TOWARDS A EUROPEAN SOFTWARE STRATEGY

REPORT OF AN INDUSTRY EXPERT GROUP

Working Group 2
"Technology and Business Trends in the Software Industry"

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1. Introduction

The European Commission announced plans to develop a new policy on a "European Software Industry". Following a workshop with stakeholders on January 20 in Brussels, seven working groups have been created that should provide input on various issues for such a strategy.

Working Group 2 is supposed to address "Technology and Business Trends in the Software Industry". Indeed, any European Software Strategy should take into account technology and business trends that affect and drive the software industry. A thorough understanding of the technology and business drivers is essential for the creation of a sound policy to foster both the development of a strong European software industry and the uptake of software by European business and consumers.

The report of WG 2 contains four main sections: Sections 1 provides a comprehensive analysis of the global technology and business trends in the software industry. We added trends in regulation and industrial policy that increasingly impacts software vendors. Section 2 then addresses the future market structure in the software industry, especially as a consequence of the technology and business trends that were described in Section 1. Section 3 looks into the challenges and opportunities for the European software industry that arise from the technology and business trends and the emerging market structure of the sector. Finally, in section 4 we have developed a set of recommendations on the role of EU policy-makers in this changing environment.

WG 2 has coordinated its activities with other working groups, in particular with WG 1 "Future Internet", WG 3 "IPR, Standards and Interoperability" and WG 7 "Open Source Software", to avoid overlaps and duplication of work. Both WG 1 and WG 2 obviously deal with technology and business trends. WG 2 though focused on how technology and business trends affect the market structure and the business models in the software industry. WG 1 on the other hand identified new growths opportunities that arise from those technology and business trends. On IPR, Standards and Interoperability: WG 2 has identified technology and business drivers that lead to an increasing need for interoperability in the software industry. We left it to WG 3 to elaborate how interoperability can actually be achieved. Finally, OSS is certainly a business trend in the software sector. Hence, it could not be ignored by WG 2. However, we left it to WG 7 and other working groups to address the specific issues that are related to OSS.

It should be noted that the member of WG 2 reached consensus on almost all technology and business trends and the related issues. However, while all members of WG2 do acknowledge the need for open standards to enhance interoperability in the sector, we could not agree on a common definition of open standards. Annex 1 contains the different definitions of open standards that have been proposed during the discussion.

2. Technology/Business Trends in the Software Industry

The software industry has rarely been in such a period of deep and speedy change. New technologies and business models are being introduced to the market almost on a daily basis. This section provides a comprehensive analysis of the shift in costumer demand and new technologies that actually has and will change business, distribution and development models in the software industry.

2.1 Shift in customer demand

Globalization
The world is flat – The trend towards globalization has lead economies to become increasingly interrelated. Companies operate in a similar manner throughout the world, and citizens seek to transcend nationality and location as the key determinants in their social and business transactions. In short, geographical and "national" barriers are reducing, changing the influence of a given Individual, Company or State and challenging the business models applied to Industries and Economies. Software vendors need to respond to demand and will no doubt undergo multiple business model transformations to facilitate the requirements of increasingly globalized customers.

Faster Time to Value – Capex to Opex – New Market Expectations
Companies of all sizes are seeing increasing competitive pressures, customer demands and rapid shifts in the market – particularly as they move to join business networks. In addition, businesses are becoming more global (virtual) and realize that speed and flexibility will drive profit and competitive differentiation.

While the market demands flexibility, CIO's face challenges to keep up. Shrinking or static IT budgets can be overwhelmed by increasing demands from the business. In fact, Gartner's research has shown that approximately 66% of IT budgets are used just to keep existing infrastructure and applications running (Source: Gartner, November 2008). With the remaining budget, CIOs are challenged to innovate quickly and adapt to this "do more with less" challenge.

To address the need for flexibility and fiscal responsibility, companies are revisiting the traditional "buy" (Capex) vs. "rent" (Opex) IT tradeoff. In prior years, the "buy" vs. "rent" equation would be run on real estate and machinery, the Internet is now enabling the equation to be run for IT.

"Scalable IT" is now not just a hype – it's a service where users access the necessary compute power or application for a specific job. Amazon.com is a perfect example of delivering compute power on demand. The adoption of these service oriented models (vs. a software oriented model) allows companies to

scale when needed (for instance at the end of a month for payroll) consume the "service" and then scale back down. The flexible, service based consumption model puts less strain on the business by minimizing capital expenditures and truly operationalizing costs which could be charged to a particular cost center.

The shift to Opex has significant business model implications for traditional software companies. Shifting to or introducing a consumption based software model will have a drastic impact on revenue recognition, sales compensation model, and go to market strategy.

IT consumerisation: From product experience to personalized User experience (including services)

The shift to Opex also helps drive an evolution (not a revolution) in the IT buying center by empowering those outside of IT to make software buying decisions. Line of Business (LOB) leaders now can make IT decisions to support their specific goals. LOB users are increasingly tech savvy and looking for business solutions that mirror their consumer experiences. LOB executives are demanding solutions that offer accelerated innovation, rapid deployment, fast time-to-value and low risk, avoiding long IT purchasing and deployment cycles.

The traditional "top down" hierarchy for IT purchases is evolving for a number of reasons. The days of CIO's mandating specifications down to users is turning to a more balanced approach. Typical software salespeople would focus on the CIO but as LOB users gain influence, the role of the CIO as the resident IT authority is being challenged. Through the line of business, end users are now becoming empowered to make buying decisions and driving the influence "up" to the CIO. In fact, Gartner actually predicts that the separation between the business and the IT decision making will disappear sometime in 2009-2010.

In addition to LOB execs, end users are now influencing software buying decisions. With the advent of new software delivery models (ASP, SaaS, BPO) and the requirements for new user experiences, the software market is becoming more consumer oriented, as users demand similar experiences to those on everyday Web sites like Google, eBay and Facebook. This adoption, plus the maturation of generation Y (discussed in the next section) is having a dramatic effect on consumption patterns and user experiences.

Internet developments and the Gen-Y influence (generation shift)

A recent study of a number of Gen-Yers at NASA states, "The traditional concept of top-down, one-way communications strategy is dead." Just that statement says so much. The implications are staggering, not just for Gen-Y, but for the generations preceding them, specifically the Baby Boomers. Gen-Y is now entering the workforce and are expected to represent 1.3bn (38%) of the 3.4bn workers WW (in 2012).

Gen-Y is the first generation raised on the Internet and it is clear that they will have a significant impact the IT market. The development of the Internet as a business medium and the corresponding usage by Gen – Y is expected to impact the enterprise software market across the globe.

For instance, Gen-Yers live on their cell phones. As these workers enter the workforce, their expectations of work will be defined by their work styles, which are significantly different than the beginning to retire baby boomers. User expectations for software will change based on experiences with Web sites and users will demand easy to consume, real-time information, where many legacy applications face challenges. By 2012, aging Gen - Y will have significant decision authority, while Baby Boomers begin their retirement cycle.

Business User
As our industrialised countries moved from an equipment economy to a replacement economy, clients have felt more and more empowered, and from an enterprise point of view thus became volatile and moving targets. In the past decade, innovation and competitive differentiation progressively became strategic, and this key trend was but accelerated by the globalisation that prevents our enterprises to compete on a productivity basis only.

Gaining the agility and innovation capability necessary to serve a volatile, moving target customer in a globalized economy, leads organisations to “fragment” the silo / matrix structures inherited from the past century into more “cellular” models both internally and externally**.**

This “componentisation” of the economic world and subsequently of enterprises entire value chains induces re-architecting the information systems in a much more modular way (known in software development as Service Oriented Architectures / Infrastructures), which impacts the software industry bound to supply the “components” necessary to build the Next Generation Information System and address the needs of the current business networks transformation

Business Users expect to benefit from more flexible and personalized IT environments and subscribed services in an “always connected” mode. Those tools, complementing their business transaction processing systems, will reinforce their ability to interact, collaborate, contribute, decide and adapt to their fast changing environment fusing their professional, social and private lives.

Consumer User
In the consumer market, several specific trends could be observed:

- ‘Conditioned’ by advertising-funded applications and service – consumers expect more and more offerings to be free or near free. The underlying trend is separation of user and payer – ad-funded software service would be a great example of this trend

- Device proliferation. Increasing number of devices consumers interact with on a frequent basis – software in devices becomes more and more important. This also drives increased demands on the network infrastructure – from local (home/apartment) to national and global scope. These demands cover multiple angles – bandwidth requirements, latency expectations, number of devices connected, etc. Increased amount of endpoint-to-endpoint traffic (as opposed to hub-to-endpoint) leads to growing importance of peer-to-peer technologies (hence the need to differentiate at policy level legitimate vs illegal uses of P2P). Explosive growth of computing power available on the network (in form of large number of small devices) leads to interesting opportunities in system-level optimization with increase in efficiency, but also raises all sorts of questions about privacy, security, control of information, etc.

We expect embedded and traditional software to become increasingly interconnected – which raises interesting possibilities to leverage Europe's traditional strength in embedded industry, and opens opportunities to leverage initiative like Artemis in broader software context.

- Growing need to own/control flow information (new media – on-demand consumption, filtering, shrinking audience, etc). The need to provide more and more sophisticated services and offerings to consumer, expectations of being able to search anything, access media in multiple ways, increase context awareness inevitably leads to closer links between media and ICT industry.
- User-generated content – consumers are increasingly able and willing to contribute to creation of content. The need to share content coming from different sources requires increasing levels of interoperability and standards support, and pushes the limits of existing legal frameworks on privacy, information control, data protection.

2.2 Technology Drivers

The group has identified four main technology drivers of Technology/Business Trends in the Software Industry: Service Oriented Architecture (SOA); Cloud Computing; Enterprise 2.0; Semantic Web (NGW).

Service Oriented Architecture (SOA)

SOA is a paradigm, it's an approach to using technology in order to deliver a set of reusable, agile services that can be applied to a multitude of projects from the system that you have in place already. So a service-oriented architecture is simply an systematic approach where you try to expose as many systems as possible as a collection of services that later can be combined or reused, for integration, portal or business process management (BPM) projects.

Service-oriented architectures are poised to transform business by enabling more flexible and agile IT infrastructures. Indeed, it is an essential tool for software vendors to address the complex needs of enterprises and business networks that have become volatile and moving targets in in a globalized economy. The key change agent in this transformation is middleware. Leading companies are gaining operational efficiencies and business agility through adaptable, re-usable business processes and services built on portfolios of open, middleware products that transform their client/server infrastructures into services oriented setups.

Unlike client/server systems—characterized by tangled webs of tightly coupled integrations that are expensive to maintain and update—SOA is based on loosely coupled services whose interface exists independently of the implementation. Services can be built, used and reused based on changing business need, and easily integrated across heterogeneous platforms. Creating such reusable software building blocks—confusingly called services—that can combine with other services to form new business applications, yields cost savings since you do not have to build applications from scratch.

The additional flexibility benefits both customers and vendors. In fact, the technology drivers of SOA based software contributes towards re-outfitting legacy systems across Europe by building interoperability layers on top of them and/or replacing them with state-of-the art, open standards based systems. Most applications (HR, CRM, Financial management, Supply chain), regardless of the industry they are destined to serve (Banking, Communications, Financial Services, Health Sciences, High Technology Insurance, Public Sector, Retail, or Utilities) similarly rely on interoperability. Finally, all layers of technology need to be interoperable. While middleware and service layers are a current focus of standardization, more needs to be done, and government funding of such activities would be a prerequisite to greater SME adoption of, and participation in standards activities, and in the innovation within the European software market as such.

The concept of Service Oriented Architecture is widely understood among business and IT circles and almost everyone agrees with the benefits of SOA. However, the question everyone's asking is how do I get to SOA? In fact, even though most corporations realize the benefits, SOA adoption has been sluggish at best. Why the disconnect? The bottom line is that changes of this magnitude require strategy, and many corporations understandably don't know where to start. As an example of what some vendors are doing, Oracle's Application Integration (AIA) project[1] gives programmers (and customers) a toolkit and a library that leads to manageable, adaptable and upgradeable SOA Integration with less time, lower cost, and minimum risk.[2]

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1 Oracle AIA, see http://www.oracle.com/applications/oracle-application-integration-architecture.html

2 IT as the Strategic Enterprise Business Partner: Building Manageable, Adaptable and Upgradeable SOA Integration with Less Time, Lower Cost, and Minimum Risk, an Oracle White Paper, September 2008, available at: http://www.oracle.com/applications/it-strategic-enterprise-business-partner-white-paper.pdf

Cloud Computing

"Cloud computing" has become the generic term for IT-related services that are used as flexible services. It serves as an umbrella term for the providing of a different set of these services, such as storage, computing power, software development environments and application, combined with service delivery through the Internet to consumers and businesses. Accordingly, cloud offerings today roughly fall into three categories, namely Hardware Clouds, Development Platforms, and Application Delivery Clouds, addressing the different target audiences of service providers, software developers and users. Additional terms for the same distinction are Infrastructure as a Service (IaaS), Platform Service (PaaS), and Software as a Service (SaaS).

The main innovation is that the IT infrastructure no longer lies with the user, meaning that even inexperienced users can access these services. The key feature of all of these ICT service offerings is the breaking up of the previously monolithic ownership and administrative control of the assets at the various layers of the stack and distributing them across multiple separate entities.

Clouds provide major opportunities for new business models by restructuring the value chains in the ICT industry. In addition, cloud computing dramatically changes the dynamics for new service offerings since it considerably lowers the entry barriers for newcomers by shifting from huge initial capital investments to pay-what-you-use business models. The infrastructure demands of the visions for the Internet of Services and the Internet of Things can be met most economically by the cloud computing model. It is especially small, innovative companies who will use cloud computing as a scalable service.

Effective usage of cloud computing could give companies a competitive edge. The uptake of cloud services by end-users has been fairly uniform across the globe. However, adoption by enterprises in Europe lags behind other regions. While a recent Gartner study showed plans for SaaS adoption in practically all enterprises, actual current usage in Europe somewhat lags behind the U.S. by 62% versus 67% and strongly trails the adoption of SaaS in Asia/Pacific at 89%.

Using clouds is more efficient and more flexible than the maintenance of internal IT departments, which may lead to a new wave of outsourcing. Accordingly, the biggest advantage lies in a very low initial barrier to entry for all players (SMEs) and flexible consumption. Furthermore, clouds offer a very affordable provisioning of IT-services. Small businesses, in particular, wanting to launch innovative business ideas would benefit the most from these advantages. Moreover, resource sharing via clouds offers an overall optimizing energy usage.

Reservations about cloud computing derive from concerns about dependability, vulnerability, and lock-in to providers, as well as security-related issues, when

there are no longer true internal systems. There is no uniform service level agreement (SLA), and the third-party cloud providers involved are dealing with sensitive data. Indeed, hardware breakdowns, loss of data, and a critical reduction in performance have occurred in relation to today's cloud computing offers. Therefore, several users are choosing to combine internal IT and cloud computing. In terms of data privacy and jurisdiction, national standards and regulations have resulted in few providers storing regional hardware and, instead, caused a large number of providers to offer users cloud computing across European and American infrastructures. In general, the question that arises is how national privacy and security standards can be ensured in a global cloud environment.

From a European perspective, two issues should be addressed:

Firstly, cloud computing could potentially develop into an essential infrastructure of the information economy, as did roads and electric grids for the classic industrial society, thus creating a deep dependence on the reliability and availability of the supply and freedom of access and balance of power between providers and consumers. Since cloud computing, by its very nature, is global, there are no short-term concerns of any geographic region being at a disadvantage despite the current dominance of US providers. At least low-level interfaces for hardware clouds are reasonably standardized, and there is a healthy level of competition. Still, Europe should strive to also develop hardware cloud infrastructures since this will become a strategic asset in the digital economy. Moreover, Europe needs to be much more active in developing development and application clouds, regardless of underlying hardware infrastructures.

Secondly, Europe should increase the use of cloud computing throughout the economy, in particular by SMEs. We recommend targeted action to foster education about the opportunities and pitfalls of cloud computing and to ensure a regulatory framework around clouds that ensures privacy, dependability, and a fair distribution of power between providers and users.

Finally, it should be stressed that openness, interoperability and collaboration should be the guiding principles for the development of cloud computing, as it has been for the Internet so far. Hence, global standardization efforts should be a key priority in cloud computing.

Enterprise 2.0

Enterprise 2.0 is what happens when Web 2.0 gets down to business. Social networking tools applied in the firm are about to generate an Enterprise 2.0 based on collaboration tools which will significantly affect most IT applications across domains. But does Enterprise 2.0 simply mean using Web 2.0 technologies such as wikis, blogs, mash-ups, and gadgets within the

organization? Dramatic changes are affecting traditional business models across most industries, making the case for a different approach. Competitive advantage today is achieved not through command, control, and operational excellence. Instead, it is realized though collaboration, communication, and management excellence. To the extent Leadership From Below[3], a management perspective based on attitude, not so much positions in a hierarchy, becomes prevalent in tomorrow's business, these trends will accelerate. In the meantime, Enterprise 2.0 is already making its way into business software and is invigorating the feedback process around the tools themselves and the processes they govern.

Web 2.0 technologies will impact the way system services will be accessed and combined to create final applications. Combined with Semantic Web technologies, they will drive the evolution of the Web. The open and collaborative nature of Web 2.0 technologies will enable end users to assemble, disassemble and reassemble applications. They will also enable them to share applications and knowledge with other users (employees) within the company. In the context of Enterprise 2.0, these newly created applications also need to be secure.

The popularity of Web applications such as Facebook (which hosts almost 34 million monthly users) and MySpace (which averages 72 million active monthly visitors) are indicative of a shift in the way people communicate with each other. Social networking applications are becoming the preferred method of communication between not only friends and family, but also between businesses, customers, partners, and markets. In their work environment, digital native managers and professionals expect the same methods of communication. This is because social networking applications have, for the first time, technologically enabled conversational communication on a mass scale.

Organizations know that online communities formed around specific interests could help promote their products and services. However, the public Web has few, and often no, rules of engagement or controls over what is said or how content is presented. This is where Enterprise 2.0 technology differentiates itself from Web 2.0 technology. Because it originates from within the business, users of Enterprise 2.0 technologies begin as known—rather than anonymous—entities with a specific identity or role. After all, they are employees of an organization working toward a common goal: the success of the business.

Andrew McAfee of Harvard Business School defines Enterprise 2.0 as the use of emergent social software platforms within companies or between companies and their partners or customers. One of the most powerful aspects of social networks is the ability to provide nearly instantaneous connections to people that one knows only casually. McAfee refers to this as the value of “allowing knowledge workers to maintain and exploit weak ties.”

However, we could also envison a connection between Web 2.0 and Enterprise 2.0 where feedback flows freely between the two. Hence, the feedback would

[3] See http://www.leadershipfrombelow.com/

benefit new groups, and contribute to new forms of collaboration and insight across organizational and stakeholder boundaries.

Unlike a piecemeal deployment of distinct islands of information or capability, the Enterprise 2.0 platform allows services to be snapped in, turned on, and rolled out without long, expensive integration projects. Most importantly, the platform model means that employees are not required to constantly learn new software products and business processes in order to use the technology.

There are three fundamental capabilities that any rich Enterprise 2.0 platform should incorporate from the outset:

- A centralized information management system that contains both structured and unstructured information
- Native collaboration services
- Enterprise applications that are enabled to participate in the business conversation

In short, Enterprise 2.0 is an integrative business strategy that combines multiple disciplines, technologies, and experiences. It shows that the era of the pure "technology drivers", if it ever existed, is no longer the dominant force of contemporary computing.

The Semantic Web

The Future of the Internet will not only be determined by its technological drivers, but also by the political will to maintain its openness through supporting open standards. The Internet of Services and new collaboration platforms building upon the semantic web will also depend on fragile collaborative efforts at the technology development stage.

Semantic technologies are a body of technologies that (a) support or otherwise natively implement the World Wide Web Consortium's standard metadata formats of RDF (Resource Description Framework) & OWL (Web Ontology Language), (b) leverage modern forms of Artificial Intelligence (AI) technology to perform expert system type behavior, or (c) employ a predominantly model and metadata driven declarative environment that effectively mimics the effects of an autonomic (self-learning) system.

These technologies, collectively referred to as semantic technologies, are important to business leaders because of their ability to create exponential value in reducing costs.

Intelligent internet searches are probably the best example of Semantic Web technology in action. If the semantic web was here, a Google search for yacht racing would yield America's cup results, even without using that search term.

Semantic interoperability is about drawing together data from different sources and relating data to real life objects. The Semantic Web puts HTML data into a machine-readable format, so that computers can aggregate it and understand

these relationships. It accomplishes this task with Extensible Markup Language (XML) and data-language standards such as Resource Description Framework (RDF) and Web Ontology Language (OWL), two World Wide Web Consortium (W3C) standards. These standards and descriptors enable Web developers to add layers of meaning to Web documents, supplying a framework for defining how data is linked and how its intended relationships are expressed.

Metadata management is a key requirement for next-generation enterprise software and semantic technologies are key to metadata management. The adoption of semantic technologies can only happen while driving open standards and delivering a wide range of software products using those technologies. We believe that semantic technologies will see wide adoption in the next few years, but it will require commitment from industry, understanding from end-users, and vision. While there are four typical ways a business could use Semantic Web technology: search, Web services, grid computing, and content management/compliance, many other areas will be ripe for it soon.

Future Networks

The work to migrate to a new internet protocol, i.e. the standard that enables the connection, communication, and data transfer between computing endpoints is essential. IPv6[4], a standard currently being developed by IETF is an important part of the next generation of Internet technology. IPv6 fixes a number of problems in IPv4, such as the limited number of available IPv4 addresses, and is expected to gradually replace IPv4, with the two coexisting for a number of years during a transition period.

Overall,IPv6 will improve the performance of the Internet and it will enable the Internet to be integrated into a wide range of devices and services in our homes, businesses and while on the move. The introduction of IPv6, alongside unrestricted access to broadband, is of great importance. Together they will help to offer citizen's wider access to an advanced Information Society. However, as Vint Cerf, sometimes called the Father of the Internet, has said: "The value of IPv6 can be realized only if the deployment effort is broadly based on a global scale." currently, its penetration is still less than one percent of Internet traffic in any country, so this is going to be a challenge for years to come.

2.3 New Business Models Potential

The shift in consumer demands and new technologies such as SOA , cloud computing and the next generation of the Internet have a profound impact on business models in the software industries as well as the underlying software models. In particular, large software vendors are exploring new business models that combine elements from proprietary and OSS software models as well as

[4] See http://www.ipv6.org/

new distributions and revenue generation schemes.

2.3.1 Business model impact of proprietary and Open Source models

Software models: proprietary or OSS / Free Software

Proprietary software is a software model in which the software remains under control of the proprietor of the software, typically the developing party, and users obtain certain permissions on the software by accepting a licence. Typical conditions include time limitations for the licence, use for a certain purpose, on a certain computer, or by a certain person, as well as payment of royalties to the proprietor for obtaining the licence.

Open Source Software (OSS)[5] represents a software model defined by a high level of user control over the software in combination with far-reaching freedoms to inspect the source code, to study and innovate upon the software. All grants have to be permanent and universal, allowing for rapid incremental innovation in large communities. These benefits have become so associated with the software model that OSS is often misunderstood as a new development or business model itself, which is not accurate.

Development models: single party or co-development

There are various ways of developing software, ranging from development by a single person or organisation using a limited cooperation model, through open co-development as will be described in the next section. While some software models offer advantages for certain development models and are traditionally seen as aligned, e.g. OSS allowing for easy implementation of a co-development issues across international boundaries including individuals and companies of varying sizes, the choices of software model and development model are largely orthogonal. It has become common practice to work with different combinations of software and development models.

Business models: model of revenue generation

Business models are intimately connected to the issue of revenue generation and are largely orthogonal to both the issue of software model and development model choice, although both typically have some influence on the business model. Some sources of revenue are effectively unavailable for one software model or another. For example, the proprietary model provides direct licensing revenue from distribution or usage. This revenue is not available in the same way with the OSS software model, although very similar revenue streams can be implemented through contractual constructions, trademarks and/or certification.

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[5] Common terms for this software model include Free Software (1986), Libre Software (c.a. 1991), Open Source (1998), Free/Open Source Software (FOSS) and Free/Libre/Open Source Software (FLOSS). This paper will use the currently preferred terminology of the European Commission (Open Source Software, or OSS) throughout.

The various business models that can be built on top of the proprietary or the OSS software model overlap to a large extent. Most business models can be built on either software model; custom development, COTS, service based approaches, SAAS, appliances, advertising models can all be based on proprietary or OSS software models, or a combination of the two.

However, the overlap of possible business models is not total. Some business models are tied to one software model or the other and some business models depend on a mix of both models. What can be said is that the rising popularity of OSS has increased the ability for business model innovation, and it is common understanding that new models will emerge in the future.

Impact of software model competition

The competition between the proprietary and OSS software models has led to a heterogeneous ecosystem in which several trends can be observed. Established large companies tend to use OSS components for diversification and to reduce cost in areas which do not determine the differentiator for their business model. For these large players, the trend is toward mixed software model approaches.

For new market entrants the choice of software model is between proprietary, mixed, or fully OSS, a decision intertwined with considerations of development and business model requirements. Some change regarding the direction of software model choices can be observed. Many companies have tended towards OSS, in particular mixed model companies moving to a fully OSS software model to leverage the full benefits of the model for their strategic growth. However, at this juncture a lack of scientific data available from the SME environment prevents any authoritative conclusions regarding the consequences of this.

That specific impact of OSS on business models arises from fast commoditisation of the software, resulting in ubiquity to various sectors. This is one of the reasons the United Nations Conference and Trade and Development (UNCTAD) in its Information Economy Report 2007-2008 highlighted the superiority of OSS in harnessing the benefits of ICT innovation in ICT-enabled sectors for innovation and economic growth in these sectors, which are understood to outweigh the direct growth in the ICT sector especially in economic environments that are characterised by a high SME quota, such as the European Union.

OSS also has benefits for the ability to reuse and recombine software across individual vendors, which can result in lower development costs, faster deployment, and peer reviewed components with fewer bugs. This is helped by the interoperability of licences. Though licences are selected by the individual software projects, economies of scale lead to a consolidated legal environment where more than 80% of all software is made available under five OSS licenses, most of which are compatible and allow recombination.

However, actual realisation of these benefits is dependent upon additional criteria, such as quality of the source code, quality of the documentation, and support for Open Standards. It should be noted that well-developed proprietary software can also meet the latter criteria, giving it a higher potential for the ability to reuse and recombine than sometimes recognised, especially when combined with an offer to license widely. The unique advantage of OSS software in this particular field is the ex-ante permission to reuse and recombine, while proprietary software relies on grant of a licence upon request.

The competition between both software models has generally led to more choice for the users, and had impact on the way in which the proprietary model is being applied. An example for this development is the practice by some vendors to offer providing customers with the full source code of a solution upon discontinuation of service for the particular software. This seeks to emulate some of the advantages of OSS for customers of companies using the proprietary model, and while the effectiveness of this particular offer depends upon the particular terms, the example demonstrates the positive impact that software model competition can provide.

In conclusion, large enterprises seem to leverage the benefits of either software model for their individual business model and combine them quite freely with various development models. From their perspective, the future is mixed. Smaller enterprises tend to focus more on one software model or another, with some mixing applied for particular business model constellations. Overall, there is a wide variety of business models available, and the competition between software models is helping to drive innovation in business models.

2.3.2 Software as A Service (SAAS)

The goal of software was always to provide certain benefits to its user. Traditionally, end-users need to install and operate software on-premises, taking responsibility for operations, maintenance, upgrades, user support. This approach gives end user considerable control and flexibility however comes at a cost.

Software as a Server (SaaS) is a different delivery model, where end user receives the benefits provided by the software without the need to install & operate it. In SaaS the provider of the software takes the responsibility of operating the software on providers' premises, and end-user simply utilises the software over the network. SaaS as a delivery model is actually not new. Mainframe with terminals might not be what comes to mind when you talk about SaaS – but, say, in the case of airline reservation system like Sabre where clients (travel agents & airlines) access the system from remote terminal, it's a perfect example of SaaS delivery model. Over last several years SaaS was almost exclusively associated with browser-based delivery of software – it should be stressed that from technical perspective SaaS is not tied to any particular product or technology.

On-premises and SaaS models are not mutually exclusive – there are multiple examples of mixed model (software plus service, S+S), combining on-premises software and services. Recent example here would be introduction by Google of offline capabilities to GoogleMail – using client-side software to allow user of internet mail in disconnected mode.

Similar to the software model (proprietary or OSS), SaaS is not tied with a particular business model. It's clear that certain business models (subscriptions, pay-as-you-go, usage-based billing) are easier to implement using SaaS as delivery model – but these models are not exclusive to SaaS.

SaaS provides both advantages and disadvantages to end-users. The advantages are well-publicized, and include better clarity of costs, absence or reduction of substantial up-front investment, increased efficiency due to economies of scale, faster development cycles and incremental delivery of new of improved functionality without extra costs to end user. However SaaS also has its drawbacks – less control (or even loss of control) over user data, limited opportunities for customization, increased vendor lock-in and switching cost, increased complexity of integrating various SaaS applications, potential issues with regulatory compliance especially in the area of data protection, need for producer to acquire operational skills in addition to development skills.

The benefits and limitations of SaaS vs traditional model determine whether in which particular case one model or another (or a combination of two) would be best. SaaS is most suitable to standardized services which are (relatively) common across many companies and do not form a base for company's competitive advantage and its differentiation vis-a-vis competition.

2.3.3 Appliance, or embedded software & service

Appliance, or embedded is another model of delivering the benefits of software to end-user. Traditionally embedded software is associated with specific applications like industrial automation solutions, controllers, etc – however recently we start to see increasing number of companies offering more 'traditional' software in the appliance form.

This essence of this delivery model is combining of hardware, software, and more recently internet- or intranet-based services in single easy-to-setup, easy-to-operate package. Appliance model shares some benefits with SaaS (ease of implementation, ease of use, lower maintenance fees) however unlike SaaS end user retains full control over data in this case.

Data warehouse appliances, search appliances are just the most visible examples of traditional, server software being delivered in the appliance form. Looking at the consumer space, vast majority of today's consumer electronics devices have very high software component, and increasing number are including access to services as key component of the package. For example, all 3 of latest-generation game consoles are actually a package of hardware, software (OS+other core components) and online services.

2.3.4 Advertising Model

Advertising is, unlike SaaS or appliance, a truly different business model in the software industry. A product or service is provided to end-user free, with software provider earning money from selling advertising services. Essentially software provider sells advertisers access to its customer base – and the revenue thus generated depends on size of the user base, ability to target ads to maximize relevancy, access to otherwise hardly reachable audience.

Advertising model allows companies to create and monetize products and services which are valuable to end user, but for which user is not necessarily is willing to pay – thus fostering innovation in new areas. Use of advertising in software industry did not start with Google – for example, many developers of try-before-you-buy products include advertising in trial versions to complement direct sales revenue.

This model requires provider to be able to collect, store and utilize considerable amount of information about users of its software, raising potential regulatory concerns in the area of privacy, data protection, cross-border transactions.

2.4 New Development Models

Shifts in demand and new technologies have had an impact on software models and the development models used inside them. There are trends towards increased co-innovation in ecosystems, involvement by users in development, and interoperability between solutions. Some of these characteristics initially emerged in the Open Source software model, facilitated by the broad grants contained in its licenses. However, these trends have become a significant factor in the proprietary world as well. This development reflects one emerging trend of new business models that combine elements of the traditional proprietary and Open Sources software models. It is important that such trends, as with purely proprietary and purely Open Source models, are fairly facilitated by policy makers.

New models for co-innovation in ecosystems

The Internet has driven increased investment in shared development and innovation. This can be partly attributed to global communication networks reducing the barriers and costs associated with co-innovation between two or more interested parties. Equally pertinent is the limited feasibility of a single vendor developing all the solutions needed to meet the complex needs of customers. It is increasingly easy for multiple parties to work together to enhance a mutually available value proposition, and they increasingly do so.

The Linux kernel is an example of a co-innovation software development model facilitated by the Free Software paradigm. The Linux software development model allows easy entry for new participants while maintaining strict structure (or gatekeepers) for the release of the final product. Each individual stakeholder may have different reasons to invest in the kernel and can choose their level of

involvement dynamically, and the collective output of stakeholder's investment – coordinated through the Internet – is a stable, reliable and widely used software technology.

Co-innovation in ecosystems is also a trend in the proprietary software model. Today members of the SAP Enterprise Services Community (ESC) collaborate with SAP employees to define services and features for future releases of products, while more than 1.5 million members of the SAP Developer Network (SDN) share their experience with each other and developers working for SAP. Top contributors obtain 'SAP Mentor' status, gain direct exposure to top executives and have more influence on the SAP product strategy.

Co-innovation has a profound effect on the market, with increased user involvement in consultation, design, testing and improvement noticeable in every approach to software today. One result of this is to blur the distinction between what constitutes a user and what constitutes a provider. Indeed, the Open Source model notably empowers all users to become providers. While the proprietary paradigm does not encourage this level of user freedom, the relationship between providers and users has become less static than before.

Increased openness and need for interoperability

The trend towards co-innovation is one driver for interoperability, though it is far from the sole reason that interoperability has become critical to the future development and competitiveness of the software market. Customers spend a significant part of their IT budgets on the integration of initially incompatible products and services. These costs do not benefit customers, who should be able to obtain their choice of solution from their choice of vendor, and in doing so reduce costs and increase performance. The key to allowing this type of market dynamic is the ability of different products to work together to create an overarching solution.

Fair competition drives innovation and provides an impartial method of determining the success of products, businesses and approaches. In the context of software, access to information regarding interoperability and interaction between software components is a key requirement to accomplish this. Indeed, approaches such as co-innovation require interoperability for optimal efficiency.

Interoperability information needs to be made available to all participants in all software paradigms without prejudice to facilitate competition. Such information can be disseminated through standards, though with the proviso that such standards are informed regarding the requirements of the different software paradigms, and explicitly enable all parties to operate without undue restriction. This theme is discussed in more detail in the WG 3 'IPR, standards and interoperability' submission.

It should be stressed that standardization in the software industry is mainly driven by global standardization industry consortia such rather than de jure standardization organization. Unfortunately and despite their growing importance, these global standardization consortia have not been formally recognized by European policy-makers.

2.5 New Trends in Public Policy

In addition to technology and business trends, there are public policy initiatives that impact the software industry. Foremost are policies related to Green IT and IT security.

Green IT and Energy Efficiency
As computing becomes increasingly pervasive, the energy consumption attributable to computing is climbing, despite the clarion call to action to reduce consumption and reverse greenhouse effects. At the same time, the rising cost of energy — due to regulatory measures enforcing a “true cost” of energy coupled with scarcity as finite natural resources are rapidly being diminished — is refocusing IT leaders on efficiency and total cost of ownership, particularly in the context of the world-wide financial crisis.

Energy is an increasingly scarce and expensive resource. This reality will continue to have a profound effect on how IT solutions are designed, deployed, and used, particularly at the data center level. While virtualization and other power-saving technologies may go part of the way to solving the problem, virtualizing inherently inefficient applications has obvious limits.

Today’s most utilized approaches — primarily focused on infrastructure optimization — may be too narrow to deal with the power challenges of tomorrow. Methods of optimizing infrastructure usage are required that run the entire ecosystem, spanning the disciplines of application architecture and design, data center management, and IT operations.

There are multiple examples of applications in use today which lead to extremely inefficient datacenter. The first example is where applications are run alone on servers not because of capacity constraints, but to avoid potential conflicts with other applications — because of complex application installation issues, or simply because corporate purchasing or budgeting policies make sharing servers difficult. Another example is applications that run on multiprocessor computers but only effectively make use of a single processor. This is the case for many applications that were developed on single-processor computers and that now run on computers fitted with multiple processors. Yet another common occurrence is computers that are underutilized or are not utilized at all, such as servers that run applications that only run at certain times of the day, servers that run at night to provide fle and print capabilities that are only needed during the

day, test environments that are used infrequently but left running permanently, or computers that run because nobody is quite sure what they do.

Most large organizations today probably have examples of all of the above categories, consuming valuable resources and producing emissions from the energy that they consume. Optimizing software for energy efficiency could lead to acceleration or slowdown of certain technology trends, increase demand for new skills, potentially increase complexity and cost of software development process.

IT Security

Governments in several countries are developing policies that are designed to increase the security of public IT systems. However, in some cases there is at least a risk that these policies may be misused to unduly protect or foster the national IT industry.

China may serve as an actual example. On 27 August 2007, China filed 13 Technical Barriers to Trade notifications to the World Trade Organization, covering a broad range of software and hardware product areas including secure routers, smartcards, chips, operating systems, data backup, and recovery or security audit products. The main concern here is forced Intellectual Property transfer, required encryption codes, and lacking compatibility between the CCC and international standards (ISO 15408-1:2005 and Common Criteria). The crucial issue is that China defines “state/government applications” wider than the norm.

The regulation would create significant trade barriers to software vendors doing business in China. Some companies might even decide to pulling out of China or drastically scaling down their offerings.

Following interventions by the EU, Japan and the US, China temporarily suspended the regulation. However, China has not taken a final decision.

China should consider joining the voluntary Common Criteria Ratification Agreement (CCRA) with roughly 22 countries that trust each other and use a few trusted labs to issue certificates. The Common Criteria for Information Technology Security Evaluation (abbreviated as Common Criteria or CC) is an international standard (ISO/IEC 15408) for computer security certification. The fact that CCRA is an open standard is crucial. It means there is a guarantee that all parties have access to the innovation going on. That way, there would not be the need for such a far reaching Chinese IT security legislation.

3. Towards a New Market Structure Paradigm

New technology and business trends will lead to a new market structure paradigm in the software industry. The major trends are consolidation and de-verticalisation,

which reflects an overall maturation of the software industry just as it has been seen with “heavy” industries in the past century.

Consolidation

Compared to other more mature industry, the 30+ years old software industry is still very fragmented. However, as the software industry is a capital intensive market, it has started and will continue to consolidate. This trend can be described by the “capitalistic market axiom”, which states that at the end of its consolidation process, a mature market organises itself around a Leader and a Challenger (or two co-leaders) with market shares above 20%. In this scenario niche players that focus on particular segments of the market would hold a market share of 5% or less and all “middle” actors will be acquired by market leaders.

Recent merger and acquisitions underline the trend towards overarching consolidation in the software industry. Middle actors proprietary software companies like BEA, Business Objects, Cognos and Hyperion were acquired, as were SuSe and Jboss from the Free Software arena. It is reasonable to suggest that such consolidation would continue the way we have seen it in the last 10 years in the monolithic software world.

However, as enterprises move into more cellular organisations, and concepts such as Software Oriented Architecture create trends towards the Internet of Services, the software industry is entering a new era and new rules will appear along with its de-verticalisation.

De-verticalisation

Software Oriented Architectures, required to build agile Information Systems, will facilitate and catalyse the maturation process of the software industry. The result will be a strong de-verticalisation, leading to the emergence of a few leading **“**software systems manufacturers” and quite a few “software component developers”. Moreover, the software system of a manufacturer will become a “platform” for the component developers. Hence, in a few years from now, the software market may look very similar to the automotive industry.

One key impact of de-verticalisation will be that, for small and medium-sized market players, not being “big” will no longer mean to be « marginalised ». Thus, a lot of innovative companies will emerge, fostering creativity into the software world, once realised that one can thrive as a Tier-1, Tier-2, Tier-3, etc. “component developer”, providing “spare parts” to the integrator – platform provider who will remain responsible in front of the client to deliver an integrated package. Among these spare parts, whether proprietary or Open Source, there will be the regional / local adapters that will continue to be required for the foreseeable future, especially in Europe as national regulations will survive possibly for ever.

As for the software systems manufacturers and platform providers, the competition will likely stay global. Leading American Companies seem already well advanced in

the “platform competition”: so, Europeans must get their acts together if they want to play this game.

4. Challenges and Opportunities for the European Software Industry

As stated in §3, with de-verticalisation and the emerging Service Orientation era, cards will be reshuffled, the system will be so-to-speak “re-booted” and the game is indeed quite open as the future winners cannot be anticipated yet.

4.1 Strengths and weaknesses of the European Software Industry today

The European Software Industry is dynamic, but remains small.

Despite substantial production figures, Europe is a net importer of packaged software.

The Truffle 100 study, carried out by IDC and CXP estimates the software sales figures of the 100 largest European software companies (Headquarters and R&D management based in Europe) at 22 billion euro in 2007. According to IDC, the European Software Market weighs roughly 63 billion euro in 2008. This means that a large part of the packaged software sold in Europe is produced outside of Europe.

Despite the fact that consolidation is gaining ground in Europe, the European Software Industry remains very fragmented. According to IDC figures, roughly 20,000 European packaged software companies have been created in Europe. Most of these European Software companies have less than 15 employees and €1 million in revenues. A significant proportion of these companies are high potential and high growth companies often called "gazelles". For example, a 2006 study carried out in France by IDC and CXP identified more that 150 "gazelles" within the French software industry (companies with a minimum 20th growth rate) among the 600 interviewed companies. This study showed that software "gazelles" create more jobs, are more profitable, expand faster abroad, have wider channels and adopt faster new business models (12% were SaaS "pure players" in 2006). All over Europe, new technologies and innovative software are produced by young companies that have the potential to become leaders in future world markets. As of today, less than 40 software vendors of the Truffle 100 Europe ranking are over the EU SME definition threshold (€50m). Despite their high growth rates, R&D workforce and profitability, they remain small and most of them have not been able to compete efficiently on the European market place.

This European packaged software industry is a major provider of highly qualified jobs in Europe. The Truffle 100 ranking[6] also pointed out that the European packaged Software companies in the top 100 have a collective workforce of 175,000 people, of which 38,000 are employed in research & development. Using the same definition, IDC estimated in 2006 that there were around 207,000 people working in the whole European packaged software industry.

Two major weaknesses: fragmentation of the European market and insufficient focus on innovation and marketing

European Software companies have so far rarely been able to face two decisive challenges:

- How to turn excellent research into successful innovation and profitable business? (1)
- How to expand beyond national borders despite the market fragmentation? (2)

(1) In this industry excellent R&D has often proved to be very counterproductive if not combined with excellent development strategy, marketing and a channel policy.

Mainly due to the lack of marketing and managerial skills, the trap many packaged software companies fall into is an insufficient anticipation of go-to-market and industrialisation phases (product marketing, packaging, setting up a customer support service etc).

The Software Business Laboratory of the Helsinki University of Technology uses the concept of "productisation"[7] to describe the process experienced by the vast majority of European Software Companies. "Productization" means “standardization of the firm offering so that the cost and effort of selling and serving an additional customer is decreased. " In other words, productization results in making the product easier to market, sell and deploy. Studies in Finland have shown that Finnish companies usually that start to productize their offering usually go through a transformation process from technology companies to product companies, and then to marketing companies. According to one respected Finnish entrepreneur this is a disadvantage compared to US companies, since they are marketing organizations from the day one.

(**2) The fragmentation of the European software industry first derives from the fragmentation of national markets.**

A software entrepreneur in the EU starts with two main challenges: his national market is much smaller than the US market and the European market is

[6] http://www.truffle100.com/europe/downloads/2007/Truffle100_2007.pdf

[7] “Finnish National Software Industry Survey 2008” : http://www.sbl.tkk.fi/oskari/)

extremely complex to address. Entrepreneurs face too many barriers when expanding in Europe beyond their national borders. They face different languages, social regulations, corporate laws, intellectual property regulations, business habits, request for references on the targeted market, distribution strategies and industry specific regulations (as in the case of a software vendor addressing the needs of a specific industry). This challenge often seems overwhelming and, as a result, many vendors choose to focus their energies on their domestic market. Many European packaged software companies remain small and very often increase the share of services in their revenues to “survive”, which drives them apart from a pure software vendor business and its potential “economies of scale”. This small size hampers their “pricing power” on its domestic market. This can lead them to the end of the story when competing with global leaders that reached a sufficient size to address this market efficiently."

4.2 New Challenges and Opportunities for the European Software Industry

It can be argued that a successful European Software industry will largely be based on the commercial success of individual European software vendors, which will in turn generate additional and complementary sources of benefit and value to the region as a whole. However, in order to achieve this a number of key challenges must be addressed, and the opportunities offered by changes in technology and software delivery models must be exploited.

Changes we described in the shape and form of the European software market due to technological shifts are creating opportunities for the small European software companies.

The emergence of a "long-tail" market where technology and the emergence of the Internet of Things and the Internet of Services, provide smaller players with the ability to rapidly address evolving or niche markets. This development has been particularly visible in the music industry where the ability to download songs relatively cheaply, provided music publishing and distribution companies with access to hugely expanded group of customers with widely diverse musical tastes. SOA create market pools that will be addressable either by large, broad-based services players who have the capabilities to cover the majority of their clients' infrastructure needs, or by smaller, more focused players who leverage economies of scale in one or more of these pools. The promising high level of acceptance we see in Europe for the SaaS concept announces the development of an alternative form of software delivery facilitating the "long tail" model In Europe. Similar to the situation in the music industry, where technology gave artists the opportunity to profitably sell and distribute their music on line without the need for a traditional record company, small players will probably be able to profitably address large markets, even if their products are only of interest to a relatively small proportion of buyers. Big companies are likely to transform into to a new breed of record company which provides its "artists" access to customers through its online platform. This again provides the basis for many smaller, more focused markets in the "tail" of the curve, where individual purchases may not be large, but the potential addressable market is.

A more detailed examination of the role of technology would explore how the European SW industry could look to the music industry for an indication of how the software business could develop in the near future and the types of players who will survive in this new environment.

One has to be aware that these new delivery models also open the same opportunities for non-European firms who can address European markets from anywhere in the world.

In the first part of this section we deliver some guidance to build a winning model for European Software companies in the emerging new software economy. Then we explain why financing of innovation and focus on skills are the two areas where the European Union and the Software Industry have to invest on a massive scale to turn these opportunities in real success.

4.2.1 A Guidance for building a winning model for European Software companies in the emerging new software economy

In this fast evolving environment, the top players of today will not necessarily be the top players of tomorrow. European companies have the opportunity to establish top positions. A relevant question is whether or not there is a model for European software companies to establish a global market presence, developing beyond the point solution that will avoid an early trade sale?

In this context, no general prescriptive model exists but a framework of guiding principles/best practice does. Three major factors: market and strategy alignment, principal motivation and go to market execution feature as the building blocks for such a framework

The framework can be utilized to direct “build to buy” / “go global” behavior rather than a “hope to be bought” mind set. The framework can be utilized to maximize the chances of early success, retention/motivation of principals and value building.

What is highlighted is the need for a common goal (a vision) and a strong element of focus being applied to attain such a vision. Likewise M&A is part of a range of options appropriate for growth strategy – it remains a high-risk option and others routes such as joint venture should not be easily discounted. Fostering an environment where such opportunities readily emerge appears key. A general level of entitlement is also required to enable the progression and contribution of all towards a desired goal or vision

When we focus on the issue of building a commercially successful software industry**,** the issues that European firms must address can be distilled down to the following key elements:

- Establishment of solutions and products that meet global market requirements in new or challenging areas
- Establishing market presence outside the home country (not necessarily global initially)
- Avoiding un-necessary transfer of control away from European companies
- Development beyond point solutions

- Speed to appropriate scale

Within this context, the following guiding principles can be used to help address these challenges.

- Market and strategy alignment: a continuous focus based upon an objective view of market and company situation (Targeted product/solution development through whole product thinking, Clarity of value proposition and positioning, Appropriate growth strategy)
- Principal motivation: ensuring and supporting commitment, confidence and aspirations: this implies balancing risk and reward, business funding, alignment and good-will)
- Go-to-market execution: timely and effective participation in target markets with appropriate capacity and capability (Assisted sales and marketing structures in foreign countries, Eco-system initiatives…)

Generally speaking, the new delivery models are built on a framework of three pillars:

- ‘Location-less’ and 'any time'
- New roles for software vendors and other industry players (according to new market structure, see section 3).
- Turn-on/turn-off and payment for what you use

These changes affect everyone in the software and related services market. European companies need to consider what role they play in this new software economy and be open to the evolutionary changes it is bringing. These new delivery models have two main effects on the software industry. They both increase diversity in the delivery model (how the software product reaches the customers) and the diversity in the revenue model (how the customers pay the software vendor.)

This is causing evolution in the technology model (SaaS in particular demands a different way of building software), but also in the software value chain (Software vendors may control more or less of their own value chain) and finally in the ecosystem as the roles that the different players have are evolving

A generic technology product must respond well to an identified and sufficiently popular market need and serve to solve its associated problem/challenges. However, many European software companies have had a tendency to ignore this and solve “problems” that may not even exist and/or appear somewhat tenuous. History has shown that companies with this approach ultimately falter, or fail to break through a relatively modest revenue ceiling. “Whole product” thinking takes the “problem/solution/market” debate to a higher level and is designed to create and bring to market solutions with a compelling reason to buy. Regular software industry augmentations can include maintenance, support, training, ways to purchase, implementation services etc. Some augmentations are more expected than others and much depends on the specific product and business‘ market position.

- Managing the “augmented to expected” gap means ensuring customers can easily acquire additional products and services (either

directly or through loose affiliates) to use the generic product as expected.

- Managing the “potential to expected” gap means ensuring the product is defined/ updated/innovated by relevant changes in the market environment. Changes that manifest themselves in the generic or augmented product e.g. consideration of sustainability or adapting for provisioning a product via software as a service techniques.
- There are a number of regular strategies utilized to fill the gaps.
- Build: Add required features
- Buy: Acquire relevant technology
- Partner: Augment with other companies' products and services
- Minimize: communicate on the how/why the gap may be not a high priority for clients.

As a consequence "whole product thinking" is a key driver for ecosystem formation and downstream M&A. It also promotes a need to clearly understand market position and value proposition. Positioning in the technology space is essentially functional in nature – i.e. how well a solution can solve a problem and provide benefits. "Whole product thinking" means innovation and not only research. Encouraging this approach should be the cornerstone of the European Software Strategy. It will require a double focus on skills and financing of innovation.

4.2.2. Focus and priorities for European Software Players to turn new opportunities in real success

The emergence of SaaS, cloud-computing and other new online delivery models smaller companies quicker access to geographically distributed customer bases without the need for significant investments in local operations or channel management and smaller "pools" of opportunity that previously might have been unprofitable can now be addressed. Admittedly much needs to be done in terms of security, reliability and resiliency of such an approach, but these models will be highly significant in the near future.

However, as these developments play to all small software players wherever they come from, they do not offer any indemnity form the rules of competition in a globalized market. Financing of innovation and focus on skills are the two areas where the European Software Industry has to invest on a massive scale to turn these opportunities in real success.

Financing of Innovation

As explained below European software vendors have very often failed to make substantial investments in all elements of the product lifecycle, not only in R&D (for instance documentation, translation and packaging) Once the product is available there are major investments to be made in marketing, sales, and service and support capabilities - not to mention the cost of building and maintaining an effective distribution and channel program. When viewed in this context the software industry is highly capital intensive and very substantial

ongoing investments are required to maintain competitiveness and ensure business success.

Many European gazelles are "SaaS" pure players that have already acquired their first foreign customers this way without investing in a tradition channel of distribution. The potential establishment of an ongoing revenue stream has helped them to attract investors that have been very cautious towards this industry in Europe so far. On the other hand, SaaS subscription model also complicates the recognition of revenue and the valorization of the created software. Moreover shifting to a pure “SaaS” business model does not only imply a complete change to revenue recognition, but also a strong investment in new skills to move from a product oriented company to a service oriented company. As an example, they would increasingly need to re-craft their sales proposition and retool their sales approaches to deal with the increasing number of technical queries. Software as a Service will require a major change in the way packaged software companies are managed. One has to bear in mind that European software companies are traditionally technology and R&D centric solution providers. It will require them heavy investment to compete with more business- and process-oriented global players once the market booms. As described before, partnering will Application Service Providers is likely to become a successful alternative approach. As the development of new business and delivery models means that the global software industry is entering a new phase in its development, the need for massive cash and a "whole product thinking" of financing that goes beyond the traditional goals of supporting research and development is more critical than ever.

Skills

Determining which skills are necessary in the European countries to enable growth in the European software industry is critical. Not having the necessary skill base, with the right level of skills – and in adequate numbers – as well as a strong pipeline of new skills feeding into the market to support continued innovation and implementation of new technologies would be a strong barrier to successfully growing and supporting Europe's competitive position as enterprises and consumers embrace the Internet of Services.

The fast growing trend of global sourcing strongly impacts which skills are needed locally. The "offshore v. 2.0" model that is gaining ground is based on a combination of resources and skills from different regions and it will be necessary to undertake a detailed analysis to ensure that candidates with the right qualifications are available to the industry. The underlying premise of the Internet of Services is the possibility of doing anything from anywhere. This also applies to the "production" of the technologies for the Internet of services, driven by the fact that improved network and telecommunication technologies have made it less important (and less transparent) where a workforce is located. An aspect of ensuring the right competencies available for the software industry is to consider how to develop advanced experiences in the local workforce, given that many entry-jobs are moved offshore.

As previously seen, the European Software industry has been suffering from a lack of management and marketing skills (notably a matter of concern for investors), which has resulted in low performance when turning solutions into industrial products. The importance of marketing and management skills has been underestimated so far. New business and delivery models will make them even more crucial.

5. Recommendations for EU Policy-Makers

The previous sections have demonstrated that the new technology and business trends provide huge opportunities, also for the European Software Industry. First and foremost it will be the responsibility of the European software vendors to exploit this potential. Indeed, we strongly believe that the sector should continue to be market-driven and that regulatory intervention should be kept to the minimum and limited to addressing market failures.

However, EU policy-makers have a role to play to ensure a favorable environment for both the development of a strong European software industry and the adoption of software by enterprises, consumers and administrations in Europe.

We would like to propose the following recommendations to the European Commission for actions.

(1) Software/Business Model Neutrality
Any policy measure should be neutral with respect to technology, vendor and the underlying software and business models. Given the dynamic development of new technologies and business models, policies that are designed to foster specific technologies or software and business models could hinder innovation and distort competition. Rather policy-makers should ensure a level-playing field and a favorable environment for all market players. In this respect, the European Commission should help to address the bottlenecks for the growths of the whole European software industry that were identified in the previous sections.

(2) Toward a truly-functioning Internal Market
Obviously, one of the major stumbling blocks for the development of a strong European software industry is the fragmented market structure in Europe. National markets differ significantly in terms of regulation, IPR, labor law, and so forth. WG2 had no mandate to look into the details of the problem. And to our knowledge, no other Working Group has addressed this issue. Against this background we would like to encourage the European Commission to launch an empiric study that should analysis the specific barriers for an internal market for software in the EU and propose policy measures to address them.

(3) Skills Development
The lack of skills, both in terms of engineering and management skills, have also been identified as being bottlenecks for the development of a competitive European software industry. WG 6 is supposed to address this issue. Nevertheless, we recommend that the European Commission conduct a comprehensive analysis – possibly through an external study – of the specific skills gap for the European software industry as well as the specific measures on how to close the gap.

(4) R&D and Innovation Policy
Europe certainly needs to establish large-scale ICT research and innovation clusters that deliver what is most urgently needed in Europe: turning knowledge into marketable products. It is certainly the role of the European software industry to invest in R&D, to engage in those ICT clusters and to bring innovative solutions to the market. However, public policy can support these industry efforts: The European Commission should put a strong emphasis on new software technologies in its FP7 research programs. Areas of activities for the next work program should include the semantic Web, cloud computing as well as the transition from Web 2.0 to Enterprise 2.0 and the interconnections between them.

(5) Cloud Computing
Given its potential future importance, we recommend that the European Commission puts an emphasis on creating a favorable environment for cloud computing in Europe. To this end, the European Commission should

- Launch an economic study on the global trends in cloud computing and the respective challenges and opportunities for Europe. The study should, among other things, address the following issues: impact of cloud computing on the ICT industry and the economy in general; global trends and evolution of the market structure for cloud computing (drivers, barriers, regional developments, etc.); opportunities for the creation of European clouds (players, business models, incentives, drivers, etc.); usage of cloud computing in different regions (U.S., Europe, Asia); barriers for uptake in Europe;
- Launch public consultations with all relevant stakeholders on the risk and opportunities of cloud computing. The public consultations could be based on the findings of the economic study and possibly lead to a Commission Communication on cloud computing;
- Leverage E.U. programs (e.g., Structural Funds) to promote the effective and secure usage of cloud computing by SMEs. In particular, SMEs should be trained to fully understand the benefits and risks of cloud computing.
- Promote the use of cloud computing by public administrations. A visionary approach could even consider the development of a pan-European cloud-based platform trans-border eGovernment services.

(6) Next-generation SOA/Web technologies

Today, it can be anticipated that a number of technology trends will affect the way SOA will be materialized, probably leading to a new concept (Internet of Services ?): Web 2.0 and Semantic Web technologies will drive the way services (both application and content delivery services) will be accessed. Cloud Services will affect how and where services will be deployed. Last but not least, autonomic and even-driven technologies will probably bring different perspectives on how processes can be monitored and managed.

Given the relevance of the topic, the European Commission should launch an economic study on the global trends in SOA/Web technologies and the respective challenges and opportunities for Europe. The study should, among other things, address the following issues: impact of next-generation web technologies in the evolution of SOA and the Future Internet, enablement of service marketplaces where different elements are delivered as a service (XaaS models) and services are managed as tradable goods, the way web technologies will enable discovery, representation and management of services linked to things, governance on user generation of contents and applications, impact of Cloud Services in SOA, role of autonomic and even-driven technologies in process management, security and trust aspects etc. It should also investigate the opportunity to set up public-private funding instruments for research in this specific area.

(7) Public Sector as early adopters

As mentioned before, software solutions could significantly enhance cost efficiency and the quality of public services. At the same time, investments by public administrations could be instrumental for achieving critical mass for a breakthrough of innovative software in Europe, since the public sector accounts for more than 40% of GDP. WG 4 has got the mandate to address issues related to public procurement.
We therefore would like to put forward only a few recommendations: The European Commission should encourage public administrations to become early adopters of new software applications, for example by making use of pre-commercial procurement. The Commission could also foster investments in software by public administrations through its lead market initiative and the Competitiveness and Innovation Program (CIP). It should be stressed that public procurement should be neutral in terms of technology, vendor and software/business model.

(8) Standardization
As mentioned before, there is a growing pressure by both customers and software vendors for enhancing interoperability and accordingly an increased demand for standards. Therefore, we believe that standardization in software should continue to be market driven. Global industry standardization consortia have overall proven to meet the needs of the software industry.
The role of policy-makers in standardization should be limited to ensuring fair competition and a level playing field for all market players. In addition, the European Commission should foster the participation of European software vendors, especially SME, in global standardization consortia. Finally, we recommend that the EU establishes a fast-track process for the formal recognition of industry-led consortia standards at the EU level. We welcome the initiative by the Commission to define jointly with stakeholders a minimal set of criteria for the recognition of consortia standards. We refer to WG 3 to address in detail the issues related to IPR, Standards and Interoperability.

(9) Green IT
If the full environmental costs of IT systems are included into cost calculations, then we do not see any need for specific regulations for software vendors regarding energy efficiency. Economy-wide mechanisms (ETS and any others) would make sure that price of energy fully reflects environmental impact. If however there is a need for specific regulation or policy (for example concerning maximum power of data centers) this regulation should be completely neutral with regards to choice of technology/specific products. Visibility of environmental impact, energy efficiency of IT could be improved in education – and this is an area where policy can have a considerable impact on attitudes and skills of future workforce.

(10) Trade Policy
The EU in its trade policy should ensure fair access for European software vendors to third markets. This in particular holds true for IT security policies such

as in China. In this respect, the Commission should deepen the engagement to break the existing market access barriers, share models of information assurance between the EU and China and renew the EU-China program on IT collaboration with emphasis on IT security..

(11) Raising visibility of the European software industry

While there is an increasing awareness among European policy makers about the growing importance of ICT for society and the economy, the role of software in this context is often overlooked. We therefore recommend that any European Software Strategy should strive for raising the visibility of the European software industry. Otherwise the impact of such a strategy, especially with respect to adoption of proposed measures in EU Member States, will be rather limited. We particularly propose to closely link the European Software Strategy with the EU Stimulus packages, the new Lisbon Strategy and the EU programs related to energy efficiency.

Appendix: Definitions of Open Standards

Members of WG 2 could not agree on a common definition of Open Standard. What follows are alternative definitions that have been proposed during the discussion.

EICTA

EICTA, the European ICT Trade Association representing more than 10.000 ICT businesses in Europe, has adopted in its White Paper on Interoperability the following definition of open standards:

"Control: the evolution of the specification should be set in a transparent process open to all interested contributors
Completeness: the technical requirements of the solution should be specified completely enough to guarantee full interoperability
Compliance: there is a substantial standard-compliant offering promoted by proponents of the standard
Cost: fair reasonable and non-discriminatory access is provided to intellectual property unavoidably used in implementation of the standard"

While these criteria encompass the full range of issues relevant for an open standard, some specific aspects of the process of open standards development can further be emphasized:
1. Multi-lateral control:
It must be possible for all affected and/or interested parties to have the opportunity to contribute to the standards development process. The process of developing an open standard must not be controlled by a single person or entity with vested interests.
2. Transparency:
The process of developing an open standard must be transparent and open to all affected parties. In addition, a public consultation phase may increase the level of acceptance and broad feedback.
3. Agreed process for ratification:
The final approval of an open standard must be done according to an agreed-upon process. Consensus is a major value for agreeing on an open standard, and it should be up to every workgroup's charter to strive for consensus whenever possible.
4. Open availability:
The standards need to be publicly available for evaluation11 and once an open standard is final, it needs to be published and available for free or at low cost, including the availability of specifications and the respective supporting material."
For the EICTA White Paper on Interoperability
See http://www.eicta.org/web/news/telecharger.php?iddoc=359

ECIS

ECIS has long supported a definition of "open standard" which includes the following characteristics.

In ECIS' view, open standards are characterized by :
o collaborative and democratic development and management processes; o transparent evolution and management processes open to all interested parties; o approval through due process arriving at consensus among participants; o implementations which interoperate among each other; o platform-independence, vendor-neutrality, and unrestricted numbers of competing implementations; o open and complete publication of specifications and documentation sufficient for fully independent implementations; and o royalty-free or FRAND licensing terms that do not discriminate against the open source software development or licensing model.

FSFE

Concerning the definition of Open Standards, FSFE decided to follow the lead of Certified Open, the SELF EU project, and the 2008 Geneva Declaration on Standards and the Future of the Internet, which we consider to be the most balanced and complete definition in existence so far.
The definition can be traced at http://fsfeurope.org/projects/os/def.en.htm.