SOFTWARE INNOVATION

for fun, profit and the common good - An insight into open source initiatives at BT

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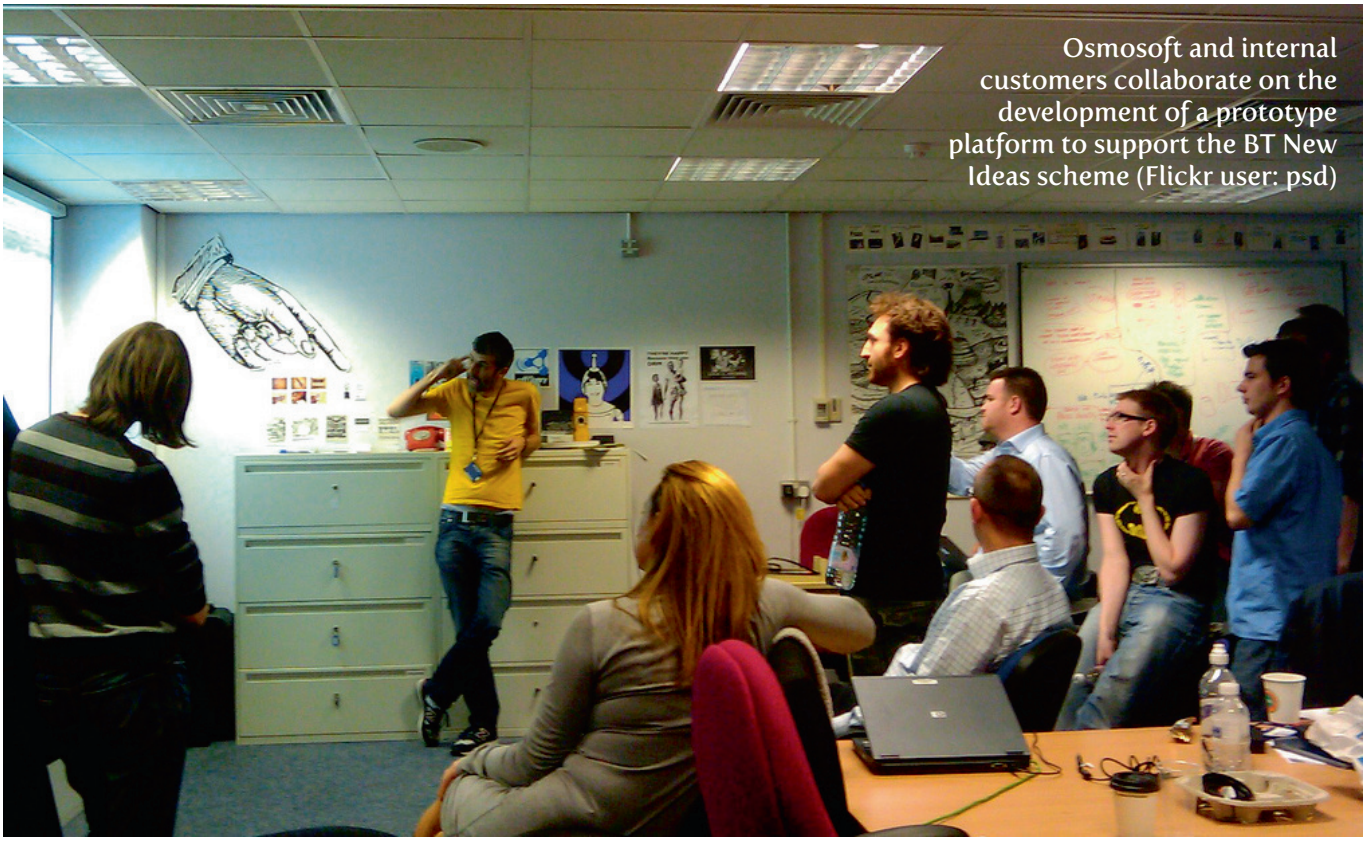

Osmosoft and internal customers collaborate on the development of a prototype platform to support the BT New Ideas scheme (Flickr user: psd)

Sustained innovation is a key goal for many large organisations. With software this is no longer the reserve of companies with substantial research and development budgets. A great deal of software innovation now takes place at a grass-roots level employing open source licensing so as to encourage reuse, modification and further improvement by third parties. As an organisation that is effecting a transformation from a telecommunications operator to a global software-driven services company, it should come as no surprise that BT has made a significant commitment to working with open source software.

Where proprietary software is typically licensed so as to explicitly restrict usage and to obscure its inner workings, open source software is liberally licensed in order to enable the study of its source code and to encourage reuse, sharing, modification, improvement and the creation of derivative works. Whilst at first such free and unimpeded availability might appear to suggest that it would preclude open source software from supporting commercial enterprise, this could not be further from the truth. In 2007 spending associated with the Linux ecosystem alone totalled $21 billion [1].

Up until relatively recently enterprises have been faced with two options when it came to software procurement: build or buy. If it is a fairly common problem that you are trying to solve, the chances are that a commercial, off-the-shelf (COTS) solution is available and that there is little benefit to be had from building your own. However, if it is a niche

An informal information sharing session for the TiddlyWeb server-side (Flickr user: psd)

problem it is possible that no COTS software exists, or alternatively, that a competitive advantage may be had from engineering your own solution. The decision as to which of these two routes to take is, more often than not, easily arrived upon as the pros and cons to both approaches have become reasonably well understood.

The advent of the availability of enterprise-ready open source software solutions and associated services have now provided a third major option: utilisation of open source software. However, with this new third route comes a myriad of other considerations, such as whether to self-support or contract out support, and whether to assume risk or seek to offload this to a third party. At one end of the scale, enterprises may consume open source software as they do proprietary software - from a vendor and with various contractual assurances - albeit with the added benefit of access to source code. At the other end of the scale they may choose to participate directly in the communities that create the software and to contribute to its development, and to support their own use and to carry any associated risk themselves. Enterprises must update their understanding.

OPPORTUNITY

In support of its transformation to a software-driven services organisation, BT has naturally put software at the very heart of its operations and, to date, this strategy has been most visibly evidenced through the substantial investment made in 21CN – its software-driven customer network [2].

As software becomes ever more critical to the ability of enterprises to meet and exceed customer expectations, they must relentlessly strive to innovate in this space, not only in terms of technology but in terms of how it is delivered and, crucially, whilst keeping in mind how it will enable their customers to deliver. BT has positioned its network as a platform and the success of the business will increasingly be underpinned by its ability to enable its customers to themselves deliver services that are built upon this platform.

As software usage increases, costs will need to be kept under control and new levels of efficiency will be required. Virtualised infrastructure, prevention of system proliferation, a carefully controlled architecture, common, shared capabilities and a commitment to reuse will all contribute to this goal.

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Open source software presents organisations, such as BT, with many significant and frequently unique opportunities that are relevant to their objectives, for example to:

- shrink their operating cost base through a reduction in software licensing expenditure;
- drive down exit costs through reduction or elimination of vendor lock-in;
- foster reuse and reduce integration costs through utilisation of open technologies;
- enable reduction in delivery cycle time and increase in right-first-time, through supporting aggressive reuse, as measured by the customer;
- be able to move fast to take advantage of cutting-edge developments;
- enable them to recruit the best talent from the global software development community;
- influence the development of standards that are implementation-led;
- position key capabilities as platforms through the creation of open source software development kits (SDKs) that drive consumption of services and act as an enabler for innovation at the edges.

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However, as previously noted, with the decision to use open source software comes a host of secondary considerations. Furthermore, a passive approach to the adoption of open source technologies leads to diminished returns, whilst many higher value benefits require sustained engagement with the communities responsible for developing open source software along with a commitment to the adoption of their principles.

CHALLENGES

As of late 2006 BT, like most enterprises, had no formal strategy for open source. Whilst open source software was employed extensively both directly and indirectly – integrated in-house and as part of vendor supplied solutions - across the organisation, no open source-specific policy, process or top-level strategic approach existed. Numerous grass-roots open source focus groups and special interest groups were spread across the organisation but, whilst

***Figure 3**: Simon McManus presents TiddlyDocs at a public event hosted by The Team (Flickr user: psd)*

these served a useful purpose, they did not address matters such as company policy and overall strategy for the area. They served the needs of communities of interest and even engaged in significant advocacy efforts, such as organising conferences, but they relied upon the goodwill of employees who were contributing on a best-endeavours basis.

In order for BT to unlock the inherent potential in open source, it would require a commitment to be made at a senior level within the organisation, and the development of, not only policy and process to support the consumption of open source software, but an approach to support participation in the communities that are engaged in its production. And for this to be sustainable and to provide sufficient return on investment it would be necessary to architect a delivery model that met or exceeded the requirements of the customer whilst providing value to a wider community.

OSMOSOFT

On 21 May 2007 BT acquired a small open source software development company named Osmosoft [3]. In doing so BT gained one new member of staff, no material assets or customers, and, just prior to the acquisition, there had been a transfer of the entire Osmosoft intellectual property (IP) portfolio to a third party – the UnaMesa Association [4] - in which it held no interest. Furthermore, there was no expectation that this acquisition would directly lead to either new revenue streams or customers.

On first impression the acquisition may appear to have been a poor deal for BT. However, it served as a shrewd move that has led to the development of a clear strategy for the adoption of open source technology and principles and has provided it with the means to achieve associated objectives.

It signalled intent within the organisation and put open source firmly on the agenda and, in the Osmosoft managing director, BT gained a head of open source innovation that has a track record in running a successful open source project: the web-based, client-side wiki platform TiddlyWiki [5]. The acquisition was driven by a senior management belief that, in order to develop an effective approach to open source, BT must learn by example and that the study of open source software and communities as abstract entities would be wholly insufficient.

Over the year that followed the group was built up from one person to twelve people through both internal and external recruitment It essentially operated as a start-up and was purposely positioned somewhat on the periphery of mainstream BT. During this period it refined its focus and core technology architecture and established its operating principles, development infrastructure, delivery model and business support framework.

Focus

Osmosoft is positioned as BT Innovate and Design's [6] open source innovation capability and, due in part to both its small size and principle area of expertise, remains tightly focused on web-based collaboration platforms that are built upon the TiddlyWiki family of technologies. It is felt that this problem domain offers an excellent opportunity to investigate a new model for the delivery

The TiddlyWiki and TiddlyWeb technologies

"TiddlyWiki is a single html file which has all the characteristics of a wiki - including all of the content, the functionality (including editing, saving, tagging and searching) and the style sheet. Because it is a single file, it is very portable - you can email it, put it on a web server or share it via a USB stick." [5]

TiddlyWiki is programmed in JavaScript and runs entirely in the web browser, thus has the simplest of hosting requirements and works just as well off-line and without any server infrastructure. Code, configuration and data are all stored in the same, single html file which is updated on saving. Portability aside, this has the benefit of lowering the barrier to developer access as the source code can be viewed from within the browser and easily modified and extended via simple text editors such as Notepad and vi. These properties, coupled with an architecture that encourages adaptation and extension, have led to an extremely rich ecosystem of third party 'vertical editions' and plug-ins, e.g. versions tailored to specific use cases and adapters to support importing data from other applications.

TiddlyWeb is a server-side platform that may be used independently of TiddlyWiki and that provides the capability for storing and presenting data in various forms over Hypertext Transfer Protocol (HTTP) and that has some of the core features of a web application framework. What TiddlyWeb adds when used with TiddlyWiki is: centralisation of content storage, a straightforward system of managing access control, a system for composing functional collections of content and tools for viewing and manipulating content in different forms than those used in the wiki (e.g. JavaScript Object Notation, Atom). Together these capabilities provide a multi-user environment for TiddlyWiki that allows multiple custom views and alternate look and feel and security handling of the same or similar content. [7]

of enterprise software solutions; one where there is minimal exposure to the risks associated with developing the software to support internal systems in the open. Conversely, the group is motivated by the belief that there is much to be gained from open collaboration that is centred upon such problems and that this can prove to be of mutual benefit to all parties involved.

Whilst engaged to address immediate business requirements for enterprise collaboration tools, the long term goal is somewhat more sophisticated. It is concerned with developing a replicable approach to delivering enterprise software solutions that are built upon open source technologies and in a manner that derives sustainability through simultaneously providing value to business stakeholders and external communities.

Principles

The acquisition of Osmosoft acted as a beacon within BT and attracted the attention of engineers with a passion for web development and open source. Beyond simplifying the recruitment process, this has resulted in the creation of a tight-knit team that shares a common set of core values and that is firmly committed to engineering solutions to some of the more difficult enterprise collaboration problems.

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The group aspires to work in as open a manner as possible and, in addition to making its software works available via an open source licence, it employs extensive use of social media such as blogs and Twitter, can be frequently found attending and presenting at open source and technical web community events, and itself hosts public events on a regular basis. It is also involved with initiatives that seek to provide open access to data of a non-sensitive nature and that arguably belongs in the public domain and which, when made freely available, has the potential to lead to the development of applications that serve to foster social progress or simply provide some new or novel function.

Community

Osmosoft is resolutely committed to the TiddlyWiki community and strongly believes that it must remain so in order for it to be able to continue to successfully deliver on behalf of BT customers solutions that are built upon its technology platform. This commitment takes two forms:

- contributions of code and other efforts, e.g. software testing, to the TiddlyWiki core and associated ecosystem;
- financial support of the not-for-profit UnaMesa Association which now owns the copyright to the core technology and, amongst other things, operates the developer community infrastructure.

The TiddlyWiki IP may be considered to be a pre-acquisition of Osmosoft's largest asset and thus the decision to reassign this to a third party, and for no financial gain, appears to be counter-intuitive. However, empirical evidence appears to suggest that the success of an open source project is inversely proportional to the level of controlling interest held by commercial entities. At its simplest, this move may be seen as one motivated by a desire to send a clear signal of intent to the TiddlyWiki community in a bid to retain trust and to mitigate the risk of 'killing the golden goose'.

However, participation is not limited to the TiddlyWiki community. The group is active within a number of other communities; chiefly those that are engaged in the development of web-based collaboration and open web technologies.

Delivery model

Osmosoft's scalable approach to solution delivery is underpinned by clear working principles, a subset of which is as follows:

- Prototype to provide early access to functionality, develop in the open - make use of public source code repositories, bug tracking and collaboration tools – and solicit feedback.
- Seek to reuse pre-existing open source software wherever this is possible and makes sense, e.g. consideration must be paid to both the current state of third-party code and whether it is being actively developed.
- Where new functionality is required, strive to deliver this via generic, reusable components that will find use in solving a wider range of problems. Make this available via an open source licence and provide support for adoption amongst the wider community.
- Utilise closely aligned, reusable components in assembling vertical editions of the technology platform that are tailored to a particular problem domain and that, if not of immediate utility, serve as practical demonstrators.
- Wherever possible limit BT-specific functionality to simple tailoring such as configuration data and user interface templates.
- Strive to lower the barrier to participation through enabling the non-developer to contribute.
- Engage in frequent skills transfer exercises such as 'hack days' hosted at the Osmosoft offices and at customer sites.

Enabling others to deliver is key to Osmosoft's ability to scale to support an increasing number of internal projects without losing the benefits that are associated with being a small, tightly focused group. Rather than operate as a body shop which would need to constantly grow in order to meet increasing demands, it seeks to borrow from the organisation of open source communities and to utilise openness, multi-modal collaboration, working code examples and access to core developers to empower downstream developers in the wider BT.

Adoption is the group's principle measure of success and, by working to foster this inside BT and amongst external communities, it is able to inform and guide its approach to a particular problem, and thus attempt to avoid the pitfalls of an, often unavoidably, inward-looking development organisation.

An example vertical and delivery: TiddlyDocs and MyDocs

Osmosoft were tasked by BT Wholesale with developing a solution to support multi-user document editing that would provide a marked improvement on e-mailing word processing documents back and forth between them and their customers. In response, Osmosoft created the TiddlyDocs [8] vertical through integrating TiddlyWiki, the TiddlyWeb [9] server side and a number of other pre-existing technologies, along with an element of new functionality developed as open source licensed TiddlyWiki plugins. The resulting solution enabled permission-based, collaborative document editing in the web browser, and the subsequent creation of a canonical document at the conclusion of the iterative editing process.

BT Wholesale were provided with early access to a prototype of the vertical and this was frequently updated upon receipt of feedback and as development progressed. Once ready

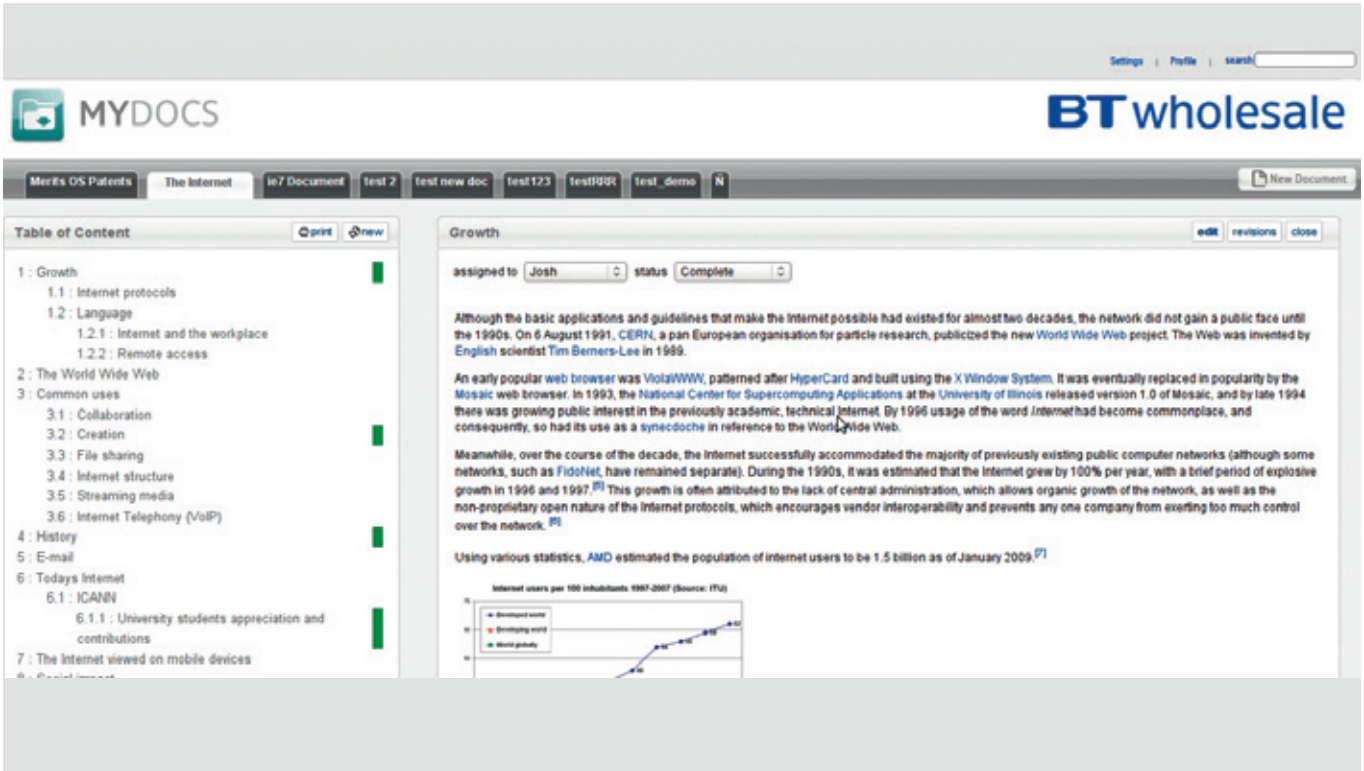

***Figure 4**: Screenshot from a demonstration instance of the BT Wholesale MyDocs tool*

for beta testing with external customers, the TiddlyDocs team worked with BT Wholesale technical staff to create a branded instance named MyDocs and to then support efforts to integrate this with the existing BT Wholesale extranet platform.

The TiddlyDocs application is completely open source, and the difference between this and the MyDocs instance is, excluding the existing extranet platform, almost entirely configuration.

Standards

The development of technology standards is something that, up until relatively recently, has been championed almost exclusively by industry consortia and formal standards organisations. However, standards in an increasing number of technical areas are moving to become implementation-led and a product of agile development culture. In such cases collaboration takes place around source code rather than specifications; an open source reference implementation exists first and may then subsequently lead to codification as a standard. The market drives this process as the adoption of an implementation drives its eventual ratification.

***Figure 5**: Slide from a presentation on Web 2.0 given to the European Telecommunications Standards Institute board by Osmosoft's Paul Downey (Flickr user: psd)*

***Figure 6**: Slide from the presentation 'Standards are Great, but Standardisation is a Really Bad Idea' given at QCon 2009 by Osmosoft's Paul Downey (Flickr user: psd)*

One of the most visible indicators of this shift may be seen in standards that are published by the Internet Engineering Task Force (IETF) that state its mission as being to "...make the Internet work better by producing high quality, relevant technical documents that influence the way people design, use, and manage the Internet" [10]. Many IETF standards are now ubiquitous - such as the Simple Mail Transfer Protocol that is used for Internet E-mail. This may be compared with the International Organisation for Standardisation's X.400-series recommendations for E-mail which, in contrast, are the product of design-by-committee, have suffered poor uptake and find themselves limited to increasingly specialist applications. The relative failure of the X.400-series of recommendations may be attributed to a number of factors although the principle cause is almost certainly that they provided too little, too late.

There are of course a great many other standards that are driven by traditional approaches to standards development and that continue to provide significant value, and thus the approach taken in their development must not be ruled out entirely. However, as the pace of innovation in almost every area of software development continues to increase, so will the value placed on working code, and the market will be unwilling to wait for standards that are a product of design-by-committee and that often provide no working reference implementation.

Members of the Osmosoft team have participated in the development of implementation-led standards, such as the OAuth open protocol for allowing secure Application Programming Interface (API) authorisation [11]. The group continues to take a keen interest in this

increasingly popular approach to standards development, and in particular in consideration of the wider implications for service providers such as BT.

OPEN SOURCE OPERATIONS

BT's Open Source Operations Team (OSOT) came into existence through increasing demand for the use of open source software in in-house integrated solutions. With Osmosoft being purposely on the periphery of the organisation it was not best positioned to address such a demand. Where the latter is engaged to develop a new approach for enterprise software innovation through aggressive adoption of open source, the former exists to make open source-related process business as usual and to remove the obstacles to the wider enterprise adoption of open source.

The principle function of the OSOT is to support open source governance activities such as those associated with operating due diligence process. However, in its naming, operations was chosen over governance in the belief that the role of the function should be much more than simply overseeing the use of open source software. The team provides a service to anyone within BT who requires guidance in connection with open source matters and draws upon a knowledge base that takes into account considerations such as:

- security
- supportability
- company policy
- shared best practice
- community principles
- relevant company strategy
- legal constraints and obligations

The OSOT does not seek to replace or subvert existing internal functions; in contrast it works in concert with them in order to effect appropriate outcomes. For example, where internal projects working with open source software would have previously engaged legal counsel directly, they now engage with the OSOT that in turn seeks the guidance from Legal as and when required. Thus the team is able to provide a more complete service to the project and one that takes into account a wider range of considerations whilst acting as a triage to Legal ensuring that it services are engaged where necessary. Typical due diligence process associated with usage of existing open source software ensures, for example, compliance with the terms of software licences, provision of architectural approval, and appropriate provisions for in-life support are in place.

The team is also responsible for maintaining BT's open source policy and process, and coordinates an open source steering group that consists of stakeholders from across the business, e.g. from Legal, Procurement and Security, etc. Whenever it is required that policy or key process be created or updated, consensus amongst the steering group is sought.

It is important to note that the support services provided are not limited to BT's consumption of open source. The team has successfully guided a number of internal projects through the process of open sourcing a BT invention [12]. For example, a lightweight Session Initiation Protocol server implemented in Java [13] and that was at the heart of the BT Web21C SDK platform (BT's first generation software development kit and services that together enabled third parties to build applications that directly drove its network), and a framework for Spring that facilitates the creation of APIs that adopt the Representational State Transfer paradigm [14].

> "Wherever practical the team seeks to share knowledge and experiences with external agencies in an open manner, so as to not only directly benefit from any knowledge learned this way, but to also visibly demonstrate intent through transparency and to contribute to the development of industry best practice"

Governance communities

Wherever practical the team seeks to share knowledge and experiences with external agencies in an open manner, so as to not only directly benefit from any knowledge learned this way, but to also visibly demonstrate intent through transparency and to contribute to the development of industry best practice. This process is supported through participation in two initiatives: the FOSSBazaar work group of the Linux Foundation [15] and the European Legal Network (ELN) [16].

FOSSBazaar describes itself as "an open community of technology and industry leaders who are collaborating to accelerate adoption of free and open source software in the enterprise". It provides amongst other things guidance to support the implementation of open source governance, discussion forums and blogs from partners that have an involvement in open source governance. Membership of the work group is not required in order to gain access to its resources.

The ELN is coordinated by the Free Software Foundation Europe's Freedom Task Force (FTF), and it is described as "a professional network of legal experts facilitated by the FTF" where "members get to know each other, share information and cooperate to increase the availability of best practice knowledge available in Free Software licensing." Network delegates have collaborated on the production of various materials to support open source governance activities. Some of these have been published via the FOSSBazaar website and others via the International Free and Open Source Software Law Review [17] in print and on-line.

CONCLUSIONS

It might be premature to see Osmosoft's approach to software innovation as a universal success. But initial signs are that it is paying dividends over the alternative of employing a team of the same size which works to a more traditional approach to solution delivery.

The return on investment is not simply limited to successful customer deliveries. Immediate benefits are clearly coming from the sustained, active participation in the global software development community and include opportunities to engage in open thought leadership, the ability to keep skills current, and the unimpeded access to comprehensive peer review and the latest best practice. And longer term benefits that are less easy to calculate, such as reduced exit costs, and intangibles, such as attracting new talent, are likely to accrue.

Much can be achieved through creating a match between the needs of enterprises and those of the communities that are engaged in the development of open source software. There are numerous ways this can happen and it is likely that no single approach will be suited to every situation. Direct community participation offers the promise of greatest return but does not come without its own risks and challenges. In the approach that BT has taken with Osmosoft, the associated risks have been kept to a minimum and the challenges have proved manageable and it is believed that there has already been a significant net return.

BT continues to benefit from a holistic approach to supporting the adoption of open source technology and principles. Effective governance and the positioning of open source within the existing IT organisation is paving the way for the innovation that is now taking place – a direct result of increasing participation as part of the global software development community.

ABBREVIATIONS

API	Application Programming Interface
ATIS	Alliance for Telecommunications Industry Solutions
COTS	Commercial, off-the-shelf
ELN	European Legal Network
FOSS	Free and Open Source Software
FTF	Freedom Task Force
IETF	Internet Engineering Task Force
IP	Intellectual Property
OSOT	Open Source Operations Team
SDK	Software Development Kit
USB	Universal Serial Bus

ABOUT THE AUTHORS

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