The Adoption of Open Source Software in Business Models: A Red Hat and IBM Case study

Neeshal Munga
Meraka Institute
Po Box 395
Pretoria, 0001
+27128413747
nmunga@csir.co.za

Thomas Fogwill
Meraka Institute
Po Box 395
Pretoria, 0001
+27128413155
tfogwill@csir.co.za

Quentin Williams
Meraka Institute
Po Box 395
Pretoria, 0001
+27128413181
qwilliams@csir.co.za

ABSTRACT
Free / Libre open source software (FLOSS/OSS) has gained increasing popularity and utilisation in commercial and governmental organisations. Universities like Harvard and Stanford now offer courses on open source as a business and also on how businesses can compete with open source firms. However, very little research has been published in regards to the influence of OSS on business strategies; the use of OSS as a viable business or its value proposition within a commercial entity. The business model, a powerful tool for extracting economic value from the potential of technological innovation, clearly plays an important role in the success of a business. In this paper we investigate the role of open source in the business models of Red Hat and IBM and describe how OSS has contributed to their success. A framework recently developed by some of the authors is used to evaluate and identify the key factors important to the integration of OSS strategies into traditional business models.

Categories and Subject Descriptors
K.1 [**The Computer Industry**]: Markets

General Terms
Management, Economics

Keywords
Open Source Software, Business Models, Case Study

INTRODUCTION
The phenomenon of free / libre open source software (FLOSS) is gaining momentum and attracting significant attention from business, where it has been viewed as both an opportunity and a threat to commercial software firms. The rise of FLOSS has forced the software industry to both lower prices and invest more in product innovation [1], thus playing a vital role in transforming the industry. Businesses, however, are still struggling to incorporate FLOSS into their overall strategy and perceiving the impact this has in the various elements constituting their commercial ventures. Furthermore, although many governments have official policies on the use of FLOSS [2], little is understood as to the integration of FLOSS into their information technology systems and where the responsibility for implementation and support lies.

A number of different models and strategies have emerged which describe the various ways FLOSS can be integrated within software firms. The most influential of these includes Hecker's [3] classification, which divides FLOSS ventures into 8 classical business models ranging from software franchising and brand licensing to loss-leaders and service support sellers. More recently after analysing the models of 120 different open source companies, Daffara [4] groups them into 6 main clusters: twin licensing, split OSS / Commercial licensing, badgeware, product specialists, platform providers, selection and consulting. These business models are usually grouped into categories based on the licensing involved ([5], [6]) and only describe the type of commercial entity for the FLOSS venture. Here the company is viewed as a software distributor, a software producer, or a service provider. They are thus not "complete" business models [7] and do not address how a firm can customise both the model and its associated strategy to the dynamics of the market or how economic value can be extracted from a technological innovation.

In order to better understand the influence of FLOSS on the business models of successful companies, this paper analyses the business models of Red Hat and IBM and describes those properties that have contributed to their success. Red Hat is considered to be the biggest pure play open source company and IBM has invested the most, and contributed the most resources to FLOSS in recent years. In [8], the authors propose a FLOSS business model framework that incorporates FLOSS strategies into traditional software economic models. In this paper, the framework is used to analyse the business models of two well known and successful companies currently utilising FLOSS strategies in their businesses: Red Hat is used as a case study in the successful implementation of FLOSS as a core business, while the IBM case study shows how FLOSS improves the flexibility of a business model making it adaptable to the dynamics of the "commercial" environment. The main aim is to understand the key factors that will assist firms to adopt FLOSS as a successful commercial innovation.

SAICSIT'09, Month 1–2, 2009, Vaal River, Gauteng, South Africa.

This paper is structured as follows: In the next section we provide a background and overview of FLOSS and business models. Combining the work of Rajala et al. [9] and Morris et al. [10] the framework for analysing the business models of these two companies is then described. The two companies are analysed and the findings are discussed.

BACKGROUND INFORMATION

Business Models

Many definitions exist for the term "business model" and despite its abundant use in recent times, no real consensus on the definition or its elements have emerged ([10], [11], [12]). Various authors distinguish between a business model and strategy, and some see it as the missing link between strategy and operations in exploring entrepreneurial opportunities, justifying the need for it to be integrated into both value creation and strategy concepts [13]. Wu [14] regards it as a general vision or strategy, an abstraction of business, which is different from a business method or specific way of doing business. It provides value as a planning tool, focusing attention on how all the elements fit into a working whole. Essentially the main functions of the business model are to define the structure of the value chain within the firm required to create and distribute the offering, and determine the complementary assets needed to support the firm's position in this chain. In so doing, the competitive strategy of the firm is articulated and its position in the market identified [15].

Various types of business models are discussed in the literature. Rappa [16], using the customer relationship as the primary dimension, defines the brokerage model, information intermediary model, merchant model, manufacturer direct model, affiliate model, community model, subscription model, and utility and hybrid models as categories of business models in technology. Recent interest and growth has also led to a number of models being defined and described for FLOSS, models which view open source as more than just a development strategy for software companies. Hecker's [3] 8 classical business models for FLOSS include the:

1. Service support seller - revenue is generated from support and services

2. Loss-leader – FLOSS is used to strengthen the vendor brand, to improve its commercial products, and to raise familiarity with the total product line

3. Widget frosting - intended for vendors who make their money from the sale of hardware, but release driver software as open source to increase the base of developers

4. Accessorising – revenue through the sale of books, computer hardware and other physical merchandise associated with and supportive of open source software

5. Service enablers – open source software is created to allow access for customers to revenue-generating on-line services

6. Sell it, Free it – existing commercial products are releases as open source when the benefit of doing so outweighs the software license revenue they produce

7. Brand licensing – software is released as open source, but the trademarks and IP are retained to generate revenue when other companies use them to create derivative products

8. Software franchising – franchising of brand and trademarks to allow other companies to do associated business (e.g. in particular geographic areas and vertical markets)

More recently based on his analysis of various FLOSS companies, Daffara [4] groups his business models into the following clusters:

1. Twin Licensing – the same software released under both open source and commercial licenses

2. Split OSS / Commercial – two differing versions of the software, one open source and one commercial

3. Badgeware – the same as Hecker's Branding Model

4. Product Specialists – for companies with specialist knowledge about an open source product, revenue is generated from services like training and consulting

5. Platform Providers - provide integration and services on a set of projects, collectively forming a tested and verified platform

6. Selection/Consulting Companies - provide consulting and selection services on a wide range of projects, in a way that is close to the analyst role

Koenig's [17] strategies are similar to Daffara's and include: a subscription strategy, an optimisation strategy that leverages commoditised technology by adding layers of value to it and a patronage strategy, where contributions to FLOSS place the business on a higher level of the software stack or eliminates the competition by commoditising a particular layer.

The taxonomies described above provide a means of classifying a business venture when FLOSS is the core business, and describing the different means from which revenue can be generated. However, it does not analyse the integration and impact of FLOSS in other commercial areas, or the flexibility required from business models to allow for full utilisation of FLOSS innovations. Thus, although these business models can be used to "classify" FLOSS firms, it does not demonstrate how value, economic or otherwise, can be appropriated from FLOSS throughout the business chain.

The Analysis Framework and Methodology

A number of frameworks have been developed to analyse various business models ([13], [11], [18]). Rajala et al.'s [9] conceptual framework for analysing software business models includes the following main elements: Product Strategy (The core product and service proposition of the firm and how development is organised); Revenue Logic (The financing of the firm's operations, how and from whom the revenue is generated); Distribution Model (How distribution is organised, the sales and marketing of the product); and Service and Implementation Model (How the product is made available for end users as a working solution). While open source is software, value from it is not derived in the same way as with commercial software, hence Rajala et al.'s framework is only partially suited for the analysis in this paper. Morris et al. [10] describe a six component framework for characterising business models regardless of venture type. The following questions are asked: How will the firm create value? For whom will the firm create value? What is the firm's internal source of advantage? How will the firm position itself in the

market place? How will the firm make money? What are the entrepreneur's time, scope, and size ambitions?

While Morris et al.'s framework expands on that of Rajala et al., it does not necessarily take into account the unique characteristics of software and its impact on business. Combining the two, [8] proposed the following framework to evaluate the impact and influence of open source business strategies on a firm's business model. The components of the framework are:

The Value Offering – This includes the product/service offering and how it creates value for the firm and to whom this value is applicable. It includes the firm's core competence, and those competencies around which an advantage is built.

The Market – This describes the firm's position in the value chain, whom it creates value for and how it can maintain an advantage over competitors.

The Revenue Logic – The economic model (or logic for earning money), this determines how the firm will make money, how and from whom revenue is generated. It also includes sales and marketing.

The future ambitions of the firm - The time, scope and size ambitions of the firm are important elements of its business model and have implications on strategy, architecture, resource management, etc. Example models include subsistence, income, growth, and speculation.

The framework briefly described above was shown in [8] to "provide a basis from which innovative firms can begin to adapt their business models, understanding the impact of FLOSS on the various elements, and how it can ultimately provide value to the firm. In addition, it provides a means from which firms can re-evaluate and reshape their business models, possibly discovering new avenues of value." In the following sections we use this framework to analyse the business models of Red Hat and IBM to understand how FLOSS can successfully be integrated throughout all the operations of an enterprise and how best to extract value from FLOSS.

To fully comprehend the business models of Red Hat and IBM, literature was gathered from the two firms' business strategy documents and articles published on the operations of the firms. Many strategic policy documents, alongside official company statements and published economic literature were analysed to deconstruct the business models into the above framework. It is important to note that although it was attempted to only utilise academic literature, much of the information regarding the business practices of the two firms was only reported in newspaper articles and official company press releases. While these "secondary sources" might bias the information towards "official company lines", the main goal was to understand the companies business models and the role that FLOSS plays within them. This was achieved through the referencing of various sources and ensuring a consistent framework within which the evaluation was conducted.

CASE STUDY 1: RED HAT

Company Background

Founded by Robert Young in 1993, during the early days of Linux, the ACC Corporation was a small distribution company that sold Unix applications, books and low-cost CD-ROMS. In 1994, Marc Ewing created his own Linux distribution, Red Hat Linux, which in 1995 merged with the ACC Corporation to become Red Hat Software. Young describes the initial growth of the company as a "fluke" and describes how they "stumbled across a new economic model and helped to improve an industry" by "giving the software away" [19]. This model has evolved over the years, and today Red Hat is synonymous with Linux and listed as one of America's 25 fastest growing technology companies. The Company now provides open source software solutions to the enterprise, and its acquisition of JBoss, the world's second largest FLOSS software company in 2006, allowed it to become a full service infrastructure provider [20]. It boasts a number of powerful customers including the New York Stock Exchange, Amazon, DreamWorks, and Morgan Stanley.

Open source is not a get-rich-quick scheme and success for Red Hat did not happen overnight. In August 2000, on the first day that Red Hat was publicly traded, it closed at $52.06 a share and a few months later the company's shares peaked at $150, valuing Red Hat at $150 billion. At the time, Red Hat had revenues of $52.8 million and an operating loss of $46.7 million. By the middle of 2001, Red Hat's share price had fallen to $3.75, giving the company a more modest market cap of $637 million. In the interim, the company had annual revenues of $102.65 million, but losses of $107.4 million. It was not until November 2002 that Red Hat finally reported a positive net income of $305 000 [21]. More recently its financial status is even more impressive, with reports that its annual revenues now top $523 million, up more than 30% on 2007's results. Profits for the year 2008 were $76.7 million with the company expecting $1 billion per annum in revenues within 3 years. Chief financial officer (CFO), Charlie Peters attributes the financial performance to growing demand for their open source solutions and the value that they are able to demonstrate to their customers, $450 million of their revenue coming from subscriptions and support contracts [22].

The Red Hat Business Model

The Value Offering

A platform provider and once a distributor of CD-ROMs, Red Hat's offering in open source solutions to the enterprise now includes: their core enterprise operating system platform, Red Hat Enterprise Linux (RHEL); their enterprise middleware suite, JBoss Enterprise Middleware Suite (JBoss Enterprise Middleware); and other Red Hat enterprise technologies. Their integrated management services include: Red Hat Network (RHN) and JBoss Operations Network (JBoss ON). Their subscription model is designed to provide customers with an all-inclusive solution, incorporating product delivery, problem resolution, ongoing corrections and enhancements, certified compatibility with a portfolio of hardware and software applications, its open source assurance program and rights to new versions [23]. As stated by CEO, Jim Whitehurst, there is a clear distinction between where value is created and where it is extracted. "With our model, we create value by working with the community to develop really good software. We extract value by making open source consumable by the enterprise" [24].

The open source development model has proved to be highly beneficial to Red Hat, and its participation in the community

driven development process is illustrated by its role as sponsor in the Fedora project. The project is used as a proving ground and virtual laboratory for new technology that can later be included in their enterprise offerings. Through the Fedora project, Red Hat manages to balance the needs of the valuable FLOSS community - the volunteers and professionals who collectively produce the software that Red Hat packages, tunes, tests and supports - with those of the more pragmatic customers who just want the product to work [24]. The decision to eliminate a free supported version and replace it with Fedora was not a popular one, angering some and triggering the founding of rival Ubuntu [25]. The decision in 2003 was made by a global steering committee, who asserted that Red Hat was suffering from too many compromises as a "retail product" and that staff should redirect their efforts into creating a community-based project [20]. The decision has proven to be worthwhile as much innovation happens in Fedora, and this innovation is then slowly moved into RHEL, which is more robust and stable. According to Whitehurst, the secret to open source success is iteration. He explains it as follows: "*We come in and make sure that (open source) is consumable by the enterprise, and is fully Quality Assured-strong, fully tested, performance-tuned, certified, equipped with documentation, SLAs, localization aspects, iterative change development, everything. We are the people who do that and ensure stable tested bits on mission-critical deployments. Besides we commit to support it for seven years. It's not just the support but we make it bulletproof. It's all about how much can you match the pace of iterative integration and make it consumable for the enterprise. Enterprise-class software is not about functionality alone but about change in tandem in a production environment. It's very hard to dynamically change specs, maintain hardware piles, software piles, compatibility, and certifications. If you talk of us, we have monetized not on the OS but on the value it has.*" [26].

Red Hat realised that in order to generate growth for itself, it needed to promote open source within its ecosystem as well as work with customers on what is already out there. This has led to numerous strategic partnerships and alliances with sometimes competitors. RHEL enjoys the support of major original equipment manufacturers (OEMs) and independent software vendors (ISVs) increasing the interest of developers in adding further enhancements to the Linux kernel. In addition to this and in order to facilitate the wide deployment of RHEL, Red Hat has focussed on gaining support for its products from the providers of hardware and software technologies critical to the enterprise. IBM, SAP and Oracle are amongst the leading software vendors that enable their software to run on Red Hat, certificate and pre-load arrangements and relationships have been established with leading hardware providers, networking and storage companies, and chip providers [23]. The launch of Red Hat Exchange (RHX) in 2007 signalled a strategic shift for Red Hat. It is an on-line market place/catalogue that sells products from more than a dozen open source companies including MySQL, Alfresco and SugarCRM. With this Red Hat is able to broaden the landscape of open source choices for customers [27].

Part of Red Hat's strategy to continue to expand its capabilities under its infrastructure is a selective acquisition strategy. Its recent acquisitions of Acquia and Metamatrix will allow it to expand in the content and data management and integration sectors respectively. The most notable of its acquisitions was that of JBoss in 2006 for $350 million, allowing Red Hat to target the middleware and application development markets. This was not looked on favourably at the time, and Red Hat stocks took a considerable battering [28]. As Babcock [30] explains, the companies were very different, JBoss was organised as a business first and open source second, and its development ranks were not open to newcomers. However, Red Hat managed to hold on to its core developers, while the JBoss community became more open to contributors. Today Red Hat's middleware business is growing at twice the rate of the platform business [29].

The Market

After years of trying to sell to the individual consumer market, Red Hat decided to follow the money and focus its efforts on the enterprise market. The enterprise business customers have the budget for support agreements which not only provide updates, but demonstrate that IT management is treating its resources responsibly. At the same time, however, Red Hat needs to ensure that these customers are properly educated on the nature of these agreements.

Expanding Linux adoption beyond key vertical markets is an important driver for Red Hat growth. According to CEO Whitehurst, Red Hat does well with companies that use technology for competitive advantage to drive their business, such as financial services companies and major movie studios. While mainstream companies that don't care about being on the leading edge of technology adoption are still largely an untapped market for the vendor [31].

In terms of competition, it is often the case that Red Hat will compete with a company in one area, and be partners or allies in another. This is just the nature of open source competition and is witnessed in a number of other open source firms. In the operating systems market, competitors include Microsoft, Oracle, Sun and Novell. Within the specific category of Linux operating systems competitors include Suse (Novell), Mandriva, Debian, and Ubuntu (Canonical). In the middleware market, competitors include IBM, BEA, Oracle and Sun, while in the professional services offerings, Red Hat competes with IBM, HP, CA, Novell, Oracle, BMC, and other technology consulting companies [23].

The nature of open source means that it provides a much lower barrier to entry than traditional proprietary software as the source code is freely available for anyone to copy, modify and redistribute. Thus a number of factors affect the landscape of the open source products on offer. Some of these include: the name and reputation of the vendor; the ability to adapt development, sales and marketing to the product; the product price, performance, reliability and functionality; strategic alliances with major industry players; the quality of support and consulting services; the value of subscription services; compatibility with 3rd party products; the distribution capabilities of the company; and relationships and reputation within the open source community [23]. As Assay [29] citing Murphy puts it: "the underlying value proposition of Red Hat's open source offerings, is its superior brand recognition, large referenceable customer base, the reinforcing 'network' effects of a platform leadership position, broad array of ISV and independent hardware vendor (IHV) certifications, unique vision and culture, and ability to hire superior employee talent."

The Revenue Logic

Red Hat is a pure play open source company. This means that its business model depends on selling support for open source given that there are no hardware or proprietary software sales to subsidise open source development. Support service is the primary product and not a sort of loss leader or compliment to other offerings that generate revenue [32].

Red Hat enterprise technologies are provided under annual or multi-year subscriptions with which the customer is entitled to specific levels of support as well as updates, functionality enhancements, bug fixes, and upgrades to the technologies. These technology subscriptions are sold through both direct and indirect channels of distribution. In addition, agreements with various global server and workstation hardware vendors enable the bundling of Red Hat enterprise technologies with pre-configured hardware [23]. The key to Red Hat's subscriptions success is that it is not possible to get a compiled and certified version of RHEL without purchasing appropriate units of support. What differentiates Red Hat is its “unit of support” is not restricted to the traditional per server or per CPU and can be priced according to CPU bands. Complimentary sources of revenue for Red Hat also include training and training material as well as certifications and migration services, amongst others. The bulk of its revenue, however, come from subscription services which continue to grow every year, with nearly half of its top deals coming from new customers [29].

Future Ambitions

Red Hat's business strategy is designed to: gain widespread acceptance and deployment of Red Hat enterprise technologies by enterprise users globally; generate increasing subscription revenue by renewing existing subscriptions and providing additional value to customers, as well as by growing the number of enterprise technologies that comprise its open source architecture; and generate increased revenues by providing additional systems management, developer and other services as well as from additional market penetration through a broader and deeper set of channel partner relationships, including OEMs, and international expansion, among other means [23].

In order to achieve this, Red Hat is focused on increasing the adoption of its technologies amongst/by enterprise users globally. This means focusing on emerging and developing markets, capitalising on strategic partnerships and continuing to pursue strategic acquisitions and alliances. New partnerships such as that with 'Likewise', means that integration with existing technologies will further increase Red Hat's reach. Geographically Red Hat continues to expand into developing areas like Latin America. Significantly it continues to invest increasingly in the development of new open source technology, its main source of innovation. In 2007, Red Hat invested $71 million in product and technology development [23].

Patents have become a major issue in open source software, and while they do not directly relate to the growth of the firm, they are none-the-less important and must be considered. The risks of having no defence against an infringement case are significant, and therefore Red Hat has decided to bolster its patent portfolio. Its decision to get involved in the Community Patent Review is part of the ground work for building this portfolio. The community's aim is to develop a process for which applications for patents will be scrutinised more thoroughly ([20], [47], [48]).

Findings

In analysing the details behind Red Hat's business model, a number of characteristics emerge which help to explain why Red Hat's FLOSS strategy is successful.

Red Hat's business model involves aspects of a number of the prescribed business models. In particular, it combines Hecker's [3] Service Support Seller and Brand Licensing models, as well as Koenig's [17] Subscription and Consultation strategies, and Daffara's [4] Product Specialists and Platform Providers.

Red Hat's business model and strategies have continually evolved over the years to adapt to the changing industry. The key to Red Hat’s success is in realising that their core business is not in developing and selling software, but in providing value-added services that involve refinement, packaging and support of solutions customised to their client's needs. They have shown that software customers are still looking for a stable all-inclusive solution that is accompanied with reliable maintenance and support, with little concern over how the software might have been developed. Red Hat tests and certifies RHEL to run on specific hardware, and to support specific enterprise software. This provides a degree of assurance for its customers. Besides theses assurances and guarantees of support, Red Hat continually interacts with its clients, thus maintaining a good relationship with them. In doing so it made open source consumable by the enterprise.

The second pillar of Red Hat’s success is in viewing FLOSS as a complete ecosystem. To continue technological innovations in their products, they support and drive the FLOSS developments upon which their products are built. It is therefore successful because open source is successful. Red Hat has invested significant effort into driving Linux development and adoption. It continues to nurture its relationship with the open source community, particularly through its sponsorship of the Fedora project. Without the open source community, Red Hat would never have grown to its current size. Maintaining and nurturing this relationship ensures that it will continue to have access to the community as a source of innovation for future products and offerings.

A final critical element of Red Hat's success is in knowing that the solution their customer is looking for is not just the specific software product, but includes the hardware and the peripheral software packages. This is evident in its continued efforts in establishing strategic partnerships and alliances with industry leaders, its selective acquisition strategy and its continued investment into providing additional systems management.

CASE STUDY 2: IBM

Company Background

International Business Machines Corporation (IBM) is an information technology company that dates back to the nineteenth century. With over 388,000 employees worldwide, IBM is the largest and most profitable IT employer in the world. It holds more patents than any other U.S.A. based technology company

and has eight research laboratories worldwide. Today its strengths lie in business consulting, systems integration, IT and business transformation outsourcing, open enterprise software, and high performance hardware [33].

Open source software plays a large part in IBM's endeavours, but this was not always the case. Twenty years ago, IBM was one of the most vigorous advocates of strong intellectual property (IP) rights for computer programs. It relied on patents, trade secrets, licensing, and technical measures to protect its programs. Much has changed since then, and today IBM is the single largest contributor to open source community projects overall. It is involved in over 150 open source projects with more than 1000 of its developers contributing to open source projects, and it sponsors industry organisations like Eclipse, Apache and Mozilla ([34], [35]).

Unlike Red Hat, IBM is not a pure play open source company. Hence open source is not its core competence. IBM provides a wide range of services and solutions ranging from IT services, to business consulting services, and outsourcing services. It offers these services to a diverse set of clients in industries that vary from aerospace and defence to healthcare and life sciences, to media and entertainment. The lists of both offerings and clients are extensive. After 10 years of exposure and experience, open source has had a significant impact on the way that IBM carries out its business. The company has engineered a company wide strategy for open source and open standards that benefit both the company and its customers. Therefore this paper does not analyse IBM's business model as it stands but rather the ways in which open source has altered its business model and the ways in which IBM derived value from utilising and engaging in open source software over the years.

The IBM Business Model

The Value Offering

Strategy at IBM can be looked from a software, hardware or services viewpoint, or even a combination of all three. Having a single operating system span across IBM's multiple hardware lines makes things much easier. Any given customer problem can be solved and the solution optimised by choosing the appropriate operating system, middleware, applications and services to tie them all together, if necessary. As such open source increases the options available to IBM and its customers. This strategy is used in various ways by IBM within its products and services offerings [36].

IBM engineers continually contribute to the Linux community as part of their day jobs thus helping to make Linux better for its customers and the industry by addressing requirements such as security, scalability, performance, reliability, file systems, systems management, I/O, serviceability, etc. IBM provides Linux support across all their hardware platforms and software. Furthermore they contribute to the Apache Software Foundation and to the Eclipse project. IBM's early leadership and its ability to cede control to the community allowed these communities to grow, providing IBM the basis for value-added products for software development and information management. For example the Eclipse Rich Client Platform is used as the platform for building Lotus Expeditor and delivering cross-client graphical user interface (GUI) applications such as the Lotus Notes 8 release. The Eclipse Aperi project provides a common open source storage management framework on which future generations of products such as IBM Total Storage Productivity Centre can be built. Thus IBM has an integrated technology services portfolio delivering a broad range of Linux and open source services [37].

Open source has taught IBM how to better collaborate with others outside the company and it has demonstrated that business models can evolve and that a good intellectual property strategy balances both “open” and “closed” paradigms. Through its exposure with open source, IBM discovered that software developed in a non-commercial setting can be of exceptional quality, successful and at the same time meet customer needs. Open source and open standards encouraged open thinking, leading to flexible business models and a realisation that clinging to past practices that might have worked at one point, may not meet customer needs in the present [36].

In its decision to take the open source route, IBM played to its strengths and its endorsement of Linux led to key strategic advantages beyond those of customer demand. Linux provided it with a common set of APIs across its entire product line, providing a unified architecture for software developers. IBM refocused on targeting its traditional large corporate customers, and the need for support services, a traditional IBM strength, was recognised. Linux also allowed IBM to make changes to improve its hardware differentiation for enterprise customers [38].

The Market

Due to the vast nature of IBM's business, it is no surprise that it faces a number of competitors in various sectors. At the same time and similarly to Red Hat, it is not uncommon for IBM to form alliances or partnerships with these very same competitors. Some of the big competitors of IBM include Microsoft, Novell, Sun, Hewlett-Packard, JBoss, and Oracle amongst others. It even occurs that IBM products compete with other IBM products.

During the 1990s, IBM's proprietary strategy began to falter and it faced serious competitive pressure from Microsoft. The situation was made even more precarious after collaboration with Microsoft on OS/2 unravelled when they released Windows 3.0 destroying IBM's plans for OS/2 to replace DOS ([39], [49]). CEO during the time, Louis Gerstner, set about to change IBM's business models and internal culture to create a more customer-centric business environment. Catering to customer needs became IBM's vision for its present and future. IBM discovered that customers want a sustainable and reliable software ecosystem, open standards, interoperability, and customisation tailored to their needs [39]. IBM placed an increasing emphasis on the sale of software and services, winning business based on its unmatched ability to offer a complete end-to-end “turnkey” solution. In adopting a “patronage strategy”, which involves contributing resources to open source projects, IBM embraces and extends open source software with refinements that may help them pursue new markets or position themselves against competitors more effectively [17].

IBM's first open source spin out came from a pre-production Research and Development project beginning in early 1996. Two IBM researchers developed a prototype Java compiler that was more efficient than Sun's industry standard compiler. Ceding to

customer requests for a better compiler, IBM released Jikes as open source to allow external programmers to extend and improve the compiler. Jikes has since been widely adopted and is now bundled with several Linux distributions [40]. In addition to fostering a better understanding and appreciation for open source software within IBM [41], the release of Jikes assisted in promoting the use of Java, widely embraced by firms competing with Microsoft in web-based technologies. Widespread adoption of Java enabled IBM to generate revenue from sales of hardware and supporting services [40].

The Apache Web Server has become a de facto standard and IBM has led numerous projects in the Web services area to develop the business. Its involvement with Apache started in 1998. After abandoning its own internally developed web server and failing to negotiate with Netscape over licensing for its proprietary server, IBM adopted the Internet's most popular web server, namely Apache. The web server was central to its plans for its WebSphere product family, and by helping to fund Apache so that it would meet its specific needs, IBM set a pattern for its future collaboration in sponsorship of open source efforts [38]. In addition, by adopting Apache, IBM prevented monopolisation of the web server market by Microsoft, which was at the time steadily gaining share on Apache's 50% share of the server market. Apache continued to accelerate in popularity and by 2004 gained 70% of the web server market [17]. Today it holds 52 % of the share and continues to hold a 30-40% lead over Microsoft [42].

The WebSphere product indirectly led to IBM's 2001 formation of Eclipse, an open source development framework used for writing software. In 1996 IBM acquired Object Technology International (OTI) that created tools for its WebSphere application server product. After investing a further $40 million in refinements to the tools, IBM granted the source code to the Eclipse Foundation. As of late 2005, Eclipse had acquired 20-30% of the integrated development environment (IDE) market, continuing to grow primarily at the expense of incumbent commercial products. Other companies involved in web development including Borland, Suse, Red Hat, SAP, HP, Fujitsu and Intel have also joined the Eclipse foundation. The membership of these former competitors has increased expectations that the Eclipse platform will become a dominant standard ([38]; [40], [43]). IBM effectively rearranged the IDE landscape, levelling the field for IBM across a large development community. The commoditisation of the framework has enabled IBM to add value higher up in development tool chain and the popularity of Eclipse has opened up potential further streams of revenue [17].

Initially, IBM faced a dilemma of how to adopt an open source strategy suitable for its core competencies and resources. It sought to maintain control of its proprietary operating system and other technologies, in part to assure that it would continue to evolve and remain competitive. It also had specific concerns about aiding rivals and a historic aversion to sharing profits with others in their value chain. By taking a hybrid approach and retaining the software that enabled it to serve its markets as proprietary and unique to their respective platforms, the firm was able to retain at least some differentiation relative to both proprietary and open source competitors [38].

The Revenue Logic

The benefits associated with sponsorship of open source software includes: the establishment of the technology as a de facto standard, which at a minimum reduces the likelihood of having to re-implement the technology to conform to competing standards; attracting improvements and complimentary contributions that make the technology more attractive, enabling the sale of related products; and the generation of mindshare and goodwill with potential customers of these related products [40].

IBM, years ago, adopted open source as a central element to how it develops and deploys software. This is an important element of its customer centric business model, aimed at providing the most ideal solution to the customer. The integration of the pieces becomes more important than any one piece. This has resulted in every aspect of IBM's business leveraging open source in some shape or form. This was not always the case. In the early days of open source at IBM it was as unknown to the majority of IBM's internal teams as it was to customers, with responsibility over all open source matters assigned to a specific team or person. Through the years the situation has changed with open source strategies and decisions integrated across almost every line of business at IBM, so much so that in certain cases a division may find itself aligned with an open source product that competes with one of IBM's traditional software products [37].

Open source contributes to IBM's profits in two important ways. Since it is less expensive upfront than proprietary software it potentially lowers the cost a customer pays for IBM's computer applications and services. Additionally it provides a common platform on top of which IBM can build and sell special applications [39]. As Khongwir [35] states: “Open source can help accelerate open standards, and together they enable integration and flexibility, benefit customers and business partners and avoid vendor lock-in. Today, customers using supercomputers, to gaming, to mobile phones all benefit from the low cost of ownership, security, and reliability of Linux and open source software running on IBM hardware and server platforms.”

In a competitive market IBM does not stand to make an additional profit by having separate products and thus the total price that IBM can charge for a given system is based upon the capacity and reliability of the entire system. Therefore IBM has an interest in having a better system available, but is not concerned with how the system is improved other than that the cost of doing so be minimised. IBM recognised that rather than maintaining its own software, it could adopt open source software and provide the improvements needed in that product. IBM finds it more profitable to turn the improvements into part of the project than to keep and maintain its own derivative. “IBM is not bearing the entire cost of providing the quasi-public good, but the marginal benefit to IBM of contributing to the good is greater than the cost to IBM developing its own product” [44].

Future Ambitions

The Open Source Steering Committee, OSSC, is responsible for IBM's strategic policy supporting open source utilisation and direction. It is comprised of IBM executives responsible for overseeing IBM's engagement in Open Source Software (OSS) activities and providing guidance on more complex open source matters within IBM.

Apart from its focus on cloud and real-time computing, IBM is focussing on four other strategic areas for Linux growth: Project Big Green, business-critical workloads for Linux, expansion of mid-market opportunities, and Linux on the Desktop.

IBM is itself a showcase for server consolidation and reduction with Project Big Green. The 3 year worldwide plan, which started in 2006, aims to cut 8,900 servers to 3,900 on 30 IBM System mainframes running RHEL or Novell SUSE Linux Enterprise. When complete, the project is expected to reduce energy costs by 80% and achieve an 85% space reduction [45]. Furthermore as Linux adoption has moved from the edge of the network to mission-critical applications, business-critical workloads, such as enterprise resource planning applications, have become a growth area for IBM [45].

Given smaller IT departments and less in-house expertise, the small and medium-sized (SMB) market has lagged compared with large enterprises' Linux adoption. IBM has thus partnered with independent software vendors to offer the Linux OS and middleware software appliance packages installed by USB drive. Earlier this year, IBM also acquired Net Integration Technologies Inc., which sells a server together with all the basic business applications needed to run a small company [45].

IBM has partnered with Red Hat, Novell and Ubuntu, to enable IBM Lotus groupware products to run on the Linux desktop distributions. The company hopes that integration between Linux and Microsoft desktops and the proliferation of client computing devices will accelerate adoption of the Linux desktop [46].

IBM's open source strategic goals are therefore to utilise software technology by harnessing and fuelling the energy of Open Source communities, for example, through the Eclipse Rich Client Platform, Xen virtualisation, and the Open Healthcare Framework. It has positioned itself as a strategic player in Open Source communities, as a contributor, a consumer of technology and by capturing, focusing and translating Open Source innovation into value for their customers [35].

Findings

IBM's business model regarding open source includes a number of aspects from the prescribed business models described earlier. While most closely associated with Koenig's (2004) patronage strategy, it also combines Hecker's [3] Loss Leader and Widget Frosting models, [17] Optimisation and Consultation strategies, and Daffara's [4] Product Specialist, Platform Providers, and Selection/Consulting Companies.

IBM adopted open source in such a way that it enabled the company to play to its strengths. By adopting a hybrid approach, IBM was able to leverage the advantages afforded by open source whilst still maintaining a hold on those technologies that provided it with a competitive advantage. IBM did not seek to control those technologies that it released as open source code, and in ceding control to the wider open source community, IBM displayed its understanding of the importance of the FLOSS community. This ensured that the projects it was involved in received adequate support and enhancements from the community. IBM has shown that sharing the development efforts and cost of software amongst the open source community can prove more commercially viable than keeping the development in-house, affording them the opportunity to focus on the value-added parts of the software solution.

A further benefit gained by IBM's releasing selected software as open source is the commoditisation of specific markets, allowing IBM to build value higher up in the technology stack. This commoditisation has also driven IBM's competitors' competing proprietary products out of the market, thus allowing IBM to gain greater market share with a specific product. IBM has leveraged open standards and open source to enable better integration, more flexibility and collaboration and to prevent lock-in. All of these translate into better service for IBM's customers, and that remains the true distinguishing element of IBM's business success.

One of the key contributions to IBM’s success was in making FLOSS a de facto policy throughout its organisation and providing the internal support necessary for this endeavour. By inculcating a FLOSS culture within the organisation, IBM gained an understanding that assisted it in providing more optimised solutions to its' customers.

CONCLUSION

Innovation is vital to competitiveness and economic growth. It is about bringing new ideas to the market place and finding new ways to do things which goes beyond invention, and encompasses the creative application of technologies, knowledge, processes and ideas to some useful purpose. In technology driven industries, and with products freely available and limited protection, as in the case of FLOSS, the primary source of value for the firm shifts from product innovation to business innovation, where companies which succeed focus on the whole picture. This approach enables base-process innovation, marketing innovation, styling/packaging innovation and human factors innovation [18].

Properly crafted business models have great power and can serve as an essential strategic tool for a firm. The analysis in this paper concludes that while the business model is key, it is the manner in which a firm can reshape and align its business models to its environment and circumstances that ultimately guarantees success. Chesborough & Rosenbloom [15] note that the process of reshaping an initial business model creates opportunities to discover new mappings between technical potential and economic value, and that these novel mappings may contribute significantly to success.

In this paper, the business models of two highly successful technology companies were analysed. A framework previously developed by the authors [8] was used to evaluate how the incorporation of FLOSS strategies into their business models was vital to the survival and ultimate thriving of the organisations.

It was shown that the key to their success was investing resources into the open source development community, while using this foundation to build stable, reliable and integrated solutions that were attractive to enterprise customers. By being the link between the open source community and the final consumers, they showed that innovation and flexibility are the pillars upon which their organisational strategies are built. The main issue here is the maintenance and enhancement of stakeholder relationships with both the open source community and their myriad of customers. This included financial support of open source

projects, educating consumers on service agreements and leveraging their resources to build value-added services and support. Also important is the distribution of the open source philosophy throughout their organisations. In this manner, singular, holistic open source solutions were developed that could be used across their operation lines, decreasing their cost and thus increasing their profit margin.

The integration of FLOSS into a business thus requires an understanding of the FLOSS community and the particular needs of the business. Business models must be adapted by making FLOSS a fundamental part of the model and ensuring that the questions: How FLOSS will be used? (value offering); How will FLOSS impact the other business elements? (the market); How will FLOSS be implemented in the organisation, what will it cost and who will be responsible for maintaining it? (the revenue logic) and How will FLOSS be used and maintained in the future? (future implications); are asked and answered. The framework, analysis and case studies in this paper provide a basis from which innovative firms can begin to adapt their business models and evaluate the impact of FLOSS adoption within their business.

REFERENCES

Lee, D. and Mendelson, H. 2008. Divide and Conquer: Competing with Free Technology Under Network Effects. Production and Operations Management, 17(1):12-28.

Lee, J.A. 2006. Government Policy toward Open Source Software: The Puzzles of Neutrality and Competition, Knowledge, Technology & Policy, 18(4):113-141.

Hecker, F. 1999. Setting Up Shop: The Business of Open-Source Software, IEEE Software, 16(1):45-51.

Daffara, C. 2007. Business models in FLOSS-based software companies, Workshop presentation at the 3rd Conference on Open Source Systems (OSS 2007), Available at http://opensource.mit.edu/papers/OSSEMP07-daffara.pdf, Accessed November 2008.

Onetti, A. and Capobianco, F. 2005. Open Source and Business Model Innovation. The Funambol case, In Proc. of the First International Conference on Open Source Systems, Genova, 11th - 15th July, 224-227.

Krishnamurthy, S. 2003. An Analysis of Open Source Business Models, Perspectives on Free and Open Source Software, MIT Press, Cambridge, 279-296.

Weber, S. 2004. Why Open Source Works, Ubiquity, 5(11).

Munga, N. and Fogwill, T.A. 2009. Analysis of the value that open source contributes to business models. In Proc. IST-Africa 2009, Kampala, Uganda, 6 - 8 May 2009.

Rajala, R. Rossi, M. and Tuunainen, V.K. 2003 A Framework for Analysing Software Business Models, In Procc of the ECIS 2003, Conference on Information Systems - New Paradigms in Organizations, Markets and Society, June 18-22, Naples, Italy.

Morris, M., Schindehutte, M. and Allen, J. 2005. The entrepreneurs business model: toward a unified perspective, Journal of Business Research, 58:725-735.

Shafer, S.M., Smith, J.H. and Linder J.C. 2005. The Power of business models, Business Horizons, 48(3):199-207.

Keen, P. and Qureshi, S. 2006. Organizational Transformation through Business Models: A Framework for Business Model Design, In Procc of the 39th Annual Hawaii International Conference on System Sciences, 2006.

Makinen, S. and Seppanen, M. 2007. Assessing business model concepts with taxonomical research criteria, Management Research News, 30(10):735-748.

Wu, Y.C. 2002. A competitive analysis of business models in e-commerce, Engineering Management Conference, IEEE International, 2: 848- 853.

Chesborough, H. and Rosenbloom, R.S. 2002. The role of the business model in capturing value from innovation: evidence from Xerox Corporations technology spin-off companies, Industrial and Corporate Change, 11(3): 529-555.

Rappa, M.A. 2003. The utility business model and the future of computing services, IBM Systems Journal, 43(1):32-42.

Koenig, J. 2004.Open Source Business Strategies, Riseforth, Inc.

Pykalainen, T.T. 2007. Model for profiting from software innovations in the new era in computing, Technovation, 27(4):179-193.

Young, R. 1999. Giving it Away: How Red Hat Stumbled Across a New Economic Model and Helped Improve an Industry, OpenSources, Voices from the Open Source Revolution, O'Reilly.

Mahmud, S. 2007. Red Hat enters the patent ring. Managing Intellectual Property, 167:32-37. Business Source Premier; Available at http://www.managingip.com/Article/1254108/Red-Hat-enters-the-patent-ring.html; Accessed November 2008.

Hemphill, T.A. 2006. A Taxonomy of Closed and Open Source Software Industry Business Models, International Journal of Innovation & Technology Management, 3(1):61-82.

LXF. 2008. Red Hat in the black to the tune of $500 million, Linux Format Magazine, Issue 106, May 2008.

Red Hat. 2007. Annual Report 2007, Available at http://investors.redhat.com/phoenix.zhtml?c=67156&p=irol-reportsannual; Accessed December 2008.

Shankland, S. 2008. Red Hat's new CEO aims Linux at the cloud, CNET News; Available at http://news.cnet.com/8301-1001_3-10002150-92.html; Accessed December 2008.

Shankland, S. 2007. Red Hat to get new CEO from Delta Airlines, CNET News; Available at http://news.cnet.com/8301-13580_3-9837018-39.html; Accessed December 2008.

Assay, M. 2008. Red Hat CEO: The secret to open-source success is iteration, The Open Road, CNET News; http://news.cnet.com/8301-13505_3-10058670-16.html; Accessed December 2008.

Hamm, S. 2007. Red Hat Launches Open-Source Exchange, Business Week Online; http://www.businessweek.com/technology/content/mar2007/tc20070314_617979.htm?chan=top+news_top+news+index_businessweek+exclusives; Accessed November 2008.

Assay, M. 2008. The effects of open source on stock prices, The Open Road, CNET News; http://news.cnet.com/8301-13505_3-9895316-16.html; Accessed December 2008.

Assay, M. 2008. Some intriguing data behind Red Hat's 29 percent growth, The Open Road, CNET News; http://news.cnet.com/8301-13505_3-10050186-16.html; Accessed December 2008.

Babcock, C. 2008. Open Source for Sale, Information Week, Sep 1, 2008; 1200; ABI/INFORM Global; 25-30.

Montalbano, E. 2008. Red Hat looks to mainstream markets for growth, Computerworld; http://www.computerworld.com/action/article.do?command=viewArticleBasic&articleId=9116541; Accessed January 2009.

Haff, G. 2008. The waning of pure play open source, CNET News; http://news.cnet.com/8301-13556_3-10110383-61.html; Accessed December 2008.

IBM. 2004. Annual Report 2004; Available at http://www.ibm.com/annualreport/2004/index.shtml; Accessed December 2008.

Jollans, A. 2008. Integrating Open Source into Your Business, IBM Software Group; http://eliberatica.ro/2008/keynotes/eLiberatica-2008-Adam-Jollans-IBM-Integrating-Open-Source-into-Your-Business.pdf; Accessed December 2008.

Khongwir, G. 2008. Open Source a successful business model ", CIOL Online; http://www.ciol.com/Open-Source/Interviews/Open-Source-a-successful-business-model/10908110120/0/; Accessed December 2008.

Rueker, S. 2007. The LXer Interview: Bob Sutor of IBM, LXer Linux News; http://lxer.com/module/newswire/view/89812/; Accessed December 2008.

Assay, M. 2007. Open source @ IBM: Savio Rodrigues speaks out, The Open Road, CNET News; http://news.cnet.com/8301-13505_3-9742169-16.html; Accessed December 2008.

West, J. 2003. How Open is Open Enough? Melding Proprietary and Open Source Platform Strategies, Research Policy, 32:1259-1285.

Samuelson, P. 2006. IBM's Pragmatic Embrace of Open Source, Communications of the ACM, 49(10):21-25.

West, J. and Gallagher, S. 2006. Challenges of open innovation: the paradox of firm investment in open-source software, R&D Management, 36(3):319-331.

Capek, P., Frank, S., Gerdt, S. and Shields, D. 2005. A history of IBM's open-source involvement and strategy, IBM Systems Journal, 44(2):249-257.

Netcraft, 2009. January 2009 Web Server Survey; http://news.netcraft.com/archives/web_server_survey.html; Accessed December 2008.

Brydon, M. and Vining, A. 2008. Adoption, Improvement, and Disruption: Predicting the Impact of Open Source Applications in Enterprise Software Markets, Journal of Database Management, 19(2):73-94.

Hawkins, R.E. 2004. The economics of open source software for a competitive firm, Why give it away for free?, Netnomics, 6:103-117.

Derringer, P. 2008. IBM nears a decade of Linux and open source, Enterprise Linux News; http://searchenterpriselinux.techtarget.com/news/article/0,289142,sid39_gci1322052,00.html; Accessed December 2008.

Derringer, P. 2008. IBM furthers the Linux cause with server, desktop moves, Enterprise Linux News; http://searchenterpriselinux.techtarget.com/news/article/0,289142,sid39_gci1324370,00.html; Accessed December 2008.

Red Hat Inc. 2009. Statement of Position and Our Promise on Software Patents, Available at http://www.redhat.com/legal/patent_policy.html; Accessed August 2009.

Modine, A. 2009. Red Hat patent app sparks open source lockdown fears 'Defensive' patent or IP minefield?, The Register; http://www.theregister.co.uk/2009/03/16/red_hat_patent_app_dynamic_routing/; Accessed August 2009.

Ketelhohn, W. 1998. What is a key success factor?, European Management Journal, 16(3):335-340.