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The Impact of Social Computing on the EU Information Society and Economy

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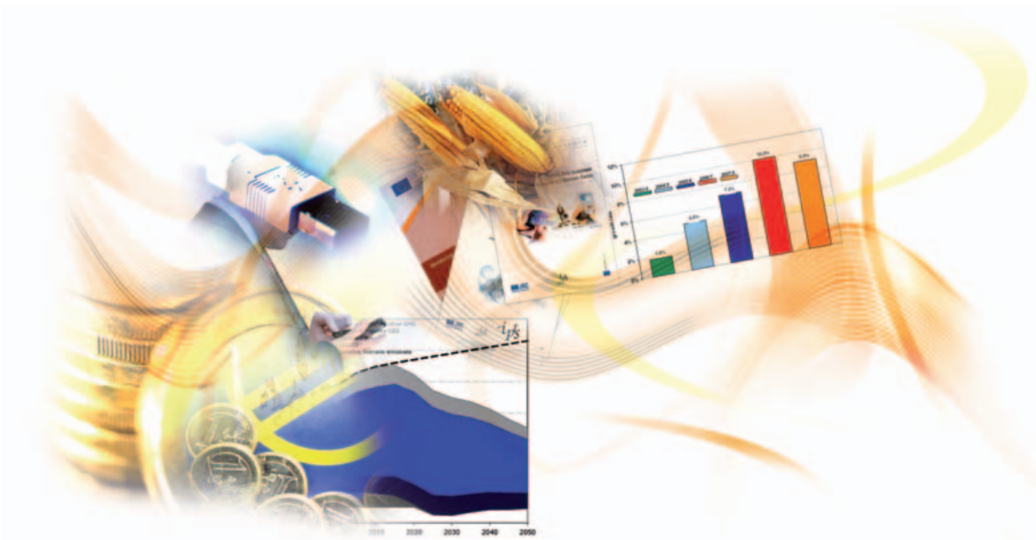

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Preface

At the European Council held in Lisbon in March 2000, EU15 Heads of Government set a goal for Europe to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion. This goal was renewed in 2005 to emphasise growth and jobs and with plans to facilitate innovation through the take-up of Information and Communication Technologies (ICTs) and higher investment in human capital.

In this context, this report, and the research that lies behind it, focuses on "Social Computing" that enables user-centric, collaborative knowledge sharing, community-building activities using the Internet. Globally, the Internet is used by some 1.7 billion people[1] (24.7% of the population) and by some 318 million Europeans (64%).[2] Social computing has exhibited a prolific growth since its genesis in the early years of this decade and, since 2005, has achieved unprecedented levels of EU and global usage. Current estimates indicate more than 130 million Europeans[3] are involved in social computing and are interacting in a broad spectrum of commercial, leisure and social domains. It is very likely that all readers will have had some social computing experience in either an active or passive role as encounters with Social Computing have become mainstream for the vast majority of Internet users. Searches for information will frequently transport us to Wikipedia, YouTube, Facebook or similar, or else to Blogs and other forms of collaborative on-line applications that have adopted the so-called Web 2.0 paradigm. For the younger generations, social computing has provided a medium for expression of interests and opinions, for collaboration and for building communities unbounded by locality.

Beyond the initial wave of "getting involved", social computing is now in a period of consolidation and maturation enabling individuals, and groups, to access and contribute to knowledge on an ever increasing and already vast array of topics. Examining the evidence in this report and elsewhere, it is relatively easy to see how, over the coming years, social computing could play an increasingly important role in re-engaging citizens in political debate, in securing social cohesion and harmony, and it could provide a platform for dialogue on the grand challenges of the EU and the rest of the world.

In 2007, the JRC initiated a project on social computing as part of the JRC Exploratory Research Scheme. At the time, available evidence was largely anecdotal and generally not comparable. Hence the objective of our research was to provide robust, evidence-based, scientific analysis to support EU policy makers. The research examined the EU position in terms of creation and adoption of social computing and identified relevant, emerging technological and socio-economic trends. After initial study, the scope of the work was expanded with co-financing support from the European Commission's Directorates General for Education and Culture, Information Society and Media, and Enterprise and Industry.

1 Source www.internetworldstats.com June 2009
2 Source Eurostat 2008
3 Source JRC-IPTS estimates based on Eurostat 2008 and Eurobarometer data from 2008 (http://ec.europa.eu/public_opinion)

This report addresses the impact of social computing in: ICT and media industries, personal identity, social inclusion, education and training, healthcare and public health, government services and public governance. The multi-sector research findings serve as a reference that aggregates commonly found characteristics exhibited by social computing. The evidence gained from examining these "lead sectors", where take-up has already reached a critical mass, certainly does not preclude further proliferation of social computing into an even wider spectrum of economic and social activities.

I invite both public and private sector policy makers to take note of the findings of this report and its contribution to assessing the potential disruptive impact of social computing and to reflect on how best to embrace these trends and inherent characteristics as a component in their future policy making agenda.

Peter Kind
Director
Institute for Prospective Technological Studies

Executive Summary

This report examines the socio-economic impact of Social Computing applications in Europe. It finds that Social Computing applications, or *Social Computing* for short, has already brought about significant changes which have led to disruptive impacts on industry, citizens, identity, social inclusion, education, health and public governance. The emergence of Social Computing in the Information Society scene in 2003 was unexpected. Today, a little more than five years later, hundreds of millions of users worldwide are using Social Computing applications such as Social Networking Sites, blogs, collaborative filtering of content, file, photo and video sharing, tagging and annotation, online multi-player games and collaborative platforms for content creation and sharing. And this is only the beginning.

The report features a comprehensive empirical analysis of Social Computing that is intended to inform policy makers. Social Computing has both direct and indirect effects on the implementation of the European Lisbon strategy, especially on the post-i2010 agenda currently being drafted. The research has been conducted by the Information Society Unit at JRC-IPTS over the last three years.

Key findings

1. **Social Computing is now mainstream and companies and policymakers cannot afford to overlook it.** Social Computing is already an important social phenomenon, in terms of reach, time-use and activities carried out. By the end of 2008:
   - 41% of all EU Internet users, and 64% of those aged under 24, were engaged in Social Computing activities;
   - 32% of European Internet users had created Social Networking Site profiles;
   - 38% of people aged 15-25 in Europe had profiles on multiple Social Computing sites;
   - Social Networking Sites alone were attracting 165 million unique visitors a month (June 2008);
   - In several OECD countries, more time was being spent on social networking and personal blogging sites than on email;
   - The number of blogs had doubled since 2007 to more than 100 million worldwide, with more than 100,000 blogs being created daily;
   - More than 1 billion photos and 40 million user-created videos had been uploaded and contextually tagged in photo- and video-sharing sites like Youtube and Flickr.

   As a consequence of this fast take-up, Social Networking Sites have become one of the largest identity and reputation management systems in the world, and mobile Social Computing applications such as *Twitter* have rapidly become a global phenomenon, allowing users to exchange and share brief thoughts and messages (micro-blogging) in real-time.

2. **Social Computing is empowering users.** Social Computing is novel and disruptive as it enables the open collaborative creation and sharing of content by users and the re-use of this content for a multitude of purposes. Social Computing empowers the user to be an active participant, co-producing content, determining reputation/feedback, sharing

storage capacity, increasing connectivity, producing collective knowledge and generating and reinforcing network effects.

User-friendly sharing and collaboration tools are being distributed on a massive scale on the Internet and real information about users and their friends is available online. Social Computing goes well beyond social networking and entertainment and has already been adopted by industries and governments to provide more user-centric and effective services. One of the disruptive characteristics of Social Computing is its capacity to harness collective knowledge for learning and problem-solving.

3. **Social Computing can drive the creation of new digital divides.** Although young people (aged up to 35) were quicker in adopting Social Computing, recently older audiences (aged 55 and above) have also been doing so (25% of EU Internet users). People of all ages are engaging in Social Computing activities to support their work, learning, and citizenship. However, geographic (North-South) and socio-economic (social class, education) usage divides exist in Europe.

   Additionally, not all users engage in Social Computing with the same intensity. A different survey (Cfr.1) reports that in Europe, 30% of Internet users make use of Social Computing content created by others, e.g. they read *blogs* or *wiki* sites, watch videos on *YouTube* or use Social Networking Sites such as *Facebook*. Around 10% (included in the above 30%) of Internet users provide feedback and comments. However, only 3% (included in the above) of Internet users are active content producers, e.g. they create blogs or *Wikipedia* articles or upload user-generated videos on *YouTube* or photos on *Flickr*.

4. **Social Computing is a driver for growth and employment.**
   The Social Computing industry has shown phenomenal growth, and has become a multibillion Euro business in terms of revenues. A conservative estimate of the annual revenue in 2007 for the top 99 Social Computing application provider companies was 3 billion US$, including advertising revenues (making 0.1% of the total revenues in the ICT sector). In total, they employ between 7,000-8,000 people (which, in relation to the revenues, represents a small share of employees for the ICT sector). Online multi-player gaming accounts for the largest share of revenues and employs the majority of people in the Social Computing industry. However, most Social Computing companies (more than 60) provide Social Networking Sites and multimedia sharing applications.

   The Social Computing industry is also increasingly attracting significant capital investment. In 2007, the industry attracted some 6 billion US$ in terms of venture capital investments or acquisitions, mostly from the US.

   However, despite the impressive development of the Social Computing industry, business models still appear immature and even major Social Computing companies such as *Facebook* were still making losses by the end of 2008. In practice, advertising is the main revenue stream which reached 2 billion US$ worldwide in 2008.

5. **Social computing is disrupting other industries.** The most immediate impact of Social Computing-based services based on user-generated content is on traditional media and publishing industries, and they represent a direct threat to established actors. For example Internet use has been shown to have a negative impact on TV viewing and reading of national newspapers, especially

among young users. Also, well-known publishers such as *Brockhaus* have stopped their printed editions, and there is 500 times more traffic on *Wikipedia* than on *Britannica online*. This impact, however, is not only predatory and competitive, but also brings new opportunities for diversification and collaboration.

Social Computing is also beginning to have an impact on enterprises across sectors. Enterprises are adopting innovations introduced by Social Computing for improving internal work processes, as a tool for customer relations, and for product and service quality, design and recruitment. Between 25-35% of enterprises were experimenting with Social Computing applications in June 2008.

As a consequence of getting more people online and making them stay for longer, Social Computing has increased the demand for ICT connectivity (broadband up-link, mobile networks), software tools, and hardware (storage space) by both enterprises and consumers.

6. **Europe is lagging behind the US in the supply and development of Social Computing applications.** The EU position in the supply and development of Social Computing applications is weak. Although the take up of Social Computing applications is almost as high in Europe as it is in the US, US companies constitute the overall majority (60%) of the Social Computing Sample. As a result, US company shares in revenues and employees are correspondingly higher. Furthermore, this situation is unlikely to change in the mid-term since the EU's innovative capability is also lagging behind, as the US has even higher shares for traditional innovation indicators such as patents, venture capital and R&D expenditures. The equivalent shares for the EU (just as for Asia) hover around 10-15%.

However, Europe is stronger in Social Networking Sites and online multi-player gaming (with 25% of companies based in Europe). These current strengths could provide a platform to build opportunities for the European Social Computing industry in the near future.

7. **Social Computing has the potential to reshape work, health and learning.** Social Computing enables new horizontal collaboration models in which users take on new roles in content creation, peer-support and service delivery. Bottom-up organisational innovation is transforming the roles of actors and their relationships. In private and public workplaces, employees are joining communities of interest outside the organisational framework in order to have better access to and jointly build new knowledge, improve their skills, find out about new jobs or recruit new colleagues more effectively. In education and training, students are collaborating with each other and with teachers, inside and outside the boundaries of educational institutions, and even across borders. Teachers are co-developing contents and methods and providing peer advice. In health, Social Computing communities are developing around specific diseases to improve medical knowledge and offer social support. Patients are sharing their experiences of healthcare services and this information is being used by institutions for quality management. Doctors are using their collective intelligence to enhance their medical knowledge.

8. **Social Computing creates new resources for the achievement of public goals.** Social Computing-driven innovation and collaboration is creating new resources which could be used by governments, politicians, civil society, intermediaries and citizens to work towards the achievement of public goals in multiple policy areas. For example, new

tools are emerging for better-informed public decision making and new forms of civic and political participation; for improving the social and economic integration of immigrants; for facilitating and stimulating citizen self-care and responsibility, improving access to medical information and care and enhancing healthcare quality; for enhancing lifelong learning processes and outcomes; and for increasing business competitiveness.

Policy implications

Policy challenges emerging from the analysis of the socio-economic impact of Social Computing relate to two different perspectives. On the one hand, there is a need to manage the risks deriving from the misuse of Social Computing; on the other hand, there are opportunities to further stimulate the transformative potential of Social Computing and further increase European presence.

1. **Security, safety and privacy risks are emerging.** Risks are either new or on a bigger scale than before. They consist of weak user identification management systems, increased malicious software in user-contributed content, and greater disclosure of (real) personal data which provides greater visibility and traceability and increases risks such as impersonation and identity theft. The latter also creates new safety threats for children and young people such as cyber-bullying and online grooming. Moreover, unclear data ownership and users' lack of control of their own data are creating unprecedented risks of privacy invasion.

2. **Governance of changes brought about by Social Computing is crucial.** Social Computing-based initiatives are emerging as spontaneous and self-governing applications. As well as their enormous potential, they also present the risk of misuse and of undermining institutional credibility. In addition, the drive towards openness –the defining principle of Social Computing– challenges existing institutional and administrative cultures, structures and processes operating with top-down, vertical policy making practices. The co-existence of these opposite approaches will need to be carefully managed.

3. **New skills are required and new digital divides need to be avoided,** if users are to benefit from the opportunities offered by Social Computing. In particular, users will need to know how to use data responsibly and have critical analysis skills if they are to participate in online communities and make effective use of the Social Computing-created content. They will also need networking, collaboration, sharing and information search skills. If these skills are not developed, there is a risk that new digital divides will emerge and that existing divides will be exacerbated such as the generational divides or those related to disadvantaged regions and groups with only basic, or no, Internet access and ICT skills.

4. **Need to stimulate EU innovation and industrial competitiveness.** Social Computing could foster an innovative approach to R&D in which multiple stakeholders, including users, contribute actively with new ideas, products and services. It could also stimulate enterprise competitiveness. However, policy impetus is needed to stimulate the potential for new innovation mechanisms.

5. **Opportunities to be grasped for enhanced European governance.** Social computing supports new forms of public engagement by citizens and organisations. Good examples can be found in the area of monitoring, management and allocation of Common Agricultural Policy subsidies and Structural Funds. It is expected that in the future, Social Computing will be used to increase the transparency and openness of

European institutions and could transform the approach to developing, implementing and assessing European policies. To ignore the potential, the role and the impact of Social Computing in our networked society appears unrealistic. Social Computing offers the opportunity to revive the political engagement of EU citizens, in particular the younger generations. However, to reap such benefits, public sector leaders and decision makers will need to commit to a more open, transparent, dynamic and broader-based dialogue with citizens. Traditional boundaries will become blurred and new governance models will need to be agreed so as to enable and guide public officials to participate in such a dialogue.

Future prospects

The momentum that has characterised the Social Computing phenomenon is expected to continue, to further evolve and to mature. The driving forces and added values reside in the practices (the values of social engagement) rather than in specific technologies. As the current younger generation moves into employment and management roles, one can expect significant changes in the way civil society functions, everyday life is lived, businesses are run and public and social services are managed. It is expected that Social Computing will contribute to these changes. In the coming decade, Social Computing, and its self-governing control mechanisms, will undoubtedly contribute to positive developments in society, business, education, health, social inclusion / cohesion and encourage a more participative paradigm of societal governance, particularly if changes are properly stimulated and managed by supporting policies. Lightweight policy guidance will be needed to mitigate some of the potential risks of misuse. Internet access and network bandwidth will continue to increase, and Social Computing, either as we know it today, or in yet another surprising evolution, will establish its place in the toolbox of the digital networked society.

Part I: Main messages

1. Key Findings, Future Prospects and Policy Implications

This chapter comprises an extended Executive Summary, in which we discuss the nature of Social Computing applications or *Social Computing*, in short, what is new about it and major impacts. We examine cross-cutting themes such as the emergence of new collaboration models, social innovation and unprecedented peer-produced resources. We then envisage future potential positive developments and socio-economic impacts of Social Computing. Finally, we present some emerging policy challenges, such as security, safety and privacy risks, the need for new skills and the emergence of new digital divides, the need for governance of changes brought about by Social Computing, the opportunities for unleashing innovation and industrial competitiveness and for European policy making in general. The following chapters of the report provide further evidence of, and references for, the arguments presented in this chapter, as well as other significant insights into the socio-economic impact of Social Computing in the specific areas investigated.

This report shows that, in the long term, Social Computing has the potential to contribute to positive developments in society, education, health, governance and social inclusion. However, these comprehensive, positive changes will bring with them a variety of challenges that need to be addressed in order to both reap the benefits and mitigate possible risks of Social Computing. Moreover, today's policy challenges will become more critical as Social Computing is increasingly adopted by society, enterprises and public sector organisations.

The difficulty is that Social Computing is still a moving target, with rapidly evolving technologies, markets and user behaviours, all of which have emerged and developed over just a few years. As a result, there is little comparable, systematic and longer-term data available. The measurement issue is a crucial one, particularly as regards assessing policy implications.

1.1. What is Social Computing, what is new and major impacts

1.1.1. Definition

This report defines Social Computing as a set of open, web-based and user-friendly applications that enable users to network, share data, collaborate and co-produce content. It includes applications such as:

- social networking sites where users connect to and share personal information with friends, such as in *Facebook*;
- other social networking sites, where users share their professional background and interests in order to find new prospects, employees or new jobs, and to find people with whom they can collaborate professionally, such as in *LinkedIn*;
- blogs, where users express themselves and interact with others;
- commercial websites where users share tastes and assessments such as in *Amazon* and *Last.FM*;

- online auction and shopping websites, where users share opinions and jointly create a reputation management system, such as in *eBay*;
- data sharing websites where people upload, share, tag and annotate photos and videos, such as in *Flickr* and *Youtube*;
- file sharing websites, such as *eMule*;
- collaborative websites where users jointly share and create new content, such as in *Wikipedia*;
- multi-player online games such as *World of Warcraft;* and
- mobile social networking and micro-blogging applications, where users extend their thoughts and messages almost in real time to anyone interested, such as Twitter.

As well as the above mostly entertainment or user-centred applications, other applications have also been adopted to connect, share, collaborate and co-produce content for social or public goals, such as:

- collaborative sites to build and share knowledge for learning, such as *Connexions (Cnx.org)* or *mylanguageexchange*;
- self organising communities of professionals, such as *Doctors.net.uk*;
- websites for peer-support and provision of services, such as in *Patientslikeme*;
- websites that facilitate citizen participation in policy decision making, such as *Theyworkforyou*;
- websites that allow citizens to report offences, such as *Mybikelane* where citizens report cars which have been parked illegally in bike lanes; and
- websites that publish anonymous reports on corruption or other wrongdoings of government, and corporate and religious institutions, such as *Wikileaks*.

The key characteristics of Social Computing can be summarised as follows:

- Social computing applications are distributed and available on a massive scale on the network;
- They enable the generation, storage and visualisation of significant amounts of personal information;
- Users are in the driving seat as active participants, who co-produce content, determine reputation/feedback, share storage capacity and increase connectivity; and,
- Networks of individuals and communities collaborate on a massive scale and generate collective knowledge resources for learning and problem-solving. This includes capacity not only for information gathering but also for collective sense-making and deliberation.

1.1.2. Social Computing massive usage

Social Computing's advent on the Information Society scene in 2003 was unexpected. Since then, it has become an important trend and driver of the Information Society and the ICT industry.

Looking at Social Computing usage, one of our main findings is that **Social Computing is now mainstream.** It is today an important social phenomenon, in terms of reach, time-use and activities carried out. By the end of 2008:

- 41% all EU Internet users, and 64% of those aged under 24, were engaged in Social Computing activities;
- 32% of European Internet users had created a Social Networking Site profile;
- 38% of people aged 15-25 in Europe had profiles on Social Computing sites;
- Social Networking Sites alone were attracting an average of 165 million unique visitors a month (June 2008);
- In several OECD countries, more time was being spent on social networking and personal blogging sites than on email;[4]

4 It should be noted that Social Networking Sites do have email incorporated.

- The number of blogs had doubled from 2007 to more than 100 million worldwide, and more than 100,000 blogs were being created daily;
- More than 1 billion photos and 40 million user-created videos had been uploaded onto photo- and video-sharing sites like Youtube and Flickr;
- Tens of billions of "virtual objects" had been created by users of *Second Life*.

As a consequence of this fast take-up, Social Networking Sites have become one of the largest identity and reputation management systems in the world, and mobile social computing applications such as *Twitter* have rapidly become a global phenomenon, providing almost real-time access to, for example, the development of socio-political events.

In the history of communication technology (e.g. phone, radio, television, computers, Internet), there are hardly any examples of such growth in such a short time.

There are **different degrees of user participation** in Social Computing applications. A different survey (Cf above) reports that in Europe, 30% of Internet users make use of Social Computing content created by others, e.g. they read *blogs* or *wiki* sites, watch videos on *YouTube* or use social networking sites such as *Facebook*. Around 10% (included in the above 30%) of Internet users provide feedback and comments. Finally, only 3% (included in the above) of Internet users are content producers, e.g. they create blogs or *Wikipedia* articles or upload user-generated videos onto *YouTube* or photos onto *Flickr*. However, in some cases, the absolute numbers for active co-producers are very high, e.g. by August 2009,[5] over 500,000 people had contributed to the English *Wikipedia* and, in that month, there were about 40,000 active contributors.

Social Computing use is traditionally associated with home broadband and school/university **access**, as most popular Social Computing applications which allow photo sharing and video watching require significant bandwidth for both downstream and upstream. However, mobile access to Social Computing is becoming more popular: about 40% of social networking users have visited the main social networking destinations via a mobile device. The main mobile activities have been checking for comments and messages and posting status updates. Currently, consumers do not wish to create new and separate social networking profiles for the mobile platform, but instead prefer to access their existing social networking accounts “on the go”.

Although young people (aged up to 35) were quicker to adopt Social Computing, older audiences (aged 55 and above) have recently been doing so (25% of EU Internet users). People of all ages are engaging in several Social Computing activities to support their work, learning, entertainment and citizenship. However, geographic (North-South) and socio-economic (social class, education) **usage divides** do exist in Europe.

Social Computing’s rapid growth has been driven by increasing broadband availability and numbers of devices accessing the Internet, which have improved user skills and its user-friendliness and open access. However, there are signs that the growth in the number of users directly signing on for Social Computing applications and services may be slowing down. Two exceptions are the social networking sites and the mobile version of Social Computing, both of which continue to grow rapidly. The growth rate of content creation and active usage is also starting to slow down. This can be thought of as a **process of maturation**, in which Social Computing gets embedded into

5 Compilation by Wikimedia, at http://stats.wikimedia.org/EN/TablesWikipediansEditsGt5.htm

other devices, applications and domains, while at the same time slightly more users every day make greater use of Social Computing applications to conduct their lives, work and affairs. This also implies a greater specialisation of applications, such as *LinkedIn* (a Social Networking Site for professional networking) and *Facebook* (mainly for friendship).

1.1.3. The emerging Social Computing industry

The Social Computing industry has shown significant growth, becoming a multibillion euro business in terms of **revenues**. In 2007, a conservative estimate of annual revenue for the top 99 Social Computing application provider companies, which employ between 7,000-8,000 people, was USD 3 billion (including also advertising revenues).[6] Online gaming accounts for the largest share of revenues and employs the majority of people in the Social Computing industry as a whole, however, most Social Computing companies (more than 60 out of the 99) provide Social Networking Sites and multimedia sharing applications.[7] Mobile industries have great expectations for mobile Social Computing. Market analysts[8] forecast that world revenues will grow from about EUR 1 billion in 2008 to EUR 7-8 billion in 2013 when this market segment of mobile content and applications will be third, after music and gaming.

Despite the impressive development of the Social Computing industry, **business models are still immature** and even leading Social Computing companies such as *Facebook were* still making losses by the end of 2008. In theory, as people come together to share their identities, knowledge, reputations and consumer experiences, Social Computing opens up opportunities for the monetisation of identity through advertising. For instance, it is estimated that each social networking profile may carry a value tag of USD 20-40. So far, however, the overall value of Social Computing has not been visibly monetised. For example, in 2008, only 5.5% of the USD 26 billion spent on online advertising came from social networks in the US. This raises some questions about the sustainability of the phenomenon or, at least, it opens up opportunities to exploit Social Computing better through finding ways to extract more value from the services it creates.

Advertising is the dominant revenue model for Social Computing. Advertising spending for social networking only reached USD 2 billion worldwide in 2008. Social Computing-enabled advertising is significantly cheaper than traditional media advertising, and it can reach an increasing number of niche customers (i.e. long-tail effects). Other prevalent revenue models include: subscription-based and premium service-based models where end users pay for content or premium services; bundling Social Computing with other goods and services (e.g. the *Big Brother TV* series which uses social networking sites to boost the TV show); or donations like those made to *Wikipedia*. In addition, the mobile Social Computing domain has seen the recent emergence of value-added applications as an alternative business model.

The Social Computing industry is also increasingly attracting significant **capital investment**. In 2007, the companies in the IPTS dataset had attracted about USD 6 billion in cumulated capital investments of which about 1.5 billion in venture capital and 4.5 billion from acquisitions, mostly from the US, with a sharp rise in recent years.

6 Still, this sample of Social Computing companies constitutes a very small share of the ICT industry. To put the numbers in perspective: USD 3 billion corresponds to roughly 0.1% of the total revenues in the ICT sector, and the number of employees corresponds to an even lower share. Viewed from another angle, in terms of revenues and employees it was about half the size of Yahoo in 2007.

7 Our analysis classified Social Computing companies into the following applications: blog, multimedia sharing, online social networking sites, online gaming, social tagging, wikis and others.

8 Own compilation from data of ABI Research, Berg Insight, eMarketer, Gartner, Idate, Informa Telecoms & Media, iSuppli, Juniper Research, Netsize and Strategy Analytics.

The data suggests - although limited in nature - that the **EU's position is weak** in the supply, development and R&D of Social Computing applications. Although take up is almost as high in Europe as it is the US, US companies constitute the overall majority (60%) of the Social Computing sample, of which many are based in the Silicon Valley area, with similar shares for revenues and employees. Furthermore, this situation is unlikely to change in the mid-term since the EU's innovative capability is also lagging behind that of the US, as indicated by the even higher US shares for traditional innovation indicators such as patents, venture capital and R&D expenditures. The equivalent shares for the EU hover around 10-15% (as they do for Asia).

The EU could stimulate the development of the ICT Social Computing sector. Here it is important to take into consideration that the weakness of the EU relative to the US is not so much a specific weakness in the Social Computing industry as a general weakness in the ICT sector (especially in software development) and a gap in innovation and entrepreneurship. Hence any set of policy measures needs to address a broad range of industrial and innovation policy issues. Nonetheless, in some parts of the Social Computing landscape, Europe is slightly better positioned and EU policies could build on these strengths. For two application categories, social networking sites and online gaming, the EU share (25% of companies in these categories) is larger, i.e. European industry appears to be more competitive in these two application areas than in others.

1.1.4. Impact on other industries

Although the economic impact of the Social Computing supply industry is already substantial and rapidly growing, the impacts on other industries may be even more far-reaching. In this respect, the most immediate impact of Social Computing-based services based on user-generated content is on **traditional media industries**, where they represent a direct disruptive threat to established actors. While Social Computing is stimulating the consumption of traditional content, Internet use has been shown to have a negative impact on TV viewing and reading of national newspapers, especially among young users, bringing effects of both media substitution and time replacement. For example, well-known publishers such as Brockhaus have stopped their printed editions, and there is 500 times more traffic on *Wikipedia* than on *Britannica online*. Also, Social Computing could substitute professional services such as off-line games, dating services and email. In response, traditional media need to adapt their business models and they are opening specific sites to show their content online and also developing partnerships with popular Social Computing applications. In particular, many media portals – typically of newspapers - offer a direct link to micro-blogging service to connect in real time with the development of events. Thus, the impact on the traditional content industry is not only predatory and competitive, but also complementary and collaborative.

Globally, **enterprise usage of Social Computing was 25-35%, depending on the application, in 2008.**[9] Hence, Social Computing is beginning to have impact on enterprises across sectors, which are adopting innovations introduced by Social Computing for **improving internal work processes and as a tool for customer relations**. Companies use Social Computing applications for intra-company content creation, collaboration and sharing purposes (through wikis and social networks, for instance) to increase efficiency in workplaces which are dependent on continuously evolving information. Social Computing applications are increasingly being used for customer relations. 87% of organisations that already use Social Computing applications

9 For example, the share of companies which used blogs was 34% in 2008. However, the general usage of one or more Social Computing applications may be much higher.

use them to interface with customers (including those in new markets). Interfaces with customers for product feedback can provide companies with a means of monitoring user innovations and developing ideas for improving their products. Specific Social Computing applications harness collaboratively-created user innovations for their product development, and hence potentially raise the rate of innovation at low cost. For example, *Lego Mindstorm* allows customers to design personally-tailored products, which can later be added to the general product selection, and *TomTom* improves its maps through Map Share which allows customers to make improvements to their maps directly on their navigation devices (a technique called *crowdsourcing*).

Thus, Social Computing is reinforcing the emerging and growing **role of the user in the innovation-development process,** as well as the ongoing shift towards open innovation. However, a significant proportion of firms (especially small ones) that have already adopted Social Computing have not yet fully reaped its potential benefits, if at all. Hence, there is still an untapped potential for companies, not only to adopt Social Computing to a larger extent, but also to learn how use it productively.

In the mobile domain, this open innovation model has been embraced by operators (e.g., *Vodafone's Betavine* collaborative mobile innovation portal[10]), application providers (*Google* supported *Android* to provide an open operation system on mobile phones, so that programmers can jointly develop their own applications for specific needs worldwide in a free open source fashion) and device suppliers (*Nokia* is opening *Symbian*, its mobile operating system, and creating open research centres resembling startups[11]).

10 http://www.vodafonebetavine.net/
11 See the interview with J.P. Shen, Head of Palo Alto Nokia Research Centre in Communications & Strategies, no. 74, 2nd quarter 2009, p 117-123

Social Computing can also have negative effects on enterprises, such as loss of productivity due to the increasing time spent on Social Networking Sites by staff and the risk of breaches of confidentiality.

Finally, by getting more people online and making them stay longer, Social Computing **increases the demand for ICT** connectivity (fixed and mobile broadband), software tools, and hardware (mobile devices, storage space) by enterprises and consumers.

1.2. Cross-cutting findings

This section discusses two cross-cutting findings that have emerged from our research. First, Social Computing enables new collaboration models in which users play new roles in content creation, peer-support and service delivery, driving new bottom-up social innovation processes. Second, Social Computing-enabled collaboration gives rise to the creation of collective knowledge as a new peer-created resource and allows several actors - governments, politicians, civil society, intermediaries and citizens – to use it for new purposes, including the achievement of public goals.

1.2.1. Social Computing enables new user roles driving social innovation

The open, user-centric and participative functions of Social Computing applications enable new horizontal collaboration models in which **users are empowered to take on new roles in content creation, peer support and service delivery.** These collaboration models are spreading across sectors, actors, institutions and geographical locations, outside established institutions and working practices. They have emerged in:

- Workplaces, both public and private, where employees play an active role and join interest communities outside the organisational framework in order to have better access to and jointly build new knowledge, improve skills, keep informed about the activities of others, and find out about new jobs or recruit new colleagues. Examples of such applications include the open medical knowledge base Ganfyd and the social networking site LinkedIn.

- Mass media, where users collect, report and distribute information about events producing citizen journalism (e.g. Twitter) and allow, for example, socio-political mobilisations. Mobile social computing increases this capacity as users can interact at the precise place and time of an event.
- Politics and society, where citizens and groups of citizens organise collective action across borders and cultures. Citizens self-organise to support and complement public organisations. Examples include citizens collaborating in disaster management, or controlling politicians and governments; patients getting together to build knowledge, to better manage their lives and to get social support; and people connecting with others for leisure and entertainment as they do in on-line games. Examples of such applications include e-petitions, to create and sign petitions to the UK Prime Minister's Office and PatientsLikeMe, where users share their knowledge and experience with peer patients and provide each other with support.
- Education and learning, where students collaborate among themselves and with teachers, inside and outside formal education boundaries, and also across borders. Collaborative learning models open up alternative learning channels by linking learners to experts, researchers and practitioners in the field under study. Teachers co-develop teaching content and pedagogic methods and provide peer support. Social networks and communities of interest arise around common learning interests and facilitate learning by providing social and cognitive guidance and support. Examples of important educational applications include Cloudworks, a site for sharing learning and teaching ideas and experiences, interactivewhiteboardlessons, a teachers´ resource site for interactive teaching, LiveMocha, a language learning site and RezEd.org, a resource site on virtual worlds for learning.
- Government and public administration, where various stakeholders collaborate on service provision, policy development and enforcement. Examples of such applications include PeerToPatent, which harnesses the knowledge of citizen-experts to improve patent quality; Theyworkforyou, where citizens track the activities of elected and unelected representatives in the government; Intellipedia, which links the US intelligence community and provides a peer-to-peer content creation platform. Other applications include Fixmystreet, which allows people to report and discuss problems such as speeding cars and broken pavements, and Mybikelane, which allows people to report cars which have been parked illegally in bike lanes.

New user roles are creating novel opportunities for public and private organisations to incorporate user-created *content* and new *actors* into their value chain. Hence, bottom-up user-driven **organisational innovation** together with dis-intermediation and re-intermediation processes are taking place, **transforming the roles of actors and their relationships**. Organisational innovation itself is increasingly being managed as a process which is socially distributed among multiple stakeholders. For example, learners take an active role in their learning as co-creators and evaluators and, as a result, the teacher's role evolves towards empowering learners to make use of the available resources and tools for their learning. Patients play a more active role in managing their health and become much savvier on health and healthcare, which stimulates self-care and responsibility and changes the nature of the patient-doctor relationship. Users, through a Social Computing-enabled application, *PatientOpinion,* share their healthcare experiences, becoming new actors in the quality management value chain of healthcare institutions. Finally, citizens have also become new content providers for the media industry, a trend further reinforced by real-time mobile applications «on-the-go».

This user-driven innovation often challenges the role and functioning of private and public organisations, and thus becomes a **potential driver for disruptive change**. For instance, changes brought about by Social Computing undermine traditional actors in the media and publishing industry as discussed above. Changes in learning and teaching are also challenging existing education and training structures and practices. Social Computing also provides opportunities for mass collaboration among citizens, and thus demands that public organisations and governance processes are more accountable and transparent.

Finally, social innovation is also generated in that sub-critical (long tail) needs, which were until now relatively intractable due to invisible demand or dispersed user communities, can now be effectively addressed. Social Computing production, sharing and collaboration tools can connect scattered user groups and individuals who share the same interests allowing, for instance, research and advancement on rare diseases, the connection of dispersed communities of ethnic minorities or citizen organisations to act as pressure groups around very specific or minority topics.

1.2.2. Social Computing provides new peer-produced resources

We have discussed Social Computing´s capacity for enabling users to play new roles in content creation, peer support and service delivery, and in driving social innovation. In this section, we discuss in more detail the fact that Social Computing provides unprecedented tools for several actors to **harness collective knowledge** and use it as a new peer-produced resource. Users join Social Computing applications to create, review, refine, enhance and share information around specific topics of interest, e.g. professional, health-related or political. The collective knowledge is thus gathered by employees, citizens and governments, patients and doctors, and teachers and learners, allowing them to use it **for new purposes,** including the achievement of public goals**.**

Social Computing applications are being increasingly adopted in enterprises to **generate and use new knowledge to improve internal work processes, products and services**. Concretely, access to user-generated knowledge available on professional social networking sites such as *LinkedIn*, increases the cost efficiency of recruitment processes. Customer-generated knowledge on product performance, usability and design is used by enterprises to improve product characteristics. Employees are increasingly using Social Computing peer-produced knowledge to upgrade their skills and knowledge and for networking. Also, the availability of user-generated knowledge on product and service quality (e.g. as on *Tripadvisor)* empowers consumers in their purchasing choices, and increases product competition on quality and price. Overall, these elements could positively contribute to increasing enterprise competitiveness.

Social Computing provides **new tools for social support and social inclusion.** This is particularly important for groups at risk of exclusion, for instance, in the socio-economic integration and participation of immigrants and ethnic minorities (IEM). In particular, Social Computing can support the integration of local and immigrant communities and help them find jobs. Social Computing can also provide social networking tools and content that help IEM to maintain and develop connections with friends and relatives in the country of origin. Applications in this area include *CousCous Global,* a website that allows young people all over the world to engage in intercultural dialogue through ICT mediated debates. However, the need for specific skills in order to benefit from the advantages of Social Computing also brings the risk of a new level of digital divide.

Indirectly, Social Computing applications also empower Civil Society Organisations (NGOs, voluntary groups, associations, etc.) which play a significant role in fighting social exclusion. Concretely, it enables easier participation, wider knowledge aggregation and broader dissemination, and as a consequence, improves resource collection and operational efficiency. Examples of applications in this domain include *Avaaz.org*, a new global web movement to improve the world, and *Mobileactive.org,* a community of people and organisations using mobile phones for social impact.

In education and training, learners and teachers use **Social Computing applications to support, facilitate and enhance learning processes and outcomes** in, for example, lifelong learning and workplace learning. Social Computing supports the creation of and access to learning materials such as on-line encyclopaedias, multimedia and immersive environments and podcasts by learners and teachers. These materials can be developed in a collaborative and distributed process, and delivered with flexibility. Examples of applications which support this process include the language learning site *LiveMocha* and the educational material sharing site *Connexions (cnx.org)*.

Social Computing user-created knowledge has a positive impact on multiple facets of public health and healthcare. From the patient perspective, Social Computing-enabled user-created knowledge on health facilitates and stimulates self-care and responsibility by empowering both patients and healthy citizens. An example of this kind of application is *Wikipedia*. Social Computing communities developed around targeted illnesses, as in *Patientslikeme*, also provide improved access to medical information, care and social support. From the doctors´ perspective, collective knowledge created by doctors can enhance medical knowledge and, as a result, healthcare quality. An example of this application is *Ganfyd*, a user-generated and evolving medical text book. From the health management perspective, the collection of patient experiences through Social Computing applications, such as in *PatientOpinion,* provides a tool to improve health service quality management. Finally, knowledge created by wiki tools also helps to organise a coherent, collective and more effective answer to pandemic diseases.

Finally, **Social Computing collective knowledge can enhance political participation**. Social Computing empowers users and civil organisations to build, manage, access and distribute government and political information, lowering the barriers for the citizen participation and engagement in policy and political decision-making. Social Computing also provides tools to gather citizens´ opinions on a massive scale. This allows **better informed public decision making** thanks to a more comprehensive consultative process. Finally, websites like *Peer to Patent*, *Fixmystreet*, and *MyBikeLane* provide diverse examples of information generated by citizens on the basis of their own local or specialised knowledge, opinions, and needs, which can be effectively used by governments to provide services that are **more citizen-centred, cost-efficient and of increased quality.**

1.3. Future prospects of Social Computing

This section presents some visions of a desirable future, which aims to stimulate discussion on the evolution of Social Computing over the next 10-20 years, grasp opportunities, mitigate possible risks and address forthcoming challenges. The visions presented here are derived from existing emerging Social Computing trends, assuming they will develop steadily in the near future.

In the next 10-20 years, we expect Social Computing to flourish, due to the fact that the innovation and added value of Social Computing resides in its practices rather than in discrete technologies. These practices, it was noted, include user-led, bottom-up, collective knowledge; horizontal sharing and networking; open innovation; user/citizen/customer empowerment; and crowdsourcing and mass collaboration. As today's younger generation ages and moves into employment and management roles, one may expect significant changes in the way society functions and everyday life is lived, businesses are run and public and social services are managed. In the long term, Social Computing has the potential to contribute to positive developments in society, education, health, governance and social inclusion.

Technological developments

While several trends emerge directly stemming from Social Computing, such as the 'social web' and Mobile 2.0, others relate to broader future Internet developments such as the Internet of things, the semantic web, the web of knowledge, the Internet of services, ambient intelligence, autonomic computing and augmented reality.

First, we expect that the Internet will move beyond being a network that connects computers together to become an Internet connecting 'things': cars, household appliances, energy meters, windows and lights. This new Internet of "things that think", truly a sensory network, will allow a leap forward in the knowledge about the world we live in. It will support user-centred Social Computing applications for energy efficiency, health and welfare services and efficient transport. If done well, there will be a massive improvement in our quality of life and sustainability.

Second, we expect that this will support the growth of the "Internet of Services". A new Internet based on virtualisation of processes and cloud computing, and on other technologies that will emerge, will be complementary to Social Computing-enabled technologies, applications and values, with open Application Programming Interface (API). This will require the development of innovative business models and public-private partnerships to cope with the resulting potential and challenges.

Third, in the mobile domain, we expect the growth of 'context awareness', whereby information on users' activities and positions in time-space is harnessed. Knowing when your friends and colleagues are around and meeting people sharing the same interests is expected to drive the adoption by users of mobile Social Computing. The capabilities of mobile devices as environment sensors make possible the contribution of users to "reality mining" where all types of information are placed on top of physical entities.

Fourth, Artificial Intelligence will support the evolution of Social Computing applications towards effective real time monitoring and support systems which are directly connected to human bodies and brains to augment human perception and capacities. A simple wireless plug-in in the human body could make possible the long held ambition of merging augmented reality with ambient intelligence.

We expect that Social Computing technologies and applications will blend in and support these four areas by virtue of the practices described above: user-centred interaction, easy "data portability" and ease of integration with any technological support. Although it is expected that Social Computing and future Internet of things applications will merge, it is, of course, unclear what the defining applications for the next wave of Social Computing will be.

Socio-political developments

If these socio-technical developments materialise, it could mean that in the next 10-20 years most groups in **society** could gain the ICT skills required to use Social Computing applications. More citizens could use Social Computing to build an equitable society for multiple purposes: education, health, leisure, work and employment. Social Computing could support active ageing and enhance community building by improving local service delivery and creating opportunities for economic growth.

Citizens could be empowered, well-informed and engaged in the political decision-making process. A new **participative governance** model could emerge, in which Social Computing-enabled feedback loops and co-creation would be fully integrated into the policy and decision-making cycle. Mass-collaboration systems would offer user-centric and cost-effective services in cooperation with private actors, informal groups and citizens. New mechanisms of interest generation and articulation could strengthen governance systems by linking it in real time to citizens and their representatives.

Governments and industries could increasingly make use of extensive and detailed citizen profiles to provide **better services** through Social Computing. User-controlled privacy-friendly solutions could allow citizens to avoid crime, stay safe and control their 'digital personae' in the virtual and in the real world. Social Computing could enable citizens to better control authorities, thus increasing the accountability, transparency and quality of public services. Social Computing-supported distributed reputation systems could also help to increase trust among online users.

The education system could be developed around the concept of 'Learning spaces': open and creative social spaces which connect formal and informal learning and communities of practice and allow individuals to learn according to their preferences, interests, time and skills. While guidance and interaction would continue to be crucial, the role of teachers, tutors and trainers could change as a result of Social Computing mechanisms and rules, which could make reputation and feedback more important than official roles and titles.

In the health sector, large scale Social Computing-enabled collaboration systems could connect an increasing number of actors permitting a critical mass of knowledge to be gathered in a structured manner and made available to patients, clinicians and researchers. This would drive advances in R&D and boost scientific discovery, thus leading to new therapies for a wide range of diseases. The changing relationship between patients and doctors could lead to new and efficient ways of organising healthcare, reducing costs and improving the quality of services. Social Computing could make relevant and updated information at each level of care globally available.

Overall, we expect that Social Computing will foster social change in the next 10-20 years. At the societal level, there could be more efficient, interconnected and transparent markets, more participatory processes of governance and new forms of economic and social innovation. At the organisational level, Social Computing could help intermediary institutions and agents work more effectively and be more responsive to users. At the personal level, users could harness Social Computing to address their information needs, develop their own strategies and solutions for improving their lives, and voice their interests in societal processes.

Foreseeable challenges

However, these developments will not materialise unaided, nor will they do so overnight; they need close observation and competent steering. On the one hand, this is about enabling the potential of Social Computing. It is important to understand how to integrate Social Computing-enabled innovations into public services and how to develop new and sustainable business models and more general ICT-enabled governance mechanisms for public service-delivery.

On the other hand, this implies avoiding the risks brought about by Social Computing: privacy infringements and security issues; the rise of "Web-populism" where only the loudest is heard; and low quality of content and liability. In addition, the "wisdom of the crowd" may not always be wise, especially in relation to public governance and decision-making. Participation can be marginal, biased, or limited to activists, extremists, experts or elites. Social Computing experiments may not always be sustainable or up-scalable. Social inequality can actually be widened instead of reduced, as universal service has yet to be provided and Internet accessibility is not guaranteed. Although Social Computing is an important driver for community building, it does not necessarily strengthen social cohesion, and may instead lead to social segregation and fragmentation, especially for already disadvantaged groups.

Moreover, innovative applications in general are met with relative inertia by complex bureaucracies, and Social Computing is no exception. The public sector will require fundamental innovations in business models, value chain concepts and user/producer relations to integrate the potential of Social Computing applications into the governance process and provide more efficient, effective and high-quality services. Indeed, the contrast between the top-down, supply-driven and hierarchical set up of most public sector organisations and the open, decentralised and user-driven organisational models of Social Computing applications, will demand a re-design of the institutional systems of government - from policy-making and regulatory functions to traditional service delivery mechanisms.

1.4. Policy challenges and opportunities

As shown before, Social Computing can have an important positive impact on key policy areas such as industry, citizens, identity, social inclusion, education and training, healthcare, public health, public governance and democratic participation. However, the analysis of Social Computing's potential to enable the comprehensive, positive changes depicted above points to a variety of challenges that must be addressed, in order to reap the benefits and also mitigate the possible risks. In this section, we describe a number of challenges that have directly emerged from the research. Other important policy challenges originating from Social Computing have also been identified, which deserve further research and attention, in particular, the unclear legal responsibility for user-generated data and the fact that the lack of interoperability and open standards stifles competition.

Nonetheless, there are opportunities to further stimulate the transformative potential of Social Computing and further increase European presence in this domain.

1.4.1. Security, safety and privacy risks

Security risks arise from the fact that user-friendly Social Computing applications have weak user identification management systems. Most systems require simple email ID and password identification, which reduces the reliability of the identification and makes it easier to break into someone's account. Also, user-contributed content can be infected by various forms of malicious software.

Furthermore, user behaviour in the digital world has evolved. Initially, people played anonymous or pseudonymous roles but now they use their real identities and their real names, and tend to disclose significant amounts of personal data. This provides greater visibility and traceability of (real) personal information and greatly increases risks such as **impersonation and identity theft.**

In addition, new challenges emerge related to **safety issues for children and young people such as online grooming and cyberbullying.** Indeed, young people are particularly susceptible to security and safety risks as, for some adolescents, these platforms have become a way to advertise their own selves and to declare their identity. Online grooming refers to actions deliberately undertaken to befriend a child and establish an emotional connection with him/her, in order to lower the child's inhibitions in preparation for sexual abuse. Cyberbullying refers to the use of ICTs to support deliberate, repeated, and hostile behaviour by an individual or group that is intended to harm others. This phenomenon, however, does not only affect youngsters but also a wider group of people. With Social Computing applications, it is easy to broadcast angry blog posts or embarrassing videos and pictures of neighbours, classmates, teachers and politicians, the consequences of which may be damaging. There are already reported cases of cyberbullying of both students and teachers through online materials.

Furthermore, external plug-ins and applications contain and collect increasing amounts of user data, creating an environment of **unclear data ownership and user control**. The persistence of data in Social Computing applications, search engines and web history repositories leads to extensive and difficult to control search and cross-indexing capabilities, creating unprecedented **privacy invasion risks.** These risks are exacerbated by the lack of transparency on the side of service providers on privacy policies. This has raised concerns that employers, for example, could use digital trails to search for information on personal issues such as ethnicity, sexuality or other criteria in recruitment processes, or even about pervasive surveillance by the state of citizens' behaviour and opinions. Finally, as the freedom of individual opinion and the lack of public control of personal opinions and preferences is usually understood to be the key pre-condition of **democracy**, privacy protection also has fundamental consequences for the ways society organises its policy processes. Additionally, the very rapid diffusion of Social Computing considerably amplifies the policy challenges at this more societal level. Significant examples of the tension generated by Social Computing applications between openness and freedom of speech and control of personal data and censorship of opinions are the recent cases registered in China in relation to the protests world-wide about the situation in Tibet and in Iran in opposition to the re-election of President Mahmoud Ahmadinejad. In both cases, Social Computing facilitated spontaneous self-organised protests and freedom of expression but, at the same time, provoked a counter-reaction from the established governments that increased online surveillance and repression.

New risks could emerge through Social Computing applications, which, in addition to causing social harm, could limit their exposure to the web and thus the realisation of the potential benefits and opportunities offered by the collective knowledge enabled by Social Computing. In order to prevent this, policies could address the need to:

- Protect young and adult citizens by raising their awareness of security, safety and privacy risks, and available tools to manage them;
- Continue the wide range of efforts to educate and steer parents, children, teachers, workers and all users towards safe and responsible usage of Social Computing;
- Encourage Social Computing providers to be actively involved in preventing crime and vulnerabilities;
- Enforce the current data protection regulatory framework and develop guidelines for privacy protection and data ownership on Social Computing applications.

1.4.2. New skills for new jobs and new digital divides

New critical skills and digital competences will be required for users to benefit from the opportunities brought by Social Computing. These go beyond basic skills for ICT use. In order for users to participate in on-line communities and make adequate use of the Social Computing-created content, networking, collaboration, sharing, and information search, they will need to have analytical skills and critical attitudes to understand and make responsible use of Social Computing data. These are necessary for employment, education and training, self-development and participation in society. At the same time, these requirements create the **risk of a new level of digital divide**, which must be addressed and anticipated.

In addition, there is the risk that existing divides, such as the generational divides or those related to disadvantaged areas and groups with only basic, or no, Internet access and ICT skills, will be exacerbated. Equal access to broadband Internet and basic and advanced skills should be ensured for **disadvantaged areas and groups**, which still suffer from limited basic ICT skills and Internet access (i.e. learners with special needs or disabilities might not have access to learning through Social Computing applications).

Finally, Social Computing applications create open access to new sources of user-generated information. However, this new resource is being dynamically created through the collection of individual knowledge and experiences and is corrected and refined through diverse self-managed quality assurance processes supported by Social Computing applications. Although Social Computing-enabled applications may enjoy better quality than traditional websites, Social Computing content is also subject to errors and malicious contributions. As a consequence, lack of awareness on the nature and quality of content and lack of advanced ICT skills for information search, critical evaluation and responsible use of data may lead to numerous **risks of inadequate use of the information**: students not questioning the correctness of information in *Wikipedia*, patients using peer information for self-diagnosis and self-medication, or citizens being misinformed and influenced by political or commercial opinions.

In order to develop the necessary critical skills and digital competences for employment, education and training, self-development and participation in society, policies could:

- Ensure that the necessary learning programmes are in place as early as possible in education and that they are continuously updated and maintained throughout people's lives.

In order to reduce existing divides which could be aggravated by Social Computing developments and avoid the emergence of new divides in the adoption of Social Computing applications and their related benefits, policies could:

- Continue to promote availability and affordability of access to broadband Internet as this is a pre-requisite for the use of Social Computing applications and user participation in social networks.

In order to limit the risks arising from misuse of user-generated information available on the web, policies could:

- Raise awareness about the nature and quality of user-generated content and risks involved in its use.

1.4.3. Governance of changes brought about by Social Computing

The analysis presented in previous sections shows the potential benefits of user-driven Social Computing applications, innovations and the collective knowledge gathered for achieving public goals, i.e., service quality, user-centricity, increased citizen participation, better evidence-based policy making and education and healthcare quality. Social Computing initiatives however emerge predominantly as self-governing and though they are often self-regulated, there may be a need to define rules and codes of conduct, especially when public services and the use of public data are involved.

Furthermore, in spite of their enormous potential, these applications could be misused and could, for example, create inefficiencies, social damage or undermine institutional credibility. It is suggested that governments and public institutions in education, health, etc should pay more attention to the governance of changes brought about by Social Computing applications. On the one hand, they could integrate or support Social Computing-based bottom-up social innovation, and on the other hand, they could work towards the prevention and management of the potential risks involved.

Additionally, any attempt to maximise the potential of Social Computing in the public sector has to meet the new challenges arising from the need to incorporate the openness of Social Computing on freedom of public opinion, access to data and collaboration into existing cultural, institutional and administrative cultures, structures and processes, and allow and manage their coexistence.

In this regard, the above-mentioned recent cases of online censorship in China and Iran as counter actions to the open flows of information and opinions, which Social Computing and especially micro-blogging application such as Twitter facilitated, are an evident manifestation of the tension between the openness of the Internet and the security needs advocated by different approaches and perspectives in the current debate on Internet governance.

Finally, the measurement issue is crucial, particularly in the context of informed policy implications. The most urgent need is certainly for new metrics to address the emergence of new social media, and in general, for systematic measurements and internationally comparable data. These would enable better assessment of the long-term importance of Social Computing trends in terms of their socio-economic impact, and the quantitative and qualitative differences between the EU and the rest of the world. This is especially necessary in order to bridge the gap between the wealth of "marketing-type" data and the lack of official statistics, which occurs for every new socio-techno-economic trend, especially in the fast-evolving ICT landscape.

In order to help Governments to embrace the changes driven by open Social Computing applications to improve public service quality, user-centricity and democratic governance, policies could address the following areas:

- The opening up of governance and policy-making, considering the possibility of integrating new Social Computing-enabled user-generated applications, services and data and existing bottom-up user-led initiatives;
- The promotion of new governance approaches to enable Social Computing-based bottom-up social innovation, while preventing misuses and negative impacts;
- The promotion of learning and experimentation with innovative Social Computing-driven initiatives in public service delivery and mass-collaboration participatory governance;
- The promotion of an accountable, transparent, democratic and multilateral form of Internet governance;
- The gathering of comparable, systematic and longer-term official data and statistics on the take-up, use and impact of Social Computing which would help to develop evidence-based policies enabling opportunities and mitigating risks.

1.4.4. Opportunities for innovation and industrial competitiveness

The dynamics of Social Computing are already substantially modifying the way business is done in many contexts, as already described above. Firms could incorporate Social Computing principles into their business models to gain and sustain competitive advantages in the context of a networked society; and incorporate participatory tools into their practices, first within their own organisations, and then by opening them up to customers on the web. The **economic and competitive impact of Social Computing on enterprises** is expected to be significant, as the more efficient sharing of intelligence and knowledge will allow cost savings and/or improve productivity and also enhance decision making. Also, the adoption of Social Computing by enterprises could result in completely new or disruptive business models or processes, as input from other sources (e.g. outside the company), can be brought in more effectively, giving rise to more fundamental changes in behaviour. For example, open innovation and user-driven innovation can lower the cost of doing research and integrate innovation with a greater disruptive potential.

The mobile industries are responding and adapting to this shift. There are many (and increasing) examples of the supply of both open and proprietary platform products that offer user-innovators a framework in which to develop and use their improvements. The main examples lie in the current race for the software framework to develop and distribute mobile applications.

Finally, the open environment facilitated by Social Computing, in which universities, private companies, NGOs and ´prosumers´ (proactive consumers or producer-consumer) work together could result in new applications and reinventions that trigger market take-off and further shape the development of Social Computing. Social Computing can enable **an innovative approach to R&D** in which users participate and contribute actively, creating instant feedback on new ideas, products and services. Users could also play important roles in the development of new services as co-creators and initiators, thanks to Social Computing.

For Social Computing-driven innovation in enterprises to enhance product and service quality and overall industrial competitiveness, policy measures would need to:

- Raise European companies' awareness of the potential opportunities that could arise from the adoption of Social Computing applications and technologies;
- Support funding instruments for research into innovative Social Computing applications, and eventually support experimental open innovation, and promote exchange of good practices and EU-wide collaboration;
- Support the implementation of innovative Social Computing-enabled public services in order to stimulate a lead market for European industry in Social Computing-enabled systems in this context.

1.4.5. Opportunities for enhanced European policy making

Some considerations on other important policy challenges of direct relevance for EU policy-makers can be identified, though they are not directly built on evidence from the individual chapters of this research. Social Computing seems to be a great opportunity for European policymaking but it will also undoubtedly affect how the European institutions function and the way European policies are developed, implemented and assessed (Cf. the entire policy process).

Social Computing supports new forms of public engagement. These involve people and organisations from diverse backgrounds, languages and with different interests and concerns. For example, Social Computing applications already allow social monitoring of the management and allocation of Common Agricultural Policy subsidies and Structural Funds. *Farmsubsidy* and *FollowtheMoney* are successful examples of how Social Computing could be used. The challenge is that while these new forms of engagement will be increasingly difficult to ignore, they are rather difficult to control – in the traditional way. Social computing represents a significant paradigm shift *vis-à-vis* top-down, vertical policy making practices and requires specific re-thinking of current governance models in order to guide the consultative process. This also includes the issue of constituency since typical Social Computing participants are not limited by citizenship, geography or cultural boundaries. Consequently, there is a need and an opportunity to re-think current notions of democratic representation and consultation, opinion gathering and involvement of stakeholders and interest groups, to mention only a few.

To ignore the role and impact of Social Computing practices in our society appears unrealistic and increasingly anachronistic. Additionally, the opportunity to revive citizen engagement with public policies has emerged. However, the benefits will only be reaped if public sector leaders are committed to a radical shift towards openness and transparency and public officials are encouraged, enabled and guided to engage openly and spontaneously.

In conclusion, the analysis of possible opportunities and risks associated with Social Computing indicates that today's policy challenges will become more critical as Social Computing continues to be embraced by society, enterprises and public sector organisations. The fast development and adoption of Social Computing technologies and applications could also accelerate the risks if it is not properly and promptly governed. Policy intervention is therefore needed to address both present and future challenges arising from Social Computing. If we are to reap the benefits of Social Computing in the future and manage the upcoming challenges it poses, policy measures should aim to guarantee security, safety and privacy, foster new skills development and avoid new digital divides. New governance models and mechanisms are called for and policies that stimulate innovation and improve competitiveness will become crucial.

Part II: On defining Social Computing, its Scope and Significance

2. The Adoption and Use of Social Computing

2.1. Introduction

Increasing importance is being given to user empowerment (Reding, 2008b), as it is considered to be a crucial factor for the growth of the digital economy. Approaches like Web 2.0/ social computing are rapidly expanding in the context of 'user–led innovation' and in particular in user-driven service innovation, i.e. where users are involved in the co-creation of services. The adoption rates of media technologies over the past few decades clearly show the benefits of timely user involvement.

Largely steered by users, Social Computing applications like blogging, podcasting, collaborative content, social networking and on-line gaming exploit Internet connectivity to support the networking of people and content. In the history of communication, there are very few examples of such fast growth in such a short time. But is the rate of content creation slowing down? Are the adoption rates levelling off? How important is this in terms of Internet usage? Comparative research over longer periods of time is needed in order to answer these questions.

In order to address this need, we have attempted a systematic empirical assessment[12] of the creation, use and adoption of social computing applications. We have also looked into the way adoption is shaped by age or gender among other factors, and also at the dynamics of participation i.e. the way people adopt social computing. Key trends expected to shape the digital future are then indicated. Finally, we identify challenges associated with this analysis.

12 Desk research based on a large number of sample-based measurements, either from Internet audience measurement companies (e.g. Hitwise, comScore, Nielsen Netratings, Mediametrie), international research companies like IPSOS Mori or Novartis or research projects of non-profit centres (e.g. Pew Research Centre's Pew Internet and American Life project in US), international firms like Edelman or industry itself (e.g. Technorati, Wikipedia, SecondLife, PodLook, Feedburner), weblogs and private analyses.

2.2. The state of Social Computing

Social Computing is more than blogs and wikis. New forms of content have been taken up by the masses, tapping into the 'wisdom of crowds' (Surowiecki, 2004). By 2008, there were more than 130 million blogs (nearly double the number in 2007) (Technorati, 2008). In October 2008, 41% all EU Internet users, and 64% of those aged under 24 had used Social Computing applications. Also, 32% of European Internet users had created Social Networking Site profiles (Gallup, 2008b). In June 2008, Social Networking Sites attracted an average of 165 million unique visitors a month (comScore, 2008a); in several OECD countries, more time was spent on social networking and personal blogging sites than on email (Nielsen, 2009). More than 1 billion photos and 40 million user-created videos have been uploaded onto photo- or video-sharing sites; tens of billions of objects have been created by users in Second Life; social tagging is on the rise - millions of photos have been tagged in Flickr, and videos in YouTube (see Table 1).

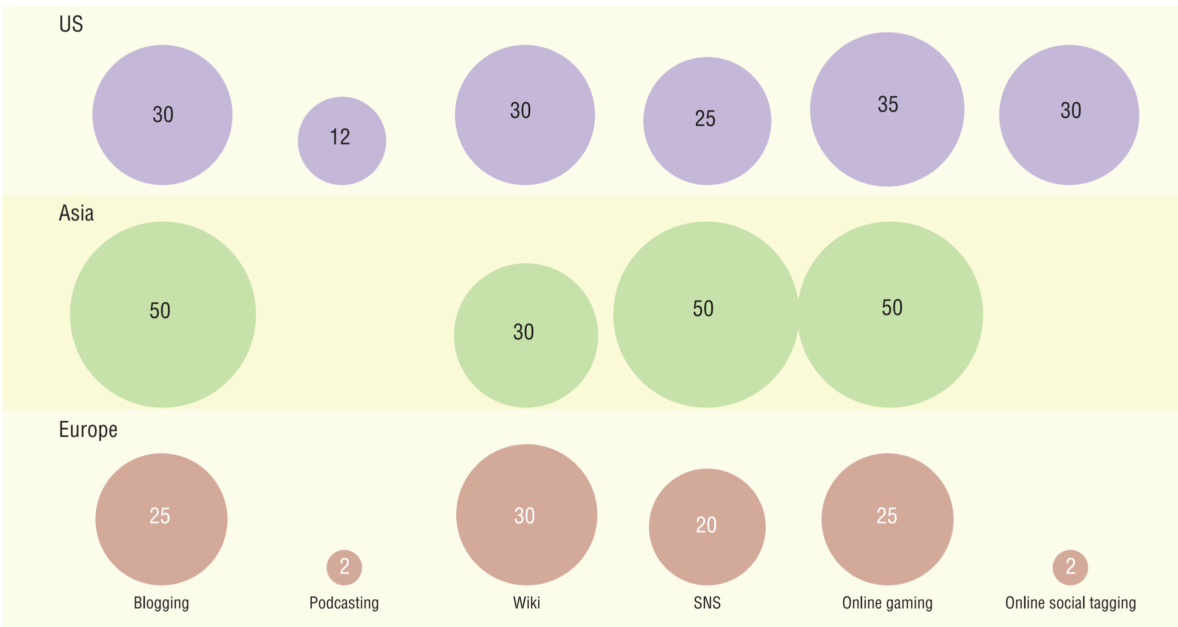
Social computing applications have become part of mainstream Internet use for at least a quarter

Table 1: State of Diffusion of Social Computing

Application	State of diffusion	Rate of creation of new content
Blogging	>100M blogs and doubling every 5-7m or the last 2 years **Between 20 and 50% Internet users read blogs**	120,000 new blogs created daily Slowing down in the growth of the blogosphere and in the rate of posts created per day since Oct 2006
SNS incl. Multimedia sharing	Over 250M profiles on-line (Oct 2007) >1billion shared images on-line (Aug 2007) ~40M shared videos on-line (June 2007) **25-50% of Internet users visit SNSs**	Growth in number of profiles in MySpace slowing down ~1M new images uploaded daily in Flickr (growth levelling off); >65,000 videos uploaded daily in YouTube (June 2006); number of videos decreasing since March 2007
Podcasting	>100,000 active podcasts worldwide <10% of Internet users listening/downloading podcasts. (Statistics vary considerably)	Number of podcasts growing rapidly, up from 10,000 in 2004 (IDATE Aug 2007)
Collaborative content (wikipedia)	7.5M articles in all combined Wikipedia sites (Oct 2007) **30% of global Internet users visit Wikipedia**	Growth in number of articles in the English version of Wikipedia tailing off since Sep 2006
Social tagging	Lots of content tagged **30% of US Internet users tagging**	>1M tags per week in Flickr (2006); 2.6M geotagged photos in Flickr in Aug 2007, up from 1.6 M in 2006

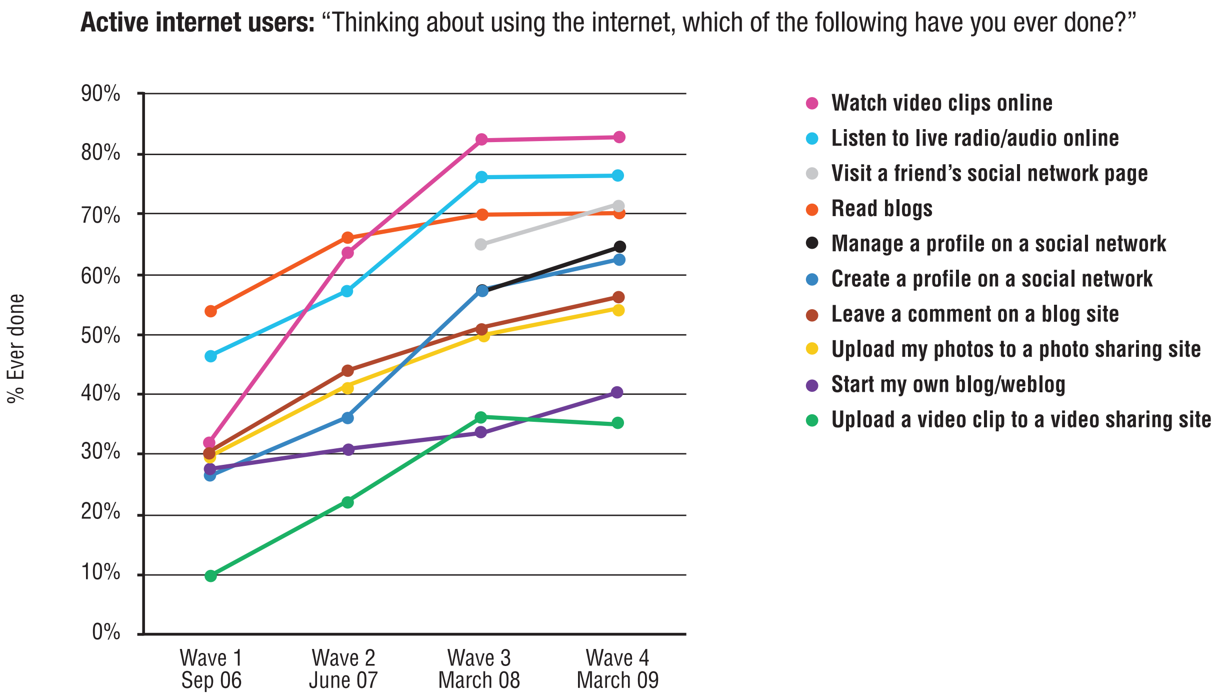
Source: (Pascu, 2008a)

Figure 1: Adoption of Social Computing



Source: (Pascu, 2008a), estimation based on existing surveys

Figure 2: The growth in active usage of social computing applications



Source: (Universal McCann, 2009)

of Internet users in Europe. By 2008, blogging, photo- and video-sharing, social networking and on-line gaming had been embraced by half the Internet users worldwide. Some regional patterns seem to emerge: Asian countries are leading the adoption of Social Computing, followed by the US and Europe (see Figure 1).

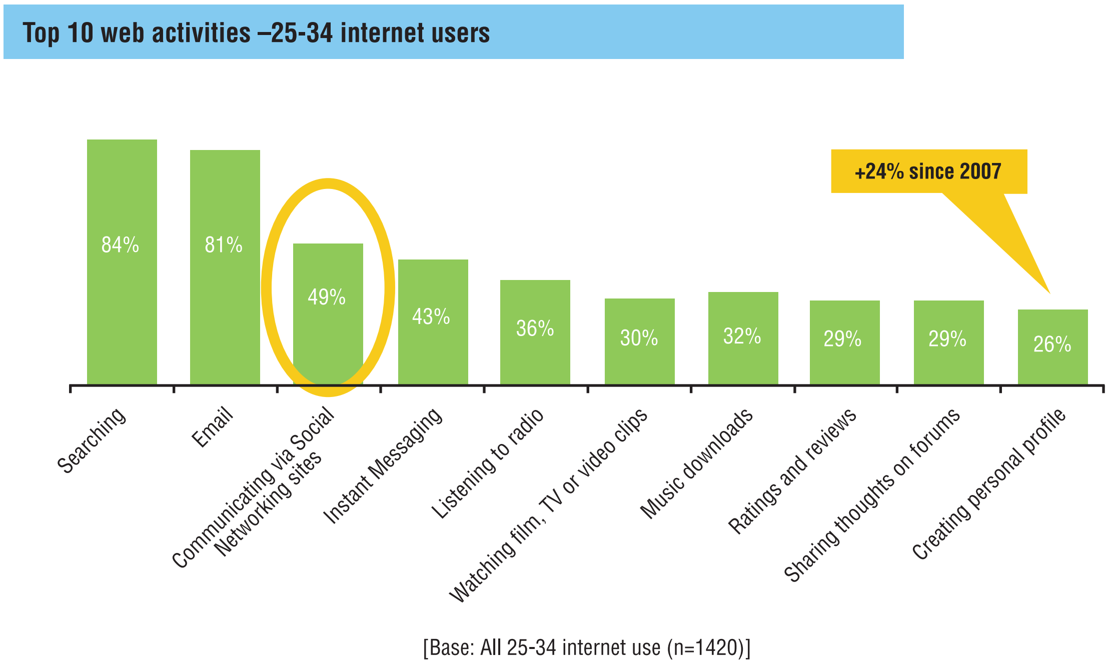
Recent surveys (Universal McCann, 2008, 2009) further reveal that the use of social computing is growing, but at the same time, a process of consolidation is taking place (Ofcom, 2008 ; Universal McCann, 2008, 2009) (see Figure 2).

While social networking sites, blogging and photo-sharing grew in popularity, Internet users appeared to be slightly less engaged with uploading videos to the web. Users are increasingly focusing their digital lives around social networks such as Facebook. They are still taking part in photo sharing and blogging, however they are now doing it via their social networks.[13] At the same time, applications like blogging or photo-sharing have reached saturation level.

This may be related to the fact that the novelty of uploading content onto the Internet may have begun to wear off for some consumers, or to the increasing take up of even newer types of social media. In 2008, more personal forms of web publishing than blogs appeared, such as "micro-blogging" (Twitter) and lifestreaming, which enables users to aggregate and comment on a wide variety of Web media. This may indicate a shift in social computing from "old social media" (e.g. blogs) towards the "new social media". Another possible reason is what has been called 'rationalisation' of social media:

13 Universal McCann Wave 4 surveyed 19 EU countries

Figure 3: Increasing use of social networking by 25-34 year olds



Source: (European Interactive Advertising Association, 2008)

i.e. the addition of new functionality to platforms originally designed to serve each of these areas (Universal McCann, 2009).

2.3. Demographic profiles of adopters

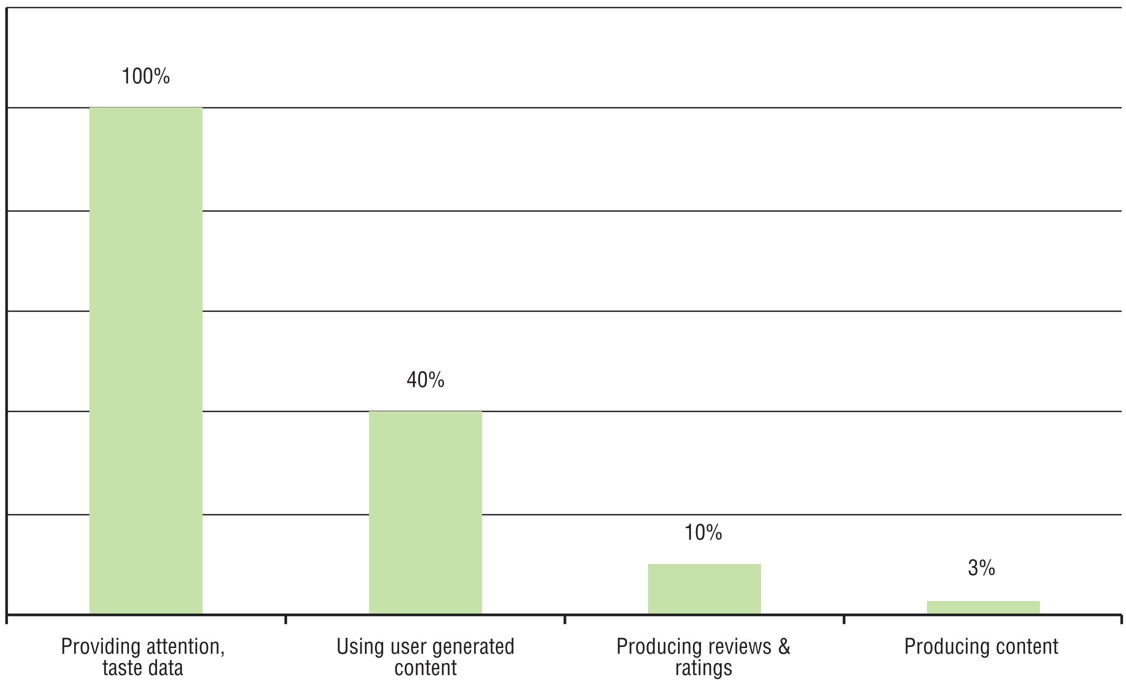
Although early adopters of Social Computing are very young (50% of teens aged 12-14 and about 70% of those aged 15-17 have online profiles; 70% of young adults aged 18-29 share online videos and 44% of them contribute to Wikipedia), research shows that the demographic groups with the greatest usage growth were women and those aged 50-64 (the so-called 'silver surfers') (European Interactive Advertising Association, 2007; Rainie, 2008). In October 2008, 25% of all EU Internet users aged 55 or more had used Social Computing applications (Gallup, 2008b). Recent surveys also show that other demographic groups seem to be increasingly adopting social computing, some of which had been untapped before i.e. those aged 25-34 (European Interactive Advertising Association, 2008) – see Figure 3.

Although user participation is a key aspect of social computing applications, not all users participate in the same way. Overall, fewer people engage in activities that are time-consuming and require a lot of effort. Forty percent of Internet users use social computing content (e.g. they read blogs or wiki sites, watch user-generated videos on YouTube, or use social networking sites), a tenth (10% of Internet users) provide feedback (e.g. they post comments on blogs and reviews, share content on Flickr, or YouTube, or tag content in deli.cio.us). Finally, around 3% are "creators" in that they create blogs or Wikipedia articles, upload their user-generated videos on YouTube or photos on Flickr (see Figure 4).

2.4. What comes next?

According to some highly influential bloggers, we can observe currently the emergence of three competing groups in desk-based social computing. Competition between these three groups has been called the 'Social Graph Platform War' (McClure, 2007). The first

Figure 4: *Degrees of user participation in Social Computing in Europe*



Source: Author adapted from (Osimo, 2008)

group is led by FaceBook, which recently opened up its API (Facebook Platform) to enable outside developers to add new features and content into Facebook. In the second group is the Google Open Social, which aims to provide the same opportunity as Facebook, but to any other social network or applications developer, in an open and compatible way. Finally, in the third group there is, for example, MySpace with its Open Platform, which is clearly a response to the Facebook Platform, and has led to the creation of thousands of third party applications on Facebook.

There is a similar trend in the mobile area, where the relationship between Internet and telecom operators is becoming more open as third party applications and solutions are deployed on mobile systems. Nokia has taken an important step in this direction by making its Symbian platform open source, in order to make it attractive for third-party developers (Nokia, 2008). Major IT companies like Google or Apple are seen as the main drivers behind the next generation mobile web applications. The impact of these is expected to affect all players in the mobile environment, driving innovative developers to build new applications that leverage both the mobile networks and the Internet, and helping to change the way consumers behave when on the move.

The rise of "freeconomics" is being 'driven by the underlying technologies that power the Web' (Anderson, 2008). Examples are free web mail, free newspapers, and free digital video recording devices (DVR) as evidence of the emergence of freeconomics in other industries. Blyk – the first ad-based mobile network reveals possibilities for growth in the area of ad-supported mobile social networks.

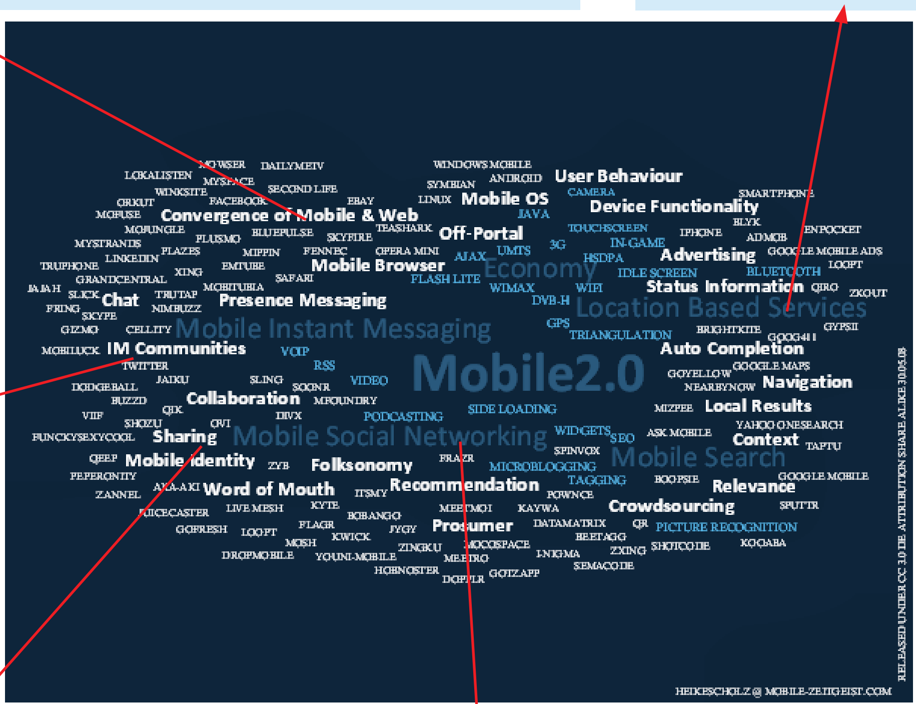
Ever since 2006 (Reding, 2006), the importance of social computing has been acknowledged by European policy makers. A number of megatrends (Reding, 2008a) are seen

Figure 5: Innovation in mobile social computing

Mobile Social gaming
Do most (or indeed any) Second Life users want to access the world on their phones?
Mobagetown – more than 6M users in 18months (currently 10M), I-Citizen (UK); Lamity based on Android

Mobile Location-based services…
Mobile presence
"Bliining My Life"

Mobile social objects
Mobile Twitter, Mobile video twitter (video streaming from Twitter) e.g. Seeismic
Mobile lifestreaming e.g Mobile Jaiku, Tumblr Lifestrea.ms



Mobile multi-media sharing
YouTube / Flickr Mobile …but also Shozu, Twango, Orange Pikeo

Mobile social communities
More than 'social networking going mobile
Cross-carrier approach and integration e.g. SeeMeTV , LookAtMe

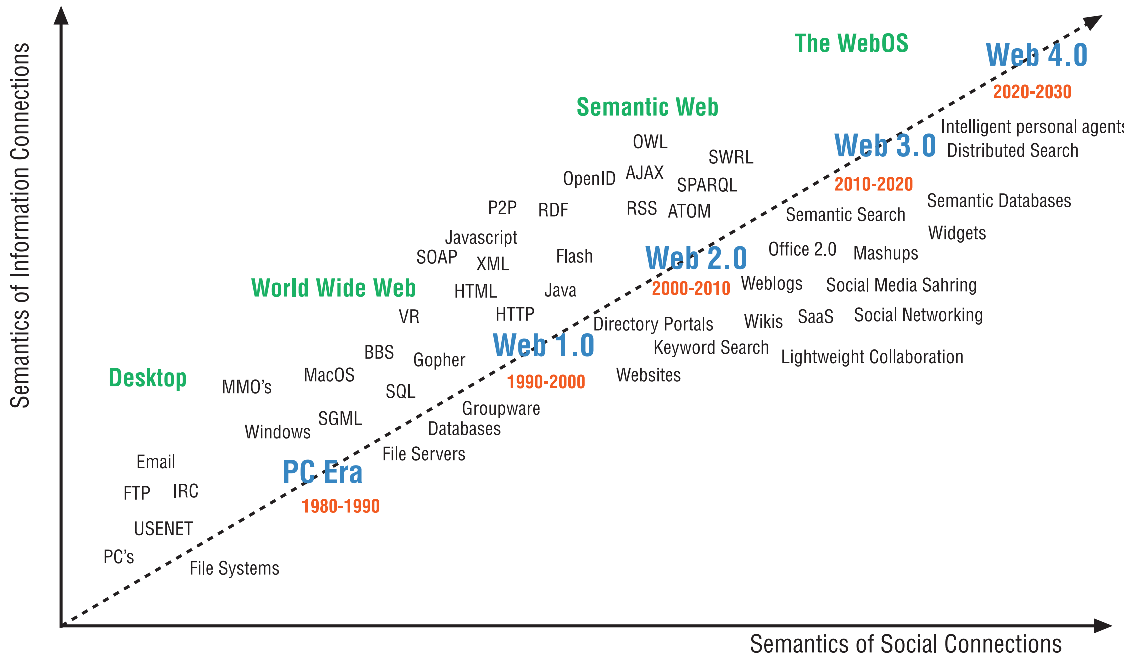
Source: (Pascu 2008, adapted from Mobile 2.0 tag Cloud from Heike Scholz - Mobile ZeitGeist)

as key to shaping the digital future in Europe, such as the emergence of wireless web or the shift from Web 2.0 to Web 3.0. Mobile social computing has recently emerged as a key innovation area, given the growth of social computing applications and the growth of mobile devices. Regarding the latter, there are three times more mobile phone subscriptions worldwide than Internet users (Resende, 2009); the number of devices that can access the net is growing rapidly (consoles, TVs, DVD players, MP3/MP4, digital cameras and GPS devices). Competition in this field is fierce. Mobility is an important European trend given Europe's strengths in mobile technologies and mobile devices. Many desktop-based social computing companies (YouTube, Flickr, MySpace) are racing to replicate their success in the mobile area, alongside the start up innovation taking place in the mobile social computing area (see Figure 5 and also Chapter 4 in this report).

In terms of adoption, research shows that mobile social computing has a small but increasing user base. At the moment, only 3% of mobile subscribers are creating content on mobile. In terms of activities, mobile blogging seems to be the least common activity, while uploading videos or photos is by far the most popular, in both the US and Europe. Although the mobile is not a predominantly a 'youth-oriented device', teens (18-24 year olds) are still leading the move to mobile social computing.

Smartphone innovations like the Apple iPod / iPhone seem to be driving the adoption of mobile

Figure 6: Web developments



Source: (Spivack, 2007)

social computing. Statistics[14] seem to suggest that the use of social computing applications by iPhone users, for instance, appears to be much larger than by other phone users.

The momentum for what may come after Web 2.0 is being built on developments like cloud computing, which may enable a 'more revolutionary web' (Shannon, 2006). A recent European Commission report shows that Europe is well placed to exploit these developments and that it could take the lead in the next generation of the Internet (European Commission, 2008a). There is a widespread agreement that: (1) Web 3.0 will not be the immediate future of Web 2.0, and instead, the future will be consist of many small evolutionary steps (see Figure 6), (2) beyond Web 2.0 will be still "more Web 2.0", (3) Web 2.0 and Web 3.0 are complimentary rather than competing developments (European Research Consortium for Informatics and Mathematics, 2008). A Gartner report also predicts the "combination of Semantic Web with Web 2.0 techniques" and a gradual growth path from the current web, via semantically lightweight but easy to use Web 2.0 techniques, to higher-cost/higher-yield Web 3.0 techniques" (Cearley, Andrews, & Gall, 2007). Although ubiquitous connectivity and broadband adoption are crucial factors in the evolution of the web (European Commission, 2008a), there are also semantics-related innovation paths rolling out in a Web 3.0 scenario. According to Gartner (Cearley *et al.*, 2007), "during the next 10 years, Web-based technologies will improve the ability to embed semantic structures [… it] will occur in multiple evolutionary steps…"

Cloud computing, defined as "the Cloud" -a metaphor for the Internet- combined with "computing' (Knorr & Gruman, 2008) in particular is considered by Gartner to be one of the most disruptive technologies that will shape the IT landscape over the next five years (Gartner

14 comScore/M:Metrics data for July 2008 for Europe , in % mobile subscribers

Inc., 2008). Major industry players are investing in cloud computing data centres[15] and research infrastructure.

2.5. Policy implications

The research agenda in the field of social computing applications and their impact is still to be defined, especially where policy implications are concerned.

Social computing is a moving target, with rapidly evolving technologies, markets and user behaviours, all of which have emerged and developed over just a few years. The measurement issue is a crucial one, particularly in the context of informed policy implications. The most urgent empirical need is certainly for new metrics to address the emergence of new social media, and in general, for systematic measurements and internationally comparable data. These would enable better assessment of the long-term importance of social computing trends in terms of their socio-economic impact (for instance, on business models, on other sectors, on the ICT industry etc. and on society and the overall economy), and the quantitative and qualitative differences between the EU and the rest of the world (the US, Asia). This implies a choice of innovative data collection methods which combine robustness, cost-effectiveness and agility. This is necessary in order to bridge the huge gap between the wealth of "marketing-type" data and the lack of official statistics, which occurs for every new socio-techno-economic trend, especially in the fast-evolving ICT landscape.

The diffusion of social computing is entering the maturity phase and this will affect research needs. The growth in take-up of social computing applications was initiated by young Internet users. More recently, however, new user groups are emerging that are not made up of the typical ICT early adopters. There are indications that users are shifting from the well-known social computing applications to more local and niche-based platforms.

The development of social computing applications also poses a wealth of policy-related research questions, such as the impact of these new trends on the ICT industry and also on society as a whole, as outlined in this report. Social computing presents challenges for public policies in very diverse fields, such as media and telecom regulation, innovation policy, IPR regulation, democratic participation, public sector information, trust and security, public service delivery, education and culture.

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3. Social Computing from a Business Perspective

This chapter investigates the economic and industrial impacts of Social Computing. It starts with some key figures on the significance of the emerging Social Computing industry. The emerging value network of Social Computing and the main revenue models in place are then outlined. The principal economic impacts of Social Computing in terms of growth, disruptive potential and use are discussed and the position of the European ICT industry with respect to Social Computing applications is examined. Finally, policy implications are indicated.

3.1. The Social Computing industry and its value chain

The Social Computing industry is already a multi-billion euro sector in terms of revenues and valuation, providing abundant entrepreneurial opportunities. Even a small blog can become a source of revenue, mainly thanks to advertising. The blog BoingBoing generates advertising of more than USD 1 million a year (Tazzi, 2007); YouTube declared revenues from advertising of about USD 15 million a month before being purchased by Google; Cyworld, the major Korean online social network, brings in an estimated USD 140 million in yearly revenues.

The aggregated revenues of Social Computing are substantial. The combined yearly revenues of 99 Social Computing application companies in the IPTS database were estimated to be about USD 3 billion for 2007. The total number of employees at these companies is estimated to be about 7,000-8,000 (Lindmark, 2009).

The Social Computing industry also attracts significant capital investment. The companies in the IPTS database have attracted about USD 6 billion in cumulated venture capital investments or acquisitions. In recent years, the amount of venture capital has risen sharply. In 2007, it amounted to about 1,350 million in the US alone (Schonfeld, 2008).

These figures may, in fact, underestimate the size of the industry as they only partly consider companies diversifying into Social Computing services and applications (such as those of Google and Yahoo), and companies using Social Computing applications internally (captive markets). For instance, revenues stemming from the Enterprise 2.0 market (Social Computing for enterprise use), have been estimated to be about USD 0.5 billion (Young *et al.*, 2008). On the other hand, most Social Computing companies struggle to generate revenues,[16] which is common for new emerging industries. It was estimated that Youtube, one of the most popular Social Computing sites, generated losses (for Google) of almost USD 0.5 billion in 2009 due to high costs of bandwidth, content licensing, ad-revenue shares, hardware storage, sales and marketing and other expenses (Spangler, 2009).

The IPTS survey of 99 major Social Computing companies and their websites shows that most companies are based in the US and that most of them (more than 60) can be found in online social networking (OSN) and multimedia sharing (Table 2) applications. These application categories have attracted a very large share of total Social Computing venture and acquisition capital, while online gaming accounts for the largest share of revenues and employees (Lindmark, 2009).

Most sites are still not profitable and do not generate revenues that correspond to their

16 See e.g. (R. Waters & Nuttall, 2008), (Nuttall & Waters, 2008) and (IDATE, 2008)

Table 2: Social Computing companies distribution

Application Category / Region	Asia	EU	US	Other	Total
Blog	1		8	1	10
Multimedia sharing	5	1	17	1	24
Online social networking	5	9	18	5	37
On-line gaming	1	3	5	2	11
Social tagging	1		5		6
Wiki			2		2
Other (e.g. suppliers, plugins)		1	8		9
Total	13	14	63	9	99

Note: Geographical allocation is based on the location of headquarters and/or author's assessments of where the main development activities take place. Source: IPTS – COMPLETE (Lindmark, 2009)

audiences, not even leading sites such as Youtube, MySpace and Facebook. Youtube is known (as mentioned above) to be unprofitable for Google and Myspace and Facebook generate between USD 0.2 and USD 0.4 per visitor per month, which is much less than traditional Web 1.0 sites such as Yahoo (USD 1.2 per visitor per month). This raises some questions about the sustainability of the phenomenon or, at the very least, it opens up opportunities to exploit Social Computing better by finding ways to extract more of the value created by Social Computing services (IDATE, 2008).

Within this context, although **value chains** are not yet settled and differ between applications, some key features are common. The major players examined are: (1) Social Computing platform and site providers; (2) users; (3) content producers (professionals and users); (4) suppliers of ICT goods, software and services enabling Social Computing; (5) traditional players in related industries such as media; and for some value chains (6) advertisers and providers of advertising tools. The simplified Social Computing value chain in Figure 7 illustrates the most important relations. In particular, the most important content flows are shown. User content contribution is highlighted in red, as it is one of the key distinguishing features of Social Computing.

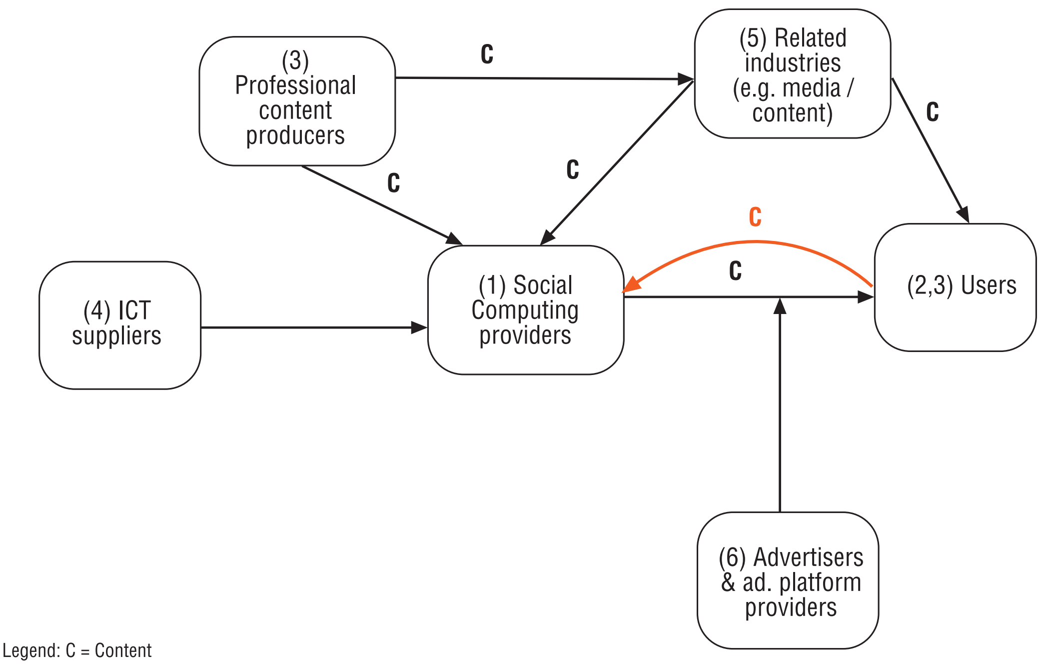
Social Computing application providers (or platform and site providers) such as Wikipedia or Facebook are at the centre of the value network.[17] They may be new Social Computing players or traditional players from related industries such as the media (e.g. Disney) or Web 1.0 industries (e.g. Yahoo). They provide opportunities for users (individuals, companies and other organisations) to network and/or to create, provide, distribute and consume content. Content on Social Computing sites is created in different ways and by different actors. It is generated by, among others, users (not necessarily for profit) and by traditional players in related industries (such as the *media industry*).

The creation and contribution of content by users, and the value this renders to other users, are key traits that distinguish Social Computing from traditional Web services. Users may provide traditional content such as videos to Youtube, photos to Flickr or encyclopaedic contributions to Wikipedia. Value may also result when users review content contributed by others, thus providing social networks and social network activity with their professional or private experience, reputation etc.[18] The traditional content industries also provide content in order to generate online revenue, to stimulate

17 This section draws on (OECD, 2007b) unless otherwise stated.

18 See also Chapter 5 on the Economic of Identity in Social Computing.

Figure 7: Simplified content related Social Computing value chain



Source: (Adapted from Lindmark, 2009)

consumption of their own traditional content by reaching out to Social Computing audiences and to retain audience and advertisers. They may also do so for defensive reasons, i.e. to prevent Social Computing from reducing their revenues from other content and/or to prevent disintermediation.

Professional content creators (journalists, photographers), who previously produced their content for the media industry, are now also producing content for Social Computing sites and having to deal with competition from free content providers. Related industries include *Web services/portals/search engines/ISPs* that use Social Computing functionality to build more attractive websites, customer services and information (e.g. a travel agency has encouraged users to post pictures and share reviews). A prime example is Yahoo, which has for a long time provided services with Social Computing elements such as Flickr, del.icio.us, Groups, Geocities, 360o, Answers, Video! and Mxd (OVUM, 2007).

ICT suppliers include software producers which provide software for the creation, hosting and delivery of Social Computing services, IT services companies, telecom operators and consumer electronics and ICT goods suppliers who are selling hardware with new functionality and interoperability for users to create and access content.

In most, but not all, value networks, the dominant revenue model for Social Computing has so far been advertising (see further below). *Advertisers and companies providing advertising platforms* (like Google and Yahoo) are major players in the value chain, participating in increasing online advertising directed at communities on Social Computing platforms.

At this point, it is worth pointing out that value chains are diverse and still emerging. All the above actor categories are not present in all value chains; some Social Computing services are provided without advertising, while many do not involve traditional media companies. In addition, some Social Computing applications (e.g. Wikipedia) revolve around non-commercial players who are creating value with no expectation of profit or remuneration.

To conclude, there are essentially two new elements in the Social Computing value chain that distinguish it from traditional web services: (1) the providers of Social Computing applications and (2) the users providing content. Both these categories of actors need incentives, commercial or other, if they are to be present in the value chain, creating value. These incentives, and their related business models, will be elaborated in the following sections, starting with the revenue models for Social Computing application providers.

3.2. Business models for application providers

In order for Social Computing applications to be sustainable, there have to be profitable business models for all players on the value chain. A key component in a business model[19] concerns value appropriation, i.e. it is not enough to create value - a sufficient share of that value also has to be appropriated.

Revenue models for Social Computing applications are still emerging and they differ according to application and site.[20] We identified the following dominant groups and combinations of revenue models for Social Computing service providers: (1) advertising (e.g. YouTube); (2) end-users payment for content or premium services (e.g. online gaming); (3) Social Computing tied with complementary goods, including bundling and 'razor and blade' (e.g. Big Brother); (4) donations (e.g. Wikimedia). These four models will be elaborated below, together with a fifth – the interim business model in the case of companies that set out to be acquired by a larger company.

Advertising model

The predominant revenue model in Social Computing is advertising. Social Computing advertising is quite similar to online advertising in general and is growing rapidly. According to eMarketer, spending on online social networking advertising is already USD 2 billion and increasing (eMarketer, 2009). Advertising revenues for some Social Computing companies have been substantial. YouTube declared revenues from advertising of about USD 15 million a month before it was purchased by Google. In Social Computing, context-aware advertising makes advertisements increasingly more personalised (e.g. previous website, geographic location, topic interest)[21] than is possible in traditional media. Product placement is used in some online game or virtual world environments, such as Second Life, where enterprises can build their own online presence imitating the real world (VTT, 2007). Social Computing adverts are cheaper than TV adverts, e.g. less than USD 2 per thousand views for MySpace, as compared with USD 30 for prime-time TV. Google and Yahoo are the largest enterprises that mediate advertisements on the Internet, with AdSense from Google being the most widespread and popular advertising tool used (Cachia, 2008; VTT, 2007). However, in terms of advertising revenues, Social Computing sites are underperforming in relation to their traffic (IDATE, 2008). CPM (Cost Per Mille – per

19 In management literature and among practitioners, a business model is a conceptual tool that allows the business logic of a specific firm or one business area of a firm to be expressed. It is a description of the value proposition, target customer segments, distribution channels, value configuration, cost structure network of partners, core capabilities and revenue streams (Chesbrough & Rosenbloom, 2002; Ostenwalder, Pigneur, & Tucci, 2005).

20 See e.g. (OECD, 2007b) for one overview of Social Computing-related revenue models and (Anderson, 2009) for an overview of online business models in general.

21 See e.g. (Glaser, 2007) and (Brain, 2007).

thousand views) is substantially lower at MySpace, for example, than for other online media. This is partly a result of the inability of social computing sites to adapt their advertising beyond Web 1.0 and to capitalise on their key features (member profiles, user involvement, community tools etc.). In 2008, only 5.5% of the USD 26 billion spent on online advertising came from social networks in the US (of which more than 70% came from Facebook and MySpace, though it still did not make them profitable) (IDATE, 2008).

Payment for services model

Revenue models where users are paying for access to platforms and related services have also developed around Social Computing. The most common means of charging are subscriptions fees or ad-hoc transactions. Subscription fee-based services include online gaming such as World of Warcraft, which had 8 million paying users in 2007 paying about EUR 10 a month (VTT, 2007).·Direct payment for services is used in the Korean online social network Cyworld (which has estimated revenues of USD 100 million from the sale of items for personal pages) and Second Life (OVUM, 2007). Basic access to a service is often free of charge in order to attract customers, especially at the outset. Examples of partially free platforms are Flickr, Last.fm, LinkedIn and some Blogging platforms (VTT, 2007).

Complementary goods (bundling) model

Social Computing applications may be bundled with other services such as search engines and email. Customers pay for the bundles instead of the separate services. In these cases, Social Computing applications generate revenues indirectly rather than directly, through service differentiation. For instance, tools to track friends and create personal-profile pages are provided by Yahoo, Microsoft and AOL. Google Gmail allows users to chat with online friends, and share pictures and documents. In some cases, a Social Computing service promotes other goods, sometimes through cross-subsidising (i.e. one product subsidises another, which in isolation would be unprofitable). The Big Brother TV series uses online social network functionality to boost the TV show. This functionality stimulates discussion and produces free content for the programme, e.g. inventing tasks. In addition, it increases interest in the show. This creates added value that can be used in the TV programme and also in other media (such as tabloids) supporting it (VTT, 2007).[22]

Donations model

Voluntary donations can be a source of revenue, though it is questionable to refer to this source as a "business" model. Projects where the content is produced through collaborative authoring are often supported by donations. For example, the projects of the Wikimedia Foundation, such as Wikipedia, Wiktionary and Wikispecies rely solely on donations and the voluntary work of the community participants (Ala-Mutka, 2008).[23]

Acquisition model

The wave of emerging Social Computing applications provoked various buyouts, mergers, acquisitions and partnerships. Often these applications had built up large customer bases before they were sold. Several of the most popular Social Computing companies have been sold to established players such as Google, Disney, Yahoo and Microsoft for large amounts. Disney paid USD 350 million for Club Penguin (a social site for children), NewsCorp paid USD 580 million for MySpace, and Yahoo! bought Flickr

22 In principle, it also possible to use the information on user behaviour generated from Social Computing for other commercial purposes.

23 All content is created under GNU Free Documentation License, and the foundation is committed to keeping the project non-commercial. As with FLOSS, this still allows business models based on packaging and additional services, e.g. printing and selling Wikipedia books or offline versions. Hardware manufacturers can also bundle Wikipedia as additional value in their products.

for an undisclosed amount of money, rumoured to be around USD 40 million (Sokullu, 2007). Microsoft purchased a 1.6% share of Facebook for USD 240 million (Stone, 2007). Time Warner's web portal AOL acquired Bebo, an online social network, for USD 850 million (Economist, 2008). Some observers regard starting a company in order to later sell it as a business model in itself. This is questionable as it is a means of earning money for the founder rather than for the service or platform.

Revenue models for content producers

One of the distinguishing features of Social Computing is the role of users as producers of content for many applications. There are different ways of compensating them:[24]

- Platform providers share advertising revenues with content producers, who are rewarded according to the attention their content attracts. It is reported that users of Newsvine (a user-generated news and discussion site) are paid 90% of all advertising revenue generated by the site (Sparkes, 2007). The YouTube Partners Program offers independent video creators and media companies the opportunity to share advertising revenues from YouTube videos.
- Users may be remunerated by application providers if the product is purchased by a third party. The photo agency Scoopt was set up by 16,500 amateur photographers. When an image is sold, the photographer gets a 40% royalty (Sparkes, 2007).
- Some content platforms may directly compensate content contributors: for example, Weblogs Inc is paying its blog contributors.
- Companies which gather user innovations and inputs through collaborative platforms – crowdsourcing – may reward the best ideas or buy them (Sparkes, 2007).[25] The Metacafe Producer Reward program awards USD 5 for every 1,000 views of any video that is viewed at least 20,000 times, has achieved a certain rating and does not violate any copyright or other Metacafe community standard. In total, more than 550 independent video creators have earned more than USD 1 million through the program (Wikipedia, 2009).
- A large part of Social Computing content is created by the voluntary contributions of content creators, as for instance in all WikiMedia projects. Often motivations are non-commercial and similar to those behind open source communities.[26] Nonetheless, there are sometimes commercial aspects related to uncompensated content production, such as promotion, especially in the case of photo and music artists. Through these means, the UK band Koopa reached the UK top 40 list without a record deal (Beer, 2007).

3.3. Industrial impact

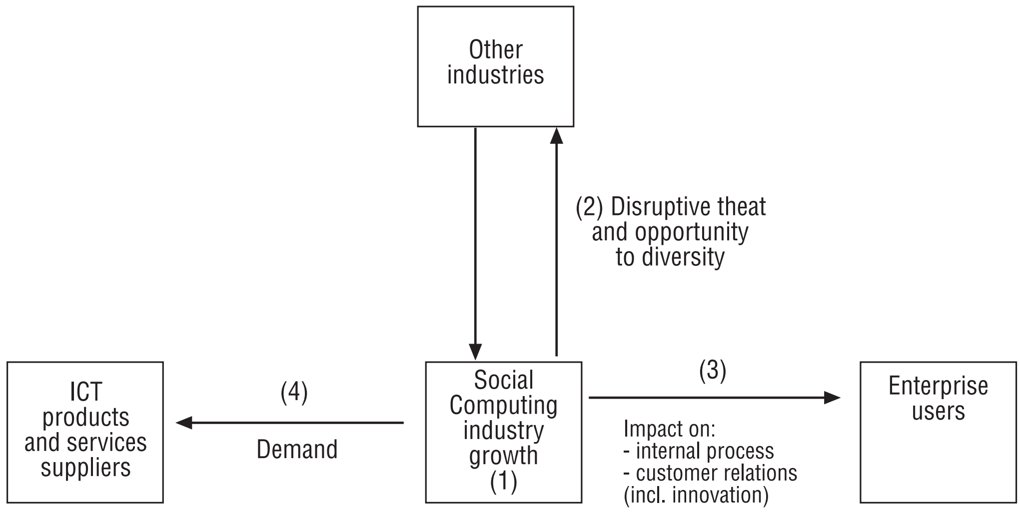
Social Computing is only just beginning to have a business impact, of which there are 4 major categories (see Figure 8): (1) The Social Computing industry is showing phenomenal growth rates even by Internet standards. (2) Related industries (mostly those concerned with content) are facing a threat of substitution, but at the same time have the opportunity to enter (diversify) into Social Computing. (3) Other enterprises are adapting innovations introduced by Social Computing in their relations with customers and in their internal work processes. (4) Finally, Social Computing creates demand for established ICT industries. Impact (1) has already been dealt with above; the other three will be discussed in the following paragraphs.

24 This section draws on (Ala-Mutka, 2008).

25 Another example is Activephone's momo platform, which was launched in 2006 in order to enable users to pay for content uploaded on mobile platforms (OVUM, 2007).

26 For a statement about Freeconomics, see (Anderson, 2008)

Figure 8: Major industrial impacts of Social Computing



Source: Adapted from (Lindmark, 2009)

Disruptive impact on and opportunity for media and other industries

Social Computing represents a direct threat to established industries. The most immediate impact of Social Computing services based on user-generated content is on traditional media and publishing industries. For television and Web offerings such as professional websites, the popularity of Social Computing applications leads to a loss of audience (media substitution and time replacement). There are few statistics available on Social Computing usage and its effects on other media.[27] However, Internet/Web use in general has been shown to have a negative impact on TV watching and reading of national newspapers in particular (OECD, 2007b), especially among young users (Ofcom, 2008b). There is 500 times more traffic on Wikipedia than *Britannica online;*[28] well-known publishers such as Brockhaus have stopped their printed editions. Less consumption means less revenue for producers, from fewer paying customers (Ala-Mutka, 2008) and from less advertising (Ofcom, 2008b). Overall, Social Computing could substitute off-line games, dating services, email and much more. With regard to the software industry, the threat is perhaps less immediate and less visible.

Partly in response, traditional media have begun to change their business models to participate in user-generated publishing platforms and to reach out for these audiences in order to promote their own content. They are opening specific sites to show their contents online[29] and developing partnerships with popular Social Computing platforms.[30] Social Computing may stimulate the consumption of traditional content and vice/versa. The impact on the traditional content industry is not only predatory and competitive, but also complementary and collaborative.

27 See (eMarketer, 2007) for one exception.
28 As presented by www.alexa.com [Consulted April 1, 2008]
29 For example, Hulu and NBC Direct
30 Such as the previously mentioned YouTube Partners Program.

Social Computing use by enterprises – Enterprise 2.0

According to McKinsey (2008), enterprise usage of Social Computing is 25-35% depending on the application. The Enterprise Social Computing market (Enterprise 2.0) amounted to almost USD 0.5 billion in 2007, of which some 150 million were related to online social networks. The corporate market is expected to grow by 43% per year, reaching ten times its present size by 2013 (Young *et al.*, 2008). Overall, adoption is higher in large enterprises. Social Computing can be used in enterprises to: (1) improve internal work processes, and (2) as a tool for customer relations.

Companies use Social Computing tools for intra-company content creation, collaboration and sharing purposes (through wikis and social networks, for instance) to increase efficiency in workplaces which are dependent on continuously evolving information (Forrester, 2007).[31] Social tagging enables employees to locate colleagues' personal intelligence without interrupting them with an e-mail or an instant message (IBM, 2007). Social Computing applications are typically easy to install, use and integrate between departments and enterprises. They are often free of charge, or at least very inexpensive, and based on open source, providing modifiability and transparency (VTT, 2007).

Social Computing applications are increasingly used for customer relations. 87% of organisations that already use Social Computing tools use them to interface with customers, including those in new markets (McKinsey & Company, 2007, 2008). Feedback and customer reviews have become standard in e-commerce sites (eBay, Amazon) and are often used as promotional tools and sources of intelligence to increase customers' trust and usage of the service. Interfaces with customers for product feedback can allow companies to monitor user innovations and development ideas for improving their products (McKinsey & Company, 2007). Specific Social Computing applications can harness collaboratively-created user innovations for their product development, hence potentially raising the rate of innovation at low cost. Lego Mindstorm allows customers to design personally-tailored products, which can later be added to the general product selection. TomTom improves its maps through Map Share which allows customers to make improvements to their map directly on their navigation devices (Privat, 2008). Cambrian House applies a *crowdsourcing* model (i.e. outsourcing to an undefined, large group, in the form of an open call) to identify and develop software and web-based businesses (Ala-Mutka, 2008). Thus, the emerging and growing role of the user in the innovation-development process (von Hippel, 1988) and the ongoing shift towards open innovation (Chesbrough, 2003) is further driven by Social Computing. Still, as mentioned in the introductory chapter, a significant proportion of firms (especially small ones) that have already adopted Social Computing have not yet fully reaped its potential benefits, if at all (McKinsey & Company, 2008). Hence, there is still an untapped potential for companies, not only to adopt Social Computing to a larger extent but also, to learn how use it productively.

Impact on the ICT sector – derived demand for ICT products and services

A major impact of Social Computing is the derived demand for ICT products and services. By getting more people online and making them stay for longer, Social Computing increases the demand for connectivity, software tools, and hardware by Social Computing businesses, Enterprise 2.0 and consumers.

31 As referenced by (Ala-Mutka, 2008); for a different view see (Cachia, 2008)

Concerning connectivity, in combination with the take up of interactive services such as IP-telephony, Social Computing may also drive a need for increased capacity of the up-link in broadband and mobile networks, such as High-Speed Uplink Packet Access (HSUPA) for mobile (OECD, 2007b). Social Computing services also increase the traffic and business of traditional telecom operators, and therefore the demand for broadband communications and, in the future, possibly for wireless communications also. However, changing revenue schemes and pricing models may counteract this trend so that it will not lead to increased revenues for telecom operators.

In terms of software, new application service providers are emerging, especially for video content, where they offer, for instance, publishing, syndication, commerce, content management, content delivery, and one-stop video upload, converting and transmitting optimised content services security and other platform components in the form of software-as-a-service.[32] Examples include companies which specialise in social network tools (a market estimated at USD 258 million in 2007) such as Awareness, Communispace, and Jive Software (Young *et al.*, 2008).[33] Developers have provided more than 7,000 programmes on the Facebook platform. It has been reported that, each day, developers introduce another 100 applications to the site. Facebook estimates that more than 80% of all members have used at least one third-party application (Strickland, na). Microsoft, IBM, Oracle and several other incumbents have published enterprise suites including wikis, blogs and other networking tools. It has been forecasted that the market for Enterprise Social Computing tools will be commoditised, prices will fall, and these tools will be incorporated into enterprise collaboration software over the next five years (Young *et al.*, 2008).[34]

In terms of hardware, Facebook, for example, requires massive amounts of storage space, both in a digital and physical sense. Facebook secured another USD 100 million funding for 50,000 new servers in 2008 (Arrington, 2008), in order to cover its needs for the coming two years (Ante, 2008).[35]

3.4. Europe's position in Social Computing

This section discusses the position and competitiveness of the EU in the Social Computing industry.

Europe's current position in the supply and development of Social Computing applications is rather weak. Although usage is almost as high in Europe as it is in the US, about two thirds of the Social Computing applications are provided by US companies, which have similar shares for revenues and employees, and even higher shares for innovation indicators such as patents, venture capital and R&D expenditures. The corresponding shares for the EU hover around 10-15%.

We now identify and assess the prospects for growth of a European industry in producing Social Computing applications, i.e. the impact (1) at the centre of Figure 8. We focus on the following indicators of industrial strengths and weaknesses:

(1) EU global share of Social Computing companies and sites. Europe's number of firms, share of revenues and employees will be assessed for Social Computing as

32 OECD (2007)
33 as referred to by (S. Perez, 2008)
34 as reported by (S. Perez, 2008)
35 To take another example, already by 2007, 2L required 2000 servers (Wagner, 2007)

whole and also for its different application categories (online social networking etc.).

(2) EU innovativeness as a proxy for medium-term prospects. The analysis of the European Social Computing Innovation System includes an assessment of patenting and R&D activities, access to venture capital and advanced local demand.[36]

Major Social Computing sites and companies – current EU position

Existing evidence shows that supply of Social Computing is in the hands of US companies, especially those based in the San Francisco Bay area (Silicon Valley).[37] IPTS research confirms that US companies constitute the overall majority (about 60%) of the Social Computing sample and a majority in each category (Table 2). The corresponding figure for Europe is at about 15%. Estimations based on available data show similar percentages for revenue and employee data, while the US shares of injected capital are even higher (85-90%).

For two application categories, online social networks (OSNs) and online gaming, the EU position looks slightly better. These application categories also host a relatively larger share of EU companies (about 25%) as well as several relatively strong EU players (Vivendi, Habbo hotel). Hence, there may be opportunities for Europe to further build on this relative strength.

Innovative capability: Social Computing patents, R&D and venture capital

An IPTS study (Lindmark, 2009) using the World Intellectual Property Organisation (WIPO) patent database showed that about three quarters of Social Computing-related applications are of US origin as compared to about one third of all WIPO patent applications. The rest are fairly evenly split between Europe (mainly Finland) and other countries (Figure 9).[38] Although the findings should be interpreted with some caution, not least because of the more limited possibilities of patenting software in Europe than, for example, in the US, these data corroborate previous evidence that the US dominates in Social Computing technological development. Most Social Computing patent applications are filed by large firms in established Internet and software industries, including US (Google, Yahoo and Microsoft) and major European ICT manufacturers (Nokia).[39] There is also a notable presence of pure Social Computing players (Facebook, Friendster, Xystar).

While no statistics are available on R&D spending in the Social Computing field, data are available for the ICT-sector in general and for the computer services and software sector (Lindmark, 2008). The computer services and software sector is the main engine of R&D growth in the EU ICT-sector. The problem is that R&D in the EU is dwarfed by R&D in the US. Of the US R&D expenditures in that sector, about EUR 7 billion are spent in California.[40] There may be almost as much software R&D in the Silicon Valley as in the whole of Europe. R&D intensity is also much higher in the US (10%), than it is in the EU (4%). Specifically, R&D investments made by EU web-focused companies[41] are much smaller than those made by US firms, which accounts for about 90% of the EUR 1.9 billion global R&D investments in this sector.[42] A very large share of

36 See e.g. (Bergek, Jacobsson, Carlsson, Lindmark, & Rickne, 2008) for how to analyze the performance of Innovation Systems.

37 See (Lindmark, 2009).

38 Caveats to be considered are potential geographical bias in the WIPO database, and also the varying legal possibilities of patenting software inventions in different regions. (Smith, 2005)

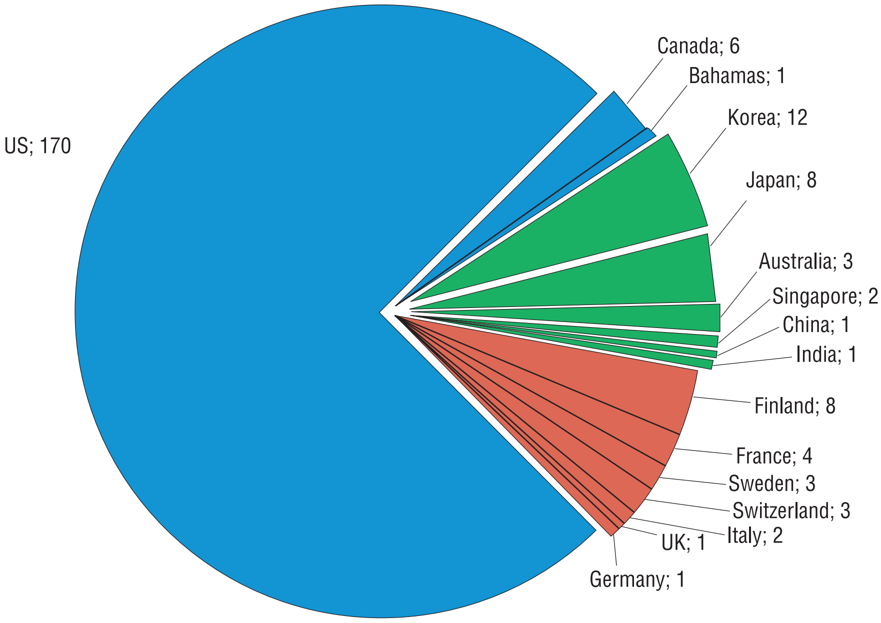
39 Some of the patents of the latter group are somewhat less Social Computing-related. Applications includes the key word RSS but with different meanings (such as remote subscriber stage).

40 Calculation based on data from the US National Science Foundation.

41 R&D investments reported by (European Commission, 2007a) ICB subsector 9535 “Internet”.

42 IPTS elaboration of (European Commission, 2007a) in which R&D investment data, and economic and financial data from the last four financial years are

Figure 9: Number of patent applications by country origin (Social Computing key words)



Source: IPTS search in WIPO Patent scope data base 2008-12-12 Search: (ABE/"social network") OR (ABE/blog) OR (ABE/wiki) OR (ABE/RSS) OR (ABE/Widget) OR (ABE/folksonomy) OR (ABE/AJAX)
Legend: Blue = North American applications, green = Asian and orange = Europe

these R&D investments is made by two Internet giants (Google and Yahoo).

Here it should be noted that a lot of Social Computing R&D takes place outside pure Social Computing players, as also indicated by patent data (Lindmark, 2009). For example, SAP (the large German enterprise software applications company) has included Social Computing in its enterprise suites and is also conducting R&D in the form of several key Social Computing implementation projects aimed at enterprise users (SAP, 2009).

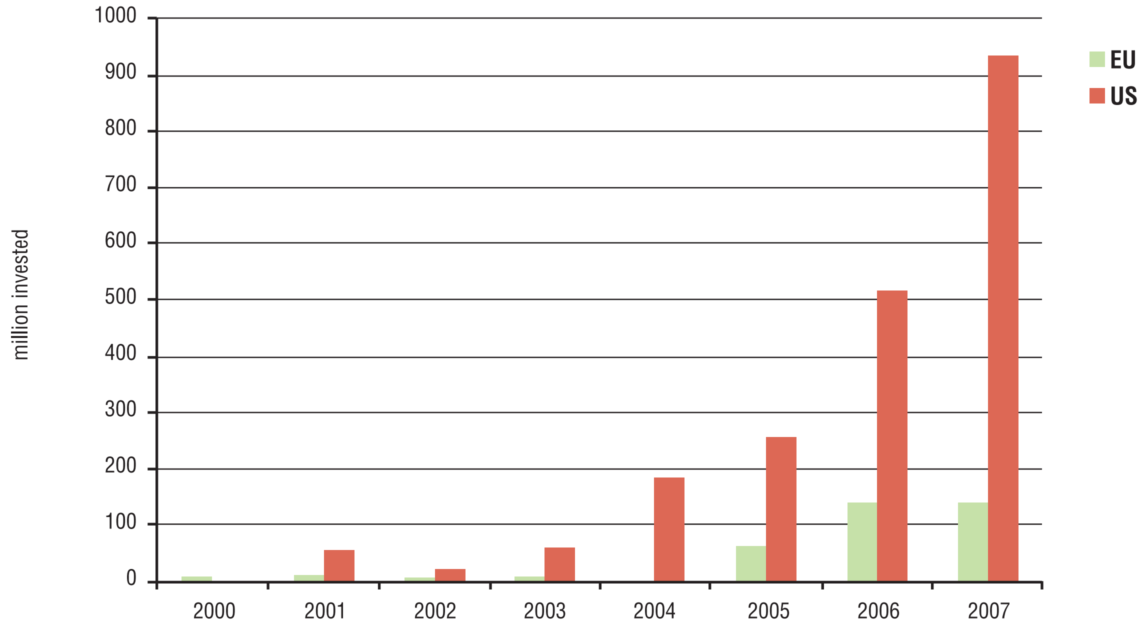
Top venture capital investors include a mix of US and European firms such as Index Ventures (Switzerland), Benchmark Capital (US) and the 3i Group (UK). Europe is lagging behind the US in Social Computing venture capital provision: in 2006 (the latest year for which we have data for both the US and Europe), it was below EUR 150 million in the EU (Library House, 2007) compared to above EUR 500 million in the US (Schonfeld, 2008).[43] This gap is comparable with the overall ICT sector venture capital situation (Library House, 2007).

Venture capital (VC) stimulates innovation, especially in sectors like Social Computing where it is often driven by start-ups. VC investment in European Internet companies picked up in 2005 after the burst of the dot.com bubble, partly thanks to the emergence of Social Computing and viable Web 1.0 business models. About the same time (2005) European VC investment in social computing companies also picked up, but did so later and at much lower levels than the US ones (Figure 10) (Library House, 2007).

presented for the 1,000 largest EU and 1,000 largest non-EU R&D investors of 2006.

43 The IPTS database of Social Computing companies includes limited data on venture capital, which also indicates much higher investments in the US, as mentioned above

Figure 10: Europe and US Web 2.0 (or social computing) venture capital investments



Note: Since US and European data are taken from different sources, they are not necessarily fully comparable.

Sources: European data are estimated from (Library House, 2007). 2006-2007 US data are from (Ha, 2008) while 2001-2005 US data are estimations based on a similar chart in (Schonfeld, 2008)

About EUR 1.5 billion have been invested in active EU Web (Web 1.0 and 2.0) companies; almost half (EUR 720 million) are in the UK and about one sixth (EUR 254 million) in France. This share is higher than for the total venture capital market in the UK (30% of all European VC).[44] VC investments cluster around London (23% of investment and 15% of the VC-backed Social Computing companies) and Paris (13% of investment and 11% of companies). Top EU Web clusters differ from traditional top IT clusters since Cambridge, Dublin, Grenoble, and Dresden are absent from the list of top web clusters (Library House, 2007).

Conclusions

Europe, although it hosts many examples of advanced Social Computing usage, is clearly lagging behind the US in terms of supply. Although Europe is home to many Social Computing companies, most leading ones are from the US, where a major share of the revenues from Social Computing applications is generated, and most of the employees are based. This situation is unlikely to change in the mid-term future, since the EU's innovative capability is also lagging behind that of the US, as indicated by patent, R&D and venture capital data.

Nevertheless, there are some parts of the Social Computing landscape where Europe is potentially slightly better positioned: online gaming, social networking, and Mobile 2.0.[45]

44 In terms of the number of VC-backed companies, this UK dominance is less pronounced.

45 See further (Lindmark, 2009).

European industry appears to be more competitive in online gaming, and in the computer gaming industry as a whole, than in other Social Computing areas. In online social networking, there seem to be niches in the form of locally adapted, or otherwise differentiated, social networks, in which European firms could become competitive. Finally, the EU could establish leadership in Mobile 2.0, building on its already very strong mobile communications operators and suppliers. However, the US is also moving quickly here (for further details, see Chapter 4).

3.5. Policy implications

The business impact of Social Computing is already high and is to likely increase in the near future. This impact can be found in several dimensions. Social Computing applications supply is already a large and still rapidly growing industry, bringing in annual revenues of several billion euro. Social Computing is also having a disruptive impact on media and other industries such as off-line games and dating services, while at the same time stimulating consumption of traditional content. Social Computing is also increasing demand for ICT products and services. Finally, through Enterprise 2.0 applications, companies can improve internal work processes, customer relations, product design and innovation processes (e.g. through crowdsourcing) and ultimately improve their competitiveness.

However, this chapter has also shown that Europe is lagging some way behind the United States in the supply of Social Computing. Although many European companies are active on many fronts of this emerging and disruptive ICT technology, the creation and growth of high tech companies is still very complex and difficult in Europe. Many opportunities have escaped from European initiatives and ownership, as has happened several times before when new IT and software innovations emerge.

Hence, it is important that the following the following options be considered in policy:

- The EU could stimulate the development of the ICT Social Computing sector. Here it is important to take into consideration that the weakness of the EU relative to the US is not so much a specific weakness in Social Computing as a general weakness in the ICT sector, especially in software development, and a general gap in innovation and entrepreneurship. Hence any set of policy measures, needs to address a broad range of industrial and innovation issues.
- Since there appear to be some strengths to draw on in, for example, online gaming, social networking and mobile social computing, these applications could be the target of more focused efforts.
- In general, there is an opportunity to stimulate Social Computing usage so as to increase demand for Social Computing platforms and applications, as well as their underlying ICT products and services. Here, the implementation of innovative public services could play an important role in creating a lead market.
- Finally there are opportunities to increase usage of Social Computing applications by enterprises as tools to increase their competitiveness. Policy could, for instance, ensure that European companies are aware of these opportunities.

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4. Social Computing and the Mobile Ecosystem

Sometimes referred to as mobile Web 2.0 and born around 2005 (Jaokar & Fish, 2006), mobile social computing replicates the usages of social computing and transforms them, adding the specific features of the mobile domain. It is defined as the range of applications developed to enable interaction, collaboration and sharing between users but with the essential characteristics that leverage the mobile context (Pascu, 2008b). Mobile social computing, in contrast to its static counterpart, uses context to profit from the information about the user's environment and to match content and applications to user's current situation and needs (de Vos, Haaker, Teerling, & Kleijnen, 2008). This second element is what mainly makes the difference between Mobile 2.0 and just a mobile version of Web 2.0.

In the Mobile 2.0 paradigm, the handset is a social artefact which people use to connect with each other; interactions are marked by democratic expression, individualism, citizenship and creativity (Goggin & Hjorth, 2007; Ortiz, 2008). There is a shift in the role of users who are becoming active producers rather than just consumers. In the new mobile techno-economic models, the user is seen as a creator of content and also a source of inspiration; the mobile device is becoming the means to harness collective intelligence (Jaokar & Fish, 2006).

Location-based services were an early, and mostly unsuccessful, incarnation of context-awareness. Navigation services, however, have been very successful. Context characteristics - users' bio-parameters and physical environment - are typically derived from sensors and from cognitive technologies[46] (Klemettinen, 2007). Mobile specificities of this type are expected to open up completely new usages and interactions. Mobile devices have a wealth of sensing capabilities, which could allow us to use the Internet to augment the real world. The surrounding environment will carry most of the computational burden, leaving only a small part to the device itself (Griswold, 2007).[47]

Therefore, users will have a determinant role in the mobile ecosystem, not only because they are no longer passive consumers and can become content creators or contribute to social computing, but also because the many situations of their real lives will be central to mobile usage. The mobile device will be used as an interface between the real and the information/content/application worlds (Feijóo *et al.*, 2009 Forthcoming).

46 Cognitive technologies are used in a loose sense to "understand" user behaviour, user intentions and personal context. Strictly speaking, they are systems that perceive the environment and take actions which maximize the chances of success. For instance, semantic processing of text messages sent by a user would allow the recipient to identify whether the sender could use voice communications in that very moment, she/he is in a professional situation, with friends, with family, planning to go to the cinema, to dinner, etc.

47 An increasing number of "point and find" solutions have been proposed. For instance, the camera on the mobile device could take a picture, carry out an audiovisual search ("cloud computing"), match available information with the physical object and provide different types of information ("reality mining", "augmented reality") linked with the physical object.

4.1. Industry and its market expectations

Mobile social computing has appeared at a turning point in the evolution of the mobile ecosystem. In the case of the traditional mobile industry, the providers of mobile voice communications in the developed world are facing mature and dwindling markets and are searching for new sources of revenue. Maturing Internet application providers, mainly Social Computing companies, search engines and portals are also reaching a turning point (see Chapter 3). For them, mobile is an opportunity to extend their reach, increasing the range and the appeal of their portfolio of solutions.[48] Last but not least, mobile hardware and software manufacturers have realised the relevance of direct contact with users in the 2.0 social paradigm and are devising value propositions immediately linked to them.[49]

Figure 11 presents data from a survey of innovative firms in the mobile ecosystem (Feijóo, Maghiros, & Ramos, 2008; Pascu & Feijóo, 2009). It shows the relative distribution over time of the appearance of new firms in the market and, where appropriate, the year they experienced major changes in their activities.[50] Not surprisingly, it is only recently, from 2005 onwards, that this domain has seen most of the "action". This wave of activity follows the advent of new enablers: the availability and increasing affordability of mobile broadband, the usability of mobile handsets and the desire to transfer the success of Social Computing to the mobile domain. Somewhat more unexpected, was that a relevant number of companies began their activities - a first wave - in 1999-2001. Most of these "early innovators" reoriented their activities to the Mobile 2.0 sphere from 2004 onwards. The figure also shows the turbulent behaviour of innovation in Mobile 2.0. Major changes in firms' lifecycles have taken place mostly in 2006-8, but they only affect 11% of firms in the sample during this period.

A deeper look into the categories where innovation is taking place (see Figure 12) reveals that mainly pure Mobile 2.0 and mobile application activities drove the interest of innovators from 2005 to 2007, after the above mentioned "first wave" of interest in mobile content. It also appears that the relevance of platforms and enablers has increased - indirect evidence of the highly fragmented nature of the Mobile 2.0 ecosystem, which still needs "glue" technologies. User-generated content is considered, by a very eloquent 59% of firms in the sample, to be a key element in value propositions.

The recent economic crisis will also affect the development of Mobile 2.0, although it is still too soon to present solid evidence, However, it is foreseeable that, on the one hand, some of Mobile 2.0's advantages for existing industries, such as its potential for explosive growth and its capacity to profit from existing infrastructure investments, will result in a more rapid and counter cyclic movement towards Mobile 2.0 applications.[51] On the other hand, the credit crunch might delay the entry of newcomers to this domain.

From the industry perspective, there are four areas of probable high growth in the economic value of mobile: social networking, user-generated content, new location-based services and mobile search. Figure 13 shows the forecasts for world revenues for the main market segments of mobile content and applications. Mobile 2.0 revenues are forecast to exceed those of mobile music or mobile gaming in 2012.

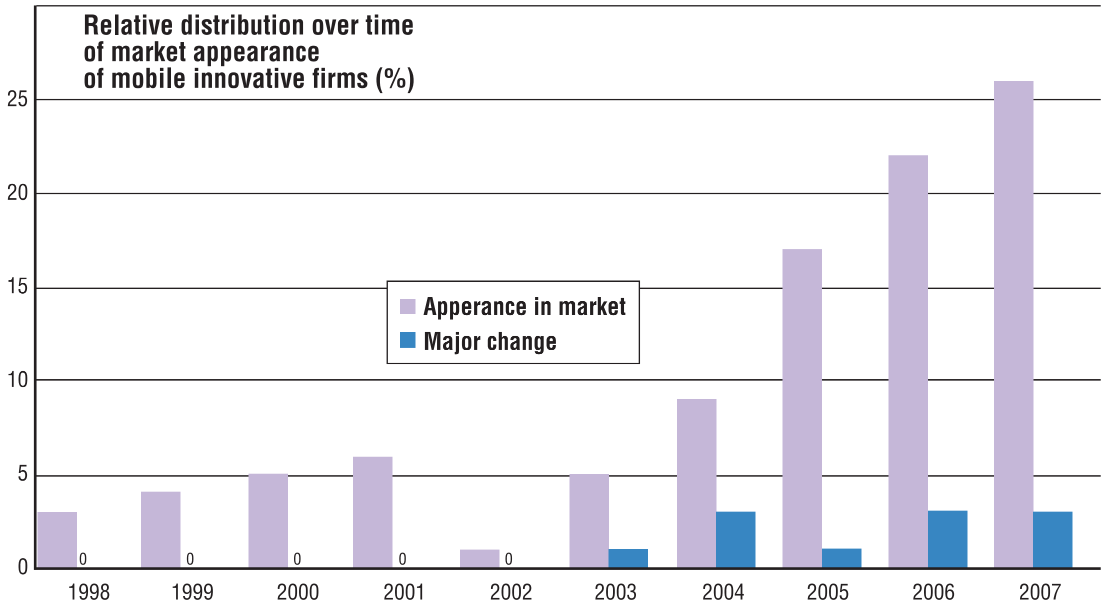
48 "There should be nothing that users can access on their desktop that they can't access on their cell phone" say Andy Rubin, Google's director of mobile platforms and creator of Android (D. Waters, 2008).

49 Apple's iPhone is a paramount example of the users directly accessing to an application store without the mediation of a mobile operator.

50 Re-foundation of the company, change in techno-economic activities, acquisition by other company, termination of activities, or re-location.

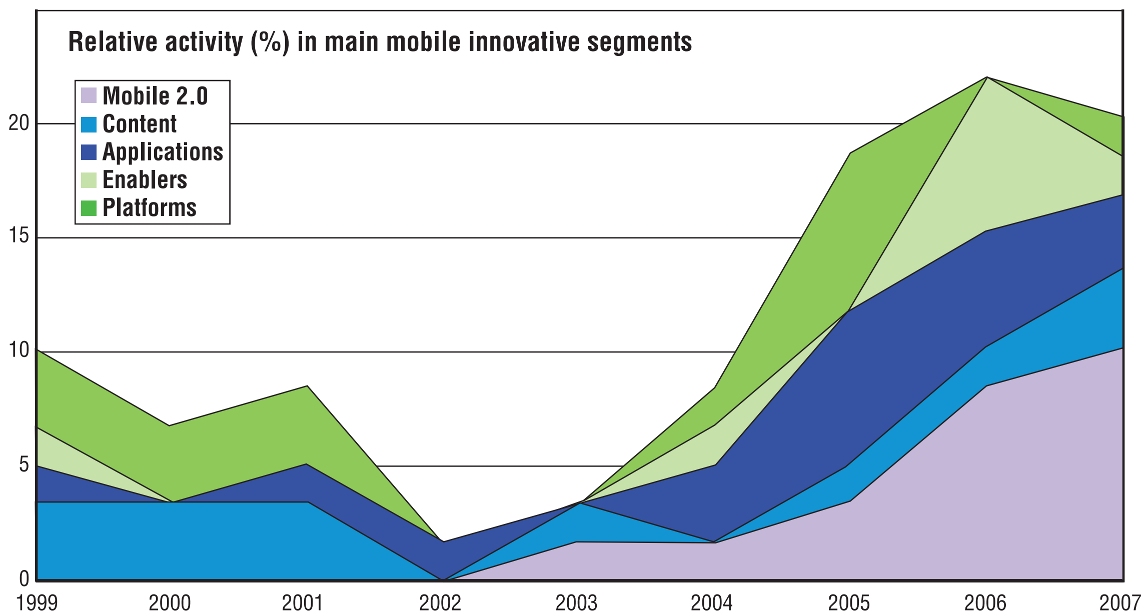
51 The case of Nokia at the beginning of 2009 is paradigmatic. While cutting R&D expenditures in handset manufacturing, it is being more aggressive in the provision of mobile value-added services and applications.

Figure 11: Relative distribution over time of market appearance of Mobile 2.0-related firms (%).



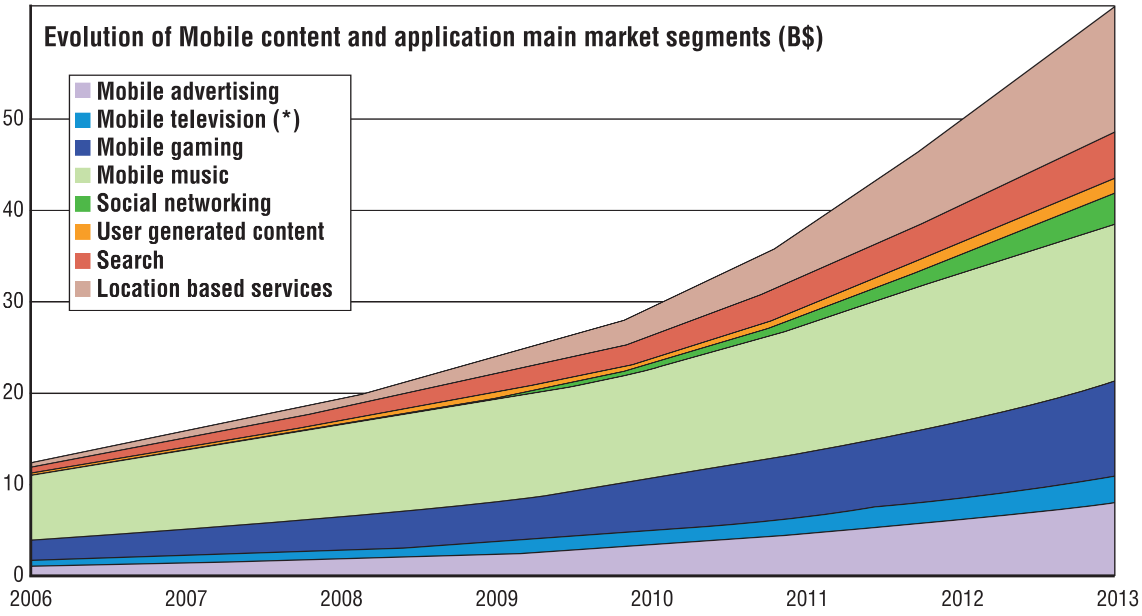
Source: data from IPTS 2007-2008 survey of mobile innovative firms

Figure 12: Relative activity (%) in main mobile innovative segments.



Source: cross-sectional data from IPTS 2007-2008 survey of mobile firms (2008)

Figure 13: Forecasts of world revenues (USD billion) of Mobile 2.0 main market segments.



Source: own elaboration from data of ABI Research, Gartner, Juniper Research, Informa Telecoms & Media, iSuppli, Netsize, Strategy Analytics and Verizon.

4.2. The user's behaviour

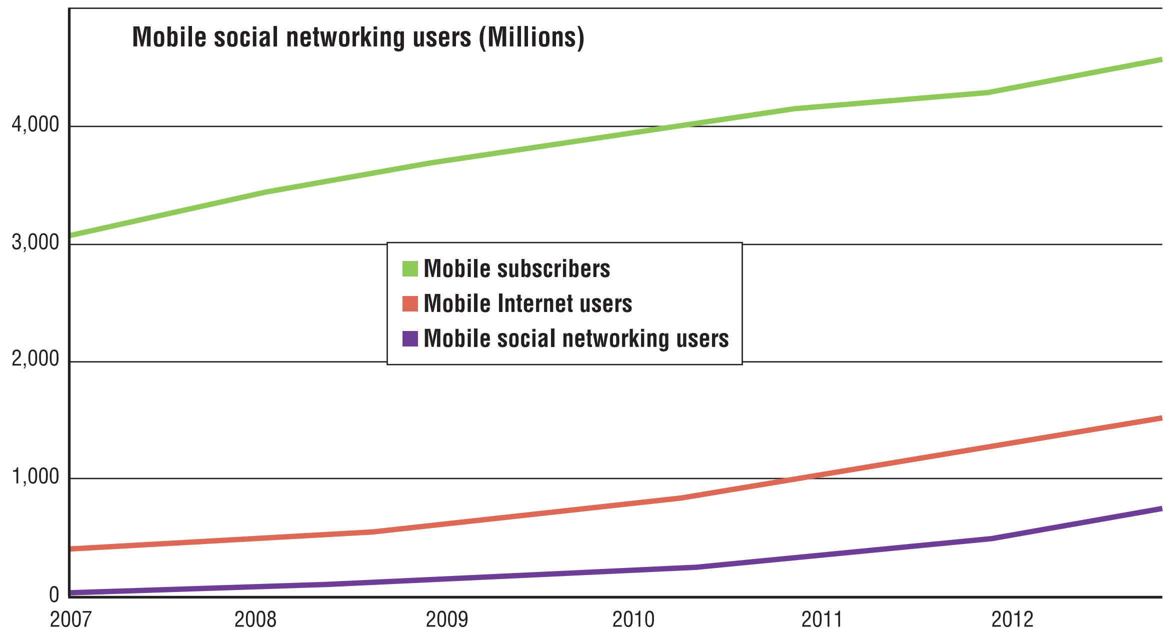
Mobile Internet penetration[52] is steadily increasing. Penetration, as regards the total number of mobile subscribers (Nielsen, 2008; Westlund, 2008), was 16% in the USA at the beginning of 2008, compared to 13% in the UK[53] and Sweden, 12% in Italy, 11% in Spain, 10% in France and 7% in Germany. Mobile 2.0, and mobile social networking in particular, has been adopted by a small user base which is now growing fast (Pascu, 2008b). The forecast for the evolution of the number of mobile social networking users is that it will reach an impressive 1 billion some time around 2014 (Figure 14). The US has the largest number of users accessing a social network via their mobile phones (4% in March 2008), followed by Europe with 3% (UK 5%, followed by Spain, Italy and France) (Ofcom, 2008 ; Pascu, 2008b). People aged under 25 are currently the most active users of mobile social networking. In France, Germany, Italy and Spain, the age group with the largest percentage of users is 13-17 year olds, whereas in the US and the UK it is college-aged consumers (18-24) (M:Metrics, 2007a). Gender issues have been less explored but the few data available -UK July 2008 - show that the proportion of male to female is 59% to 41% in mobile Internet general usage, compared to 52% to 48% in PC Internet (comScore, 2008b).

There is also a visible gap between 'intention to use' and actual use, already noticeable in mature mobile markets such as Finland and Sweden:

- In Finland, the adoption gap for location-based services was considerable. 49% of users intend to use them, but only 13% have actually tried or use them regularly (Carlsson, Carlsson, Puhakainen, & Walden,

52 "Actively using mobile Internet"
53 The figure goes up to 23% if once a month (The Mobile Data Associations 2008)

Figure 14: Forecast of mobile social networking users (Millions) in comparison with world mobile subscribers and mobile Internet users.



Source: own elaboration from data of ABI Research, eMarketer, ITU, Juniper Research, Informa Telecoms & Media, and Netsize.

2006). 27% intend to use mobile web in the long term, but only 7% intend to do so in the short-term and even fewer users - 3% - actually use them now (Verkasalo, 2008). No perceived value (with an age and gender bias), pricing and the existence of lower-end alternatives are strong barriers to adoption.

- In Sweden, mobile Internet has an adoption gap[54] of about 30%. More than two thirds of Swedes have no interest in mobile Internet usage, largely because of cost, lack of user-friendliness/usability and the existence of alternative devices (Westlund, 2008). There is a significant gap between mobile use (38%) and mobile advanced services use (6%), such as mobile gaming or mobile video, due to the complications of mobile usage, lack of interest in trying out new technologies, pricing and no interest in the services (Akesson & Eriksson, 2007).

Other factors such as digital divide factors, social support, privacy concerns and prior knowledge of communication technology use also explain the levels of user interest in entertainment (e.g. social computing), surveillance (e.g. location-based services) and instrumental Mobile 2.0 services (e.g. search) (Rice & Katz, 2008).

Information on mobile traffic to websites (traditional and social networking alike) is scarce. The distribution of mobile traffic mimics that of the Internet: primacy of search engines and the long-tail effects. Among the 10 most popular sites in the USA, the UK and Germany were two Social Computing sites and two user-generated content sites in average (Opera, 2008). Just a year before, no Social Computing companies made the top 10 mobile Internet sites (M:Metrics,

54 An adoption gap (Verkasalo, 2008) appears when the expressed intention to use a service is different from the actual usage of this service. Significant adoption gaps show that the expectations of users are not met by actual services.

2007b). Uploading videos or photos is by far the most popular activity related with mobile social computing while mobile blogging is the least common, in both the US and Europe (M:Metrics, 2008). Among US students, mobile phone and social networking usage are correlated in terms of intensity and scope of use (Lai, 2007). People who spend more time on their mobile phones also spend more time and do more things on online social networks. Today, about 45% of social networking users access online social networks via a mobile device (ABI Research, 2008) to check for comments and messages and post status updates. Consumers prefer to access their existing social networking accounts while on the move, rather than create new 'mobile' profiles.

4.3. Challenges and opportunities

A complex ecosystem with a diversity of personal involvements

In contrast with the still dominant paradigm of mobile communications, which is centred on voice and sms, the Mobile 2.0 domain consists of a heterogeneous and fragmented digital ecosystem (Feijóo, Maghiros, Abadie, & Gomez-Barroso, 2009). The innovation landscape is highly dynamic and is driven by the usual economic forces in emerging ecosystems: rising and lowering entry barriers, open and de-facto standardisation processes, platform competition, value-chain silo models and value chain disintegration, use of increasing and decreasing transaction costs, and the search for niche opportunities and economies of scale and scope.

The ecosystem also comprises many different kinds of user involvement which derive from the personal usefulness, or personal value obtained by users from Mobile 2.0 solutions. This explains the enormous influence on the success of Mobile 2.0 of both detailed demographics and the attributes of the user's environment, such as the location of the user, what the user is engaged in at the time and the situation where content is used.

However, we still take a traditional view on how to use the new mobile data technologies, which has a negative effect on explorations of any alternative uses of this technology (Jenson, 2005). The short messaging service is a relevant example. This apparently simple and limited mobile application was an unexpected success, and it has taken a decade for the mobile industry to fully understand and exploit its possibilities (Ante, 2008; Jenson, 2005; Kasesniemi, 2003). This example shows how difficult it is to anticipate mobile user preferences. It is even more difficult with richer content and applications that allow complex behaviours. It would not be surprising, therefore, if we are looking at the first steps (and skirmishes) on the winding path towards the full potential of Mobile 2.0, where success will require a much more segmented approach to markets and a continuous process of interaction and learning with the users.

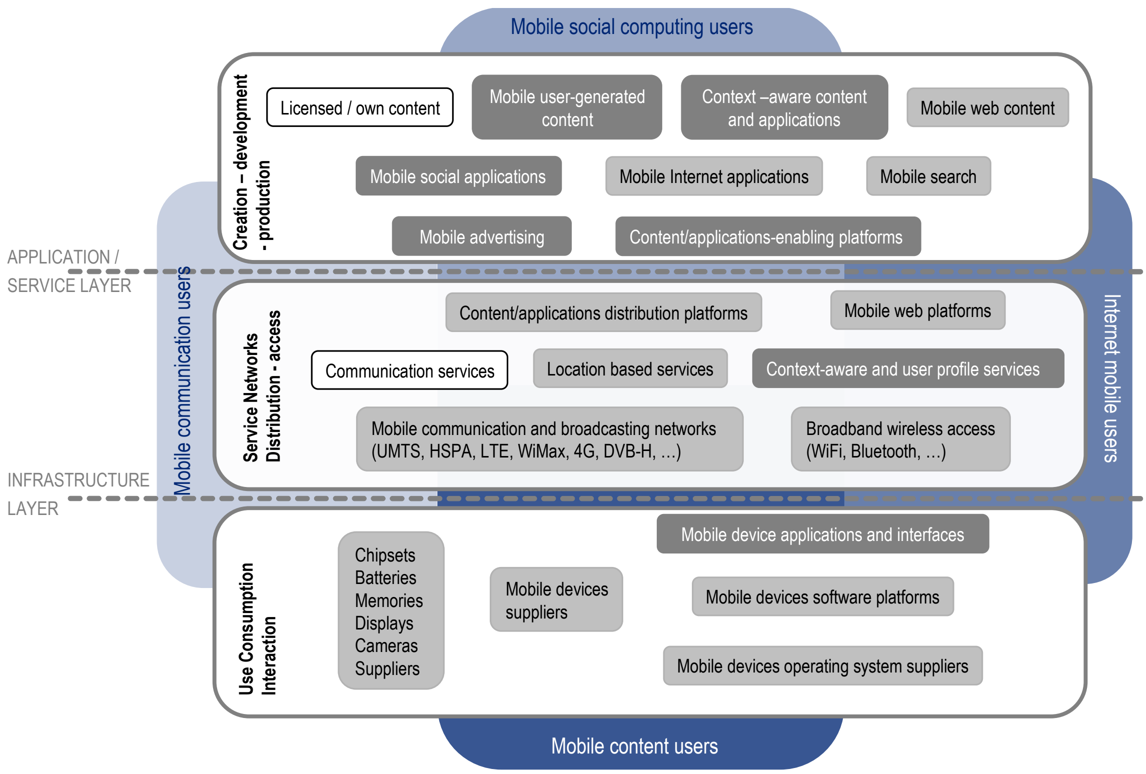
The clash of business models

The different origins and cultures of mobile market players also present a challenge.

Figure 15 represents the resulting techno-economic three-layered structure, typical of ICT ecosystems (Fransman, 2007). It identifies the main activities that take place in the mobile content and applications domain, and introduces the evolution of the role of users from mere communicators (left) to consumers of content (down) and information (right) and, finally, as social computing 'prosumers' (up). In addition, the figure highlights (in the dark grey boxes) the activities which could be considered fundamental to Mobile 2.0. Those elements directly connected to or needed by Mobile 2.0 (pale grey boxes) and the pre-existing independent elements (white boxes) are also shown.

The differences in players' perspectives can be observed in the existing or emerging business

Figure 15: Techno-economic activities in the mobile content and applications ecosystem.



models in the domain. In general terms, it can be said that the mobile industry focuses on how to generate additional revenues from mobile content and applications. At the same time, the content and applications industries are trying to figure out how to use the mobile channel as an additional source of revenues. From their perspective, the most important models for the Mobile 2.0 sector are (and will be) subscription, pay-per-use and advertising (Feijóo *et al.*, 2008). At the same time, the evolution of the mobile domain requires business models suitable for flexible, application-centric, user-determined configurations (Ballon, 2007; Bouwman, 2003).

Nevertheless, mobile business has been traditionally characterised by the pre-eminent position of the operators, which control many elements within their value chain, from network and services to applications and content. The result, as regards mobile content and applications, is the well-known "walled garden" or "on-portal" model, where content and application revenues are generated by operators within their own value structure and where users are guided to stay as much as possible within this structure. The bottom-end rationale for a walled garden in mobile content is the use of a scarce and costly resource: the mobile networks. Undoubtedly, this model has eased the way for an infrastructure development still not completed (Ramos, 2005; Ramos, Feijóo, Castejón, Pérez, & Segura, 2002). However, the increasing pressure from demand for an unrestricted and wide choice of content and applications and the changes in the mobile industry structure are causing business models for mobile carriers to evolve (Holden, 2008).

These last drivers lead us to envisage the opposite model: the mobile operator as a mere provider of connectivity[55] or a "dumb pipe". In this case, the revenues for mobile content and

55 The mobile operator "3" in the UK was the first to move in this direction (late 2006).

applications would accrue to providers, enablers and brokers.

Between the walled garden and the connectivity models, there will be intermediate possibilities, which could be attractive enough since they could represent having - at least a part of - the best of both worlds. In all of them, mobile operators will use the opportunity to become, to some extent, wholesale providers of services for applications/content-related players. Additionally, mobile operators could also offer their own private brands to users.[56] In this model, mobile operators are envisaged as the equivalents to department stores or shopping malls. This model might also be seen as a reaction by mobile operators to the possibility of losing all retail content revenues to third parties through off-portal and side activities by end-users, and will allow for an increasing presence of Internet-like business models, currently absent from the telecomm industry.

However, it has been the mobile device suppliers that have put this model into practice.[57] Nowadays, all of them are looking for new profits from the combination of innovative mobile content and applications with their portfolio of products and services. As stated by Feijoo *et al.* (2006), this introduces new paths in market evolution, but above all it is strongly influencing the users' perception of the value of mobile applications, increasing their expectations and the pressure for unbounded fruition of them.

4.4. Trust and perceived value

Security, privacy and data protection are among the most cited concerns for social/location applications (Iachello, Smith, Consolvo, Chen, & Abowd, 2005). In particular, the user's control of the level of disclosure of his/her position (and other context data) is a key element in the adoption of these services, as recent surveys confirm (Lusoli & Miltgen, 2009). Additionally, users have other serious difficulties in appreciating the value added of advanced mobile services (Akesson & Eriksson, 2007; de Vos *et al.*, 2008; Verkasalo, 2008). The results of these studies show that usefulness and ease of use are the most important aspects, and that mobile advanced services are still too complicated. Users also lack interest in the new services as such, and are discouraged by their pricing. These factors are barriers even though the advanced mobile devices, which enable the services, are widely distributed among consumers and well accepted by them.

The results also explain why mobile media services' 'anytime and anywhere' accessibility, often claimed to be a relative advantage, is not reflected in the use patterns identified. The main reason users gave for using mobiles for advanced uses was the experience of connecting to other people and learning about new things, rather than being entertained. Another relevant finding from these studies, in the particular case of rich media usage, was that the consumers need to find a context (place, environment, emotional situation, social relationships …) for using these advanced services. Precisely since Mobile 2.0 implies a unique and personal experience (a place, a moment in time, a situation, a social network), this could help explain why it is still not adopted and ubiquitously ingrained in use patterns. Overall, it would seem that utilitarian elements win over hedonistic elements in context-aware services (de Vos *et al.*, 2008).

To summarise, the fundamental driver for adoption of mobile advanced services seems to lie in the value perceived by users, and not in the traditional communication of technological

56 Every major mobile carrier in Europe, i.e., Vodafone, Telefonica, Orange, T-Mobile, etc, has a portal of this type

57 The three most relevant examples are the iPhone – iTunes – App Store, the Android open operating system platform supported by Google, and Nokia's Ovi platform for mobile services.

innovation. Mobile 2.0 evolution will be at least as dependent on the behaviour of demand as it is on the mere availability of innovations from the supply side. With this in mind, two new measures of user adoption have been proposed (Verkasalo, 2008): the "stickiness factor", i.e., the number of active users compared with those trying the service, and the "adoption rate", i.e. the number of service users compared with those interested in the service. Most of the new mobile services fall very far behind sms and voice in these two dimensions.

4.5. Policy implications

Mobile 2.0 belongs to a second and more intense wave of interest in the mobile content and applications domain (Feijóo *et al.*, 2008). It derives from the advent of new enablers like mobile broadband connections and adequate handsets, a desire to transfer the success (and the hype) of Web 2.0 solutions to the mobile domain, and the expectations of the opportunities that context-awareness can bring. However, data available show that user response to Mobile 2.0 is still lukewarm and that a more open environment is needed for innovation to flourish.

Mobile is arguably the next step in the evolution of social computing. However, user expectations and demands in an advanced mobile scenario need further research. The "build it and they will come" approach has proved not to be enough to attract users. Learning from users (user-driven innovation) is the response increasingly adopted both by the new mobile industry and by new public policies (e.g., by providing wide access to "living labs"). At the same time, it could also be argued that users are still not empowered enough in the mobile domain. Currently, users are not in control (or even aware) of the information that players across the mobile value chain have about them and how this could be used. Neither do they have transparent access ("labelling") to features of advanced services, nor easy settings for the levels of disclosure and further usage they allow for their personal data. They do not have fair knowledge of the implications that agreeing to use some advanced services may have. Many initiatives, albeit in the very early stages, are taking shape to try to address the above issues. There are auto-regulation approaches (i.e., codes of conduct), co-regulation approaches (i.e., quality seals backed by public administrations), and a general trend in public administrations to oversee consumer protection in advanced mobile services (e.g., mobile content sites inquiry, international data roaming prices, etc).

Innovation in the Mobile 2.0 ecosystem confronts the issues of "openness", (loose) interoperability and standardisation. In stark contrast with the framework for development of Social Computing on the Internet, the mobile domain is plagued with silo models, "walled gardens", incompatible technology approaches, and layers of intricacy. As a consequence, the mobile ecosystem is unnecessarily complex and lacks economies of scale. Again, there have recently been many responses from both the new mobile industry (e.g., calls and initiatives for openness at the device, application and infrastructure levels) and new public policies (e.g., spectrum management changes). However, they are, in general, still far from achieving any significant impact on an ecosystem where "winner takes all" strategies prevail.

Finally, it must not be forgotten that the base conditions for the success of any mobile advanced service are the availability and affordability of mobile broadband connections and the availability, affordability and usability of mobile devices. In particular, these conditions have an inclusive angle for those people who are under served by market priorities.

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5. Social Computing and Identity

This chapter examines the opportunities and challenges for identity that arise from Social Computing. Social Computing applications have recently become some of the largest identity management systems in the world. They raise significant policy issues concerning privacy and data protection, safety, market competition and fairness, and industrial structure.

This chapter examines technical developments regarding identity and Social Computing, the economics of identity and the social life of personal information. It then assesses the risks associated with un-social computing: personal, social and systemic. It charts the policy options and solutions for identity that Social Computing may require.

5.1. Technical trends: social identity management

Architecturally, Social Computing is substantially different from previous Internet innovations. TCP-IP allowed data transit from supercomputer to supercomputer; hyperlinks (Web 1.0) enabled horizontal transit from document to document. Social Computing, however, allows navigation through people's networks (the so-called social graph, (MacManus, 2007): people's friends, musical tastes, purchases, movements and DNA profiles (Singer, 2008). Location metaphors associated with the Internet (addresses, homepages) have given way to personal metaphors such as profiles, or 'my space' (Madden & Fox, 2006). Social Computing sites are new entry points to people's personal worlds and their online social networks. Due to this social flavour, Social Computing applications have attracted crowds in recent years.

Users' social identity is central to how Social Computing operates. According to Microsoft and IBM (and others), Social Computing relies on the notion of relational identity: who identity data 'belongs to' and how the identity of the 'owner' of that data is related to other identities in the system. In fact, Social Computing applications are, in effect, distributed social identity management systems (Maghiros, Delaitre, & Koops, 2005). In 2008, 38% of young people in Europe[58] had profiles on multiple Social Computing sites, including social networking sites (SNS) and file sharing sites (Lusoli & Miltgen, 2009). Social Computing applications are amongst the largest online, and people use them daily to manage identification and authentication into communities of practice, marketplaces and leisure sites. In 2008, social networking sites alone attracted 165 million unique European visitors a month, a 35% growth from the previous year (Table 3). Today, social identity management systems, such as OpenID, are as large as corporate and mobile identity management systems, at about half a billion users.[59]

Identity management via Social Computing is not hierarchical as it is in traditional identity systems (e.g. the state identity card system); instead, reputation, trust, accountability, presence, social roles and ownership of identity are central (Pascu, 2008a). Most Social Computing applications leverage on users' relational identity to generate a variety of social and business processes. Identity, in the form of users' personal

58 Young people aged 15-25 in France, Germany, Spain and UK, see (Lusoli & Miltgen, 2009)

59 See the OpenID 2008 timeline at http://openid.net/2009/01/15/momentum/; also see http://en.wikipedia.org/wiki/OpenID

Table 3: Social Networking growth by region, June '07 – June '08[60]

	Unique Visitors (millions)		
	Jun-07	Jun-08	Change
Worldwide	**464**	**581**	**25%**
Asia Pacific	163	201	23%
Europe	123	165	35%
North America	121	131	9%
Latin America	40	53	33%
Middle East - Africa	18	30	66%
Total Worldwide Audience, Age 15+ at home and work			

Source: comScore World Metrix [www.fusedlogic.com/?p=437]

data, is the basic currency which is exchanged in most Social Computing transactions.

5.2. Social trends: identity construction and disclosure in Social Computing

Unlike other media, Social Computing raises issues concerning identity construction, especially for young people. Traditionally, identity was a matter of societal allocation linked to locality (e.g. ID cards), not a process of individual choice and negotiation. Social Computing applications provide new means to construct and manage identities flexibly and autonomously. Structurally, five Social Computing characteristics set them apart from previous Internet applications: authentic data about users and their friends can be visualised; users' always-on, light-weight identity builds on weak links of acquaintance, common taste, activities and co-location (Cachia, 2008). This process is based on personal data disclosure, as well as a continuous process of active identity management via Social Computing where users choose what parts of identity to disclose and how to present themselves.

People disclose a great deal of sensitive personal data when using Social Computing. Most young Europeans make their Social Computing profiles public and reveal a wide array of personal information (Joyce, 2007): their names, nationality and age (>80%), their tastes, things they do and pictures (>50%) and their whereabouts and friends' details (>25%) (Lusoli & Miltgen, 2009).[61] A shift in online interaction can be observed in the way young people use Social Computing to present a self which reflects their true profile, 'showing rather than telling'. This means of representation replaces the anonymous and pseudonymous role play previously associated with chat rooms and multi-user domains (MUDs). In this way, Social Computing generates truthful fragments of identity (Zhao, Grasmuck, & Martin, 2008), real selves with real names (Tufekci, 2008). Users are more likely to befriend strangers via Social Computing and share personal data with them (Furnell, 2008; Sophos, 2007). Contact lists have become an imagined audience people perceive as part of their world (boyd, 2007).

This triggers important social processes. Establishing identity, the act of making oneself known, becomes socially bound, allowing multiple presentation of the self across different

60 See complementary data from comScore available at www.comscore.com/press/release.asp?press=2396, Synovate and Universal McCann. Available at: www.emarketer.com/Article.aspx?id=1006513.

61 Young people aged 15-25 in France, Germany, Spain and UK.

platforms (DiMicco & Millen, 2007) and numerous opportunities for peer validation of these roles and identities (Turkle, 2008). Identity becomes visibly multiple (you are a client, a family member, a worker, an activist); in 2008, 38% of young people in the US (Lenhart, 2009)[62] and 33% in Europe (Lusoli & Miltgen, 2009) had profiles on multiple Social Computing sites. Identity becomes relational: you are what you link (delicious), purchase (eBay) or write (twitter). It becomes increasingly connected to where you are and what you are doing (geo-social networking) and to whom you are connected (social networking sites). Identity (including social relations) becomes portable from one Social Computing application to another.[63] Trust underpinning transactions becomes transposable (my friends' friends are my friends, my friends' tastes are my tastes, etc).

Users are, in a sense, empowered to take responsibility for their own identity data and to engage socially via Social Computing. More young people in the UK, France, Spain and Germany believe it is their own responsibility, and not of companies and governments, to protect their identity data online (Lusoli & Miltgen, 2009).[64] People adopt hiding and distorting strategies to preserve privacy, enhance status or gain financially (Feizy, 2007; Tufekci, 2008). Users protect their identity data by shielding (e.g. using dummy email accounts), minimisation (e.g. giving minimum information) and avoidance (e.g. giving wrong information) (Lusoli & Miltgen, 2009). Also, not all activities facilitated via Social Computing applications are commercial or hedonistic: people use Social Computing sites (including commercial marketplaces) to express opinions (e.g. on performance) and for activism, as well as for consumption (Zollers, 2007). In some cases, new recommendation economies, such as the algorithmic form of word of mouth proposed by Facebook via the Beacon shopping feature have failed outright due to privacy concerns (Westlund, 2008). Overall, therefore, there is significant scope for user activism and social action in Social Computing sites.

62 Young people aged 18-24.
63 See http://en.wikipedia.org/wiki/DataPortability
64 Young people aged 15-25 in France, Germany, Spain and UK.

5.3. Economic trends: the economics of identity in Social Computing

When people come together to share their knowledge, reputation, consumer experiences and tastes, identity becomes negotiable. Social Computing opens opportunities for the monetisation of identity in future networks (European Commission, 2009b). Via Social Computing applications, masses of user-generated contents (and identity) are manipulated according to different business and personal objectives. Currently, advertising is the dominant revenue model for Social Computing applications. It is estimated that each social networking profile may carry a value tag of USD 20-40, by virtue of overall Social Computing site audience, size, attention and activity (Thomas, 2006). However, major Social Computing application providers are struggling today to generate revenue (see Lindmark); people generating contents often receive no cash benefits (Lindmark, 2008; Lytras, Damiani, & Ordóñez de Pablos, 2009). In fact, different currencies are associated with aspects of personal identity in Social Computing: professional experience, social networks, reputation and personal experience can be monetised and may generate economic externalities (Table 4). Often, these are not overtly monetised.

Where they are monetised, as in the case of consumer-to-consumer auction markets (such as eBay), the economics of identity are complex. Reputation systems based on Social Computing are key to the success of transactions and to determining the price of goods; feedback

Table 4: Identity in relation to Social Computing applications

	Logic	Business model and economics
eBay [eBay.com]	Consumer-to-consumer auction site based on user-generated reputation feedback and comments; identity is chosen and managed, often strategically, by the seller; eBay tags real-life information to the seller to improve trust	Reputation and trust as currency; Value is generated for eBay as a percentage of successful transactions; identity in monetised by means of reputation, as it is directly linked to goods' value
Facebook [Facebook.com]	Social Networking website, linking people though friendship connections	Social network and activity as currency; Business model based on advertising. Identities and profiling of members in SNS contribute to increase the click-through rate for pay-per-click services and goods; overall, users' tastes and friends' network are monetised
PatientOpinion [patientopinion.org.uk]	Health system rating site, where patients pass comment on or rate the performance of public health system practitioners and structures; identity in this case is related to personal medical information shared with other users of the system	Personal experience as currency; Economic value generated by improving quality and increasing efficiency of the public health care system; possibly also reduce contention costs
Linkedin [Linkedin.com]	Professional networking sites, where people share their work experience, professional groups and tips with other users.	Professional experience and activities as currency; Economic value generated in better job opportunities for users, cost savings on job market mobility, sharing of professional experience

NOTE: *Currency here refers to the value which users bring into the Social Computing application and which the application may monetize.*

systems help generate trust, activity, honesty and revenue (Yang, Hu, & Zhang, 2007). Institutions ensuring credible signals (assurance) and informal institutions (reputation) improve market efficiency and people's trust (Cave, 2004). However, even the best architecture cannot discourage opportunistic behaviour. Practices such as the change of identity by dishonest sellers, bidding for one's own items and failure to leave feedback hamper attempts to improve the market (Zhou, Dresner, & Windle, 2008). On the other hand, though the accountability of one's identity is a desirable principle when intangible assets are exchanged (for instance: intellectual property) (Weitzner *et al.*, 2008), even anonymity in peer-to-peer file exchanges can generate positive economic externalities (for instance: anonymous music file-sharing) (Huygen *et al.*, 2009).

In other words, Social Computing applications comprise distributed systems of trust-making, distributed systems of identity making and complex reputation systems where users co-determine the rules. What is novel is that identity data exchanged in Social Computing (tastes, recommendations, text) may actually have a value tag associated to them in open rather than closed markets. One's friends, behaviour, reputation, trust and identity affect earning, social position and ultimately the quality of life of an increasing range of EU citizens. This was the case previously in local rather than global markets. What is new is the integrated use of these systems on a global scale, one nested in the other and alongside increasingly globalised markets for e-services and goods.

5.4. Challenges

Security and safety challenges

Social Computing builds on identity informally, by using algorithms, application design and use practices rather than consolidated procedures and process controls typical of traditional identity management (in place, for instance in workplace identity management or in the credit market). The main issue with Social Computing as a distributed identity management system is that it has no in-built or at least established or interoperable security, assurance, quality control, or process control typical of professional systems (Hogben, 2008). Most Social Computing systems require simple email ID and password identification. This leads to the multiplication of identification across multiple sites, limited security of transactions based on password identification, with potential for data loss, impersonation and identity theft as the extreme consequence. Within the sites, some areas, for instance applications written by third parties, may endanger users' privacy (Felt & Evans, 2007). The security agency ENISA examined in great detail the security aspects of social networking sites and found them wanting (Hogben, 2007).

In terms of safety, children and young people are particularly at risk (Livingstone & Haddon, 2008). Overall, there is a movement towards increased security and questioning of the portability of secure identity across multiple applications (Lievens, 2007). In February 2008, 18 major social networking sites in Europe signed the «Safer Social Networking Principles for the EU». This is a set of self-regulation principles and practices aimed at minimising potential harm to children and young people, which came into force in April 2009 (European Commission, 2009c). Some providers such as MySpace are currently considering fingerprint enrolment and validation for underage users (NA, 2008). Websites aimed at under-age people are starting to have inbuilt enhanced security (e.g. Anne's Diary, http://www.annesdiary.com). Finally, steering parents and children in the direction of safety remains a challenge. Less than one EU parent in three regularly checks whether their child has a profile on a social networking site, and, if they are non-users themselves, they are particularly unlikely to do so (17%) (Gallup, 2008c).

Children under the age of 10 have little awareness of the dangers of going to meet someone they have been chatting with online, however awareness grows for 10 to 13 year olds and then steadily declines after that age (Joyce, 2007). Risks extend beyond disclosure and predatory behaviour to self-inflicted harm. Self-validation is transposed online when young people share their fragile selves with people they do not necessarily know. The case of Megan Meier (Collins, 2008) and seven suicide cases in Bridgend (UK) are examples of such fragility (de Bruxelles & Malvern, 2008). The implications of this behaviour are magnified by the viral nature of Social Computing (emulation, for instance).

Unsocial computing: personal, social and systemic challenges

People display little to no awareness of the relationship between online privacy concerns and information disclosure (Tufekci, 2008). One the one hand, 86% of Europeans claim that they avoid as far as possible giving out personal information online (Gallup, 2009).On the other hand, it was noted that a vast majority discloses anyway, in order to receive services and to connect with other people (Lusoli & Miltgen, 2009). Only half of the minority of Europeans who are aware of privacy-enhancing technologies (42%) actually use them (Gallup, 2008a). People adjust profile visibility and use nicknames rather than restrict information within their profiles, with little regard for issues of persistence, searchability and cross-indexability of personal data (Edwards & Brown, 2008). This carries significant risks of identity-theft, impersonation and other perils implied by the loosening of privacy regarding personal data, and becomes more problematic the closer it gets to the individual. The following box lists the possible challenges, including both plausible risks and instances where harm has occurred.

Personal challenges

Increased visibility of people's private lives gives rise to greater risks of person-on-person unsocial computing practices.

- Cyber-bullying is on the rise, where people are targeted online and offline (Hammond, 2007); there have been cases of suicide as a result of harassment, or as a bid for celebrity status (Davies, 2007).
- People increasingly post sensitive information about their friends and colleagues, regardless of the 'harm' this may do them (Get Safe Online, 2007);
- It can provide ammunition for social engineering whereby offenders have more precise information on potential victims of scams (Workman, 2008).
- It increases the likelihood of distributed (lateral) social surveillance (Albrechtslund, 2008; Fuchs, 2009), enhanced by the advent of geo-tagging.
- People whose personal data privacy is compromised online (5%) are likely to suffer some form of damage in terms of reputation or further privacy loss. Young people are more prone to these losses (Gallup, 2009).
- Disclosing data about users' location and schedules could be risky in cases of stalking (Hogben, 2007). Social Computing users disclose their full personal address and current activities (Lusoli & Miltgen, 2009).

Social challenges

There is no 'safety net' in relation to Social Computing activities, as the individual is often the weakest link in the chain and also the guarantor of last resort.

- Significant complications posed by Social Computing for citizen privacy and data protection have been identified in Article 29 of the Working Party (Article 29 Working Party, 2008a, 2008b) and EPDS (EDPS, 2008).
- Information from social networking sites is used as evidence to screen job and university applicants, possibly prejudicing their future reputations and careers (Joyce, 2007).
- Social Computing enhances advanced social profiling of groups and individuals, what ENISA defines as 'digital dossier aggregation' (Hogben, 2007) that can then be used for social sorting purposes.
- There are clear risks of social exclusion, what is termed a 'second-order digital divide', as e-included, skilled and educated young people make the most of social networking sites, whereas lower-class and less educated people miss out on interactive, added-values services (Hargittai & Walejko, 2008).
- Intellectual property, data ownership and moral rights of authorship intrinsic in cultural production are not formally and clearly recognised (Vickery & Wunsch-Vincent, 2007); unclear rules may depress rather than foster creativity.

Systemic challenges

Unprecedented amounts of information and data-points about users are generated in online interactions, most of which are beyond user control.

- Advanced behavioural tracking threatens users' privacy, (Story, 2008a, 2008b) especially when data-points from different sources such as search engines and social networking sites are linked (Zimmer, 2008). However, commercial data fusion is still in its infancy (Garfinkel, 2008).
- Users have limited control over their data and connections in relation to mash-ups from different sources. While about 70% of the digital universe is created by individuals, companies are responsible for the security, privacy, reliability and compliance of 85% of this universe (Gantz *et al.*, 2008).
- Clear systemic loss of control of personal data. Disclosure is due to profiling by design which endangers user privacy, the organisation of sensitive personal data as main identifiers, the availability of secondary data-sharing applications and to geo-locability and linkability to offline identity traits (Edwards & Brown, 2008).
- The idea of 'data portability', whereby users can 'carry' their relations (and their identity) from one site to others is largely limited to and controlled by site owners and developers.
- Deletion of personal data and trails left when using Web 2.0 applications is problematic, as the recent Facebook controversy demonstrates. What exactly are personal data, who they belong to and for how long they can be retained by Social Computing companies is an unresolved issue.

5.5. Policy implications

With challenges come significant opportunities. There is wide agreement by regulators and the industry that privacy and data protection legislation need to be supplemented, refined or revisited to respond to the challenges arising from identity management via Social Computing (EDPS, 2008; European Commission, 2009c; Kuneva, 2009; Lambrinidis, 2009; Reding, 2009). Europe has one of the strongest frameworks for the protection of citizens' privacy and personal data. Even so, the social logics of Social Computing shape local regulatory regimes that do not conform to traditional social rules, let alone Data Protection and ePrivacy norms. The opportunities and challenges introduced by Social Computing are currently being tackled by the Data Protection Directive, the ePrivacy Directive, the Services Directive and the reformed Telecoms package. As of 2009, there is no single eIdentity policy in the EU. Whether the disruption introduced by Social Computing calls for an integrated policy framework is beyond the remit of this report (Lusoli, Maghiros, & Bacigalupo, 2008). A few points are, however, worth noting.

First, significant social and economic potential comes from the 'new oil' of the information society (Kuneva, 2009): personal data. Social Computing is the conveyor belt in any economic engine using this fuel. Social Computing opens the way for the monetisation of a hitherto invisible asset. Such gains do not just materialise in the commercial sector, via better tailored services, but rely heavily on collective intelligence: healthcare services, career-related services and public services all depend on the possibility of identifying people as part of a small group, and harnessing this belonging.

This, of course, raises crucial issues concerning people's privacy; the remuneration of people's presence, attention and activity; the intellectual and practical ownership of shared cultural goods; and the border between what is (and what should be) commercial and what instead belongs to the public in terms of data. All these issues need tackling if this 'invisible asset' is to be monetised fairly and efficiently in the interests of European citizens. One clear aim should be to try and prevent foreclosure in this new identity market; while there is no clear business plan that is dominant at the moment, an advertising model based on behavioural, contextual and lateral tracking is likely to prevail. If this is the case, regulators need to pay close attention to the main players in this multi-sided market, to ensure competition, fairness and preserve users' privacy.

Second, this whole new market that harnesses people's data in business and public sectors rests on a burgeoning, underlying infrastructure of identity, only partly managed via Social Computing. More pointedly, Social Computing has forced a shift from traditional identity management (eID) to a more distributed system (eId). There is a significant issue with interoperability, as identity management based on Social Computing is not compatible, let alone integrated, with official identity management systems and at present, there are no plans to make this convergence (Graux & Dumortier, 2009). On the one hand, the fully-fledged integration of the social and political roles of citizens may introduce significant risks of surveillance, violating data protection principles such as data minimisation and proportionality of use. On the other hand, the logic of Social Computing may provide technical solutions to the identity management puzzle, with solutions bridging different identities (such as OpenID) and possibly some integration between 'traditional', state-allocated identities (e.g. identity cards) and new forms of identity introduced by Social Computing. As the EU lags behind in the identity management systems market, the promotion of technical and regulatory integration of eID and eId via Social Computing may provide a competitive advantage.

Third, a number of challenges, which originate from, or are amplified by, social computing, will require a response (or are at present eliciting one). People have become accustomed to the ease and convenience of identity management via Social Computing, and it is extremely common to share information about one's tastes, identity, personal behaviour, orientation and relations. Risks deriving from disclosure include cyber-bullying and stalking, online social engineering, identity theft, social surveillance and social profiling, risks for reputation, intellectual property risks, and risks to people's privacy and personal data protection and control. The fragmentation of competences between Member States, the EU, courts and specialised agencies compounds these challenges. The rejection by the European Parliament of a single communications regulatory authority may signal that an integrated solution is not on the horizon. Any innovation in this sense, however, would set the standards for regulation of these issues in other regions.

Finally, it is necessary to foresee what lies in store for identity with social mobile technologies, Web, social reality data mining in distributed computing, all foreseeable future trends. If and when Social Computing becomes an integral part of a wider information economy, anywhere and everywhere (Westlund, 2008), and if and when Social Computing social intelligence merges with the distributed intelligence in pervasive computing and the *Internet of things*, closer scrutiny will be required of the place of the individual and of issues of identity in the new information space.

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Part III: Sectoral Impacts of Social Computing: Opportunities and Challenges

6. Social Computing and Learning

Lifelong learning plays a crucial role in today's society with its changing jobs and skills needs (European Commission, 2008c, 2008d, 2008e). New ways to support value and acknowledge learning are needed in order to provide equitable and high quality learning opportunities, which foster skills for innovation and further learning. This calls for the development of education and training systems, but also for empowerment of learners so that they are able to take responsibility for developing their own competences.

Social computing provides resources, connections and new tools for creativity and collaboration, which empower all actors in the educational landscape in new ways, in both structured and unstructured learning settings. Empowered learners are already pressing for change in learning approaches, and new tools and resources support teachers and institutions in developing these. However, a major challenge for all actors is the need for new skills, especially advanced digital skills beyond basic ICT use. These are required in order to guarantee quality of learning, innovation in learning approaches and safe use of new tools.

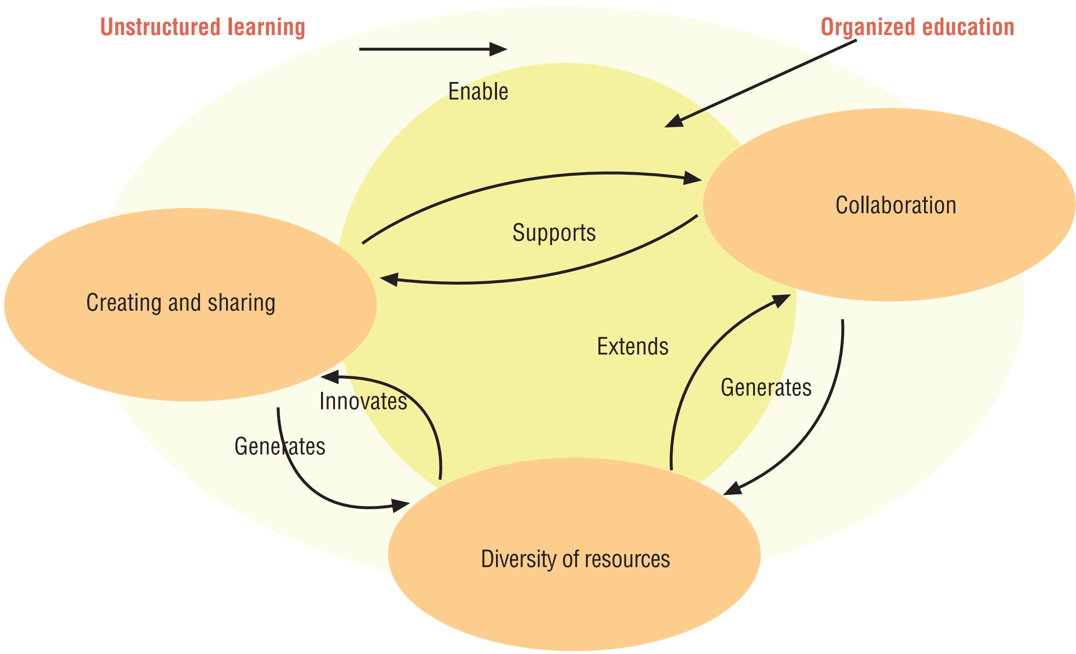
6.1. Social computing for education and training

IPTS exploratory research (Ala-Mutka, 2008) suggested that content-based collaboration in social computing has three key aspects with both economic and social impact: 1) easy access and great diversity of resources, 2) connecting through online content, and 3) new tools and models of collaboration. Later IPTS studies on the role and impacts of Social Computing in organised education and training (Redecker, 2009) and learning in unstructured online community settings (Ala-Mutka, 2009) support these aspects. However, in the educational sphere, not only the opportunity to share created content with others (above: 'connecting through online content'), but also the enhanced creative and productive processes as such are important sources of learning.

Social computing applications play an important role for education and training as: 1) a large share of young students use them in their everyday lives and would also naturally use them in their schoolwork; 2) adults and workers use these tools as well and need skills for them; and 3) social computing provides new ways to develop learning opportunities and teaching approaches and provides new empowerment for lifelong learning.

'Empowerment' of learners refers to their ability and opportunities to own their learning as regards what, when and how they learn, and to the possibility to create personal learning paths that suit their needs. Providing this empowerment is a key challenge for making lifelong learning a reality. This calls for availability of relevant resources, methods and guidance, and also for learners to take responsibility for their continuous personal development and contribution to society. The role of teachers will remain important, but it will shift from knowledge transmission to

Figure 16: Affordances and deployment of social computing for learning



facilitating learning processes (Punie, Cabrera, Bogdanowicz, Zinnbauer, & Navajas, 2006).

Furthermore, social computing tools empower teachers to innovate and to develop new learning approaches contributing to their own personal and professional development. Finally, social computing provides new tools to follow, participate and innovate for parents and members of the public outside learning institutions.

6.2. Emerging trends and drivers

Each one of the three social computing aspects, as defined in this report, can promote learning in new ways. Furthermore, Figure 16 illustrates how these aspects are interconnected, and, therefore, can accumulate further learning, either for learners themselves or for others. Several examples show that educational institutions have started to experiment with social computing tools (Redecker, 2009). Examples in organised education show knowledge building collaboration and networking with blogs, social networking, wikis and discussion forums. However, there seem to be somewhat fewer experiments on how to encourage new creativity or how to benefit from the vast amount of diverse learning resources and communities emerging through social computing. For this reason, it is suggested that the scope of the current deployment of social computing in organised education (see Figure 16) is slightly aligned towards the 'collaboration' aspect. Informal and unstructured learning can take place in various ways with these tools, benefiting from all aspects of social computing (Ala-Mutka, 2009). However, not all social computing usage necessarily leads to learning (e.g. Selwyn, 2008).

Opportunities for creating, expressing and sharing

Social computing tools allow easy creation and sharing of a variety of media materials, which enable the development of personal creativity and can give the learner a sense of ownership and responsibility for learning.

Creativity. Multimedia opportunities and the diverse availability of resources and connections can help individuals to imagine and make new connections, ideas and creations through drafting and exploring (Loveless, 2007). Tools for creating blogs or creating and sharing photos, videos, or podcasts, enable users to practice skills in their mother tongue, in a foreign language, and in writing and media production. Furthermore, social computing tools allow teachers to create media-rich learning materials for their learners and share it more easily. For example, Minnesota University professors created 3D animations to illustrate Möbius transformations and uploaded them to YouTube (NMC & Educause, 2008).

Developing transversal skills and identity. Blogs, wikis and online writing can enable users to learn important transversal competences such as critical and reflective thinking, active participation, and meta-cognition (Antoniou & Siskos, 2007; Xie, Ke, & Sharma, 2008). Carbonaro *et al*. (2008) suggest that digital storytelling allows students to engage in learning by design, inquiry-based lessons, and meaning-making activities. Participating in a global community with members from different cultures offers new opportunities for becoming aware of, and learning about, cultural expressions and differences. Creation of online profiles and identities provides young people with a new learning tool for identity exploration and development (Cachia, 2008). Blogs and ePortfolios[65] are also tools for building professional identities and for showing skills and competences acquired via individual learning paths.

Sharing and reflection. Social computing empowers users to develop and share their knowledge with others and for others. For example, the reasons given by US bloggers for blogging were creative expression (77% of respondents), sharing personal experiences (76%), and sharing practical knowledge (64%) (Lenhart & Fox, 2006). Sharing stories and experiences allows learners to learn through narratives situated in different contexts, and provides new sources for reflection. For example, Park *et al*. (2008) found that 62% of adults participating in online social networking believed that the online profile-related activities led them to learning activities such as reflecting on themselves, sustaining social bonding, acquiring specific knowledge, and cultivating a constructive life.

New ways and reach of collaboration

Social computing tools enable wide-reaching collaboration on a large scale, promoting new ways to learn both implicit and explicit knowledge. Learning collaboration can be set up intentionally by educational institutions, but it also emerges informally in the communities that rise up around joint interests.

Peer learning and support. Social computing tools can be used to provide learners with social networks of peer support and assistance for learning, and for overcoming physical and institutional boundaries. Allan and Lewis (2006) found that a virtual learning community provided a safe place for exploring roles and identities, and helped adult learners to widen their professional horizons and even make significant life changes. Students are also using networking facilities outside courses to support their formal learning. For instance, 50% of pupils using social networking tools say that they discuss schoolwork (National School Boards Association (NBSA), 2007). Specific communities are emerging to support informal peer learning, such as LiveMocha,[66] which puts language learners in touch with each other and with native speakers.

Communities mixing experts and novices. Social computing communities are emerging to support different communities of practice, which empower the professionals to communicate and share knowledge with each other, and let novices

65 See European work on ePortfolio at http://www.eife-l.org/about/europortfolio

66 http://www.livemocha.com/, accessed 12 September, 2008

learn from their expertise. For example, 75% of IT professionals using IT online communities said that communities of practice help them to do a better job and 68% stated that they benefited personally in their professional development (King Research, 2007). Cloudworks[67] is an example of a social networking site for sharing learning and teaching ideas and connecting educators. There are also online communities for educators on specific teaching tools, such as whiteboards[68] or virtual worlds.[69]

Learning through collaborative production. Collaborative work on a joint project facilitated by social computing applications can significantly increase individual and group performance (Liaw, Gwo-Dong , & Hsiu-Mei, 2008). Wikis and blogs used for collaborative learning in formal education, can furthermore lead to learning material that can be used on a wider scale, as illustrated by the example of Welker's Wikinomics for secondary education.[70] Social computing enables communities in various areas to support the development of professional skills in, for instance, writing, moviemaking and music making through collaborative work.[71] These tools also allow participants to earn money from the resulting products. Wikiversity[72] is an example of a collaborative community where teachers and anyone who wishes can join to exchange and develop learning materials.

A great diversity of resources

The affordances of social computing tools for both individual creativity and collaboration provide Internet users with a completely new range of resources, both in terms of access to products and connections to people, which support the personalisation and building of lifelong learning paths.

New channels to learning providers. Learning institutions are already experimenting with social computing tools and environments. Searching for 'university channels' gave 1,140 results in YouTube in February 2009. Learning providers are also establishing their presence in online social networks[73] and the Second Life virtual world.[74] Opening access to course learning materials can benefit users both inside and outside learning institutions. For instance, 49% of the visitors to the MIT OpenCourseWare (OCW)[75] site were self-learners outside formal education, 56% of them wished to enhance their personal knowledge, and 16% to keep up to date in a particular field (MIT OpenCourseWare, 2006).

Learning on demand. Social computing technologies make it possible to find and develop resources for learning when needed. For example, the availability of podcasts on course materials has been shown to be beneficial in revising for exams, providing 15% better results (Cramer, Collins, Snider, & Fawcett, 2007). The large range of different communities makes it possible to find information on almost any topic. In addition to active productive participation, users also learn by observing and following the experts and activities in the communities (Dennen, 2008; Holliman & Scanlon, 2006). Furthermore, global communities make it possible to quickly connect with someone to ask for advice.[76]

Personalising learning paths. New availability of different types of multimedia resources enables

67 http://cloudworks.ac.uk/
68 For example, http://www.interactivewhiteboardlessons.org/
69 See, for example, http://www.rezed.org/
70 http://welkerswikinomics.wetpaint.com/
71 For example, Song community for music making (http://www.songcommunity.org/), Lulu for book publishing: http://www.lulu.com/), WreckAMovie (http://www.wreckamovie.com/) for movie making.
72 http://en.wikiversity.org/

73 For example, the University of Warwick has a MySpace profile providing information about the university http://ww.myspace.com/warwickuniversity
74 For example, The Case Western Reserve University has established a campus in Second Life to give virtual tours, recruit prospective students, conduct classes and showcase students' work (Shapiro *et al.*, 2007)
75 http://ocw.mit.edu/
76 An example of the educative responsiveness of a global community: In the World of Warcraft game community, novices get the first answer to their question on average in 32 seconds, and the community culture is to educate novices into the rules and ethos of the game environment (Nardi, Ly, & Harris, 2007).

new types of learning, based on inquiry and exploration, where users are free to select the resources, communities and activities that match their interests and needs. Authentic and situated learning experiences can be supported by virtual 3D environments, such as learning to drive with virtual communities (Miao, 2004), or with serious games where the learning content is blurred with game characteristics (Pivec, 2007). Teachers are empowered to provide a wide range of learning opportunities to suit the needs of their learners. At the same time, as learning materials for degree and other courses are increasingly online, students are better informed when they choose their field of interest and training provider.

6.3. Challenges

Empowering users for open participation and learning poses challenges as regards ensuring the quality of learning. Advanced digital competence and critical evaluation skills need to be nurtured, for producing and using resources and for collaborating with others (Ala-Mutka, Punie, & Redecker, 2008a). Critical skills are required to ensure awareness of privacy and security aspects and respect for intellectual property rights. Furthermore, teachers and organizations need support and incentives to develop innovative approaches that accommodate opportunities for learner empowerment through social computing (Ala-Mutka, Punie, & Redecker, 2008b).

Skills of learners. Education is a key enabler of inclusion and is also reflected in digital divides. In 2008, while 33% of the EU27 population as a whole had never used Internet, this applied to only 8% of the highly educated and to 55% of those with little or no education.[77] ICT has important potential for groups at risk of exclusion, such as immigrants (Kluzer & Rissola, 2009) and ICT skills are also a key factor for participation in content creation activities in social computing (Hargittai & Walejko, 2008). However, learners need advanced digital competences,[78] such as critical evaluation of information, searching, reflection, personal knowledge management and collaboration (Punie & Ala-Mutka, 2007) in addition to basic skills, if they are to benefit from social computing. These advanced digital skills do not follow automatically from the basic ICT usage skills (Ala-Mutka *et al.*, 2008a). In addition to lack of digital skills, some learners are not prepared for collaborative modes of learning, or for the increased responsibility this demands of the learner, and need to first learn this new way of learning. Furthermore, some groups of learners, including dyslexics and the less able users, have difficulties in reaping the benefits of social computing tools (Fisseler & Bühler, 2007; Woodfine, Nunes, & Wright, 2008).

Quality and use of learning resources. An important challenge arises from availability of content which has not gone through traditional quality checks and may reflect ill-informed or biased viewpoints. For instance, 13% of Wikipedia articles have been shown to have mistakes (Chesney, 2006) and it may take several months to correct inaccurate information (Priedhorsky *et al.*, 2007). Furthermore, Priedhorsky *et al.* showed that the probability of encountering incorrect information has been increasing in recent years. When learners can choose to learn in a self-directed fashion with available resources and communities, they may encounter, and be influenced by, subjective interpretations instead of expert-led and assessed learning. Several educational institutions have banned the use of

77 Eurostat data table (isoc_ci_ifp_iu): i_iux Percentage of individuals who have never used the Internet http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,45323734&_dad=portal&_schema=PORTAL&screen=welcomeref&open=/isoc/isoc_ci/isoc_ci_in&language=en&product=EU_MASTER_information_society&root=EU_MASTER_information_society&scrollto=0

78 Digital competence is defined as "the confident and critical use of information society technology for work, leisure, learning and communication. It is underpinned by basic skills in ICT and the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet" (European Parliament and the Council, 2006).

Wikipedia, as students have lacked the necessary critical skills to be able to use it effectively (Ala-Mutka, 2008). Students may also lack knowledge of copyright issues and referencing. Chou *et al.* (2007) found that only 66% of college students answered correctly about acceptable uses of online content, and even fewer - only 37% - could choose the correct reason for their answer.

Privacy and security. Online activities raise new questions concerning the visibility and traceability of people and opinions. In schools, cyberbullying via social computing is a concern for both students and teachers and as many as 43% of students may have experienced online bullying (Palfrey, Sacco, boyd, DeBonis, & Tatlock, 2008). Among adults, workers without adequate critical skills may share online information that is harmful for their employer. For example, 21.4% of US companies had detected exposure of sensitive information in blogs or similar sites by their employees, 19.2% of the companies disciplined these employees, and 9.1% terminated their contracts (King Research, 2007). For all individuals, online contributions and discussions can build up a visible and permanent digital trail. For example, 22% of hiring managers in the US use social networking sites to screen potential employees (CareerBuilder, 2008). Furthermore, all users should be aware of the computer security issues, as user-contributed content be infected with various forms of malware and cause security risks both for individual users and their employers (Provos, McNamee, Mavrommatis, Wang, & Modadugu, 2007).

Innovation in learning approaches. Education and training systems do not appear to be ready to integrate new technologies and models into educational processes, and, thus far, ICT has not had much transformative impact (European Commission, 2008c). The impact of ICT use on students is highly dependent on teaching approaches. Better skills result from approaches that allow learner empowerment through group work, inquiry and problem-based learning (Law, Pelgrum, & Plomp, 2008), and teacher skills play an important role in this. In addition to the barriers such as unsupportive institutional settings for teacher training, lack of incentives, curricula and assessment (Ala-Mutka *et al.*, 2009), there may be cultural obstacles against sharing or using resources developed by other people or institutions (OECD, 2007a). A new culture that is responsive to innovations coming from users is needed. Learners may benefit from social computing tools in unexpected ways, not always through the learning processes and outcomes intended by the teacher (Redecker, Ala-Mutka, & Punie, 2008).

6.4. Policy implications

Social Computing with new technologies and social innovations implies specific opportunities and challenges for the four strategic objectives of European education and training: 1) making lifelong learning and learner mobility a reality; 2) improving the quality and efficiency of provision and outcomes; 3) promoting equity and active citizenship; and 4) enhancing innovation and creativity (European Commission, 2008e).

Social Computing provides new access and flexibility for learning. It empowers and connects learners from different settings; formal, non-formal and informal, and allows them personalised *lifelong learning* (European Commission, 2006a, 2007c). With social computing, individuals can build the basis for lifelong learning with resources and networks for personal knowledge management during their formal education, and continue deploying and enhancing it throughout their lives with the diverse opportunities available.

Social Computing enables both pedagogical and organisational innovations in educational systems, improving *learning outcomes to more efficiently respond to the future skills needs*.[79]

79 See New Skills for New Jobs site: http://ec.europa.eu/social/main.jsp?catId=568&langId=en

The collaboration and personalisation aspects of social computing provide new effective means for learning *key competencies* (European Parliament and the Council, 2006), including digital competence, transversal skills for learning to learn, complex problem solving and critical reflection. Especially in the European Information Society, ensuring advanced *digital competence* is a major challenge. However, social computing can also provide new approaches and peer support for improving digital skills.

Social Computing supports *equity and inclusion* by providing a new diversity of tools, resources and approaches for learning, both in organized and informal learning settings. Online communities offer learners new opportunities for learning and new ways to access the materials and learning approaches provided by educational institutions. Social Computing also supports openness of education systems, thus providing tools for developing assessment and certification of skills obtained and demonstrated in different ways, such as ePortfolios. As recognized in recent policies, there is a need for transformative innovation in education and training systems in order to provide new skills for new jobs (European Commission, 2008b, 2008c). Social Computing provides new opportunities for learners to develop their creativity and for teachers to innovate new approaches, hence enhancing *innovation and creativity*[80] both inside the educational institution and as skills for the learners. Social computing has the potential to help education and training systems to meet policy objectives and to implement the future vision of lifelong learning spaces in a knowledge society (Punie *et al.*, 2006).

80 European year of Creativity and Innovation 2009, http://ec.europa.eu/education/lifelong-learning-policy/doc56_en.htm

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7. Social Computing and Social Inclusion

This chapter examines how Social Computing applications relate to processes that enhance social inclusion. We first clarify what is meant by social exclusion and digital exclusion and how these two conditions are related to one another. We then review the potential of Social Computing to enhance the situation of Europeans who suffer from some form of social exclusion.

7.1. Social exclusion and digital exclusion

Social exclusion encompasses inequity, discrimination and lower access to education, healthcare, work, lodging and entertainment. Social exclusion is a process of marginalisation, whereby citizens do not fully participate, have little access to decision making, and feel unable to take control over decisions affecting their lives.[81]

Some social groups appear to be more at risk of becoming socially excluded, for example disabled and elderly people, women, immigrants and ethnic minorities (IEM), disadvantaged youth, and people living in deprived areas. Poverty constitutes one of the most visible aspects and causes of social exclusion, and as stated by the European Commission communication on the renewed social agenda, some 16% of the EU population is at risk of poverty (European Commission, 2008b). Other factors have nevertheless been found important, such as poor health.[82] Lack of access to ICT and related skills in today's digital world also seem to contribute to social exclusion, as we shall explain later. In normative terms, digital access and competence have been identified as relevant for personal fulfilment and development, active citizenship, social inclusion and employment (European Parliament and the Council, 2006).

In general terms, digital exclusion is equated to the lack of access to ICTs and of the skills needed to use them. Beyond this first level, called the digital access divide, the existence of a second level is now acknowledged, comprised of knowledge or digital use divides,[83] which refer mostly to the quality of the user's experience of the Internet in terms of skills and online activities.

Even though lack of access to ICTs has been declining in recent years, approximately 40% of Europeans still do not use ICT at all.[84] Among ICT users, the intensity and variety of Internet use have been found to vary significantly. This second-level divide persists beyond connectedness and is increasingly important as broadband access increases: broadband seems to multiply the opportunities and benefits for frequent and diversified Internet users, thus worsening the relative position of weak or non-users (OECD, 2008).

Educational attainment, income, age, gender, place of access and other factors have significant impacts both on access to and use of PCs and the Internet. However, the relationship between these variables and access and use patterns is complex,

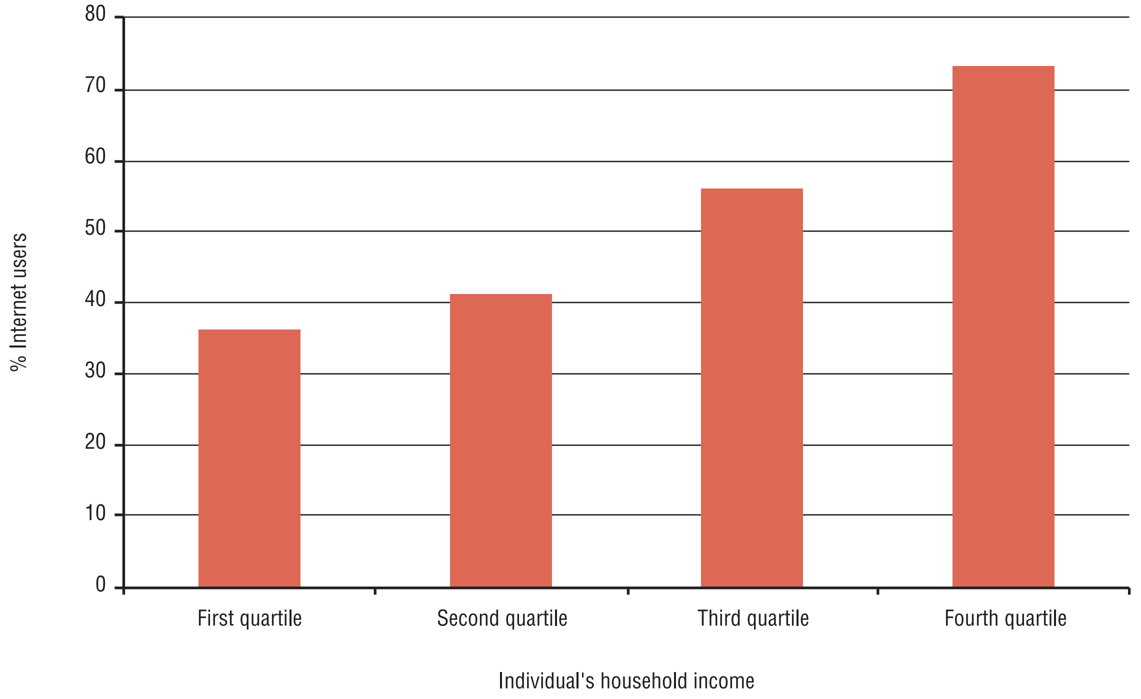
81 Definitions from the EC's 2004 Joint Report on Social Inclusion

82 In a Dutch study (Jehoel-Gijsbers & Vrooman, 2007), health actually proved more important than income in determining social exclusion. The command of national language was also found to be crucial.

83 A discussion of knowledge/use divides and existing evidence can be found in chapter 4 of (OECD, 2008)

84 See for instance (European Commission, 2007e).

Figure 17: Percentage of individuals regularly using the Internet by income level (EU 27, 2008)



Source: Eurostat 'Community survey on ICT usage in households and by individuals 2008'

changes across time and space and is not uniform across applications.[85]

Concerning the role of social exclusion as a potential cause of digital exclusion, the Eurostat community survey on ICT usage in households and by individuals highlights the correlation between digital inclusion (measured here in terms of regular use of the Internet[86]) and level of income (see Figure 17) or of formal education (see Table 5).

In fact, Table 5 also shows that the gender gap in Internet use diminishes as the formal education level grows, almost disappearing among the highly educated group.

Table 5: Percentage of individuals regularly using the Internet in EU27 by formal education level and gender (EU 27, 2008)

	Male	Female
Low	39	31
Medium	63	58
High	87	83
Average	56	

Source: Eurostat 'Community survey on ICT usage in households and by individuals 2008'

While income and education levels are important factors for social in/exclusion, they are only proxies. A Dutch study (Jehoel-Gijsbers & Vrooman, 2007) measured social exclusion directly based on four critical dimensions[87] and

85 For instance, the use of instant messaging for chatting among French high school students seems to be higher the lower their socio-economic status (OECD, 2008).

86 Regular use = average access in the 3 months before the survey of at least once a week.

87 Social exclusion was measured in terms of economic/structural deficiencies –material deprivation (8 indicators) and social rights access to good housing (7 indicators) and to social institutions and provisions (5 indicators)- and of socio-cultural deficiencies: social participation (8 indicators) and normative integration (4 indicators).

identified the importance of different risk factors and the causal mechanisms through which they operate. It found that, in 2003 in the Netherlands, 12% of the adult population above 25 could be said to belong to the socially excluded, as they scored high on at least two dimensions (while nearly two thirds were not excluded on any dimension at all). Poor ICT capabilities were considered to constitute a risk factor with a significant correlation to low social participation (ranking fourth out of twenty risk factors considered) and, to a lesser extent, to material deprivation. ICT capabilities included not only 'computer skills', but also activities that may be counted as basic skills required in a modern society, such as the ability to use cash machines, to buy public transport tickets from automatic vending machines, etc.

Similarly, the Digital Inclusion Team of the UK government[88] identified social exclusion as corresponding to the presence of at least three of six deprivation indicators concerning income, employment, health, education, barriers to services and living conditions. In 2006, according to this measure, approximately 20% of the UK population was socially excluded, and three times more likely to be excluded from the information society than to be included.

The finding that 25% of socially-excluded people use the Internet raises interesting questions about the drivers/motivations for ICT take up and use among people suffering from various types of deprivation, the patterns of appropriation of these technologies in that context, and their effects on the users' lives and their social exclusion condition (Digital Inclusion Team, 2007). A large share of these "socially-excluded Internet users" is likely to be represented in the UK (and elsewhere) by immigrants and ethnic minority (IEM) people, as deprivation indicators are usually higher within this group, but at the same time IEM people have been found to be intensive ICT adopters, due to their younger average age, strong usage motivations (related in the first place to communication needs) and other factors. For this reason, reference to this group will be made frequently later in our discussion.[89]

Digital exclusion does not equate with social exclusion. Yet, in today's European society, digital exclusion is increasingly considered to be a source of disadvantages and missed opportunities that might lead to social exclusion, or more likely compound other risk factors that already concern people threatened by social exclusion: "…digital exclusion/inclusion is the quintessential form of social exclusion/inclusion today. As our everyday lives are increasingly entangled in activities and relations enabled by ICT, being digitally excluded is a new source of inequalities as it can result in exclusion from relevant networks and social relations, jobs and leisure opportunities, and from informed participation in the public debate" (Codagnone, 2009, p. 6).

Fostering the digital inclusion of people at risk of social exclusion is a clear target for today's European policies in this area.[90] Besides avoiding the emergence of new inequalities and providing (indirectly) benefits by enhancing policies and services for socially-excluded people, eInclusion contributes to social inclusion to the extent that people at risk of exclusion are empowered by ICTs, i.e. using ICTs enables them to gain power, authority and influence over others, institutions

88 See (Digital Inclusion Team, 2007)

89 Another vulnerable group with high digital inclusion is represented by disadvantaged young people. A study from the UK found that "Technology access and use by young people (16-24 years old) who are not in education, employment or training (NEET) is generally (and perhaps surprisingly) high. On the whole, ICT is used for communication purposes more than for information purposes" (Passey, Williams, & Rogers, 2008) p.10

90 Current EU eInclusion policies have two broad aims in this respect: to reduce ICT access and usage gaps by socially-excluded groups (and all people suffering from digital divides) and to promote the use of ICT by policy makers, service providers and intermediaries to better fight social exclusion and improve employment opportunities, quality of life, social participation and cohesion of specific groups and localities. See on this (European Commission, 2007d, 2007e), both following on (Riga eInclusion Ministerial Declaration, 2006)

or society.[91] Access is not enough to achieve this. To enhance the autonomy and capabilities of users there is a need for creative ICT practices, combined with the awareness and critical understanding of the opportunities and risks associated with them. These can be stimulated through collective processes that promote and enhance the sharing and appropriation of knowledge regarding ICT and its potential use for social and digital inclusion.

7.2. Social computing, digital inclusion and social inclusion

Social Computing can be seen to have a positive effect on digital inclusion because it significantly enhances motivation and also makes it easier in some ways to use computers and the Internet (at least in basic ways), i.e. it lowers two important "barriers" (lack of motivation and lack of skills) for many non-ICT users. "Don't need it" (because it's not useful, not interesting etc.) is the first reason given by 37% of respondents in Europe for not having access to the Internet at home (Loof, 2008). "Lack of skills" comes as the third reason (23% of respondents), at the same level as the too high cost of equipment (25%) and of Internet access (21%).

We contend that the communication and socialisation opportunities brought by Social Computing – e.g. publishing and exchanging of personal pictures and videos, cheap audio-video communications (through VoIP) and others – can motivate people who have not been using ICT due to their distance from digitally rich work and education environments. At the same time, Social Computing applications tend to pay a lot of attention to user-friendliness[92] and usually allow simple, streamlined use for inexperienced users, thus lowering skills barriers.[93, 94] These users therefore find their new motivation easy to satisfy.

On the other hand, Social Computing increases the negative implications of broadband access divide[95] and does not eliminate (or possibly enhances) second-level usage divides.[96] The balance between these contradictory effects on eInclusion is likely to vary across different groups in society and across geographic locations with different infrastructural endowments.

Looking specifically at socially-excluded people, Figure 18 shows the preconditions and different causal links that can make social computing contribute to the social inclusion of disadvantaged people (this scheme/model has been derived from the analysis of a large number of eInclusion initiatives in Europe, only a few of which, however, are directly concerned with the use of Social Computing for socially-excluded people).

A crucial element, as discussed before, is that the use of Social Computing requires some level of digital inclusion in terms of broadband access

91 Wikipedia: empowerment http://en.wikipedia.org/wiki/Empowerment

92 Also thanks to their development approach based on recurrent, intense adjustments (permanent beta versions) driven by strong user feedback and the cooperation between communities of free software developers using open standards and interoperable solutions.

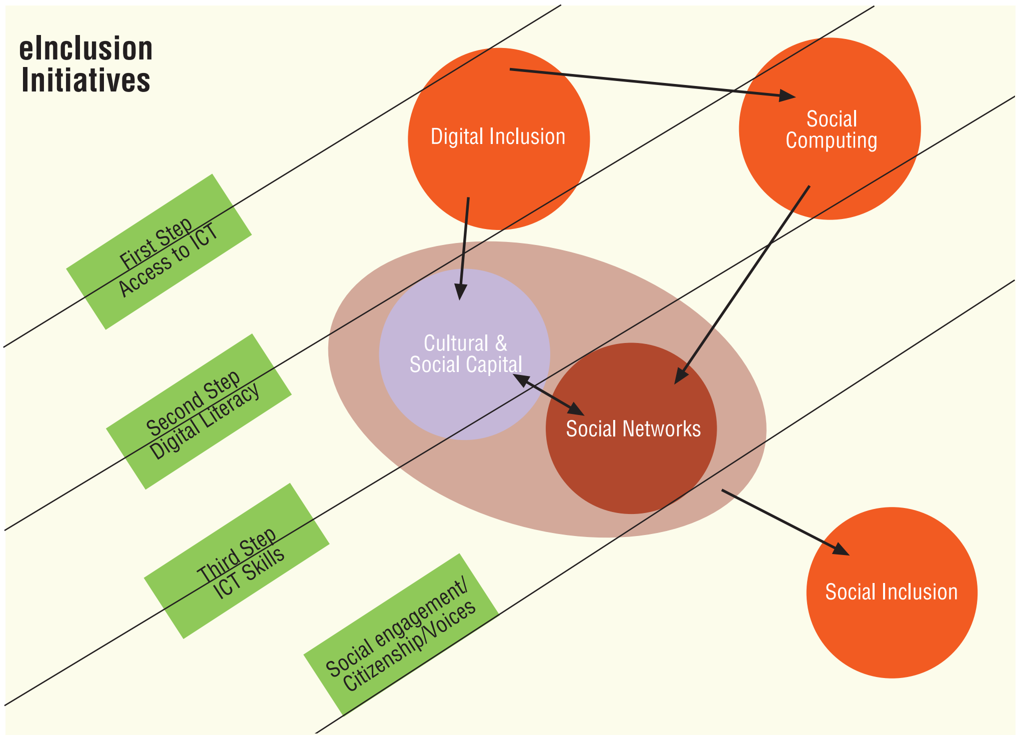
93 This is particularly true for functionalities supporting user content production and sharing, which are much simpler today with Social Computing than with previous applications.

94 The IST Coordination Action "Design for All for eInclusion - DfA@eInclusion", promoted under the Framework Programme 6 of the European Commission, has been working specifically on the links between eAccessibility, social and digital inclusion. Pages 41 to 44 of project report D2.1 (Emiliani, Burzagli, Billi, Gabbanini, & Palchetti, 2008) address in particular the impact of Web 2.0 applications on eInclusion. See also http://www.dfaei.org/index.html

95 The use of most Social Computing services with narrowband connections is very frustrating if not impossible and, viceversa, broadband availability leads, *coeteris paribus*, to a richer and more intense Internet use. See on this (Dolničar *et al.*, 2009).

96 For instance, in Ofcom's study on social networking all users interviewed in the qualitative research step, even those who were confident with ICT, found the privacy and other settings on most of the major social networking sites difficult to understand and manipulate (Ofcom, 2008b). Also, the levels of proficiency in Social Computing services use was found to vary significantly even among digital native college students (Hargittai & Walejko, 2008).

Figure 18: The layers composing eInclusion



and digital literacy. Broadband access might not be available in certain locations or might be too expensive for the individual household, but can often be gained through public Internet access points run on a commercial or non-profit basis.[97] Digital literacy is the primary goal of the majority of eInclusion initiatives in Europe, which however seldom cater specifically for socially-excluded people. Instead, they tend to address digitally-excluded people as such, and, much for the same reason, they tend to provide generic ICT courses which do not link the use of applications to the specific needs and conditions of the learners (Groeneveld, Haché, & Kluzer, 2008). This latter shortcoming is gradually being overcome, with the development of ad hoc content and training approaches for given target groups[98] such as elderly and disabled people, women and migrants. This trend is itself enabled by Social Network Sites (SNS) which facilitate the aggregation of people sharing specific problems and conditions and developing by themselves content and services to address them. The attention to the digital inclusion needs of socially-excluded people is, on the other hand, still rather uncommon.[99]

Assuming that a degree of digital inclusion is achieved, Figure 18 highlights the fact that once the use of Social Computing is enabled, it must

97 ICT public access points play a crucial role for many people who lack access at home and there are a few cases of access points specifically devoted to homeless and vulnerable people (e.g. the network of 13 community technology centres called Cyberspaces run by the French charity Emmaus in and around Paris. People at risk of social exclusion, however, have been found to face additional obstacles when accessing "regular" Internet access points, as in the case of homeless people requested in some countries to provide an address in order to register and make use of a public library's Internet access point or migrants being requested (by law) to provide documents and personal data to use Internet/phone shops in Italy.

98 The e-Citizen programme developed by the ECDL foundation provides a clear example of this evolution (see http://www.ecdl.org/).

99 A significant exception is the UK government's new Delivering Digital Inclusion Action Plan (UK Government, 2008a) which has accurately profiled the four vulnerable groups to be targeted: young adults not in education, employment or trainings (NEETs); people with mental health problems; people with learning disabilities; and ex-offenders.

be accompanied by the growth of cultural capital (starting with enhanced digital capabilities) and social capital[100] through the practice of networking activities in order to produce social inclusion effects. As mentioned before, the activation of collective processes (e.g. ICT and media workshops, learning circles, digital storytelling and others, and also the everyday use and exploration of ICT potential by associations, voluntary groups, charities etc.) seems to be very important to achieving both.

Social Computing can itself contribute to enhancing users' social capital as it enables the multiplication of interactions between offline and online sociability and the enrichment of social relations by creating and maintaining weak links through the use of social networks (Ellison, Steinfield, & Lampe, 2007). Social Computing can also contribute to the development of the cultural capital of disadvantaged people as it broadens the access to digital content and other opportunities which enable (informal) learning processes (Ala-Mutka *et al.*, 2009; Cullen, Cullen, Hayward, & Maes, 2009).

Another potential area of impact of Social Computing is the large number of organisations belonging to the so-called third-sector (charities, NGOs, voluntary groups, associations etc.) which play a very important role in fighting many of the root-causes of social exclusion and in assisting socially-excluded people. As these organisations increasingly adopt Social Computing applications to manage, promote and run their activities, they experience many changes in the ways of organising, recruiting, raising funds, and broadly enhancing their transparency and responsiveness. In fact, Social Computing is even seen to challenge the established mode of operation of the third sector, by favouring light structures of engagement based on technical solutions which make it easier to link volunteers and activists with a cause and with the resources to support it, without the need for a stable organisation.[101]

By enabling users to create, disseminate and share content, Social Computing contributes to freedom of expression, opinion and communication, thus empowering citizens and advocacy organisations that aim to achieve the social and political transformations which are felt necessary to address the social needs of disadvantaged people and their governance.[102]

Beyond advocacy, Social Computing is enabling new approaches to fight social exclusion by broadening participation and knowledge dissemination, improving resources collection and operational activities of social networks and organisations which cater for the daily life and social needs of disadvantaged people.[103]

Finally, in line with the European eInclusion policy goal of using ICT to better help the socially excluded, service providers in social care and other areas have started using Social Computing in various ways to reach the hard-to-reach[104]

100 Lack of social capital is a characteristic of social exclusion: low levels in the indicators of social participation are reported in both Dutch and UK studies on this matter (Jehoel-Gijsbers & Vrooman, 2007) and (Digital Inclusion Team, 2007). It can thus be assumed that the availability of social capital can at least partly compensate for many forms of material and financial deprivation.

101 See on this (Shirky, 2008) and the related blog http://www.herecomeseverybody.org/, and check the following initiatives: MyCauses (application for facebook): http://apps.facebook.com/causes/help; Care2 petition site: http://www.thepetitionsite.com/; Net2: http://www.netsquared.org/about; Nabuur: http://www.nabuur.com/; Avaaz: http://www.avaaz.org/en/

102 See the ICT foresight reports developed by ICT Hub, (Ferguson, Griffith, Howell, & Wilding, 2007; Schultz, 2008; Verclas & Mechael, 2008). See also Mobile active: http://mobileactive.org/; and (Baggs, 2007)

103 See the ICT foresight reports developed by ICT Hub, "Charitable giving and fundraising in a digital world", how online communities can make the net work fort he VCS", 2007. Check also Roots 'n Routes http://rootsnroutes.tv/; Archivo de la experiencia http://www.archivodelaexperiencia.es/; UntldWorld: http://unltdworld.com/

104 See for instance the European Correlation Network project (http://www.correlation-net.org) carried on by the Dutch Foundation Regembooc on Health, e-Outreach and e-Counselling addressing homeless people and hard drug users. A discussion of different ICT-based approached to deal with vulnerable young people can be found in (Passey *et al.*, 2008).

and to enhance training of staff and service delivery across the multiple organisations which typically address the socially excluded.[105] On the other hand, various communities (indigenous, neighbours, environmental activists etc) are actively using wikimaps and GIS tools to develop maps about their needs, problems and desires in order to explore and develop new models of participatory governance.[106]

To the extent that socially excluded or vulnerable people initiate and/or are reached and involved in the above processes (also) through the use of Social Computing, the latter's contribution to social inclusion becomes direct, as participation in such processes can be deemed (almost by definition) to reduce social isolation and is likely to alleviate the effects of other types of deprivation. Otherwise, all these positive contributions that might be made by the use of Social Computing to improve the conditions of socially-excluded people are largely indirect ones.

Given the initial figures showing a high level of digital exclusion among the socially excluded, the other variables in the above discussion and the novelty of Social Computing itself, it is not surprising that there is limited evidence about the use of Social Computing by socially-excluded people and, even more so, about its effects. As we mentioned, however, a segment of the population which tends to suffer from social exclusion, but shows relatively high levels of digital inclusion and has also started to make use of Social Computing, is that of immigrants and ethnic minorities (IEM). In the next section we report therefore some findings from our research on the use of Social Computing by IEM people and their implications.

7.3. Emerging trends and drivers

The following considerations are drawn from the studies on ICT for cultural diversity carried on by IPTS with other research organisations for DG Information Society and Media of the European Commission.[107] Besides some general observations on the take up and use of ICT by IEM, we report here the findings specifically related to the use of social computing services and applications.

- Overall, based on the few available statistics,[108] IEM people show high levels of adoption of ICT –mobile phones in the first place, but also computers and the Internet as well - and high motivations and interest for learning to use ICT. There are predictable differences across ethnic groups and significant digital divides within them (reflecting in particular age, education levels, command of the host country language, socio-economic status and gender), but, in general, take up levels are higher than could be expected given the on average worse socio-economic conditions of the IEM population. Beyond the fact that they

105 For instance, Borough Council of King's Lynn and West Norfolk (UK) is developing an interactive learning resource that will be used to improve customer service across voluntary and public sector agencies dealing with migrant workers. Learners will take part in discussion forums, read blogs, view podcasts of council workers and podcasts of migrant workers.

106 Some examples are: http://www.nijel.org/; http://www.mapcruzin.com/svtc_ecomaps/; http://www.maphub.com/ http://www.inforain.org/maparchive/ ; http://www.nativemaps.org/; http://gis.co.humboldt.ca.us/ and http://www.ushmm.org/maps/projects/darfur/

107 The main study was entitled "The potential of ICT for the promotion of cultural diversity in the EU: the case of economic and social participation and integration of IEM" and was carried out in 2008 with IDC Italia Srl (main contractor), Milan Polytechnic University, Fondation Maison des Sciences de l'Homme – TIC-Migration, University of Bremen - Institut für Medien Kommunikation und Information, Universidad Sevilla – Laboratorio de Redes Personales y Comunidades, and Sheffield Hallam University – Culture, Communication and Computing Research Institute. Other two lines of research concerned the use of ICT in domiciliary care work and the role of migrants, and the use of social computing by immigrants and ethnic minorities. At the time of writing, the results of these studies were being revised and prepared for publication. Already available reports are referenced in the text.

108 For Germany, see (Simon, 2007); for the UK, see (Ofcom, 2008a); for the Netherlands see (van den Broek & Keuzenkamp, 2008).

often have a younger demographic profile, other strong motivational factors have been identified for this: diasporic pressure (the need to maintain communicative networking throughout the world with friends, family and other people with the same origin); occupational pressure (the need to have IT skills as a pre-condition for many jobs in the host country labour market), entertainment and education interests (computer use for gaming and children's studies).

- Such motivations are further enhanced by Social Computing services/applications which lower the cost (e.g. VoIP) and make it easier to find and keep in touch with dispersed friends and acquaintances (SNS). This emerges clearly, for instance, from the 2008 "ICT and households survey" in Spain[109] that shows that use of the Internet for telephone calls and for video/webcam communication was about three times more frequent among foreigners[110] than Spaniards (respectively 25% vs. 8% for telephone and 42% vs. 17% for video/webcam). An Ofcom survey on social networking (Ofcom, 2008b) in turn found (as indicative rather than robust results) that respondents who use the Internet from Indian (31%), Black Caribbean (40%) or Black African (41%) ethnic minority groups were more likely to have set up a social networking profile compared to all UK adults who use the Internet (22%).
- Mobile phones are extremely popular among IEM, as they are crucial for maintaining personal and job-related connections especially on arrival in the host country and under conditions of high residential and work mobility. With the growing trend towards the integration of Social Computing services/applications with mobile phones, a further reinforcement in the use of both can be expected.
- Informal 'ICT leaders' and often teenagers as early adopters facilitate the learning of others and drive innovation in ICT usage within IEM communities. Newly-arrived young people (for family reunification or work reasons) make intensive use of SNS for keeping in touch with friends back home and to maintain relationships with new acquaintances in the host country. Peer pressure on the use of SNS is very strong, especially among students, and also among members of second generation immigrants.
- SNS mainly support the online reproduction of the offline social lives of IEM people (and users in general) (boyd & Ellison, 2007). An analysis of the Moroccan blogosphere (Diminescu, Jacomy, & Renault, Forthcoming) and of the use of SNS by Polish and Russian immigrants in Germany (Hepp, Welling, Aksen, Bozdag, & Suna, 2009) found that this tends to favour geographic and social nearness, rather than ethnic or national identities when developing contacts and exchanging content. Trans-local (between the city or village of origin and those at destination) rather than trans-national social networking is thus mainly supported.
- A further reflection of this is the enabling effect of Social Computing services/applications on new forms of online diaspora (or post-diaspora) organisation. Traditional diaspora community websites are started by a few catalytic entities (individual migrants or associations), they put emphasis on homeland and nationality (including links with home country institutions) as the main aggregating and legitimating factors of the community, and they tend to promote and view integration in the host country as mostly dependent on knowing about and dealing with local institutions and their services (Nedelcu, 2004). Against this background Social Computing is enabling the emergence of polycentric online communities of

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109 The survey's data can be found by querying for different years and variables INE's website at the URL: http://www.ine.es/jaxi/menu.do?type=pcaxis&path=%2Ft25%2Fp450&file=inebase&N=&L=0

110 The Spanish national survey differentiates between nationals and foreigners, without further detailing the nationality or the country of birth of respondents.

IEM people (many becoming reference "authorities" in specific domains), driven more by shared, pragmatic interests than by reference to the homeland, nationality or other common identity factors (Diminescu *et al.*, Forthcoming). Such online communities or networks are also often very open to interaction with members of the host society who share the same interests.[111]

- Finally, SNS have been found[112] to support the conversion of interest-based social networks into relations of cultural and economic production, thus creating new opportunities for market entry and economic participation for members of IEM communities.

Given the "novelty" of Social Computing and its recent diffusion on a large scale, the findings provided so far must still be considered preliminary and can hardly support strong conclusions. Nevertheless, based on these, we can say that there is a strong positive reaction to Social Computing among IEM users, as it enhances the opportunities to manage and further articulate their social networks across different locations and to increase their visibility and "voice" through bottom-up content production and sharing. Both these effects can be deemed to positively contribute to the social inclusion of IEM people. In terms of integration potential, the evidence we found is inconclusive, as it concerns both cases where Social Computing seems to mainly support the strengthening (albeit, as we saw, in new ways) of co-ethnic social networks (in the host country, at home, and spread in transnational and Diaspora communities) and cases where it is used to create and develop inter-ethnic relations and exchanges with members of the host society and with other minority groups.

7.4. Challenges

Social Computing like other applications which currently rely on computers and the Internet is undoubtedly a set of tools which can be more easily used and better exploited by people with a certain amount of technical skills, who possibly know some English, who have and know how to manage social networks, and who are capable of catching and distributing useful information that enhances their social support networks, who have spare time to devote to online sociality, who don't suffer from serious disabilities and so on. Consequently, Social Computing beneficial effects for social inclusion renew the need for inclusive efforts that transform benefits for some into benefits for all.

At the moment, however, there is limited evidence of Social Computing applications aiming specifically at providing opportunities and resources to the socially excluded and there is a lack of experimentation of methodologies and tools that take into account and build upon the experiences of the socially excluded. Public institutions and private organisations are starting to use Social Computing applications and services to better deal with their most vulnerable customers. The latter however are hardly ever part of the design process, where they could give input regarding performance, scalability and easiness to adapt of the solutions to their daily needs.[113] Among other factors, this process is hampered by the lack of connections between civil society organisations, socially excluded

111 In an overview of ICT initiatives for/by IEM people in the EU, several cases were found of blogs giving visibility to the culture, artistic achievements and initiatives, political issues and so on of specific IEM communities aiming explicitly at promoting dialogue and exchanges with interested members of the host society and designed to enable this, e.g. by providing multi-language versions of navigation interfaces and content(Kluzer, Hache, & Codagnone, 2008).

112 SNS offer free online visibility for any user. However, navigation and the possibility to be found on SNS with millions of pages rely less on searches than on friendship links, which gain therefore an economic value. This came out quite clearly from the analysis of ethnic musicians using MySpace to promote their work (Diminescu *et al.*, Forthcoming) and from the use of Skyblog by Maghrebian traditional wedding service providers in France. (Diminescu, Renault, & Hassane, 2009).

113 Interesting experiences and methodologies have been developed in this direction by (Virginia Eubanks, 2006; Virginia Eubanks, 2008; Virginia Eubanks & Campbell, 2004).

people and communities of developers working on technology for social action.

We have seen nevertheless that at least a segment of the socially excluded population is digitally literate and has been making use of Social Computing applications and services. The ability (or lack of it) to manage one's online identity and its display, especially inside Social Networks Services is an important challenge raised by Social Computing to all users, and that can be deemed even more critical for users suffering from social exclusion. These users are likely to have personal characteristics and experiences which expose them to social stigma, hence issues regarding their privacy and the level of public exposure they are willing to cope with become even more serious than for "unproblematic" users.

Another challenge which concerns all users, but even more so is likely to affect vulnerable people with limited support networks is the risk of expropriation or misuse of one's intellectual property. Users who produce and share content online are stocking it in platforms that are managed under specific intellectual property rights rules, very often unclear or difficult to understand by the users (creative commons, copyleft, copyright), that can be in contradiction with the content creator's motivations (e.g. when his/her content is re-used by the platform's owner for advertisement or other purposes) and (in many cases) that don't provide users with the possibility to back up the data they put online.

7.5. Policy implications

If we take into account the renewed social agenda drafted by the European Commission, we can see that the achievement of its goals is built around three dimensions: creating job opportunities [...], providing equal access to social services [...] demonstrating solidarity between generations, regions, and people (European Commission, 2008b). Social Computing applications will provide interesting opportunities to achieve these targets. Today, however, Social Computing presents a double face: it can create new digital divides widening the gap created by digital and social exclusion for already vulnerable groups and people, but it can also be an enabler of self-organisation and self-help processes started by, or involving, socially-excluded people, that transform weak ties created across the online and offline worlds into effective collective structures of engagement and participation.

eInclusion initiatives that specifically aim to activate socially-excluded groups so that their opinions are heard, their civic engagement is encouraged and support services designed for them are improved, could help to reduce these new digital divides. Overall, no single approach to enhancing digital inclusion and to reducing social exclusion using Social Computing has been established. This is positive to the extent that initiatives take into account local specificities and causes of social and digital exclusion. However, initiatives should avoid reinventing the wheel and wider exchanges of existing tools and methodologies should be promoted to achieve this. In all cases addressing social inclusion through Social Computing requires the development of accurate knowledge about the socio-cultural and economic characteristics of each vulnerable group, its background and specific needs. And this can only be obtained by adopting participatory design strategies.

Currently, social, education, employment and other policies targeting socially-excluded people tend to ignore the opportunities offered by new technologies; especially mobile devices which are also very widespread among vulnerable people, and also computers and Internet which have been taken up by at least some socially-excluded groups (we have mentioned the case of IEM, and disadvantaged young people are in much the same situation (UK Government, 2008b)). There is a need to mainstream digital inclusion opportunities, by exploring and exploiting more thoroughly and systematically the use of new technologies to connect with and engage those users and to deliver services to them.

Funding programmes to enhance digital inclusion in vulnerable groups –which we have seen to be a pre-condition for benefitting from Social Computing opportunities- should adopt a longer term and broader perspective than is currently the case, especially on skills development and should fully involve local community organisations, IT champions and young people.

Enhancing the ICT capacity of non-profit organisations working with/for vulnerable people is an important complementary measure, especially from the point of view of promoting greater collaboration with public service organisations.

Finally, most EU- and Member State-funded initiatives promoting digital literacy and the use of ICT by vulnerable groups are carried on at local level. Evaluation and learning from these experiences and exchanges and networking among them are, as mentioned before, currently very limited and poor, leaving much scope for improvement.

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8. Social Computing and Health

The healthcare sector in Europe represents around 9% of EU GDP, and provides direct employment to 15 million people. This sector has been characterised by the dichotomy between high responsiveness to scientific and technological advances and traditionally relatively low responsiveness to change with respect to organisational structure and processes. In the last few years, a new element has come to disrupt this dichotomy: Social Computing (Web 2.0). Social Computing applications are being used to empower the patient in a citizen-centred healthcare system through extensive information exchange. As well as facilitating focused information exchange, Social Computing has given rise to patient-driven research which contributes to better treatment, especially for complex diseases. In a context where increasing pressure on existing healthcare systems is being brought to bear by the ageing society, Social Computing applications are poised to have a positive impact not only on patients and their informal carers but also on the medical professionals who will be able to use their valuable time more efficiently.

Assessment of this change does not lead to simple outcomes such as positive or negative impacts. Instead, it should be looked at as a "natural or ecological phenomenon" produced by the interaction of technology with millions of people. We should be looking at those healthcare institutions that adapt and evolve so that we can learn from their example and foster the diffusion process. We should try to better understand the motivation of those that resist change and raise the awareness of those who adopt a 'wait and see' attitude of the potential benefits they may miss. In any event, the rapid take up of these services is likely to create challenges that have to be addressed.

8.1. European healthcare and health 2.0

The European health situation is characterised by long life expectancy, ageing populations, high quality healthcare provision, shrinking numbers of health professionals, highly developed health technologies and growing costs for national budgets. A considerable majority of Europeans (73%) report a positive state of general health (European Commission, 2007f). Life expectancy at birth in 2002 for the EU25 was about 75 years for males and 81 years for females (European Commission, 2005). The economic importance of the healthcare sector in the EU27 is illustrated by the significant share of health expenditure as a percentage of GDP, which varies from 11% in Germany to 5% in Romania (WHO-Regional Office for Europe, 2008). The health sector employs almost 10% of the total EU workforce and total EU27 health expenditure represents EUR 1,000 billion.

In 2006, the eHealth industry in the EU15 was estimated to represent EUR 21 billion and the typical European investment levels in healthcare ICT averaged 2% of total health expenditures (European Commission, 2007b). Main targets for European eHealth strategies include Electronic Health Records, interoperability of health technologies, telemedicine and Personal Health Systems. The share of Social Computing as part of the total eHealth expenditure is not known; a preliminary assessment indicates that it is growing but there are no standard ways to measure its economic impact yet. The most likely reason for this is the fact that business models (Sarasohn-Kahn, 2008) for these applications are still evolving.

In the last few years, Social Computing[114] has emerged as a new trend in the Information Society. The biggest players in the Health 2.0 space by market capitalisation are Google, Microsoft, WebMD and Yahoo. Social Computing for health consists of a novel breed of applications that facilitate the evolution of traditional medical practices and attitudes, towards the co-creation of health knowledge, assisting permanent beta developments (ecological society-immersed evolution) and the establishment of new reputation and confidence systems in healthcare. The concept of Health 2.0 goes far beyond the traditional understanding of health; it includes promotion, prevention, self-care, self-responsibility, individual and collective wellness, nutrition, life styles, and even the external assessment of healthcare providers by societal agents or individuals. In other words, Social Computing has an impact on all dimensions of medicine (Giustini, 2006). Furthermore, the ease of use, ubiquity, immediateness, simple language, low cost of the technology and the participative, disinterested attitude of the players (Pascu, Osimo, Ulbrich, Turlea, & Burgelman, 2007), make Social Computing a key tool for maintaining a constant, lively, inclusive and evolving dialogue with society. It thus enables the development of the empowerment of the patient/citizen, long sought by European healthcare systems managers and theoreticians.

Social computing applications play a role in influencing management and decision-making on health processes, as shown by the following examples:

- Blogs gather opinions about particular healthcare services which contribute to creating consensus among users. This in turn helps health service providers to improve their service provision. The UK NHS-sponsored Patient Opinion[115] platform is an example of how healthcare providers leverage users' opinions to improve their services. Blogs – sometimes run by hospitals – have also become part of clinical treatments, as health professionals start to recognise their therapeutic value (Wapner, 2008). Research has shown that expressive writing has a positive impact on sleep, the immune system and even healing after surgery (Atkinson, Hare, Merriman, & Vogel, 2009).
- Wikis help to organise a coherent collective answer to pandemics[116] from the many stakeholders involved and to create online medical encyclopaedias, regarded as quality trusted information. An example is Wikisurgery, a wiki sponsored by a peer-reviewed journal (Agha, 2006) which provides a wealth of knowledge including interactive surgery skills training programmes, operative images, operation scripts, etc.
- Online Social Networks help patients to meet virtually and join forces to raise interest in their unmet care needs or research into, for example, orphan drugs,[117] (Landro, 2006) or rare diseases. RareShare,[118] for instance, is a social network which builds communities for patients affected by rare disorders, their families, and healthcare professionals. The Interactive Autism Network (IAN) project is an illustration of how online tools are used to bring together people affected by autism spectrum disorders (ASDs) and researchers in

114 About 35% of online users consumed health content using one-to-one and social media, 30% more than in 2006 June 2008. http://www.ihealthbeat.org/Data-Points/2008/Do-Online-Users-Create-and-Consume-Health-Content-Using-OnetoOne-and-Social-Media.aspx (Accessed 03/10/08).

115 See www.patientopinion.org.uk

116 See www.fluwikie.com a wiki tool on influenza providing research articles, experiences and information (including information on preparation for pandemics), targeted at health carers and local communities who may be confronted with an influenza pandemic.

117 Medicinal products for which the cost of research and production would result prohibitively expensive, and not profitable in a normal market environment. Regulation (EC) No 141/2000 of the European Parliament and of the Council of 16 December 1999 on orphan medicinal products. http://ec.europa.eu/enterprise/pharmaceuticals/orphanmp/doc/141_2000/141_2000_en.pdf http://en.wikipedia.org/wiki/Orphan_ drug

118 See www.rareshare.org

Table 6: *Social Computing applications impact on health: opportunities and advantages.*

TYPES	OPPORTUNITIES	ADVANTAGES	CASES
Blogs	- Publication for masses - Encourages participation around health - Expressive writing - Research tool	- Easiness of use - First hand information - Multiplicity of contents	- *Clinical Cases and Images* - *Running a Hospital* - *The Healthcare IT Guy*
Wikis	- Enhance collective effort - Increases sharing - New open educational resources - Internal communication tool for research	- Global accessibility - Quick update of new developments	- *Ganfyd* - *Ask Dr Wiki* - *Wikisurgery* - *Clinfowiki* - *RHIO1 Wiki* - *Flu Wiki* - *Wellness Wiki*
Information Distilling (RSS,[2] tagging)	- Organising the information overload - Irrespective of type of content	- Personalisation - Automatic update - Improved health information equality	- *Medworm* - *Dissectmedicine*
Podcasting for Education	- New way of learning - Medical education tool	- Ubiquitous	- *Health-EU* - *WHO3 Podcasts* - *informarse.essalud*
Social Networking Sites	- Enhance social cohesion - Crisis support - Quick spreading of best practices - Development of patient condition related communities - Health professionals communities	- Permanent link - Combat social isolation - Psychological sense of community	- *Patientslikeme* - *MyCancerPlace* - *Sermo* - *Rareshare* - *Facebook* - *MySpace*

1 *Regional Health Information Organisation*
2 *Really Simple Syndication*
3 *World Health Organisation*

Source: modified from (Cabrera & Valverde, 2009)

search of answers. In addition, such networks are useful tools for health professional networking (Luo, 2007).

- Podcast and Vodcast assist continuous and personalised education and training (Boulos, Maramba, & Wheeler, 2006) which is particularly beneficial for medical professionals in remote places.

These diverse applications share one element - their bottom-up nature. Innovation emerges from individuals and social communities despite the relative inertia of traditional health institutions. Overall, the design, planning and implementation of health policies are set to benefit considerably from the widespread diffusion of Social Computing.

8.2. Opportunities for Social Computing and health

Citizen participation in social sites is counted in millions in Europe. These channels are becoming natural information sources in the health domain. As a result of their intuitive character, their ease of use and low implementation cost, Social Computing is being heralded as a vital ingredient in tomorrow's healthcare system.[119] While early adopters have to be imaginative as to how to use these tools, the challenge for healthcare organisations is to be

119 Social media represents already the third source (34%) for Americans looking for health information on the Web. (Elkin, 2008)

innovative in their adoption of the new media so as to re-shape their processes and make them fit user wishes.

In the case of Social Computing, innovation implies the interaction of technology with millions of people; thus it is as much a social as a technical innovation. The adoption of Social Computing by healthcare institutions is well underway, and early monitoring of its evolution suggests it may be a more general future trend. While it is too soon to scientifically measure the impact of the implementation of Social Computing innovation by early adopters, the large number of participants and the institutional support they have been receiving, strongly demonstrate their perceived usefulness. Table 6 summarises the opportunities and advantages offered by Social Computing applications in the health domain.

Below we provide early evidence of the impact of blogging on healthcare service provision, and its contribution to improving Public Health administration, extending and expanding medical know-how, and better coordinating bio-medical research. These are but a few examples of the positive impact on the health sector that the utilisation of the collective intelligence enabled by social computing can have.

Direct open societal evaluation of healthcare services

While the demand for change to the supply side by many consumers joining forces through Social Computing tools is expected to have a significant impact on healthcare service delivery, the added value of a societal evaluation of healthcare services quality seems to bring benefits to all, including main stakeholders, service providers and users. First, healthcare providers, both public and private, are using Social Computing tools to receive immediate feedback from users and are thus able to react promptly to user requests. In other words, healthcare providers are able to service their users more efficiently by solving internal clinical and administrative issues, while showing a high degree of receptivity to societal interaction. Second, users feel that their requests (both positive and negative) are treated better and faster. This creates a virtuous circle whereby they feel that their contribution to their personal healthcare is bearing fruit. They are in turn more motivated to continue contributing and accept better the negative side (bad news).

An example of tangible benefits to patients is the UK-based Patient Opinion[120] site where citizens anonymously give opinions and praise, criticise, assess and rank the healthcare services delivered by the National Health Service (NHS). Patient Opinion claims that more than 5,000 comments have been posted so far (Nov. 2008) and about 20,000 pages are seen per day. Financial sustainability is achieved through subscriptions paid by NHS Trusts (51 NHS organisations at present) which receive immediate information on any new entry concerning them. Even though the main aim is to provide a free public service to the citizen, revenues are required to fund the constant need for innovation. There are at least two more similar cases in the UK.

Social preparedness for pandemics

Another general benefit of social computing is its potential for the dissemination of information among large numbers of people (word-of-mouth diffusion). Public Health administrations can increase the impact of their population campaigns by using Social Computing tools and mechanisms. The impact on the end-user is mainly about raising awareness of specific information and to maintaining the quality control of information that is diffused through the co-creation of knowledge by citizens. The following examples of Social Computing's positive impacts in the area of current epidemiology alarm systems demonstrate public acceptance:

120 http://www.patientopinion.org.uk

(a) The *Flu Wiki*[121] was started in 2005 by a citizen to help local communities prepare for and cope with a possible influenza pandemic. It aims to complement, support and extend public efforts in raising awareness on causes, precaution and remedies rather than to supplant them. Nevertheless, interpreted from a more radical perspective, the approach inherent to these applications leads to a blurring of the borders of the Public Health administration domain.

(b) Very recently, in response to Salmonella contamination of peanut derived products, the U.S. Department of Health and Human Services (HHS), Food and Drug Administration (FDA), and Centers for Disease Control and Prevention (CDC) created a website that included various social media tools.[122] To avoid security risks, this *Social Media Tools for Consumers and Partners* was located separately from other government systems, directly connected with the Internet. This initiative shows a change of attitude of the HHS towards social media and may be interpreted as the acknowledgement on the part of the public administration that Social Computing tools offer a quicker and more direct responsiveness to Public Health emergency situations.

Collaborative medical knowledge base

While in previous examples, our analysis of the impact of Social Computing tools focused on the interaction between the authorities and the individual, benefits are also anticipated from their impact on the interaction among medical professionals. Healthcare professionals are aware that they can no longer cope with the quantity of medical information available or check its accuracy. They therefore adopt Social Computing applications to organise and share as much of the knowledge as possible. Medical Wikis are already under development to fulfil one of the oldest aspirations of medicine which is to have the most up-to-date information of the highest quality available wherever needed. It is clear that the quality of the information exchanged in this case is guaranteed by its authoritative source.

A good illustration of the above is *Ganfyd,*[123] a medical wiki launched in November 2005 by a group of medical doctors and students. The site defines itself as an evolving medical textbook for the provision of free, updated, un-biased and high quality medical information to health professionals around the world. Only medical professionals and invited non-medical experts can contribute and edit the wiki. While anybody can access the contents, a disclaimer informs users that the site is directed at health professionals.

While the accuracy of online medical information needs safeguarding, the issues arising from the sheer quantity of information that is produced are far more difficult to handle. It is in this respect that the potential use of this wiki is very high.

Another example is Radiopedia,[124] a wiki launched in 2005 to enable the sharing of up-to-date knowledge relevant to the needs of radiology staff. The founder of this wiki refers to the added value of the collaborative element of wikis as opposed to existing online resources on radiology, a wiki giving the flexibility and ability to respond to users' needs. Although the site is open to anyone, it is directed at radiology professionals.

121 http://www.fluwikie.com and http://www.newfluwiki2.com
122 http://www.cdc.gov/socialmedia

123 Ganfyd uses the Open Source MediaWiki software and has a variant Creative Commons content licence, which was specifically developed for this site. By July 2007, it had 3,000 topic pages and 380 editors from six countries: UK, Australia, New Zealand, Canada, Ireland and USA. See site: http://www.ganfyd.org
124 See www.radiopaedia.org

Virtual co-laboratories

Social Computing-induced collective intelligence is particularly interesting for medical professionals but it also promises to deliver benefits even when knowledgeable non-expert actors are involved. Since 2005, Social Computing tools have been used as routine communication tools (Sauer *et al.*, 2005) in experimental surgery and regenerative medicine. These tools are being used to fight fragmentation of information from scattered research teams and even more widely scattered clinical cases around the world. Moreover, Social Computing networks of patients are being used as a precious infrastructure for new ways of developing clinical trials, gathering new evidence on existing or new drugs, and reporting adverse effects of drugs. In addition, patients with rare diseases (Sarasohn-Kahn, 2008) are taking advantage of social computing to relate their experiences to other patients, clinicians and researchers. It may well be that biomedical research on orphan diseases will become more sustainable if global research is undertaken with the help of Social Computing tools which would help reduce the costs.

8.3. Challenges for Social Computing and health

As can only be expected, increased use of Social Computing in the health area also introduces a number of challenges that will need to be addressed if users are to continue adopting these emerging services. The most important challenge is deemed to be the threat of isolation. Social Computing has re-ignited the old academic dispute 'good net – bad net', which is about whether the Internet is a tool for social integration (supporting weak social ties, with positive health consequences) or social isolation (face-to-face time substitution, with negative biological consequences) (Sigman, 2009).[125] The limited evidence in the case of Social Computing seems to support the former rather than the latter as it generates, rather than suppresses, further offline interaction.

Table 7 reports open issues and societal risks of Social Computing applications applied to health.

As can be seen from the table, known challenges that are being addressed relate to the quality of information. Standard solutions include clarifying the information sources, avoiding the misuse of information provided by citizens and professionals and introducing these new applications as a complement to already functioning socio-healthcare systems.

The quality and reliability of health information remains a source of concern for clinicians and health managers. However, consumers of online health information are not very concerned, and base their choice on the relevance to their query (65%) rather than on the trustworthiness of the source or author (16%). In America, the source and date of the health information is not consistently checked by three-quarters of health information seekers online (Fox, 2006). It would be worth developing new reputation systems and codes specifically adapted to Social Computing, like the Health on the Net´s (HON) Code of Conduct[126] and the EU 2002 recommendations (European Commission, 2002), which were directed at static websites.

Avoiding the use of medical information out of context is crucial for ensuring the adoption of these applications. In Europe, the sensitivity of health data tends to be higher than in US, and the challenge for public administrations is to allow the freedom needed for the development of these applications, while maintaining control of the use of the personal information.

125 Also see http://www.bodyspacesociety.eu/2009/04/19/new-discovery-actually-Internet-cures-cancer-eng/

126 http://www.hon.ch

Table 7: Social Computing applications impact on health: challenges.

TYPES	OPEN ISSUES	SOCIETAL RISKS	CASES
Blogs	- No editorial control - Sustainability in the long term - Relies on updates	- Lack of reliability - Misuse - Concerns about subjectivity and privacy	- Clinical Cases and Images - Running a Hospital - The Healthcare IT Guy
Wikis	- Voluntaristic - To be read critically - Stronger editorial control	- Vandalism and hackers - Doubts on reliability of sources - Cultural dominance of health information - Risks of bypassing medical intervention (self-diagnostic and self-treatment)	- Ganfyd - Ask Dr Wiki - Wikisurgery - Clinfowiki - RHIO Wiki - Flu Wiki - Wellness Wiki
Information Distilling (RSS, tagging)	- Mix of high and low levels of evidence - Extreme customisation non-understandable	- Unchecked quality of the information	- Medworm - Dissectmedicine
Podcasting for Education	- Not paying enough attention to "live" training - Language and cultural barriers	- Sources of doubtful information - Inappropriate use to convey biased information	- Health-EU - WHO Podcasts - Johns Hopkins Podcasts
Social Networking Sites	- Funding/influence by interest groups - Misuse by criminal groups	- Reuse of patient data for commercial purposes - Use of information out of context - Bypass health professional expertise	- Patientslikeme - Sermo - Rareshare - Facebook - MySpace

Source: modified from (Cabrera & Valverde, 2009)

New technologies in medicine seldom substitute previous ones; they usually evolve until they find a niche inside in the healthcare system. Social Computing will be no exception. The main trait of Social Computing is that it is driven bottom-up, as opposed to previous applications which have been fostered by health managers, the industry or clinicians. They also represent an irruption of social aspects into the traditionally isolated silo of healthcare provision. Social Computing may force a new transparency into the system, and hence empower the citizen-patient.

Other challenges include:

- Participation by health professionals is already limited in public fora, and may be further hampered by the fear that they could be made liable for their comments posted on blogs, should these be taken out of context (Johnson, 2007);
- Messages in digital format (Electronic Health Records, e-mail, blogs) may be misinterpreted, because tone is difficult to represent in text and due to lack of writing skills (Cole, 2008);
- Health data submitted by patients on social computing applications could be accessed, re-used and abused by third parties. As a result, patient privacy could be at a risk. (Associated Press, 2008; Hogben, 2007);
- A significant number of medical students using social networking sites post content that may affect their future careers. (Thompson *et al.*, 2008).

8.4. Policy implications

Serious problems for the healthcare sector in Europe are forecasted in the next few years as population ageing, higher costs and lack of professional carers converge. Introducing further efficiency through the use of emerging ICT applications and services and overall re-organisation of processes is necessary. A patientcentric approach to healthcare has also been proposed as a solution and Social Computing-based applications can help to achieve it. A new model of enriched dialogue and interaction between society and the healthcare system based on social computing principles can bring benefits to patients, medical professionals, industry and public administrations alike. The key facets of the new model are collective creation, sharing, trust, individual responsibility, inclusion, participation and dialogue.

There are many areas where social computing can help transform healthcare by, for example:

- Enabling quality information exchange between and among like-minded groups of patients, health professionals, industry and the public administration.
- Empowering the health consumer to opt for wellness and prevention principles and empowering the patient to contribute to his/her own treatment.
- Facilitating medical education and training and also collaborative biomedical research, especially in relation to rare diseases and related medical trials.

At the same time, emerging Social Computing applications introduce challenges that need to be addressed if the current rates of adoption of these types of service are to continue. The challenges primarily relate to the quality and the authenticity of the posted information, possible privacy abuse of sensitive information and the alleged isolation of the individual from real life through the use of social computing.

Overall, the advantages of the use of Social Computing in transforming the healthcare sector in a way that is beneficial to all the stakeholders involved are many and the disadvantages seem to be under control, as can be demonstrated by the adoption rates of the many spontaneously emerging applications.

At policy level, the advantages translate into an opportunity to:

- extend broader support to health policies, by the introduction of Social Computing tools into decision making processes ,
- receive immediate feedback and societal tracking of the perception of policy implementations,
- apply a certain flexibility according to changing priorities in society,
- enhance the impact of Public Health policies (prevention and promotion campaigns) on the health status of society,
- Re-enforce the role of health administrations and the process of decision making. While the long-term impact of social computing on health and society is currently undetermined, medical practitioners and policy makers cannot afford to ignore these new developments (McLean, Richards, & Wardman, 2007).

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9. Social Computing and Governance

Evidence indicates that Social Computing technologies, applications and values are impacting many areas related to governance issues in the public sector. Social Computing affects several aspects of public governance, influencing both citizen-government relations and back office public administration activities. Social Computing is also leading to new forms of participation, which could enhance social awareness and the involvement of users. In brief, Social Computing is transforming relationships and ways of working within and between public sector organisations, opening the way to innovative service delivery and regulatory and policy-making mechanisms. After presenting an assessment of the impacts of Social Computing on governance, this chapter highlights opportunities, risks and challenges, and discuss some policy implications.

9.1. Introduction

Over the last decade, European governments at national and local level have invested heavily in introducing ICT-enabled public services. Nevertheless, up until now the results of these investments have not always met expectations, particularly in the public sector, where the take up of online public services has been relatively low and the anticipated transformation of the administrations has not been as rapid or as radical as predicted (European Commission, 2006b).

More specifically, despite the rise of Social Computing and its fast growth, the take up of online public services has not improved much. This is in stark contrast to the much more significant success and wide appeal of community and user-driven ICT applications in civil society and business in recent years (Frissen, 2005).

The paradox of the quick take up of user-driven Social Computing applications and the slow usage growth of supply-driven public services raises the question whether there are lessons to be learned from the development of Social Computing applications which could be useful for improving governance mechanisms.[127]

9.2. Emerging trends and drivers

Public sector institutions are beginning to recognise the need to shift to services that are closer to people's everyday lives, to use innovative tools to reach citizens and to better engage employees and to share information and knowledge within and between organisations (Berce, Bianchi, Centeno, & Osimo, 2006). Also, public institutions are increasingly making use of collective intelligence and user-generated content to encourage real-time interaction and facilitate participation (Dutton & Peltu, 2007).

Social Computing-enabled governance mechanisms could enhance collaboration within government agencies and interaction with stakeholders, transforming processes into more user-centric, cost-effective solutions and bringing public value to end-users (DiMaio, Kreizman, Harris, Rust, & Rishi, 2005) and (Osimo, 2008).

In line with Social Computing trends, public service delivery is beginning to be considered

127 This chapter also draws on previous research conducted by IPTS on Social Computing and Government (Web 2.0 in Government: Why and How?, David Osimo, 2008), and the Report of the IPTS study on "Public Services 2.0: The Impact of Social Computing on Public Services", conducted by TNO and DTI (IPTS 2009) (Authors: Noor Huijboom, Tijs van den Broek, Valerie Frissen, Linda Kool, Bas Kotterink, Morten Meyerhoff Nielsen and Jeremy Millard, Editors: Yves Punie, Gianluca Misuraca and David Osimo).

as not necessarily the business of government alone. The role of government is shifting towards providing reliable data or regulating how data are handled, data that will then be reused by individuals or other organisations through web application hybrids (*mashups*) and eventually personalised and contextualised to specific needs. This lateral approach would, in principle, empower users to express their needs, choices and shape service delivery tools.

The opportunities provided by Social Computing in government are in line with experts' visions of future public services (Punie, 2007), (Punie, Misuraca, & Osimo, 2009). These will be increasingly delivered by a plurality of private and non-profit intermediaries. Users will play an important role in shaping how services are delivered – they may even take part in their actual delivery. Policies for social inclusion now recognise the importance of social networks in skills acquisition, finding jobs, coping with health problems, social mobility, and fighting poverty. In this context, the role of civil servants as innovators is seen by many as a crucial aspect in the area of Social Computing, both in terms of organisational empowerment and the reshaping of the relations and communication channels with public service customers (businesses and citizens) (Punie, 2007).

The normative visions of experts are quickly becoming consolidated trends. This demonstrates the relevance of Social Computing developments in addressing emerging issues in governance, and the impact of Social Computing on government and society (Pascu *et al.*, 2007). Indeed, our research shows the emergence of new partnerships, the involvement of intermediaries and the acknowledgement of new stakeholder roles in all governance domains. Citizens, civil society, and advocacy groups are increasingly empowered to organise themselves and play a role in public service delivery. In this context, Social Computing represents an important enabler for developing new models of governance and participatory mechanisms in policy and decision-making (Punie *et al.*, 2009).

9.3. Assessing impacts of Social Computing for governance

There are four key areas of Social Computing impact in the governance domain. Social Computing applications: 1) enhance political participation while increasing transparency and accountability; 2) enable user-involvement and empowerment; 3) allow mass-collaboration in government and public service delivery reinforcing knowledge sharing and management and, moreover, 4) contribute to support organisational, legal and regulatory changes. Overall, Social Computing increases efficiency and productivity gains in the public sector and improves quality and effectiveness of service-delivery. Thus it helps to achieve the key goals of better, simpler, joined-up and networked governance systems.

Our preliminary analysis of Social Computing impacts on governance is therefore focused on the following key areas that can be referred to as the overall policy – the regulatory and service delivery processes of public governance.

Opening-up of new channels for political participation and public engagement

The most visible impact of Social Computing on governance is related to political participation. In the past few years, many politicians and local governments have started blogs and accounts on popular online social networks (Facebook, myspace and Linkedin), aiming to improve their images and provide an open communications channel with citizens and potential voters.

Electronic systems to facilitate citizen participation are being developed and are operational in various countries at national and local level with varying degrees of adoption (Charalabidis, Misuraca, & Wimmer, 2008;

European Commission, 2009a). For example, the results of an IPTS-TNO survey[128] show that no less than 50% of respondents from the political community **"Petities"** (www.petities.nl/) state that the community has some kind of impact on local or national political levels. 27.2% state that a petition has put an issue on the local or national agenda. 12.7% report that local or national politicians have acted on petitions. Around 7% of the respondents say that policies have changed as a result of a petition and some 3% that local or national politicians have responded to the petitions (Punie *et al.*, 2009).

Social Computing is becoming an important way of engaging citizens and especially young people in political life through social networking, getting them involved and making their voices heard more than the vested interests of party-political decision makers.

ePetitions (petitions.number10.gov.uk) is a system directly embedded into the official website of the British Prime Minister which allows users to create and sign petitions, giving citizens the opportunity to reach a potentially wider audience and to deliver the petition directly to Downing Street. More advanced systems experiment with pre-election participation platforms, eConsultations or monitoring systems (www.commentonthis.com, www.theyworkforyou.com or www.change.org). **Smartvote** in Switzerland (www.smartvote.ch) is a system which helps citizens define their "political profile" through a questionnaire about their attitudes and recommend candidates who show the closest political match. A similar experiment has been conducted in preparation for the EU elections (www.euprofiler.eu).

128 As part of the IPTS study on "Public Services 2.0: The Impact of Social Computing on Public Services", a survey has been conducted in December 2008 by TNO on 8 Social Networking Sites. The main findings of the survey are available in the Final Report of the IPTS study (IPTS 2009, forthcoming).

The **presidential campaign of Barack Obama** used Social Computing to give voice to millions of Americans who traditionally don't usually get heard. Part of Obama's success in being elected President of the US is due to his insightful use of the Web to raise campaign funds of about USD 500 million (with small contributions of, on average, USD 10-25) - more than twice as much as those of any candidate in history. One of the unique features of Obama's campaign has been its ability to embrace social networking sites. For example, Obama's decision to run for President seems have been influenced by a page created by unofficial supporters on Myspace, to which 160,000 members quickly signed up. And Obama was far more popular on Facebook (mostly used by college students) than any other candidate (the Facebook page 'One Million Strong for Barack' was initiated before the start of the campaign), and at present Obama has roughly 5.5 million supporters on his Facebook page. After his election, Obama presented his vision for Open Government, focusing on the openness of the Internet, Next Generation Networks and improving America's competitiveness. Obama's administration has several tools for communication, sharing information and collaboration to engage directly with citizens: WhiteHouse.gov, Change.gov, USA.gov, Citizen's Briefing Book, and presence on social networking sites (including Twitter). However, despite the attitude of Obama's newly established administration towards the transformative role of ICTs and Social Media, it remains to be seen how ICTs will play a role in effectively reshaping and implementing "true" change within government and what the impact of ICTs and e-Services will be in reshaping America's role in the global community.

Social Computing-enabled participation leads to better informed decision making due to stronger evidence-based policy formulation and implementation. Crowdsourcing techniques and online communities enhance the knowledge of government practitioners in a specific domain and therefore strengthen the evidence and arguments on which policy is based. Political impacts have emerged in terms of the opening up of governments, transparency and accountability of civil servants and politicians which enable mobilisation and participatory electoral processes. For example, the EU-funded project **"Demos@ Work"** enables, through an online platform, a Europe-wide discussion between elected representatives and citizens on the harmful effects of smoking (www.demosatwork.org). Another European project, **eMPOWER**, allows citizens and non governmental organisations to express their views to national and European decision-makers, and to form proposals on a range of environmental issues using Social Computing applications (www.ep-empower.eu).

Within the framework of the **EU eParticipation Preparatory Action,** initiated by the European Parliament and jointly implemented with the European Commission in the period 2006-2008, a total of 21 projects were funded in different areas addressing citizens' participation in governance and policy making, and supporting streamlined ICT-enabled public services. Most of these projects use Social Computing applications and technologies for greater interaction and mass collaboration, and to monitor legal procedures and allow people to express their opinions on policy issues. A specific study was also carried out to gather information on the current use of eParticipation across the EU and to better understand the challenges and opportunities involved. At the same time, two other activities were funded. The first was a monitoring and evaluation activity (Momentum) of the overall action, which also aimed to enhance the coordination and cooperation among the eParticipation projects in order to sustain the development of synergies and their long-term sustainability. The second was a specific network (PEP-NET) which sought to promote local and regional eParticipation. Other projects related to eParticipation, often driven or enabled by Social Computing applications and technologies, have been funded through the **eTEN** and the **ICT Policy Support Programme (ICT-PSP)**, a component of the EU's **Competitiveness and Innovation Framework Programme (CIP)**, through which the funding for new eParticipation activities will be channelled from 2009 on.

Social Computing applications, especially blogs, video-sharing and social networking sites, therefore enable a greater transparency and accountability of the public sector and governance systems. They allow no-profit organisations, citizens and loosely organised groups to identify, collect, share and disseminate in a structured manner information that can be made available in real-time to a large audience. Content published by individuals and organisations can raise issues previously unknown to the wider public. This provides a new form of monitoring of public people, who need to be more careful with what they say and do than before, because everything can be recorded and publicised. The same applies to public organisations and processes.

Various Social Computing applications make hitherto undisclosed official documents public (e.g. **Wikileaks**), follow and inform on discussions in parliament, send information requests to government officials, track and publish the answers, and evaluate and rate civil servants and organisations. The EU-funded project **eCommittee** is an online platform which gathers citizens' questions for the European Parliament's Climate Change and Environment Committees (www.ourclimate.eu). **Ratemyteache**r allows students to rate their teachers (www.ratemyteachers.com). **Ratemycop.com**, **ratemydoctor.net** and **ratemylawyer.org** all apply online rating mechanisms to professionals in different fields. Based on online rating and reputation systems, a **Rate your Councillor** website was created (www.rateyourcouncillor.com). While it is unclear who is behind this site, it allows citizens to pass judgment on their representatives at city hall based on three criteria: whether they would re-elect the councillor, the councillor's responsiveness to constituents and the councillor's communication with constituents. Besides rating, other Social Computing-enabled websites compare municipalities, schools, universities, hospitals and allow citizens to give their opinions on the quality of government services.

Sensitive and confidential information made available by crowds has an impact on government transparency as it becomes accessible to the public and the media. This impacts on government as agencies and officials can be held accountable and may have to change their policy and practice. The disclosure of documents also has legal impacts by providing evidence for court cases and thus influencing their outcomes. An example is the publication on Wikileaks of the military manual detailing the day-to-day operations of the US military's Guantanamo Bay detention facility. The "Camp Delta Standard Operating Procedures" was leaked in 2007 and it has been used since by lawyers and human rights associations against the Pentagon, in their claims of violations of International Law.[129]

Wikileaks (www.wikileaks.org) is a website that allows anyone to anonymously post documents which contain evidence of government corruption or other wrongdoings or, as Wikileaks phrases their mission: "to provide an uncensorable Wikipedia for untraceable mass document leaking and analysis". Activities within the Wikileaks community often produce significant political pressure, and documents published on the site contribute to the opening up of governments. Several documents published on Wikileaks have been used by lawyers and interest groups to strengthen evidence in court cases against government officials or agencies. Wikileaks' revelations of a confidential report on government corruption in Kenya changed the results of the Presidential election in 2007, swinging the vote by 10% towards the opposition, which won the election with a 1-3% majority of the vote.[130] However, the Wikileaks community also receives severe criticism, especially in terms of privacy infringements, and with regard to the possible endangerment of public security by revealing sensitive military information.

However, information may be manipulated. Therefore, an important aspect is related to information reliability and validity, and the regulatory mechanisms used in implementing technologies and systems. While today's Social Computing technologies provide a powerful means to connect and to access vast amounts of information, there is increasing evidence that they may also disconnect and distance people from each other. Information overload and the accelerating pace of life - conditions that Social Computing technologies encourage - appear to contribute to health problems, decrease work satisfaction and productivity and lower ethical, social, and political interests, perceptions and values (Lasica, 2009).

Another element to take into account is the fact that while Social Computing facilitates openness and freedom of speech, at the same time it also generates counter reactions from established government systems to reinforce the control of personal data and censorship of opinions, as shown by the recent cases registered in China in relation to the protests world-wide about the situation in Tibet and in Iran in opposition to the re-election of President Mahmoud Ahmadinejad. In both cases, Social Computing facilitated spontaneous self-organised protests and freedom of expression but, at the same time, provoked a counter-reaction from the governments that increased online surveillance and repression.

129 www.wired.com/politics/onlinerights/news/2007/11/gitmo
130 The Guardian, 12 September 2007

The recent opposition protest in Iran, already being defined as **"Iran's Twitter revolution"** highlighted the disruptiveness of social media and especially micro-blogging. *If you wanted to get the latest news on what happened after the disputed re-election of President Mahmoud Ahmadinejad, you should have better being reading blogs, watching YouTube or following Twitter updates from Tehran, minute-by-minute.* (Blog posted on The Nation online, 15 June 2009). For instance, some thrilling reporting has been done over Twitter by a university student whose pseudonym was "Tehran Bureau". The Iranian authorities shut his website down over the weekend and he was attacked by police. He still managed to send short posts around the world over Twitter through his mobile phone. (www.savetheinternet.com/blog 15 June 2009).

On the other side, just in time for the 2008 Olympics Games, the Chinese government has been a pioneer in cutting-edge online censorship methods. "Golden Shield" is the term Chinese officials use for what may be the most sophisticated censorship system in the world, also referred to as the **"Great Firewall of China"**. In the aftermath of the Chinese crackdown on Tibet, bitter protests, both online and offline, have been sparked off around the world and further emphasised by the coincidence with the Olympic Games in Beijing. In response to this, China's Internet users came up with even more creative ways to express their outrage against the pro-Tibet protesters. Almost overnight, millions of Windows Live Messenger chat-service users added symbols depicting a red heart beside the word China to their contact names. This culminated in calls from individual bloggers on portals such as people.com.cn to boycott –for instance- Germany (Boycott Volkswagen, boycott German goods, boycott the German chain Metro"). (Spiegel Online International, http://www.spiegel.de/international/world/0,1518,551110,00.html).

The Chinese government, however, managed to "shut down" the counter protest thanks to the surveillance computers from the backbone of the Chinese security system, which monitor online communication in real time, supported by an army of government censors, whose numbers are estimated at over 30,000. This Herculean effort is on the increase as Internet users multiply at a record rate (As of February 2008, China officially has the most Internet users in the world: 221 million, surpassing the USA's 220.6 million (USAToday Online, www.usatoday.com)). Moreover, it is believed that the country has already exported its innovative censorship methods to countries such as Vietnam and as the rapid response to the Twitter's revolution shows, Iran.

User-involvement and empowerment

A remarkable characteristic of Social Computing is that it empowers individuals through the widespread dissemination and use of information and knowledge. Anyone can generate considerable impact by leaking information through online communities. Social Computing enables individuals to acquire knowledge and create and disseminate content, and thus gives them the opportunity to influence government activities and political issues of relevance for society as a whole.

Social Computing applications are increasingly used by citizens and civil society to press for the modernisation of governance systems. Several governments are learning from the private sector and attempting to benefit from the opportunities offered by Social Computing to improve public services and government functions. For example, Social Computing facilitates the development of new information channels which increase governments' capacity to reach and interact with young audiences, providing citizens with new tools to get their voices heard and enhancing collective knowledge sharing.

An example is the EU funded project **U@MareNostrum**, which aims to help citizens and local organisations, through Social Computing-enabled tools, to identify and solve environmental protection issues in the Mediterranean region. Citizens can report problems to help improve the implementation of water protection and management policies, and give their input to the design of long-term marine environmental protection policies. Similarly, **VoicE** is an open source, Social Computing-enabled platform that hosts clear information about EU consumer protection legislation. It aims to help people understand an important policy issue in few minutes, without having to read long legal documents. Citizens are also encouraged to contribute ideas and proposals by contacting their local European parliamentarians directly. An extension of the project, **VoiceS**, integrates popular social networking sites to make it easier for many more people to get involved. A "serious game" may help citizens, especially young people, understand the complexities of the EU parliamentary procedures.

Furthermore, through Social Computing applications, citizens can monitor the delivery of public services, and support public management by providing information and opinions. While the final decision and editing power is held by the government, public organisations benefit from citizens' contributions and knowledge for their work. There are many examples of citizens taking active roles in the tracing and solving of crimes and in cooperating with the police (e.g. by contributing phone camera material, eye witness reports, and information about stolen goods on virtual marketplaces). These examples demonstrate an important aspect of Social Computing for governance that has also been defined as "sousveillance", which happens when citizens turn the tables and monitor government activity (Misuraca, 2009).

An example is **FarmSubsidy.org** (http://farmsubsidy.org), a website that helps find out who gets farm subsidies from the EU, from small farmers to big multinational companies. Subsidies paid to farmers and others under the European Union's Common Agricultural Policy amount to approximately EUR 55 billion a year, more than 40% of European Union's entire annual budget, or around EUR 100 a year for each EU citizen. Farmsubsidy.org is a project coordinated by EU Transparency, a non-profit organisation in the UK and Kaas og Mulvad, a research and analysis company in Denmark. The aim is to obtain detailed data relating to payments and recipients of farm subsidies in every EU member state and make this data available in a way that is useful to European citizens. The project has brought together journalists, analysts and campaigners in more than ten countries. This initiative is part of the **Followthemoney.eu** family (http://www.followthemoney.eu), which aims to make it easier for European citizens to understand the EU budget: how it gets decided, where the money comes from and how it is spent, in order to make the EU work in a more transparent and accountable way.

Social Computing thus provides opportunities for governments to harness the efforts of citizens, civil servants and organisations to improve efficiency, effectiveness and quality of public services. Crowdsourcing mechanisms generate information about citizens' needs and allow the exploitation of experts' knowledge. The effectiveness of public service provision is strengthened as government gathers users' collective intelligence and is thus able to take effective measures to achieve intended public goals.

However, governmental structures do not necessarily have the capacity to "embed" Social Computing systems into their operations. Processing user-generated information can influence policies and administrative procedures and requires the control of reporting accuracy and "real time" action, which is not always possible. Moreover, although public service providers do sometimes make use of this "wisdom of the crowd" potential, and other citizen contributions, most of the user-generated public value initiatives take place outside the traditional governmental sphere.

Indeed, user empowerment through Social Computing leads to developing new ways of organising the governance process, and allows stakeholders other than the state to play innovative roles. New models of public management are therefore required. Citizens are empowered by Social Computing and are enabled to express their personal interests and preferences. They can openly support public officials and policies, mobilise around an issue and even stop policy. However, as a downside, citizens or groups of citizens also become more vulnerable to possible privacy infringements and violations.

Professional collaboration and knowledge management mechanisms

Professional collaboration enabled by Social Computing is emerging in the governance arena and demonstrating its impact on the efficiency of public management. An IPTS-funded survey found that 63% of respondents from a professional community stated that their service has improved due to their involvement in Social Computing platforms. In particular, the allocation mechanism of Social Computing platforms stimulates a more efficient match of demand and supply, as around 12% of the respondents of professional communities stated that they save time by efficient knowledge allocation.

As differences in collaboration are correlated to large differences in corporate performance, public sector organisations are recognising the influence of enhanced shared platforms to deliver services and increase productivity gains. Social Computing, in fact, strengthens the production of public value (public services or legislation) and knowledge is built in a more efficient way (through crowdsourcing) or can be allocated in a better manner. However, evidence in the private sector shows that the efficiency gain can only be achieved if existing processes are transformed (Chui, Miller, & Roberts, 2009). In other words, following (C. Perez, 2002), a sort of "creative destruction" is required in order to actually improve efficiency.

Social Computing makes information and material openly and freely available and accessible, and stimulates further professional specialisation and user innovation. It also influences organisational structures, which has the effect of changing policy and management practices. Communities of practice and knowledge sharing platforms have emerged both within organisations and across public institutions, linked by specific interests or domains, at local, national or international level. For example, around 24% of respondents to the IPTS-funded survey stated that their daily practice had altered as a result of their engagement in the community.

In the legal sector, there is evidence that Social Computing has had an impact in terms of legal knowledge sharing, for example through **Jurispedia** (http://jurispedia.org) and the **LawGuruWiki** (http://wiki.lawguru.com). These sites allow users to collaboratively create large repositories of legal terms, definitions and information.

An interesting example in terms of collaborative working models is the **ePractice.eu (www.epractice.eu),** a portal created by the European Commission to offer a service for the professional community of eGovernment, eInclusion and eHealth. It has been specifically set up to empower users to discuss and influence open government, policy-making and the way in which public administrations operate and deliver services. Launched in June 2007, ePractice had reached at the end of 2008 more than 15,000 members from about 50 countries worldwide, and is developing a considerable "knowledge-base" (more than 1,000 real-life cases, information about events and other resources, a weekly newsletter and a peer-reviewed Journal of ePractice, that presents both academic and practitioners' papers). ePractice also created a Facebook group and it is experimenting with other online social networking tools to exchange information and knowledge and build communities of practice. The ePractice.eu Portal is therefore gaining more and more recognition as a Knowledge Management platform in the broader area of eGovernance and it could even be expanded to other domains (for example, education). However, there are challenges in its further development, mainly related to the lack of legitimacy and validity of cases presented. Furthermore, a number of active users are required to keep such a community alive and at the moment participation is low.

Community building also has a strong long tail effect (e.g. geographically scattered members who share the same interests or problems are able to find one another). This also facilitates what can be defined as "wisdom of professionals" in different public service and governance domains which, in turn, may enhance users' capacities and the effectiveness of policy formulation and implementation, and performance of service delivery.

However, despite the claims of early adopters and advocates that Social Computing can increase productivity in the public sector, it must be remembered that Social Computing applications operate in a perpetual *beta*-version. While this is ideal for unleashing innovation, it may limit the potential of Social Computing in the public sector which is regulated in a bureaucratic manner, and is not always open to radical and disruptive changes.

Organisational and regulatory innovative dynamics

Evidence shows that Social Computing technologies could disrupt the existing institutional establishment. Although government institutions have not yet changed significantly as a result of Social Computing, there is considerable potential for disruption. Social Computing enables cross-organisational and cross-boundary production processes and allows "horizontalisation", rather than hierarchical governance structuring. Moreover, Social Computing facilitates the emergence of new business models and enables changes in power balances mainly due to "bottom-up" user-driven innovation. Social Computing also stimulates the accessibility of public services, as it enables user groups to create new delivery channels that hitherto were mainly provided by government agencies (e.g. peer counselling, online tutoring and teaching).

The values, processes and structures of Social Computing-enabled communities which provide public value are open rather than closed, horizontal rather than hierarchical and informal rather than formal. If the trend towards networked provision of public services continues, it is likely that the character of government bureaucracies will substantially change and that new governance system will be established.

An example of internal cross-agency collaboration is Intellipedia (http://www.intelligence.gov), a collaborative drafting tool for intelligence reports based on Wikipedia software, and used by 16 US security agencies on a highly-secure private Intranet network. Similar experiences have also been developed for collaboration among the Social Services in Canada, in environmental protection and disaster management (for example, to prevent earthquakes in Japan or manage disaster in general), in many inter-agency consultations in different countries, and in international organisations.

Another impact of Social Computing on existing organisations is the replacement of government tasks, in the sense that the public value previously created almost exclusively by public institutions is now also generated by individuals or groups of users. Although there is limited data on user-generated public services, there is substantial anecdotal evidence that the provision of public services by citizens takes place in various governance settings. For instance, **Zopa** is a social lending and borrowing marketplace, which enables people to lend and borrow directly with each other. The main goal is to give people around the world the opportunity to help themselves financially at the same time as they help others.[131]

Furthermore, the use of Social Computing is having legal implications and impacts on the preparation of legislation and through collaborative drafting of regulations. For example, Social Computing applications have been used to enable content development approaches for regulatory tasks in patent review processes (**Peer-to-patent** - www.peertopatent.org). In this regard, Social Computing raises regulatory and legal questions as the legislation of western countries is based on an offline world (Lessig, 2004). There is a tension between the "all-sharing and co-creation" character of Social Computing and traditional rules of ownership of information, ideas and creations. Our research shows that impacts can also be found in terms of recognition of open content in endorsement procedures, and innovative copyright licensing schemes (Punie *et al.*, 2009). As a reaction to copyright constraints, several initiatives have emerged that attempt to provide alternative regulations. One of these, the **Creative Commons** (www.creativecommons.org)**,** developed a software application that allows copyright holders, who do not want to exercise all of the restrictions of copyright law, to dedicate their work to the public domain or license it on

131 See: http://uk.zopa.com/Zopaweb/

terms that allow copying and creative use (Ala-Mutka, 2008).

There is also an increasing need for new regulations to combat the new forms of crime and violations which have emerged with Social Computing and other technological trends. Moreover, considering that ICTs in general, and Social Computing in particular, influence several areas of governance and bring about new needs, simply extending existing laws seldom solves the problems that arise. Therefore, co-regulation mechanisms are considered to be more effective in view of the fact that responsibility is shared between governments and users themselves, including industry and other groups or categories of individuals (such as, for example, parents, professionals of specific disciplines, etc). In this regard, one of the impacts of Social Computing that is gaining recognition is the opening up of the law making process. The **OpenLaw project** of the Berkman Centre for Internet and Society (part of the Harvard Law School) is an example of an open platform on which existing legislation is discussed and modifications are proposed (http://cyber.law.harvard.edu/openlaw).

Another example of collaborative lawmaking is the European Commission's **Lexipation project** (www.lexipation.eu), which aims to create a "living lab-like" community of citizens and public authorities involved in moderated online discussion for enhancing citizens' participation in the legislative process. Similarly, **CitizenScape** is an EU-funded citizen-driven initiative which integrates Social Computing and more formal online tools to allow debate and participation in the implementation of EU environmental legislation at local level (www.citizenscape.org). Also in this area, the Estonian **TID platform (Today I decide)**, launched in 2001 to allow citizens to propose and discuss new legislation, has been improved in **TID+** (http://tidplus.net) and a guide on how it can be best used in other EU countries has been produced. It will be made available free for non-commercial use to all interested stakeholders in order to increase citizen participation.

9.4. Opportunities and challenges

The opportunities offered by Social Computing for governance are many: citizen empowerment, data availability and access to multiple sources, multiplication of networking capacities, and exchange of information and knowledge. Openness and freedom are key elements of a democratic governance model where aggregation, motivation and mobilisation for "collective problem-solving" are the basic rules. Social Computing has shown it can have an impact on fundamental collective values, such as trust, authority, reputation, self-regulation and control, which are part of the general public goals. Therefore, the development of Social Computing could change the context in which governments act by providing new opportunities for achieving social benefits and by changing the scope and nature of government action, in particular with regard to the role of the civil society and individual citizens (Frissen, 2005).

The Social Computing logic has huge potential for open innovation and ICT-enabled governance in the public sector. It is capable of supporting user-centric transformation of public administrations and facilitating cross-organisation collaboration and knowledge management implementation, especially through codifying and exploiting tacit and "sticky" knowledge and building on user-driven innovation (often incremental and market led). However, it is important to understand how to integrate Social Computing-enabled innovations into public services and how to develop new and sustainable business models and more general ICT-enabled governance mechanisms for public service delivery. In spite of the emerging trends and some consolidated cases (mainly from northern countries and much more scattered in other regions of the world), there are still limitations in the practical implementation of Social Computing for improving governance (Reding, 2008c).

The risks that arise from the use of Social Computing in government are diverse and range from: privacy infringements and security issues; the rise of "Web-populism", that only he who shouts loudest is heard; the low quality of content and its liability. In addition, the "wisdom of the crowd" may not always be wise, especially in relation to public governance and decision-making. Participation can be marginal, biased, or limited to activists, extremists, experts or elites. Social Computing experiments may not always be sustainable or up-scalable. Social inequality can actually be increased rather than reduced, as universal service has yet to be achieved in many regions and Internet accessibility is not guaranteed. Although Social Computing is an important driver for community building, it does not necessarily strengthen social cohesion, and may lead to social segregation and fragmentation, especially at the local level (Punie *et al.*, 2009).

Many challenges remain for the effective implementation of Social Computing applications and technologies in support of governance practices. Apart from take up, changing user expectations are a key driver of change. Therefore, it must be understood how Social Computing can enable mechanisms for identifying and incorporating citizens' needs dynamically into policy development processes and political decision-making systems. Moreover, the economic impact of Social Computing innovation in governance has not been fully examined. Whether Social Computing applications are economically viable and sustainable in the long-term is crucial, thus new business models and innovative ways of solving problems (and making decisions) are needed.

In addition to this, if governments ignore Social Computing-enabled practices, spontaneous initiatives may emerge as Social Computing applications are predominantly self-governing. Governments should therefore be aware of the environment in which they operate, and be proactive in order to integrate when possible, or eventually support, Social Computing-based bottom-up social innovation, which is often initiated by new emerging actors (individuals, formal and informal civil society organisations, start-ups, and civil servants). Although most Social Computing-enabled communities are self-regulated, governments should be aware of the risks and prevent misuse and negative impacts. Governments should also be careful in arbitrating between the perpetual *beta*-version of Social Computing applications and technologies (which allows an iterative and continuous innovation process, eventually resulting in low failure costs), and the need to support complex and sensitive administrative processes. The careful integration of Social Computing technologies into the overall ICT landscape of a public organisation should allow existing practices to be challenged in order to offer new paradigms, from both a technological, and especially a service-delivery perspective.

Finally, visionary and effective leadership and strong political support is required to guarantee openness and overcome any eventual drawbacks that could result from experimentation in open contexts (particularly as the public good is at stake) and that could shift the power balance, affect reputation systems and influence policy-making in a radical manner.

9.5. Policy implications

Our research shows that Social Computing has multiple impacts on public governance. Social Computing has a potentially disruptive impact on government-citizens relations, on public sector organisational and institutional design and the way public services are created and delivered. There are also strong signals of fundamental shifts in the relationships between government and citizens, pointing to new ways of "public value creation".

Social Computing can play an important role in this innovation process by supporting profound transformations (or even by enabling "creative destruction") which would allow citizens (as voters, taxpayers, patients, students, residents) to take an active part in policy-making processes, at local level and globally. Social Computing applications can promote the modernisation of existing governmental functions by supporting the optimisation of back office processes and procedures, by streamlining and consolidating information flows and by exploiting knowledge sharing mechanisms for administrative purposes.

For this to happen, public sector data has to be made effectively available and standards for information and data exchange have to be properly defined so that public information can be re-used by non-governmental actors, while citizens' "digital rights" are guaranteed. This would enhance governance processes, allowing citizens, private sector and non governmental organisations to access and provide public data and contribute in an active manner to the management of the public governance system.

At the same time, the most promising Social Computing applications are emerging in the area of mass-collaboration for governance and policy-making, where mobilisation of politics and civic engagement is already producing a shift in the power balance between the "crowd" and political representatives. Moreover, Social Computing applications and values can support gathering collective intelligence of citizens and framing public opinion formation on specific policy-relevant issues in a structured manner so as to harness evidence-based policy-making and improve quality of regulatory and policy frameworks.

The public sector will require fundamental innovations in business models, value chain concepts and user/producer relations to integrate the potential of Social Computing applications into the governance processes and provide more efficient, effective and high-quality services. The contrast between the top-down, supply-driven and hierarchical set ups of most public sector organisations with the open, decentralised and user-driven organisational models of Social Computing applications in fact demands a re-engineering of the institutional systems of governments along the entire value-chain, from policy and regulatory making, to the service delivery functions of the state.

Further experimentation in real-life environments is therefore required to measure the socio-economic impacts of Social Computing for governance. This, in turn, may support the development of innovative Social Computing-enabled governance mechanisms, capable of coping with the changing dynamics of the European Information Society.

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Abstract

This report provides a systematic empirical assessment of the creation, use and adoption of specific social computing applications and its impact on industry, personal identity, learning, social inclusion, healthcare and public health, and government services and public governance.

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