the open source movement
- Identifying appropriate internal configuration to leverage open source opportunities

References

- 12Manage.com (2006) The Value Net (PARTS, Co-opetition) [On-line]
Accessed at
http://www.12manage.com/methods_brandenburger_value_net.html
(Accessed July 2006)
- Ågerfalk, P, Deverell, A, Fitzgerald, B, Morgan L (2005) ‘Assessing the Role of Open Source Software in the European Secondary Software Sector: A Voice from Industry’ , Proceedings of the First International Conference on Open Source Systems, Genova, pp. 82-87
- Arne, P., Yates, J. (2005) Open Source Software Licenses: Perspectives of the end user and the software developer, The Computer and Internet lawyer, volume 22, Number 8
- Behlendorf. B. (1999) Open source as a business strategy. In Chris DiBona, Sam Ockman, and Mark Stone, editors, Open Sources: Voices from the Open Source Revolution. O’Reilly and Associates
- Bezroukov, N. (1999) A second look at the cathedral and bazaar. [Online]
Accessed at
http://www.firstmonday.org/issues/issue4_12/bezroukov/ (Accessed April 2006)
- Bezroukov, N. (1999) Open source software development as a special type of academic Research (critique of vulgar Raymondism). [Online]
accessed at
http://www.firstmonday.org/issues/issue4_10/bezroukov/ (Accessed April 2006)
- Bonnacorsi, Rossi “Why open source software can succeed’
- Brandenburger, A, Nallebuff, B (1995) The Right Game: Use game theory to shape strategy, , Harvard Business Review, July-August 1995
pg.57-71
- Brannick, T and Roche W (1997) Business Research Methods Strategies, Techniques and Sources, Oak Tree Press, 1997
- Chesbrough, H., The Era of Open Innovation MIT Sloan Management Review, Spring 2003 Vol. 44 No 3; (pg.34-41)

- Clark, D (1992) A Cloudy Crystal Ball/Apocalypse Now, July 1992, 24th annual IETF conference
- Cooper, A., (1999) *The Inmates are Running the Asylum*, Sams Publishing (2004)
- Creswell, J W. (1998) *Qualitative inquiry and research design: Choosing among five traditions* SAGE Publications, California, 2002
- Cusumano, M. (2005), Software in Ireland: a balance of entrepreneurship and ... lifestyle management? *Communications of the ACM* Vol 48 No. 10 Pgs 25-27
- D'Aveni, R. (1994) *Hypercompetition: managing the dynamics of strategic maneuvering*, The Free Press, New York
- de Laat, P. B. (2004), Copyright or Copyleft? An analysis of property regimes for software development, *Research Policy* 34 (2005 1511-1532)
- de Wit, B. and Meyer, R. *Strategy* (2003) Process, Content, Context: an International Perspective, South Western College Publishing
- Dempsey, B J., Weiss, D, Jones, P, and Greenberg, J. (1999) A quantitative profile of a community of open source Linux developers. Technical Report TR-1999-05, School of Information and Library Science, University of North Carolina at Chapel Hill
- Denscombe, M (1998) *The good research guide: for small-scale social research projects*. Open University Press
- Enterprise Ireland (2005), *Software Industry Statistics 1991-2005* [Online] Accessed at <http://www.nsd.ie/htm/ssii/stat.htm> (Accessed June, 2006)
- Feller, J. ,Fitzgerald, B. (2000) A framework analysis of the open source software development paradigm. In *Proceedings of the 21st Annual International Conference on Information Systems (ICIS 2000)*, pages 58-69, Brisbane, Australia
- Feller, J. and Fitzgerald B. (2002). *Understanding Open Source Software Development*. Addison-Wesley, London
- Hamel, G (1996) *Strategy as Revolution*, *Harvard Business Review*, July-August, 1996
- Hamel, G, Valikangas, L (2003) *The Quest for Resilience*, *Harvard Business*

- Review, September
- IBM (2005a). IBM Statement of Non-Assertion of Named Patents Against OSS, (1 January 2005). [Online] Available at <http://www.ibm.com/ibm/licensing/patents/pledgedpatents.pdf> (Accessed April 2006)
- IBM (2005b) Annual Report. [Online] Accessed at <http://www.ibm.com/annualreport/2005/> (Accessed July 2006)
- ISA Software Outlook 2004 (2004) [Online] Accessed at <http://www.software.ie/Sectors/ISA/ISADoclib3.nsf/wfICCC?OpenForm&RestrictToCategory=ISA+Annual+Review> (Accessed April 2006)
- Kennedy, D. (2004) What Lawyers need to know about the open source licenses, Journal of Internet Law, February
- Koch, S. (2006), Free/Open Source Software Academic Bibliography [Online] Available at http://wwwai.wu-wien.ac.at/~koch/forschung/sw-eng/oss_list.html (Accessed July 2006)
- Lerner, J and Tirole, J. (2002) The simple economics of Open Source. The Journal of Industrial Economics, Volume 1, No 2, Pg. 197-234
- Lindman, J. (2004), Effects of Open source software on the business patterns of software industry, Helsinki School of Economics
- Magretta, J. (2002) Why Business Models Matter, Harvard Business Review, May 2002, p86-92
- Microsoft Financial Report 2005, [Online] Accessed at <http://www.microsoft.com/msft/reports/default.msp> (Accessed, April 2006)
- Mintzberg et Al (1998) Strategy Safari: a guided tour through the wilds of strategic management, The Free Press, 1998
- Nadeau, T (1999) 'Learning from Linux, OS/2 and the Halloween Memos' [On-line] Accessed at

- <http://www.os2hq.com/archives/linmemo1.htm> (accessed July 2006)
- O'Brien, D, (2006) Free software movement faces down big business, The Irish Times, Business this week, 20th, Jan 2006
- O'Reilly C. and Tushman, M. (2004) The Ambidextrous organization, Harvard Business Review, April
- Onetti, Alberto, Capobianco, Fabrizio (2005) 'Open Source and Business Model Innovation. The Funambol case' Proceedings of the First International Conference on Open Source Systems, Genova, pp. 224-227
- Open Source Initiative (1998). Accessed at <http://www.opensource.org> (Accessed April, 2006)
- OSI, History of the Open Source Initiative, [On line]
- <http://www.opensource.org/docs/history.php> (accessed April 2006)
- Perens, B. (2005) The Emerging Economic Paradigm of Open Source, Cyber Security Policy Research Institute, George Washington University. [Online] Accessed at <http://perens.com/Articles/Economic.html> (Accessed April 2006)
- Porter M, E., (1985) Competitive Advantage – Creating and sustaining Superior Performance, The Free Press a division of MacMillan Inc,
- Porter M. E. (2001) Strategy and the Internet, Harvard Business Review, March 2001; [Online] Accessed at www.hbsp.harvard.edu/hbr (accessed April 2006)
- Raymond, E, (1999a) The Magic Cauldron [Online] Available at <http://www.catb.org/~esr/writings/magic-cauldron/> (Accessed March, 2006)
- Raymond, E, (1999b) Homesteading the Noosphere [Online] Available at <http://www.catb.org/~esr/writings/cathedral-bazaar/homesteading/> (Accessed, March 2006)
- Raymond, E. (1998) The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary. O'Reilly and

- Associates, Sebastopol, California, 1999
- Remenyi, D, Money, A, (2004) Research Supervision for Supervisors and Students – Academic Conferences Ltd
- Spolsky, J. (2004) Joel on Software. Apress,
- Stallman, R (2002), Free Software, Free Society: Selected Essays of Richard M. Stallman, Gnu Press [Online] Accessed at <http://www.gnupress.org/book13.html> (Accessed June 2006)
- Sterne, J. (2004), Adventures in Code – The Story of the Irish Software Industry, Liffey Press, Dublin
- Sun (2005) Financial Report [Online] Accessed at http://www.sun.com/aboutsun/investor/annual_reports/ (accessed April 2006)
- The Economist (2006), Special Report: Open-Source Business: Open, but not as usual, March 18th, 2006
- Tornatzky & Fleischer (1990), The Processes of technological innovation, Lexington Books, 1990
- Von Hippel, E (2002) Horizontal Innovation Networks by and for Users, MIT Sloan School of Management Working Paper
- West, Joel. (2003) How open is open enough? Melding proprietary and open source platform strategies. Research Policy, 32(7):1259-1285
- Wolcott, Harry F. (1999) Writing Up Qualitative Research, Sage Publications

Appendix 1 -

Appendix 2 : List of Companies Invited to the Survey

(Names blanked for anonymity)

| | |
|--|---|
| | Produces middleware solutions that help heterogeneous software systems exchange data |
| | A platform designed for the construction of very flexible adaptable software systems |
| | Develops middleware components and platforms to simplify the implementation of service oriented solutions |
| | Voice application for the enterprise |
| | Credit card and Transaction processing software |
| | Life Science solutions to simplify sharing research data |
| | Develops software for mobile phone networks that facilitates revenue collection |
| | Develops a framework for building mobile phone portals |
| | Develops e-learning software and learning management systems |
| | Develops e-learning software |
| | A company providing GIS solutions for various industries |

Appendix 3 : Sample Analysis & Profiles

| Firm Classification | | Firm 1 | Firm 2 | Firm 3 |
|-------------------------------------|--------------------------------|---|--|---|
| Firm Size | | | | |
| | <i>Revenue (US Millions)</i> | 5 | 18 | 650 |
| | <i>Employees</i> | 35 | 200 | 2000 |
| | <i>Locations</i> | 1 | 4 | 15 |
| Firm Geographical Foot Print | | | | |
| | <i>North America</i> | 40% | 40% | 55% |
| | <i>ASIA Pac</i> | 0 | 10% | 5% |
| | <i>EMEA</i> | 60% | 45% | 35% |
| Firm Industry Foot Print | | | | |
| | <i>Pharma/Biotech</i> | | | 5% |
| | <i>Manufacturing</i> | | | 10% |
| | <i>Financial</i> | 100% | 60% | 10% |
| | <i>Technology</i> | | | 25% |
| | <i>Public / Government</i> | | 20% | 30% |
| | <i>Education</i> | | | 15% |
| | <i>Professional Services</i> | | 20% | 5% |
| Customer Profile | | | | |
| | <i>Enterprise</i> | 85% | 35% | 45% |
| | <i>SME</i> | 15% | 15% | 25% |
| | <i>Consumer</i> | 0 | 50% | 30% |
| Product Diversity | | | | |
| | <i>Number of Product Lines</i> | 1 | 3 | 6 |
| | <i>Product Categorization</i> | Customized Solution (Level 4) | 1 Service solution, 1 specialized Solution, 1 Application | Multiple Product Lines Across all Layers, Full Stack |
| Comments | | <i>Small Firm producing a customized solution for a vertical market</i> | <i>Medium Sized Software company producing several solutions at different points in the market</i> | <i>Large software company active in many parts of the software market</i> |

| Resources & Capabilities | | Firm 1 | Firm 2 | Firm 3 |
|-------------------------------------|------------------------------------|--|---|---|
| Key Capabilities | | | | |
| Development Approach | | | | |
| | <i>Corporate Standards</i> | No real standards use the best technology for the job. Although we tend to use Microsoft Products because we have an MSDN site license | Yes, very clear standards and process. Every employee is inducted in this standards and is graded / rewarded for compliance. This adherence to standards benefits reuse and prevents 'careless' accidents. Some of this was introduced after we lost a several of man years of work due to a faulty check in and some security issues | Yes, there are corporate guidelines but different groups within the organization interpret them differently. The underlying standard is to use the best approach to deliver the product on time. The standards have really morphed into a set of best practices that are applicable across multiple technology areas |
| | <i>Best Characterized</i> | Structured approach using some elements of the Waterfall Approach, with some agile elements | Structured Approach, using a waterfall methodology and objected oriented development, Analysis, Plan, Implement, Test, Maintain | Different groups use different approaches; the older technologies tend to be more structured. Some of the newer products use more agile approaches and try to get more customer involvement - we joke about the dinosaur products.. But in truth these are the ones that make the money and if a structured approach works it works |
| | <i>Release Planning/Scheduling</i> | When its ready, driven by R&D | We have regular releases every 6 months, which incorporate bug fixes, we have a major product release every 18 months where we introduce new features. This is managed by the PMO and our roadmap is made available to our partners and clients | We have several mechanisms for this, defects and updates can be distributed ad-hoc on an on-line subscription basis, we also release service e packs every couple of months, product releases are managed by product marketing, the roadmaps are often driven by market demands and are quite flexible |
| | <i>Maintenance Management</i> | Responsibility of the team | Responsibility of the development teams | Have a separate maintenance group that looks after these issues, sometimes this group calls in help from the product teams |

| | | | | |
|-------------------------------------|------------------------------|---|---|---|
| IPR & Licensing Approach | | | | |
| | <i>Licenses Used</i> | Standard commercial license | Customized Commercial license, we use a different license for different products. For the server products we do per cpu licensing, for consumer products we tend to look at per user licenses | Multiple Licenses for different markets, tend to update and frequently amend our end user licenses based on the market. We also have different licensing models for different regions and different segments. We tend to build custom licenses for large enterprise deals - these can give the purchaser special rights including access to source code |
| | <i>Compliance Policies</i> | Product to complicated to really pirate, don't focus on compliance | We have an internal compliance group who audits major customers we are also part of the BSA and actively prosecute people using unlicensed software | We have a compliance group and also outsource compliance to a third party. This varies from region to region. Piracy is a big problem for some of our solutions - we try to have trophy law suits where we go after the middlemen rather than the end user. P2P piracy is a real issue for us |
| | <i>Legal Support</i> | Off-Site Support | On-Site Dept | On-site Dept + Specialist Compliance Firms |
| | <i>Legal Stance</i> | Defensive / Neutral | Aggressive - however the costs of legal actions are a burden, if we can settle we will | Aggressive - we would tend to have numerous cases on going at any one time and are prepared to go to court |
| | <i>Patent Process</i> | No Process | Recently implemented a process and have hired the services of a patent specialist to advise us on what we can patent | Successfully established patent program, employees rewarded for patent application, have multiple applications in at any one time. Our policy is to build up a bank of patents that we can use to defend our position and as a defence against retaliation |
| Outsourcing Approach | | | | |
| | <i>Functions outsourced</i> | G & A predominantly outsourced | None | Out source call centres and customer support |
| | <i>Contractors</i> | On-site development contractors brought on site as necessary | | |
| Partnership Approach | | | | |
| | <i>Academic Partnerships</i> | No direct involvement. Has occasionally offered roles to undergraduates | Has sponsored several projects in various institutions | Sponsors two labs - one in Ireland and one in the UK. Has been considering trying to pull out of this arrangement |

| | | | | |
|-----------------------------------|---|--|---|---|
| | <i>Venture Capital</i> | No seed funding, one of the ideas for future growth is to look for a capital injection at some point | Received seed funding and second round funding. Now trying to provide an exit root for investors | Received Venture Capital before going public. Now has a fund that it uses to invest in some promising technologies |
| | <i>Research Consortia</i> | A member of an EU funded project on new banking regulations | Lead a research consortium several years ago but never provided any real value. Moved too slowly to be usable | In the early days it was involved in several research groups but gradually backed out as it developed more internal R&D expertise |
| | <i>Other Funding / Partnerships</i> | | Has set up a joint venture with an organization in Japan | |
| Key Resources | | | | |
| Reputational Factors | | | | |
| | <i>Brands</i> | n/a | 1 brand | 1 brand, multiple product brand |
| | <i>Industry Presence</i> | well regarded | In some technical areas | House hold name |
| | <i>Standards Bodies</i> | W3C, WSDL | W3C, ORB, LIBERTY | Multiple |
| Intellectual Property | | | | |
| | <i>Number of Patents</i> | n/a | 15 | 3000 |
| | <i>Copyrights</i> | | | |
| | <i>Number of Licensing Agreements / Access to Patents</i> | Agreement with supplier to use library | Cross licensing agreement to share technology x | Multiple cross licensing deals |
| Employees Distribution (%) | | | | |
| | <i>Sales & Marketing</i> | 10% | 30% | 25% |
| | <i>R&D</i> | 50% | 15% | 30% |
| | <i>Professional Services</i> | 10% | 35% | 10% |
| | <i>Support</i> | 20% | 15% | 15% |
| | <i>Admin</i> | 5% | 15% | 20% |
| | <i>Other</i> | 5% | 0% | |
| | | | | |
| R&D spending | | | | |
| | <i>% of Revenue</i> | 70% | 20% | 15% |
| | <i>% employees in pure research</i> | 1% | 5% | 10% |

| | | | | |
|----------------------------------|--|---|---|--|
| | <i>Internal vs. External Expertise</i> | All internal resources, a consultant used for X | Have a deal with an firm in India that does the security module for the firm | Several technology deals with small firms for specialized parts of the software, especially those that are region specific |
| Organizational Factors | | | | |
| Cross Functional Teams | | n/a - everyone does a bit of everything | no, primarily functional, with a project management office managing the project | yes, each product has a team that includes representatives from each of the main functions |
| Matrix Organization | | n/a - small organization, predominantly based in one location | no, organized as functions | some matrix organization, have regional managers as well as functional managers |
| Virtual Development Teams | | Yes - not all teams members on site, some work from home or from client sites | All development is carried out in one location | Development carried out across multiple locations, some virtual teams but exception rather than the norm |
| Hierarchy / Rigidity | | Very flat structure | Functional Hierarchy, with clear escalation paths and formal structure | Some Hierarchy, depending on organization, try to be as flexible as possible but the size of the organization does not always facilitate this |
| Comments | | Small firm structure, everything relatively controlled due to single site location, still technically focused | Has developed some key capabilities and resources. Has the ability to develop partnerships but also needs to look at mechanisms for growth and ways of building additional expertise. The single brand focus and limited segments make it vulnerable to changes in this segment | A mature firm with various capabilities and resources. Has a large patent bank and a number of technologies that are exploitable. Has a good partnership capability and could invest in this to build a technology ecosystem |

| Competitive Landscape | | Firm 1 | Firm 2 | Firm 3 |
|------------------------------|----------------------|--|---|---|
| Players | | | | |
| | <i>Substitutors</i> | Very Regional, a firm in Germany offers a very similar solution to German finance houses but trades on it's knowledge of German Finance Frameworks | Several global firms competing in our space, some regional focus, some competition for new entrants especially ASP providers. Biggest competitor is company X which has a very similar product line to us. We would monitor their actions very carefully and try to match their moves in the market | We are the leader in our market space and own most of the market share, we do monitor some other firms and have taken over some of our small competitors to gain technology. We are always looking for ways to move into other market segments in order to grow our customer base. We are aware of increasing commodization in our segment, and recently we have notice one or two open source projects that would seem to be aimed at our market |
| | <i>Complementors</i> | Handheld Device Manufacturers | On-line data services, communication companies | Hardware companies, software add-ons and application companies, CSI |
| | <i>Customers</i> | Mainly large MNC finance houses based in Ireland using international regulations | Primarily direct to consumers, with some enterprise sales. Product provides customer with a way of managing x and facilitates this through access to on-line functionality | Provides customers with multiple solutions based around it's family of products. These products include middleware used to connect different services and to provide access to legacy data, it also provides business intelligence solutions that can be used by CSIs to add value to their customized solutions. A version of the software is available directly to consumers that allows end users to do X. |
| | <i>Suppliers</i> | N/a | Uses components from 2 small software companies to handle security and cryptography | Most components are in-house, does use a 3rd party installer and also some 3rd party libraries - however the tendency is to 'invent' and develop internally rather than use external solutions |
| | <i>Company</i> | Small Software company trading for 5 years, starting to look for opportunities outside of EMEA | Medium sized software company that resulted as an off-shoot from another firm, experienced personal, many coming from the previous company. Very focused on growing business in the US and in AsiaPac | Large software company originally came about from an academic research project that was commercialized. Has grown organically and recently through several large purchases. Sees consolidation as inevitable. Still has a strong research ethic |
| Ecosystem | | | | |

| | | | | |
|-----------------------|--|--|--|---|
| | <i>Technology Ecosystem</i> | All Microsoft .NET | Is a Microsoft and Oracle Partner and preferred vendor - develops primarily for the Microsoft platform but has some multiple platform support. Primarily sticks to its knitting - expertise is with MS and Oracle | Has developed an ecosystem of it's own with links to major software vendors, and also includes several business and technology alliances. Multiple Platform support, tries to offer solutions for any platforms that might be profitable or are demanded by clients |
| | <i>Partner Ecosystem</i> | Microsoft Partner, no other partnerships, may franchise implementation in some regions | Is a preferred Oracle Partner and has strong links with several CSIs including Accenture and IBM Global Services. Provides consultants on loan to CSI and this is a valuable source of revenue. Has a detail with several education partners to provide specialist training on the solutions | Has a Business Alliance Programme and several large Alliance agreements with some hardware companies and with CSIs. Also has it's own professional services arm which offers consulting direct to customers. Multi-level partner support - Also has several channel programmes for various VARs. Agreements with several different distributors. The ecosystem is complicated - sometimes it is difficult to know who is competing with who. Recently there has been a lot of overlap between it's service org and it's partners and channel. Has a certification programme that is run by several education partners |
| Market | | | | |
| | <i>Vertical Market Focus (Specialisation),</i> | Very Specialized Solution based on companies in-house financial knowledge | Customizes base solution for several key verticals, this customization is based on the previous consulting 'gigs' with companies in these areas. These are distributed a product x for vertical y and a pre-customized versions of the generic product. On of the key differentiators is access to on-line data and content customized for different verticals | No product releases for specific vertical markets, most of this customization is carried out by partners. Have toyed with the idea of creating some 'special' releases based on expertise derived from professional services org. However this is complicated by the number of complementary products that have developed that piggy back of the generic product |
| | <i>Horizontal Market Focus (Generics)</i> | No plans for any generic solution across multiple verticals | Generic versions of some the products are available 'off the shelf' - Some products can be purchased on-line form the company's website | Several Generic products lines, these include several off-the-shelf products and also an on-line subscription based product offering generic updates and new content |
| | <i>Market Size (million \$)</i> | 250 - 500 | 2000 | 13000 |
| | <i>% Market held</i> | 2% | 17% | 55% |
| Business Model | | | | |

| | | | | |
|-------------------------------|------------------|--|---|--|
| Direct / Indirect | | Direct approach, sales work directly with potential clients, a contract is negotiated that includes the licensing costs and the implementation costs, usually with an agreed maintenance period | Three core models - license sales to partners and customers, service sales to partners and solution sales to customers. Recently a fourth model is starting to gain traction, that is the sale of subscriptions to on-line content | Direct retail sales are the prime model, this is back up by license sales to partners and followed by indirect revenues generated from services to CSIs. Look for ways to generate revenue from some sort of services approach. Maybe through some sort of partnership or through more use of professional services, maybe even by looking at an ASP approach |
| Revenue Split (Approx) | | | | |
| | <i>Licensing</i> | 30% | 10% | 80% |
| | <i>Services</i> | 50% | 60% | 20% |
| | <i>Support</i> | 20% | 30% | 0% |
| | <i>Comments</i> | The company is still establishing itself in the market but is looking for ways to increase its part of the pie, the fact that the product is very specialized and requires business expertise to implement makes it hard to sell off the shelf, the company is finding that the length of the sales cycle is increasing and that this quite often means that 'people are on the beach' | This is a company that has an established presence in it's market place and has several different ways of earning revenue, it has capitalized on it's exposure to vertical markets by creating products. It seems to be open to new business opportunities while remaining conservative in key areas. It is focused on it's market and is playing by the market rules. Might be exposed if the rules change, might be blinkered by technology approach and view of it's place in the ecosystem and market | This is a large company that has a dependence on its complementors and also it's ecosystem. It is very retail focused and is trying to keep everything balanced. The rules are changing and it is looking at it's tactics and the scope of the firm. It has opportunities due to it's dominant position and market share. It is thinking about the scope of it's business and is looking for ways to expand what it is doing. it could benefit from an more in-depth look at the market it is playing in and a better understanding of this market |

| Open Source Awareness | | Firm 1 | Firm 2 | Firm 3 |
|--|--------------------|--------|--|---|
| Current Open Source Contributions | | | | |
| No of Project | | 0 | 1 | Not Sure - maybe 3 or 4 |
| Role in Projects | | | | |
| | <i>Leader</i> | | | Leading one for an application gateway for technology X |
| | <i>Contributor</i> | | Contributing to an open-standards implementation of protocol X - This is just to keep in touch - our own implementation is much more comprehensive | |
| Contributions | | | | |
| | <i>Developers</i> | | We have one developer on the team | We have one or two guys working on it internally |
| | <i>Financial</i> | | No financial commitment | We sponsored a project through OSDL to do this development |
| | <i>Code</i> | | No code | We released our initial prototype code |
| | <i>IP</i> | | None other than our subject matter expertise | Have allowed our patents to be used for this project |
| Rational for Activity | | | To show support of the open standard and to keep an eye on what our competitors might be doing | If this gateway is available for Linux then our solutions can interface more easily with Linux, this would widen the number of platforms available to us. Also by sponsoring the development we get publicity for our product and get to learn a bit about the open source movement |

| | | | | |
|--|------------------------------|---|--|---|
| Informal / Un-sponsored Participation | | One of the developers is a contributor to project x, and is trying to seek company sponsorship | we recruited a few graduates last year who are still involved in various open source projects, in one case we had to let someone go because it was interfering with their job here | We know that people contribute in their spare time, in a large organization it is difficult to keep track of who is doing what. We try to ensure that any contributions are monitored by our legal team. We try to encourage developers' creativity by focusing it on internal projects and have regular sessions where developers can show what they have been working on - this is a mechanism for trying to prevent too much participation in external projects and keep it internal |
| Planned Open Source Contributions | | | | |
| Contributions | | We are evaluating whether to open source one of the components | No definite plans, might try to get involved in one of the cryptography projects | We are always evaluating options here, we would definitely like to get some of the 'dinosaurs' into the open source community |
| | <i>Developers</i> | Will probably let 1 or 2 developers maintain and support the code | | We would try to have as few developers involved as possible |
| | <i>Financial</i> | Purpose is to reduce the cost | | we might set up a foundation to support the product. This seems to have been successful for other orgs |
| | <i>Code</i> | Hoping to release some of the software solution engine as an open source project | | Would release a 'cleaned' up code base |
| | <i>IP</i> | Will maintain IP | | Would release IP to the foundation |
| Rational for Contribution | | Currently the engine is taking many man-hours to maintain while at the same time the value seems to come from the implementation. Planned open source contribution is to try and reduce this cost | | Would take the pressure of maintaining the solution, would convince customers that it was not a 'dead' product, would gain publicity for us and would also gain us some credibility in the open source community |
| Open Source & Standards | | | | |
| | <i>Open Standards Boards</i> | n/a | we participate in the committee agreeing an XML standard for the exchange of online content in vertical X | Loads of bodies - we try to stay involved and drive these to our ends. We have also set-up some consortiums that try to promote certain standards that are favourable to us |

| | | | | |
|--|--------------------------------|--|--|---|
| | <i>Open Source Foundations</i> | n/a | n/a | We have been invited to sit on OSDL and the eclipse foundations but refused - it would have given the wrong message |
| Open Source Product Support | | | | |
| | <i>Products</i> | None - thinking about supporting open office for spreadsheet analysis | Not applicable, we do support firefox for browsing some content. Will wait and see what our competitors do | we do offer plugins for Openoffice and Firefox. We also have some plugins that work with eclipse - these are all commercial products |
| | <i>Platforms</i> | None - thinking about MySQL support for DB | Have recently added MySQL support to maintain feature parity with competitor X but software works better with Oracle | We have products that work with Linux and Apache - although we don't certify it, JBOSS and MySQL can be used as a platform for solution X |
| Internal Open Source Use | | | | |
| | <i>Platforms</i> | None | None | Linux for some developers |
| | <i>Productivity Tools</i> | None - aware of | None | None |
| | <i>Development Tools</i> | Officially none - but some of the developers are looking at Eclipse | None | some cross platform development teams use eclipse and the Linux tool chain |
| Open Source Licensing Expertise | | | | |
| Products using Open Source Licenses | | None | None | none using an OSI approved license. We have created a license that allows developers access to our source code for reference |
| Products using dual license schemes | | None | None | We do have a dual licensing approach for some products - licensing terms are contingent on the number of users |
| Familiarity with Open Source Licenses | | Aware of the 'viral' nature of licensing - seen as a risk - also don't want to upset any of our partners | trying to stay clear of open source licenses, worried about copyright and also people stealing our ideas | We have examined the different families of licenses and are aware of the implications of the different license families. Our legal team have drafted a proposed open source license based on the Mozilla license that we will use if we release anything using an open source approach. We have very strict internal policies in place about vetting code and code inclusion to try and provide some protection about accidental open source infection. We this as a risk |
| Open Source Risks | | | | |

| | | | | |
|-----------------|-----------------------------|--|---|---|
| | <i>Free Riding</i> | Business Knowledge would prevent this | This would be a big risk for us, especially if our partners could choose different open source products | Since most of our revenue is from retail, this would be a big risk - if people could get our software at no cost we would have no revenue stream |
| | <i>Hijacking</i> | Not considered a risk / too much business knowledge required | We would worry about this especially competitor X | Don't really understand this - we would fight any attempt by any one to hijack our code |
| | <i>Security</i> | Security would be a concern - people could see algorithms used | We already use 3rd party security modules and components, we think that if anything our security would be improved by access to the code | We believe that we have a firm handle on this in our closed source model - open access to our security code would be a risk for our clients |
| | <i>Open Source Tainting</i> | Worried about this | We have heard about this - it would be a concern that some how open source code would get into our product and thus make all of our product open source - not sure how realistic this process could be | Our legal process tries to prevent this but we are aware of this risk |
| | <i>Liability</i> | This is a risk although the SCO case has shown this is very hard to prove | Not sure about this | We have considered this and would see this as an issue. The SCO case shows how important this areas is |
| | <i>Commodization</i> | The specialized nature of the product should prevent this. | This a risk, we are already seeing it in our market, hence our push towards verticals and on-line content | We see this happening anyway, we try to avoid this by offering solutions on all levels, in certain cases we see open source products gaining market share, we try to avoid this by closely interlocking our stack of products but for us this is a very big risk |
| | <i>Others</i> | Worried that the finance houses might take the work in house if the engine was available open source | | We also see ASP service provider as a risk especially those building on open source projects - this would be the type of hijacking we would be most wary of |
| Comments | | <i>The firm is not very open source aware but has been looking into open source, at the moment open source knowledge is mainly second hand. The firm has a good handle on where it stands in relation to open source and that currently because of the specialized nature of it's solution, it is unlikely to find open source project competing against it.</i> | <i>This firm is open source aware but at the same time is very defensive in it's attitude. It seems to feel forced to contribute to projects to be involved but there is no commitment. Open source is seen as a threat but not as much as the threat from competitors. It's attitude to developers could be worrying</i> | <i>This firm shows a good understanding of open source including the risks and consequences. It is has built up a series of policies to minimise the impact of open source but is also starting to play in the open source arena in some areas. Its legal policies are interesting as is its approach to try to keep developers engaged. It seems to have learnt from some of the best practices shown by open source projects.</i> |

| Firm Ethos & Purpose | | Firm 1 | Firm 2 | Firm 3 |
|--|--|--|--|---|
| Innovator or Knowledge Harvester | | Knowledge Harvester - Focusing on taking the existing concepts and reusing them | Innovator - We have created a new type of software and continue to innovate in this market | Neutral on this - we have an R&D facility which innovates but we also rely on our continuous improvement approach |
| Leader or Follower | | Neutral - Just trying to keep existing customers happy and not rocking the boat | Leader - in the segment we are in we are the leading technology player | We started off as a leader and continue to think that we should be a leader . However in recent years we have had to play catch up with some younger small companies |
| Stability or Dynamism | | Small Firm - so pretty dynamic - although working in the finance industry do need to demonstrate a stable platform | Stability - we have processes and structures that make us a stable company. However this is not at the expense of being innovative | A certain amount of inertia means that we are a very stable company.. Recently we have been trying to get back to our academic and dynamic roots |
| Not Invented Here or Technology Adopter | | Technology Adopter - Value comes from our knowledge of the business - not by creating super new technology | We tend to trust our technology - although we also use solutions from companies we trust and understand | We develop our solutions internally - it is the best way for us to be able to stand over our products |
| Market Driven or Product Driven | | Market Driven | Market Driven - we saw a gap in the market and went for it | Neutral on this - Often we develop to the market. But we have had some product successes with experimental products especially our first attempts with the search product |
| Comments | | This firms 'lens' could actually help it to exploit and embrace open source technologies - providing it can maintain the 'business expertise | This firm may view open source with suspicion, many of it's values don't correspond with open source values. It might have to change it's views. Rather than managing the open source threat, it could look to exploit some of the open source technologies and focus on it's efforts on higher value work | This firm looks like it is in position to manage the impacts of open source in a number of different ways. Potentially it could use open source approaches to breath new life into it's organization or could use it as a complementor to it's strategy. However like a lot of companies, it may find it difficult to "understand" the open source philosophy and might get stuck trying to barge into open source projects. It needs to earn respect not expect respect. |

Appendix 4 – On-line Questionnaire


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 because knowledge is everything

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Monday, July 24, 2006

Design Survey Show All Pages and Questions

To change the look of your survey, select a choice below. Click 'Add' to create your own custom theme.

Theme: Blue Ice [Add](#)

Factors in managing F/OSS Impacts on the Indigenous Irish Software I

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1. Survey Introduction [Edit Page](#) [Delete Page](#) [Copy/Move](#) [Add Logic](#)

This survey is designed to investigate certain factors that may link to the approach indig take to managing the impact of the open source software movement

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These preliminary questions are optional, the survey can be completed anonymously.

This questionnaire has been designed to quickly survey software companies and to test whether a number of factors might influence the types of impact that the open source software movement might have on Irish Software Companies.

I am currently studying for an MBA at UCD's Smurfit School of Business. This research is being carried out as part of my MBA.

The questionnaire is detailed, any effort and time taken to answer the questions is very much appreciated.

Please ignore questions that you feel are not relevant or your would prefer not to answer.

The core questionnaire should take approximately 30 minutes to complete. There are 24 core questions and 10 optional questions in three sections.

I will check with each respondent before using any quotes from the questionnaire in my dissertation.

If you would like to receive an electronic copy of the dissertation or research please let me know

Please note all of the responses to this questionnaire are private and will not be distributed. The information contained will be used by the researcher to test the ideas proposed in the thesis. If you have any queries, please contact Ed Sherwood-Smith at ed.sherwood@gmail.com.

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1. Company Name:

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2. If you would like a copy or the full thesis, please address here

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2. Firm Classification - 8 Questions [Edit Page](#) [Delete Page](#) [Copy/Move](#) [Add Logic](#)

These are basic questions relating to your organization

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4. Firm Revenue Approx (Millions US) – Please tick ONE of the following checkboxes

0-4 5-24 25-99 More

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5. Number of Employees – Please tick ONE of the following checkboxes

0 to 14 15 to 49 49 to 199 200 up Not Applicable

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6. How are employees distributed across different functions

% Sales & Marketing

% Research & Development

% Services

% Professional Services

% G & A

% Other

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7. Please comment on the functional make up of your organization

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8. Firm Footprint (% Revenue from each area) –

% US

% AsiaPAC

% EMEA

% Other

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9. Market Segments (% Revenue from each segment)

% Pharma/Biotech

% Manufacturing

% Professional Services

% IT / Software

% Education

% Government

% Electronics

% Financial

% Other

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10. How many products or product lines does your firm have?

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11. Please tick the statement below that best applies to your product or product line (if more than one product line please tick ANY boxes that apply)

CORE PLATFORM / OS LEVEL SOLUTIONS (Drivers, Kernel Level Development or embedded technologies)

MIDDLEWARE / SERVICE LAYER SOLUTION (Designed to be used by different users in different markets to meet a variety of requirements)

SPECIALIZED APPLICATIONS / SOLUTIONS (Used by a specific set of end users to achieve or meet a specific need)

CUSTOMIZED SOLUTIONS (Once off solutions used by one firm/organization to solve a specific business requirement)

Other (please specify and comment)

Add Question Add Page

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12. If you would like to clarify anything in regards to your organization, Please add comments or additional information here.

Add Question Add Page

3. Competitive Landscape - 6 Questions (30% Complete)

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These question relate to your firms competitive landscape, please skip any questions that you would prefer not to answer

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13. Who are your main competitors and customers?

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17. If possible, Please Provide approximate revenue distributions across these categories?

% Product Licensing

% Content

% Product Support and Service (Maintenance)

% Professional Services (Consulting, Customization, Installation, Implementation)

% Other

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18. Please add any additional comments or information on the competitive landscape?

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4. Intellectual Property Approach - 6 Questions (55% Complete)

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Please complete these statements to the best of your knowledge - they relate to intellectual property rights (IPR) in your organization and your organizations policy toward IPR

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19. How many product related patents does your company hold directly?

None Less than 10 Between 10 and 100 More than 100 N/A

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14. Is your organization a member of any technology partnership programmes ? Please tick ANY of the answers that apply

Microsoft Partner (MSDN)

Sun Developers Network

Redhat Network

Novell

Oracle Developers Network

IBM

Other (please specify)

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15. Is your organization a member of any BUSINESS partnership programmes ? Please tick ANY of the answers that apply

Microsoft Business Partner

IBM Business Partner

Oracle Business Partner

Novell Business Partner

Redhat Business Partner

Other (please specify)

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16. If possible, Please give an indicator of the competitive position your firm holds in it's markets? Please tick ANY of the statements that apply

Uncontested

Dominant Player

Top 5 Player

Niche Player

Dominant Local Player

New Entrant

Please Provide additional Details

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20. Does your organization have an official patent & IPR process?

Yes No N/A

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21. Please tick THE statement that best agrees with my organizations's legal capacity?

- The organization has on-site legal expertise
- The organization has permanent access to outsourced legal expertise
- The organization uses ad-hoc legal expertise as required
- Other (please specify)

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22. The following statements can be used to characterize your organizations legal stance. Please tick ANY of the statements that apply?

- Aggressively look for and pursue potential IPR infringements
- Defend our IPR as required but let common sense prevail
- Are primarily concerned with ensuring we don't infringe others IPR
- Regularly audit our customers compliance to our legal requirements
- Regularly audit our competing products to check for IPR infringement
- Avoid Legal complications and costs where possible
- Comments:

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23. Does your organization have licensing agreements in place with other organizations?

- Yes
- No
- Other (please specify)

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24. Please provide comments on IPR and your organization's Approach:

[Add Question](#) [Add Page](#)

5. Open Source Awareness - 4 Questions (80% Complete)

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25. Does your organization CURRENTLY contribute to any open source projects - Please tick ANY of the statements that apply?

- Contributes to one or more open source projects
- Has contributed developer time to open source projects
- Has contributed financially to open source projects or foundations
- Has contributed Code to open source projects or foundations
- Has contributed Intellectual Property (IP) to open source projects or foundations
- Please add Comments on your organization's rational for contributing:

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26. In the future, will your organization (continue to) contribute to any open source projects - Please tick ANY of the statements that apply?

- Plans to contributes to one or more open source projects
- Plans to contribute developer time to open source projects
- Plans to contribute financially to open source projects or foundations
- Plans to contribute Code to open source projects or foundations
- Plans to contribute Intellectual Property (IP) to open source projects or foundations
- Comments on your organization's rational for contributing:

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27. Does your organization currently use any open source solutions? Please tick ANY of the statements that apply

- Uses open source solutions to provide internal IT solutions
 - Distributes it's products and solutions for multiple platforms including Linux
 - Uses open source components with in its own products and solutions Packages, distributes and supports open source solutions
 - Uses open source tools & solutions as part of it's development process
- Comments:

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28. Thank you for completing the core survey - There are three optional sections consisting of 12 questions. It should take approximately 10 minutes to complete. These sections include questions on your partnership approach, development approach and firm ethos

If you have time, your responses for these will be very much appreciated. If you would like to complete these sections please choose the Continue option

Finished Continue

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6. Development Approach Edit Page Delete Page Copy/Move Add Logic

These question refer to the organizations development approach

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29. Does your organization have a company mandated development standards, processes and procedures? If yes, are these managed at a team, product or organization level?

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30. Does your organization have any type of formal quality certification (ISO, CMM or others)?

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31. Development Team Organizational Structure - How are people assigned to development groups in your organization? Please tick THE most appropriate statement

- On a permanent basis by product
- On a temporary basis according to the product lifecycle phase
- Using an ad-hoc approach
- Other (please specify)

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32. Does your organization have experience in managing and working with virtual distributed development teams across a number of different locations?

- Yes
- No
- Other (please specify)

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33. Please comment on Software / Product development and your organizations approach

Add Question Add Page

7. Partnering Approach and Experience Edit Page Delete Page Copy/Move Add Logic

Please answer the following questions, they are designed to understand your organizations familiarity and capability in relation to partnering activities

Add Question Add Page

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34. How many technology or business partnership agreements has your firm entered into?

None Less than 5 5 to 10 More than 10 N/A

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35. Please comment on your firm's partnership and supplier management capability?

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36. Has your organization collaborated in any of the following types of research partnership - Please tick ANY of the statements that apply?

- Irish Academic Institutions
- EU Funded Research Consortia
- Internationally funded Research consortia
- Irish Research Institutes
- Other (please specify)

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37. Has your organization received funding from the following sources - Please tick ANY of the statements that apply?

- Enterprise Ireland
- Science Foundation Ireland (SFI)
- Local Venture Capital
- Overseas Venture Capital
- EU Sponsored R&D Funding
- Other (please specify)

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38. Please comment on partnership and funding and your organization's approach:

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8. Organization Purpose and Ethos (Optional) Edit Page Delete Page Copy/Move Add Logic

This section is optional, it aims to gain a brief understanding of the organization's ethos and purpose and looks at several intangible factors that might characterize a firm and the way in which a firm does business

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39. Each of the follow represent a polar scale with different opposing attributes - On the scale please select the option that best matches your firm? If neither of the attributes are reflective, please pick the neutral option

| | High | Medium | Neutral | Medium | High |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Innovator or Knowledge Harvester? | <input type="checkbox"/> |
| Leader or Follower? | <input type="checkbox"/> |
| Stability or Dynamism? | <input type="checkbox"/> |
| Not Invented Here (NIH) or Technology Adopter? | <input type="checkbox"/> |
| Market Driven or Product Driven? | <input type="checkbox"/> |

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Definitions

Innovator or Knowledge Harvester? Does your organization place emphasis on developing new technology and ideas (Innovator) or does your firm place emphasis on creating value from existing technologies and ideas (Knowledge Harvester)

Leader or Follower? Does your organization focus continuously look to create new positions and new markets for its products and solutions or does you firm scan the industry to see what trends to follow?

Stability or Dynamism? Does your organization value an established position and status quo, or does it look to reinvent itself periodically by challenging the status quo and react quickly to changing trends and fads in the market place

Not Invented Here (NIH) or Technology Adopter? Does your organization place more faith in internally developed solutions or does your organization adopt and license technology from outside the firm

Market Driven or Product Driven? Does your organization consult the market to see what it should build or build the product and then try to create the market

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40. Please add comments on your firms purpose or ethos:

