Grasping the potential of online social networks for foresight ☆

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Abstract

Online Social Networks (OSNs) have gained unprecedented popularity in recent years. OSNs facilitate the interaction among members by providing a dynamic/multimodal platform which enables discussions, sharing of multimedia content, organisation of events, etc. These networks comprise millions of members from all continents and from all age groups — although the younger generation is more prominent. OSN dynamics and inherent patterns of operation are being investigated by academia as a means of studying, for instance, ICT-enhanced social change. Industry uses them to detect new commercial trends and establish marketing strategies.

We believe that the huge size of OSNs, the broad and versatile thematic topics and the fact that most users are youngsters made these new modalities of large-scale interaction also worth investigating in regard to the study of the future or foresight. In this paper, we discuss the relevance of OSNs for three objectives of foresight methods, namely creativity, expertise and collective intelligence.

First, we argue that OSNs can be regarded as a tool to enhance creativity through the unprecedented modalities of communication and interaction they offer.

Second, we propose OSNs as an expert tool to detect emerging changes in social behaviour. We assume that the recorded exchanges of information and thoughts between participants in forums offers an under-exploited source of information for detecting new social trends. The value of this information may be amplified by evaluating it in conjunction with other OSN data, such as member profiles, behavioural patterns or list of contacts or friends. In this way, emerging social trends could be detected. Similar approaches are already used in market research and could be transferred to foresight.

Third, we consider OSNs to be a means of aligning individual thinking and fostering collective or "collaborative" intelligence for a whole range of possible goals in the future.

For each of these three objectives, the theoretical foundations are complemented with some case studies. Given the novelty of the OSN phenomenon and its unexplored potential in many fields, the authors aim to trigger thinking and discussion on the potential application of this emerging phenomenon within foresight, rather than to offer a vademecum on the use of OSNs for foresight activities.

1. Introduction to foresight

The drive to discover the future is as ancient as humanity. Certainly, attitudes towards the future have changed through time and do so increasingly in the wake of new challenges, dangers and shifts in values. In the XIXth and early XXth century, science and technology were considered to be the major drivers of change. Looking into the future mostly consisted of anticipating forthcoming technological developments and most contributions were in the realm of "science fiction". Jules Verne and H.G. Wells[1] were among the most acclaimed authors in this field.

During and after the Second World War, it became commonly accepted that the long-term status and welfare of a nation would depend largely on its advancement in science and technology [1]. As a result, governments started to devote more importance to the future of technology. Foresight became clearly separated from science fiction and became institutionalized, the creation of the RAND Corporation by the US Forces in 1946 being one of the milestones. At that time, the focus of foresight was still almost exclusively on scientific and technological issues. In fact, technology forecasting, associated with a deterministic future perspective, was still the predominant terminology for the field until the 1980s, when "technology foresight" emerged. The technological experts and some professional futurologists were the main, if not the only, contributors to the field.

Gradually, foresight widened its scope when it became commonly accepted that the future was not only, or even primarily, determined by technological factors. For instance, the energy crises of the 1970s and 1980s were due to political rather than technological factors and had major economic and geopolitical consequences. However, they had not been foreseen by the foresight community. In the following "second generation" of Foresight, the emphasis was no longer on technology and innovation alone, but shifted towards trying to understand the trends and drivers of market(s) and economics [2]. The key actors in this second generation were from both academia and industry, complemented by professionals able to bridge the gap between the two.

In the 1990s and 2000s, policy makers acknowledged that the development of new technologies was also highly conditioned by political, societal, psychological and cultural factors, such as concern for the environment, or an individual's ability to understand the technology. Accordingly, this "third generation" of foresight acknowledged social determinants and behaviour as major drivers of change. In addition to the actors from academia and industry, social stakeholders such as non-profit organisations, consumer groups, lobbyists and government representatives were, and still are, regular participants in the foresight process on issues such as health, safety or environment [2].

Nowadays, Foresight as defined by APEC[2] refers to "systematic attempts to look into the future of science, technology, society and the economy, and their interactions, in order to promote social,

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[1] Wells was the first one to use "foresight" to refer to studies of the future in a 1930s BBC broadcast.
[2] Centre for Technological Foresight (www.apecforesight.org/).

economic and environmental benefit". It is a sub-discipline of "future studies", which comprise any studies where the exploration of the future(s) is one of the objectives. Practitioners of foresight draw attention to three main concepts [3]. First, it is non-predictive, in as much as it does not aim to predict a pre-determined future but to explore how the future might evolve depending on the actions of various players and decisions taken 'today'. Second, it is oriented towards action. It not only analyses or contemplates the future but also supports actors in actively shaping it. Third, it is not limited to small expert groups but is participatory, and involves a wide range of stakeholders. It is worthwhile emphasising that the overall goal of foresight is not the prediction of the future, which is unachievable in most cases. Instead it aims to open minds to new possibilities for the future, thereby contributing to shaping it in a desirable direction. Therefore, foresight should not be a restricted area for "specialists" but an open domain where individuals can share their views on a suitable future for our societies and ways to achieve it. Defining, discussing and drawing conclusions about a consensus view of a desirable future scenario is a noble endeavour. Within society, there is huge human potential and the tacit and codified knowledge of individuals should be used as far as possible.

In the past decades, a number of foresight methods, such as Delphi surveys, scenarios or roadmapping have been developed to be used in a wide variety of settings [3–5]. Georghiou [2], taking into account work by Loveridge and van der Meulen, proposed a typology of foresight methods based on three main objectives. The first objective is to foster creativity to generate plausible assumptions about the future, thereby enlarging the scope of possible futures. The second is to gather specific knowledge and expertise in the field of analysis. And, finally the third objective is to facilitate the interaction between individuals in order to contribute to the alignment of different perspectives into a coherent and solid collective view. Fig. 1 shows a number of 'traditional' foresight methods which could contribute to the 3 aforementioned objectives of foresight (creativity, expertise and interaction or alignment).

Building on Georghiou's three-axes classification of foresight methods, this paper explores whether OSNs could be used within foresight research. We base our argument on the consideration that OSNs
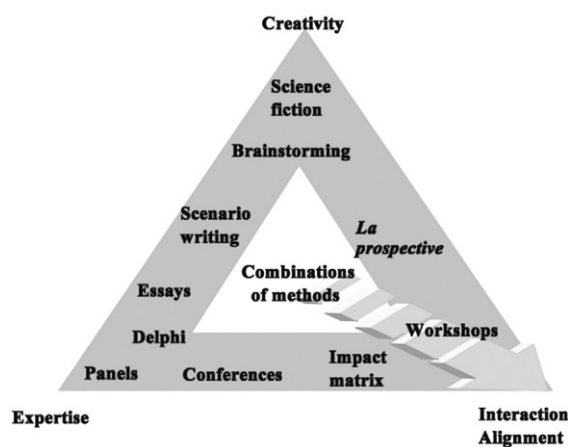

Fig. 1. Representation of a selected number of methods with regard to their contribution to three fundamental elements for performing Foresight, namely using expertise, foster creativity of possible 'futures' and aligning interaction towards generating a common contribution.

Table 1

Selection of popular OSNs by membership OSNs cover a wide range of thematic subjects and their membership can be either open or closed

Name	Description/Focus	Members
MySpace	General	130,000,000
Hi5	Worldwide	50,000,000
Classmates.com	School, college, work and the military	40,000,000
Xanga	Blogs and "metro" areas	40,000,000
orkut	Owned by Google	36,532,000
Windows Live Spaces	Blogging (formerly MSN Spaces)	30,000,000
Friendster	General	29,100,000
Reunion.com	Locating friends and family	25,000,000
Bebo	Schools and colleges	22,000,000
BlackPlanet.com	African–Americans	18,000,000
Cyworld	South Korea	15,000,000
Facebook	General	12,000,000
LiveJournal	Blogging	10,921,263
Piczo	Teenagers, Canadians, photo sharing	10,000,000
LinkedIn	Business	8,500,000
WAYN	Travel & Lifestyle	7,000,000
Care2	Activists, green living, socially conscious	6,900,000
Faceparty	British teens and 20-somethings	5,900,000
Gaia Online	General	5,000,000
Mixi	Japan	5,000,000
Flickr	Photo sharing	4,000,000
Passado	General (business)	4,700,000
Yahoo! 360°	Linked to Yahoo! IDs	4,700,000
Bolt	General (music and video)	4,000,000
MiGente.com	Latinos	3,600,000
Multiply	"Real world" networking with definable relationships	3,000,000

The number of users is a rough indicator of the network's activity. Source: Adapted from Wikipedia as of 01/02/2007 (http://en.wikipedia.org/wiki/List_of_social_networking_websites, last modified 12 November 2006).

contribute in various ways to all the three objectives, namely, creativity, expertise and interaction, and alignment.

In the next section, we introduce OSNs as a social phenomenon and then analyse their potential from the perspective of foresight methodology.

2. Online Social Networks

2.1. Overview

"Social networking", as a concept, is not new. As Barabási [6] puts it, social networking has always existed in various facets of our existence, from early Christians to the World Wide Web. It refers to the act of expanding nodes (individuals, organisations, etc.) through social links (relationships, friendship, etc.). Garton et al. [7] define social networking as "a set of people (or organisations or other social entities) connected by a set of social relationships, such as friendship, co-working or information exchange."

The wide diffusion of Internet with its vast networking possibilities has been a powerful means of expanding social relations and interacting with them as never imagined before. As early as 2000, Usenet members (a small portion of the Internet) were already participating in 80,000 topic-oriented collective discussions [8]. The emergence of user-friendly interfaces, and the meshing of multimodal platforms, among other characteristics, has provided novel ways of interaction and new modes of communication. The combination of social networking with Information and Communication Technologies (ICT) has resulted in applications, currently referred to as "social computing". As Wellman states, in recent years, computer systems have become "inherently social" connecting people and organisations ([8], p. 2031), reflecting Castells' observation that we are shifting from group-based societies to networked societies [9].

The popularity of Online Social Networks (OSNs), both in terms of membership and use, has grown very impressively over just a couple of years. Some networks now have tens of millions of members from all over the world (see Table 1). This phenomenon is currently undergoing intense research in social sciences [7,10,11] and in particular human–computer interactions (HCI) [12–15]. Private sector companies are also investigating OSNs in order to learn about emerging lifestyles that may affect traditional business models.[3] To our knowledge, the potential of OSNs for foresight has not yet been investigated and we now introduce some of their essential features with this potential in view.

Table 1 gives an overview of the indicative number of users for a selected OSNs as of February 2007. Some OSNs require registration, while others limit membership through an invitation system (e.g., the business network LinkedIn or Orkut). In most cases, membership is open. There are some limitations in determining the size and level of participation in OSNs accurately; though it can be said that the growth rates are significant and very impressive.

Participation in OSNs consists of joining as a member and interacting with other network members by sharing audio-visual content (e.g., Flickr, MySpace & YouTube), contributing to forum discussions, exchanging views and ideas within communities of common interest (e.g., Orkut[4] & Yahoo groups), sharing sources of information (such as bookmarks in del.icio.us & Digg), collaborating towards a common goal (such as the encyclopaedia Wikipedia), and, last but not least, searching for and socialising with members with similar interests (most OSNs).

2.2. A tentative classification

To our knowledge, there is no commonly accepted definition of "Online Social Networks". However, they have two functionalities which make them stand out from other related online services:

1. Advanced tools for sharing digital objects (texts, pictures, music, videos, tags, bookmarks, etc.);
2. Advanced tools for communication and socialisation between members.

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[3] In July 2005, the press magnate Rupert Murdoch bought Myspace.com for a substantial $580 M.
[4] As an illustration the classification of Orkut communities are: "Activities", "Alumni & Schools", "Arts & Entertainment", "Automotive", "Business", "Cities & Neighborhoods", "Company", "Computers & Internet", "Countries & Regional", "Cultures & Community", "Family & Home", "Fashion & Beauty", "Food, Drink & Wine", "Games", "Gay, Lesbian & Bi", "Government & Politics", "Health, Wellness & Fitness", "Hobbies & Crafts", "Individuals", "Music", "Pets & Animals", "Recreation & Sports", "Religion & Beliefs", "Romance & Relationships", "Schools & Education", "Science & History", "Travel" and "Other".

Among OSNs there is a great variety in the level of interaction and 'virtual socialisation'. These assets also determine the information that can be extracted from them. For the sake of simplicity (and without claiming to be rigorous in sociological terms), we can say that the more "modules" for cooperation there are, the more interactive the OSN is. The basic module offers online access to recorded shared network information. The second allows participants to exchange digital objects and the third offers the possibility to join and contribute to a community of interest, i.e., ideally directed towards a coordinated action (co-action). The fourth allows members to reveal their profiles (the level of profiling and level of trusted environment depends on the network). Finally, members can take on a virtual character or 'avatar' in a full 3D simulation.

Using this modular concept, we can classify online services. Each OSN can provide a different level of interaction and socialisation. Fig. 2 shows how the ones discussed in this paper can be positioned in four main strands in terms of degree of interaction and, thus, socialisation. Networks in the third strand (e.g., MySpace, Orkut, LinkedIn, Flickr) are the core group of OSNs. Though networks in the second strand (e.g., Wikipedia, YouTube, del.icio.us, dig) have a lot in common with OSNs, e.g., they offer the sharing of digital objects and collaboration towards a common goal, they do not offer socialisation between members as one of their main objectives. Online services in the first strand (Google Trends, Zeitgeist, Yahoo! Answers) give access to massive amounts of information and knowledge but contribute less to the "socialising aspect". In the future, we consider that through the use of technologies that make three dimensional representations or avatars possible, virtual environments will be created. These will allow deeper socialisation and immersion than current OSNs (e.g., virtual worlds, such as Second Life — see Section 5.2.3) which we believe will be the emerging fourth strand of OSNs.
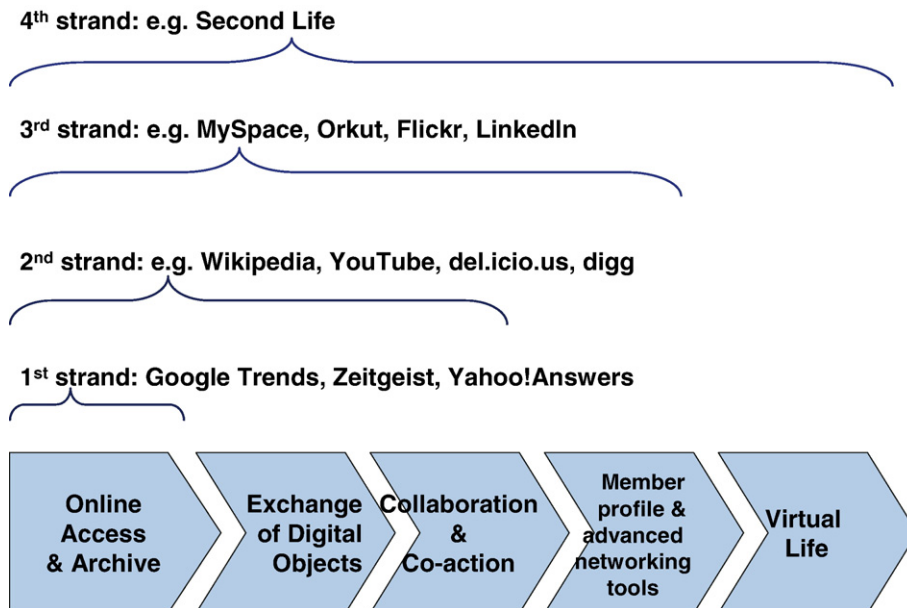

Fig. 2. Level of interaction and socialisation for Online Social Networks and other related online services.

The third strand is the focus of our analysis, though we also draw examples from the other strands to illustrate our point.

2.3. OSN in the frame of foresight studies

Young people are the main and most active participants in OSNs [16]. This sector of the population is particularly interesting as young people tend to adapt easier and quicker to cultural changes. They are what Rushkoff [17] calls "our evolutionary future". It may be anticipated that some behavioural patterns observable among youngsters will extend to other age brackets. Whether early adopters (often young people in the case of ICT) continue to be innovative as they age, or whether they continue to use technologies learned in their youth in later life, is still under discussion in the innovation technology adoption debate.

It is noteworthy that OSNs are becoming mainstream and gaining popularity across all generations and levels of society. Half of the MySpace US users are already 35 or older, according to comScore Media Metrix's analysis of U.S. Internet traffic. The 35–54 age group at MySpace grew to 41% in August 2006, from 32% a year earlier [18].

A lot of data about users and their interaction are public. A good example of this kind of data is 'profiles'. Most (but not all) systems request would be members, on joining the social network, to provide a set of personal details, which make up their "profiles". These data are generally visible to other members. Members' profiles can complement data gathered from other variables available through OSNs, such as date of discussion, list of friends or even simple tags.

We believe that the abovementioned characteristics of OSNs, namely:

- their large membership,
- the huge range of thematic topics,
- their demographic structure,
- the new modalities of large scale interaction,
- the free access to (some) public data about users and their behaviourmake them worth considering for the purpose of foresight studies [19].

OSNs can be regarded as (large) ensembles of (more or less) trusted people with specific profiles, personalities and knowledge who wish to share insights voluntarily. Starting from the assumption that it is possible to say the same for most foresight activities, the question arises of whether and how OSNs can contribute to exploring possible futures. The relevance of social networks to foresight has recently been alluded to by Gartner Consulting [20]. Gartner listed social network analysis as one of the prime candidate technologies expected to have an extraordinary impact on businesses in the next decade. Outside the business domain, it is reported that the US National Security Agency also monitors and data-mines OSNs [21].

For this purpose, we choose to examine OSNs and related online services in the perspective of the triangular classification proposed by Georghiou [2], see Section 1:

1. OSNs as tools to promote individual and collective creativity.
2. OSNs as expert tools to detect emerging changes in social behaviour. The exchange of thoughts and opinions among participants in forums offers a formidable source of information and knowledge.

3. OSNs as tools for aligning individual thinking and fostering collective or "collaborative" intelligence that could be employed for foresight purposes.

These three directions are discussed in the following three sections, where the theoretical foundations are complemented with some case studies.

3. OSNs to foster creativity

3.1. Background: novel communication tools for enhancing creativity

Traditional mass communication, such as (online or paper) newspapers, radios or television channels are channels of information, where communication is a one-way process. Although the Internet enables newspapers to include some multimedia ingredients (e.g., audio, graphics, animation, videos and interactive tools) to the traditional text, it still remains a top-down information medium with little relevance for two-way communication. Real-time communication is traditionally performed by phoning or video conferencing. The disadvantage, however, is that participants need to do it in real time and the number of people that can participate in such communications is limited. Recent ICT-enabled OSNs give new sense to large-scale communication. As Sack [22] argues, digital large-scale conversations have common characteristics, in that they are large, network-based and public. For the first time in media history, they enable and support many-to-many communication. In addition, OSNs expand the concept of community by allowing people from different corners of the world to communicate and reciprocate in real-time at an affordable cost through the use of multimodal channels, including text and audio-visual material.

Collective creativity flourishes when individuals actively interchange thoughts and expressions. Originally, when no communication tools were available, such a creative environment could only happen in a close physical environment (or with a considerable time delay, as with an exchange of letters). Later, telephones allowed real-time exchanges even over long distances. These two-way communication channels, including teleconferencing, are generally good tools for pairs of people or small groups, but they tend to be inefficient for large-scale operations. Then, the emergence of the Internet and the availability of appropriate software for social networking allowed the expansion of the interaction experience to larger communities. The inherent characteristics of new media systems, such as interactivity, and the way users have appropriated new technologies have enabled new social processes to take place. The creative use of these systems has extended innovative developments into new creative realms, where communication was not previously possible. Prime examples of such creative innovations, in terms of both technology and use, are podcasting, YouTube and MySpace.

3.2. Application

OSNs offer new opportunities for people to express their creativity, make it available to a large audience and get feedback and recognition. Recognition can be at both an individual level, as in the case of YouTube Video Awards, or at a collective level, where the ensemble of the community effort is recognised, as in Wikipedia (see Section 5.2.2). Similar mechanisms were also available prior to OSNs. What is new, however, is the way creativity takes place and the communities in which this occurs. Prior to YouTube-like OSNs, very few people communicated and shared audio-visual material. The generation and dissemination of multi-media were controlled by a restricted number of companies, most of them large multinationals.

Through their new functionalities, OSNs enable millions of individuals to participate in online content creation and express and diffuse their creativity in an unprecedented manner, from sharing bookmarked webpages on del.icio.us,[5] publishing photos on Flickr,[6] to sharing videos on YouTube[7] and MySpace.[8] Further interaction takes place by voting, discussing, and providing additional audio-visual materials that contrast or complement. With regard to foresight, these new tools become interesting whenever this creativity is used to generate plausible new assumptions about the future and thus enlarging the scope of possible futures. It is not unrealistic to believe that among millions of OSN members, there are large numbers of people who will emulate virtual scenarios in video format, share their science fiction thoughts, and discuss possible scenarios after a certain event (e.g., a military invasion), etc. Today's multimedia tools probably make it easier to be imaginative than it was in the times of Jules Verne or H.G. Wells.

In the following sections, Podcasting (Section 3.2.1), YouTube and MySpace (Section 3.2.2) and 'Fakesters' (Section 3.2.3) are presented as examples of how OSNs can foster creativity.

3.2.1. Case study: Podcasting

Podcasting refers to the distribution of multimedia files over the Internet, for playback on mobile devices and personal computers. It was conceptualised in 2000, and is now used massively in our digital society. The term is a contraction of 'iPod' and 'broadcasting' and like 'radio', podcasting (sometimes also called simply podcast) can mean both the content and the method of delivery. The popularity of Podcasting has led the editors of the New Oxford American Dictionary to declare it the 'Word of the Year' in 2005 defining the term as "a digital recording of a radio broadcast or similar programme, made available on the Internet for downloading to a personal audio player" [23]. In fact, podcasting's initial attractiveness relied upon individuals having a tool to distribute their own 'radio'. Shortly after, however, podcasting became popular in other domains, including distribution of academic material, audio tours of museums, conference/meeting updates, or public safety messages by official bodies.

3.2.2. Case study: YouTube and MySpace

The use of OSNs to share new creative material by amateur artists has prompted innovative ways of recognition (through a user voting system) and new forms of fame. A number of start-ups go even further by providing free software tools that let anyone mix video clips online and, in some cases, make movies even if they do not have content of their own [24].

Founded in February 2005, YouTube is an online service dedicated to the uploading, viewing and sharing of video clips. Videos can be rated and the best rated are ranked. YouTube is currently one (end of 2006 to beginning of 2007) of the fastest growing websites on the World Wide Web. According to a survey in July 2006, 100 million clips are viewed daily on YouTube, with an additional 65,000 new videos uploaded per 24 h.[9] As profiling is not one of YouTube's priorities, we consider it belongs to the second strand (see Fig. 2).

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[5] http://del.icio.us/.
[6] http://www.flickr.com/.
[7] http://www.youtube.com/.
[8] http://www.myspace.com/.
[9] http://en.wikipedia.org/wiki/Youtube.

Founded in July 2003 MySpace has about 130 millions members (see Table 1) and is currently the largest OSN. One of the reasons for its popularity is the way it functions as a public stage by offering possibilities to independent artists such as musicians, photographers and digital filmmakers to promote themselves and their work. In this respect, MySpace and YouTube share similar functions.

3.2.3. Case study: 'fakesters'

It is noteworthy that the facility to create one's own profile has encouraged many users to create 'fake' profiles. On MySpace, for instance, not all members are people. Pepsi, NASCAR and Burger King have their own profiles and their virtual space. Fake profiles are commonly known as 'fakesters', a contraction of the term 'fake' and the OSN 'Friendster'. This refers to a type of account pertaining to bands, movies, celebrities etc. These creative accounts, though they may seem irrelevant on the surface, are indeed extremely significant, as they have enabled networking between friends and connected new people with similar interests through an intermediary [25], in a way not unlike communities of interest. Initially, Friendster opted to discourage the creation of fake accounts (e.g., accounts for pets) and at one point deleted more than 200,000 accounts, many of which were pet accounts. However, when Friendster realised the significance and value of these accounts, and the popularity of such accounts on other OSNs, it created the official OSN Fakesters [26].

4. OSNs to detect emerging changes in social behaviour

4.1. Background

Within the frame of foresight, extrapolating publicly available information might enable the study of online social interaction on a massive scale.[10] This can be thought of as a modernisation of the traditional approach of "environmental scanning" [4] using sophisticated IT tools which can combine, analyse and data-mine a range of OSNs. Thus useful information could be extracted from (previously) uncorrelated sources. For instance, contributions within a forum can, if available, be related to the contributor's profile or to his/her contribution to others forums. An interpolation of such profile data can provide additional insights about online behaviour. As in the physical world, the value of profiling in the virtual world is also related to the level of detail and veracity of the subject. A difference is, however, that there is a wider range of options for profiles in some OSNs.[11]

The use of OSNs to detect social changes has already been explored by Adamic et al. [27]. Although small, the student community OSN at Stanford University, called 'Club Nexus', is one example of how such an analysis could be carried out and what information could be extracted. Adamic et al. [25] have

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[10] There are some possible privacy issues at stake when performing such investigation. In such studies, member names should be replaced by anonymous identifying numbers and the results should be aggregated so as to ensure anonymity and protect privacy.

[11] In the 6 months between October 2006 and February 2007, the European Patent office has awarded at least four patents to Google of IPR related to the profiling of OSN members or the combination of their use with location based systems (see European Patent 1751997 of 2007-02-14, EP1730690 of 2006-12-13, EP1716533 of 2006-11-02 and WO2006104706 of 2006-10-05). Last month, Google filed another patent in US and Europe to be able to compile psychological profiles of online game users.

found correlations between Nexus members' real lives – their personalities, tastes, hobbies, academic majors and their genders – and their online profiles.

As in other forums, the level and quality of discussions in social networks are highly dependent upon the expertise and contributions of the discussants. It may be argued that most members are novices, offering poor contributions only. Even if this were the case, the membership is so big that there are significant numbers of members who are knowledgeable on the issues under discussion. It can be argued that the number of poor contributions does not affect the quality of the networks — the important thing is the selection process to extracting constructive contributions. The fact that many contributors do so voluntarily could perhaps be taken as an indication that such users are either knowledgeable or highly interested in the topic under discussion. Irrespective of the profile of the participant, individual contributions are generally contested, which generates a dynamic debate, as in the case with Wikipedia (see also Section 5.2.1). The more dynamic the community, the more likely it is to attract new members. This way, a huge amount of historical information and communication is already stored in publicly available OSN archives. These archives represent an under-exploited resource which could be used for foresight. Emerging (particularly social) trends could be detected on the basis of data provided in the multitude of discussion topics.

Although the links between data might not be straightforward, weak signals of emerging trends, for instance of social behaviour, could be detected by analysing the archives systematically and looking for changes. Artificial environments, such as Second Life also provide potential data to detect weak signals of social behaviour and how such behaviour emerges. For instance, observation of how avatars behave in a fast growing economy with little control could, if measured rigorously, provide insights for foresight exercises.

In view of the large number of OSNs and their rapid development, one important issue is how to screen networks for emerging trends. Intuitive selection criteria include the size and level of activity of the forums and the area of activity. Another issue is how to ensure that results are statistically significant and provide a non-biased representation of the online population. In view of the specificity, this needs to be discussed case by case.

4.2. Application

Detecting weak signals of changes in social behaviour requires effective and thorough information gathering, and a solid methodology for its analysis. As mentioned in the previous section, the analysis cannot be a one-size-fits-all one but needs to be adapted to the specific research question under investigation.

Adaptive gathering of unstructured information for effective analysis is a difficult task. Unfortunately there is no public search engine equivalent for automated gathering, querying, retrieving, matching and displaying of information across OSNs, even though it is possible that something similar might emerge in the future. A fraction of these querying and matching tasks will probably remain 'manual' and – in view of how time consuming it is to collect useful information – a previous screening of suitable sources may be unavoidable.

In the next sections, we present three preliminary examples of how such investigations of behavioural trends may be carried out. First we address the changes in communication behaviour observed through 'Google Trends' or 'Google Zeitgeist' (Section 4.2.1), then the use of tags as indicators of environmental issues through 'del.icio.us' and YouTube (Section 4.2.2), the way people

see their future through 43things.com (Section 4.2.3) and, finally, social activism through Care2 (Section 4.2.4).

The aim is not to seek scientific completeness in each case study, but to simply sketch how information retrieved or compiled through OSNs or similar online services may be employed to detect and monitor changes in social behaviour.

4.2.1. Case study: changes in communication behaviour observed through 'Google Trends' and 'Google Zeitgeist'

Although they are not OSNs in the sense discussed in Section 2 (see also Fig. 2), 'Google Trends',[12] 'Google Zeitgeist'[13] and Internet traffic measurements, like the ranking offered by the company Alexia,[14] are valuable online services for detecting and observing changes in search behaviour. 'Google Trends' presents the volumes of search queries of specific keywords over time and, where possible, relates the ups and downs in the curve with specific news articles (see Fig. 3). 'Google Zeitgeist' collects the most frequent search queries on the web and presents a hit-list of keywords by time periods (weekly, monthly and yearly), by topic and by country. If Internet queries can also be regarded as an indicator in the search to address user needs, concerns and topics, then this hit-list reflects the state-of-the-art for a given date and country. (It may be assumed that, for established inquiries, users tend to access the URL directly, while for new topics and inquiries, search engines are more often used as an entry point to find relevant links). Based upon this assumption, the top ranking keywords in the Google Zeitgeist lists could be regarded as an indicator of the "temperature of hot topics" over time among online users, and a selection by countries may offer information about cultural differences.

As previously detailed (Section 3.2.1), podcasting has emerged as a novel means of individual expression. The emergence of the 'podcast' phenomenon and its rate of use can be (or could have been) detected by monitoring the frequency of relevant keywords in relevant OSNs at periodic time intervals. In addition, querying these keywords, like 'podcast', 'podcasting', 'mp3', 'iPod', over predefined time periods in 'Google Trends' and 'Google Zeitgeist' provides a better understanding of the phenomena.

Another example of changing social habits that can be monitored by OSN search statistics is the search for reference material. Traditionally, people made use of printed encyclopaedias, which were sold by well-known publishing houses. The definition and explanation of the entries in the encyclopaedias were chosen and provided by acknowledged experts in the field. In the digital era, most publishing houses adapted and offered an (sometimes reduced) online service. However, content generation was still carried out by trusted experts. Things have changed. In the past, people relied on the definition and explanation of experts alone, whereas today people trust and rely on collaborative intelligence, which in principle arises from unvalidated expertise. Wikipedia (see Section 5.2.1) is a prime example of a collective intelligence tool. Notwithstanding, controversies about the quality of information, Wikipedia has become one of the most popular sources for information online [28]. The purpose here is not to investigate why Wikipedia has become so popular or to compare traditional and online encyclopaedias, but rather to highlight the fact that changing social patterns of use were already visible at the very early stages. Wikipedia's success is a clear sign of a shift in trust patterns. While, some years ago people would only trust reputable encyclopaedias written by experts acknowledged in their respective fields, now people are also confident

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[12] http://www.google.com/trends.
[13] http://www.google.com/press/zeitgeist.html.
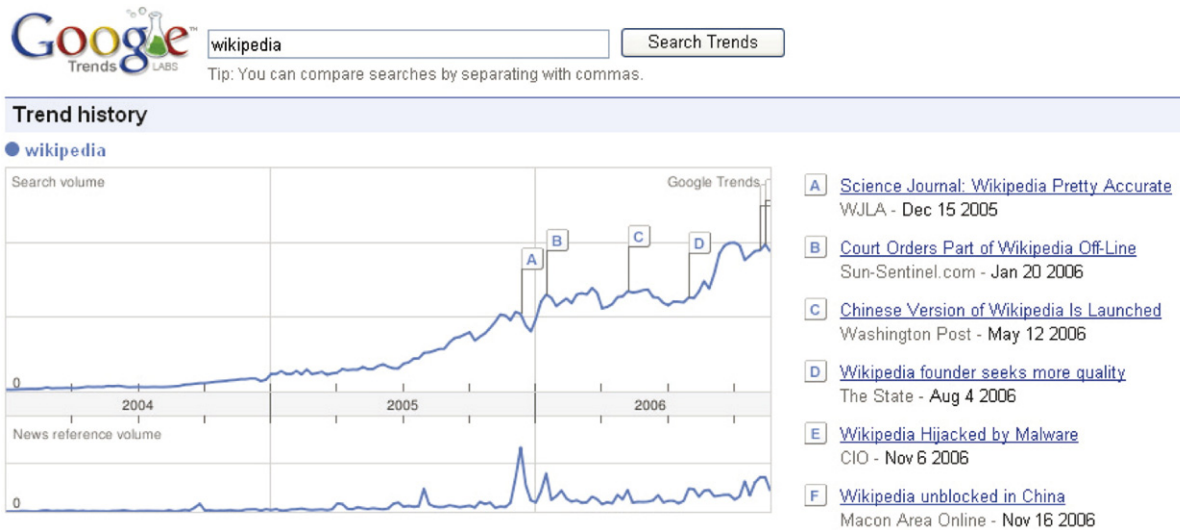[14] http://www.alexa.com/.

Fig. 3. Trend history for 'Wikipedia' using Google Trends (as of 20 February 2007).

in the collaborative work of anonymous contributors. From a foresight point of view, this effect can be (and could have been) detected in the early phases by monitoring the statistics of Google Trends, Google Zeitgeist or Alexia among others.

4.2.2. Case study: environmental issues observed through tagging

Tags could be a useful means to eliciting signals of changes in social behaviour in foresight studies. Tags are keywords selected by users to label digital objects in the network. Whenever a user considers a webpage, photo, article or video clip to be particularly useful or interesting, he or she bookmarks it, and then possibly tags it (adding a label), groups similar links or adds notes. This allows users to share their tags, search for specific items using keywords and network with people sharing similar interests.

The possibility to tag items on the web and to share the tags among members of a network has initiated a new practice of communication, sometimes referred to as 'social tagging'. Social tagging on OSNs seems to be evolving into a novel data acquisition method, similar to and – in the future – will be used in conjunction with search engines such as Google or Yahoo. Indeed, it is possible to become aware of interesting information through browsing the bookmarks of other users who have created similar tags.

Many OSNs offer tagging facilities to facilitate the sharing of digital objects. This is the case of YouTube and Flickr, where users tag their videos and photos with any keywords they choose.

In other systems, this is the core functionality. 'del.icio.us'[15] and 'digg'[16] are multi-user social bookmark managers, offering users the facility to add bookmarks to the webpages they browse. This catalogue of links can be accessed from any web browser and can be queried by date, or keywords. The networking part comes into play when bookmark catalogues are exchanged with others. One digital object can have several tags attached to it. Inversely, one tag can be assigned to various objects. This generates data about a specific network, through which data could be elicited and compared with other sources. As

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[15] http://del.icio.us.
[16] http://digg.com/.

tags are entirely generated by the user (and not by the system), they constitute a sort of metadata of users' personal selections.

We argue that these bookmark managers may provide an indication of emerging popular topics on the web, which, depending on the context of the OSN, can be used to reach a better understanding of future directions. First, they have a huge number of subscribers and feature both individual and collective behaviour. People can view the lists of links collected by others, and subscribe to the links they find interesting, thus, initiating a viral effect. At the same time, it is, in a way, self-regulating as any user can see the links that others have collected and who else bookmarked a specific site. Second, most of them offer a dynamic list of most popular tags which is based on analysing a specific tag, related tags and associations between tags. As in the previous case (see Section 4.2.1), emerging trends could be observed by monitoring changes of popularity over time. Third, the selection of tags can provide information about online semantic relations. More detailed information about the meaning associated with online tags could possibly be obtained by a systematic analysis of tags, the number and content of out-links.

We illustrate the procedure through the following examples. The tag 'environment' is first assessed for del.icio.us and for YouTube on one particular day — in our example, 3 February 2007.

The three most popular bookmarks tagged as 'environment' in del.icio.us that day were news items in reputable newspapers referring to human intervention in the environment. The first one is an article from the Science correspondent of *The Guardian* on "Scientists offered cash to dispute climate study".[17] The second is an article by the BBC environment correspondent, entitled "*Humans blamed for climate change*"[18] and the third a "*Guide to alternative fuels*" by CNET.[19]

Querying the same tag 'environment' in YouTube offers the following three most popular video clips. The first one is British comedian Ali-G (Sacha Baron Cohen) interviewing Professor Michael Redcliff (Kings College, London) and Professor Jonathan Jones (GM Food Researcher) about recycling and Margaret Wright (Green Party) about global warming. The interview is based on asking them seemingly stupid questions devised to lead them to give some ridiculous answers.[20] The second video shows journalist Rick Mercer interviewing Canada's Environment Minister, Rona Ambrose on a visit to a maple syrup farm. The Minister voices her concern about 'hurting' the trees and some of the other answers she provides hint at her lack of knowledge of her portfolio.[21] The third video shows an interview with Russell Train — the former head of the US Environmental Protection Agency, criticising George W. Bush's Administration in the environmental sector.[22] All three videos criticise, one way or another, decision-makers who have some responsibilities in environmental issues.

These examples show that both OSNs deal with the same topic in completely different ways that reflect their specific culture. While in del.icio.us members aim to share critical information from trusted sources, in YouTube criticisms are usually expressed through irony and 'fun' without necessarily going into the complexity of the issues. Both OSNs, however, are fuelling public outcry over environmental concerns

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[17] Sample, I. (2007), "Scientists offered cash to dispute climate study", The Guardian, Friday February 2, http://www.guardian.co.uk/frontpage/story/0,,2004399,00.html.

[18] Black R. (2007), "*Humans blamed for climate change*," BBC 2 February, http://news.bbc.co.uk/2/hi/science/nature/6321351.stm.

[19] Kanellos, M. (2007), "*Guide to alternative fuels*", CNET News.com, 1 February http://news.com.com/2100-11395_3-6155212.html?part=rss&tag=2547-1_3-0-5&subj=news.

[20] http://www.youtube.com/watch?v=qBro4dANNGU.

[21] http://www.youtube.com/watch?v=qeLi0aUWa00.

[22] http://www.youtube.com/watch?v=WOo_rjrhhHY.

and the responsibilities of the decision-makers.[23] The fact that a member of an OSN voluntarily shares a link about the environment with other members demonstrates his/her interest in these issues. In other words, screening different OSNs gives a good overview of how millions of members feel, in the examples we give here, about the environment and offers the possibility of estimating the 'temperature' of specific issues at specific points in time. Obviously, the above examples do not go deep enough to allow any rigorous conclusions, neither do they show us how to handle obvious drawbacks like bias or manipulative discussions and other social interaction. These are to be obtained through systematic and rigorous research across various OSNs. The change of ranking of popular tags over time would denote an expression of a changing perception of the priority issues.

4.2.3. Case study: 'my personal future' through 43things.com

The OSN '43 Things'[24] provides an interactive social platform, where users can communicate what they would like to do in the near future.[25] The groupings or communities networked through the same tag are indeed another form of classification of users having similar 'goals' or 'future projects', which in themselves are a source of valuable information.

In the context of foresight, meaningful information in relation to the vision (mostly) young people have of their future can be derived from a thorough analysis of the most popular tags on this, or similar, OSNs, in combination with the user profiles.

Accordingly, a thorough analysis of the users of the same 'tag' could provide information about online formal or informal communities involved in specific issues. This way, potential participants in foresight activities or "real-life" actions related to the same issues could be identified.

Potential weak signals for social changes could also be inferred through an analysis of 'tag clouds'. These system-generated data show which tags are the most popular with users of that site. Fig. 4 shows the tag cloud of 43things.com for early February 2007. The major future goals of its users are 'fun', 'travel' and 'health', which is not entirely surprising. More interesting from a foresight perspective, however, is whether new tag clouds emerge and grow. In such cases, signals of social change could be detected.

Other popular objects on OSNs which are often socially categorised through tagging are 'groups' or 'communities of common interest'. The data generated within the framework of a group could also provide insights, as it often takes the shape of a forum debate. Content or comparative analysis of such data could also provide useful signals about emerging behaviour.

4.2.4. Case study: social activism through Care2

An important claim made by foresight practitioners is that they contribute to shaping the future. With this aim in view, they need to understand first what the underlying reasons for people's behaviour are, before investigating options for action. OSNs are therefore of particular significance as they not only discuss and share experiences, but they also try to organise themselves towards actions. Social activism

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[23] This was not necessarily the only possibility. The label 'environment' might have been associated also to more positive aspects like 'pleasant landscape' or 'humane environment', which was not the case.

[24] http://www.43things.com.

[25] The seemingly secrecy behind the funding of 43things.com, led to speculations that its promoter Amazon, the online bookshop, could utilise data gathered from this OSN to further customise their individual marketing (http://en.wikipedia.org/wiki/43things). The CEO of 'Robot Co-op', responsible for 43things.com, admitted that Amazon was indeed the sole investor. However, he assured that Robot Co-op could act independently from Amazon (http://www.robotcoop.com/articles/2005/02/08/on-background).

Fig. 4. Tag Cloud for the OSN '43 Things'.

requires motivations. Internet tools can be utilised by foresight practitioners to gauge what concerns their members, how priorities change and how far priorities translate into facts. One example of an OSN in this domain is Care2.[26]

Care2 is an OSN which aims to put activists from around the world in contact. Its stated mission is "to help people make the world a better place by connecting them with the individuals, organisations and responsible businesses making an impact." In February 2007, Care2 had close to 7 million members (see Table 1) who had each created an online profile by inputting personal information. Within the range of OSNs, Care2 is unique in as much as it requests from its members information about their involvement in activism.

The social interactions in Care2 revolve around group discussions on specific topics. Member interactions include information sharing, discussion and posting petitions. Possible changing social behaviour could be monitored by evaluating the major subject themes of interest. For example, Care2 provides a list called the "most favourite causes", a hit-list of areas to fight for, and another called "what scares us most", comprising the topics of fear and concerns. Both lists are presented in Tables 2 and 3, respectively.

Drawing sound conclusions from priority lists like these requires a careful analysis of the contents and the level of influence of the discussion groups, to contrast the results with alternative sources from different media, and to examine if (and how) subjects are changing over time. A deeper analysis is not the subject of this paper. However, it seems intuitive to assume that some of the many fears may be rooted in human nature of people and be relatively permanent, such as "losing the ones I love". Others, however, infer changing social patterns, such as "being alone" for smaller and fragmented families and single-

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[26] http://www.care2.com/.

Table 2
Top ranking groups "Our favourite causes" in the social network Care2 (as of 1 February 2007)

"Our favourite causes"	Members
Animal welfare	61729
Environment	28786
Human rights	25025
Civil rights	23427
Children welfare	20532
Education	16818
Peace and non-violence	15828
Endangered species	15654
Cancer awareness	13275
Women's rights	13060
Food safety	12420
Adoption/Foster care	11173
Against factory farms	10410

person households. Again others, like "religious extremism," may be a sign of spontaneous reaction to current events. What matters more than the absolute membership levels is whether these grow over time.

Once again, the purpose of this development is not to analyse the reasons for these social patterns, but simply to point out that OSNs can be used in complementary methods for the identification of weak signals of emerging social behaviour.

5. OSNs as tools of and for collaborative intelligence

5.1. Background

Collective and "collaborative" intelligence emerges from the collaboration (and competition) of many individuals, where the resulting intelligence is larger than the sum of individual contributions [29]. It

Table 3
Top ranking groups "what scares us most" in the social network Care2 (as of 1 February 2007)

"What scares us most"	Members
Losing the ones I love	3103
War–cruelty–greed–indifference	2660
Ignorance and evil	1954
Global warming	1654
Cruel people	1784
Abusers	1504
Violent people	1256
Being alone	1254
Religious extremism	1140
Disrespect for others	1117
Current US Administration	1099
George Bush	1098
Criminals that are young and violent	1001

contributes to human consensus decision making (and also in bacteria and other animals), as it reduces individual cognitive bias in order to allow a collective to cooperate on one process. In this sense, OSNs appear promising as a means of generating what George Pór defines as "the capacity of a human community to evolve toward higher order complexity thought, problem-solving and integration through collaboration and innovation" [30]. As illustrated in various examples by D. Tapsott & A.D. Williams, the new low cost collaborative infrastructures (from free Internet telephony to open-source software) have created a new mode of innovation and value creation. This is based on 'peer production', where self-organised masses of individuals and firms collaborate openly to drive innovation and growth [31].

Tools contributing to collective intellectual content are high on research agenda. In fact, the consultancy firm Gartner has identified collective intelligence as one of the technologies with the greatest potential for business over the next 10 years [20]. These applications include technologies such as code and documents, through individuals working together with no centralised authority and it is seen as "a more cost-efficient way of producing content, metadata, software and certain services". These approaches are expected to become mainstream in 5 to 10 years.

As explained in Section 1, one of the main functions of a foresight method is to facilitate the interaction between individuals in order to contribute to the alignment of different perspectives into a coherent and solid collective view. Most foresight methods provide the best results when a group of people in close (physical) contact mutually foster their creativity to generate novel routes of thinking. However, when working with these traditional methods, foresight practitioners have to balance the following trade-offs: on the one hand, methods involving face-to-face encounters between participants allow for efficient interaction and enable in-depth thinking but, on the other hand, the number of participants is limited because, besides logistics and budgetary reasons, the quality of interaction quickly decreases as the number of people increases. Therefore an ongoing trend is to enhance the efficiency of foresight methods through the use of software, like electronic voting by participants from "anywhere" [5] or the online ('real time') Delphi, which enables the participation of more brains in studies [32].

OSNs suffer the trade-off in a different manner. Discussion groups can be very large, but the question is whether the advanced communication modalities can compensate for the lack of face-to-face interaction. In this respect, we believe that OSNs are inherently similar to communities of practice (CoPs). CoPs provide a social space where "individuals are united in action" ([33], p. 5) and the collective knowledge is greater than individual knowledge [34].

OSNs operate on the basis of collective intelligence, Wikipedia being a prime example (see Section 5.2.1). Wikipedia provides space for creative contributions from any users who are willing to contribute. The value of text is based on the fact that it can be contested and edited by different users. Major drawbacks are the lack of visual contact, spontaneous reaction, non-verbal communication and other physical interactions. This reduces the richness of communication and group dynamics and these shortcomings can be only partially compensated for by good online moderation. The question arises whether online networks counter-balance the abovementioned dilemma of trade-offs. Most OSNs operate without a moderator, participants are free to participate and interaction is not limited by time and space boundaries. At the same time, such characteristics facilitate more interactive, versatile and thoroughly thought-through contributions.

We foresee that OSNs – if well managed[27] – could operate as a large-scale method for online brainstorming, a test-bed for future concepts, ideas, assumptions or scenarios. The open structure of OSNs

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[27] OSN run the risk that – similar to real life forums or online discussions – they become free-running with little possibility to steer discussions towards a precise objective.

allows researchers and respondents to interact and participate on an equal level, whether they are experts or novices, as long as they share similar interests and motivation (joining thematic communities). Once foresight-tailored OSNs are in place there may be different levels of operation. They could be used to stimulate the discussion on forward-looking topics and questions.

Another idea is the creation of two (or more) "mirror" communities to brainstorm opposed concepts and compare the results of the discussions. This is, to certain extent, similar to scenario-building exercises, where, at a certain point, breakout groups are created to elaborate on particular scenarios and, in a subsequent step, the ensemble is analysed. An advantage of OSNs is that there is no time constraint. For instance, two OSN communities could be set up, one in favour and the other against American foreign policy. It would then be interesting to observe how each of them evolve in terms of the number, citizenship, demographics and sociology of their members, the topics being discussed, the activity and intensity of the discussions being triggered. From the evolution of the communities, we might be able to deduce the "air du temps" or "Zeitgeist".

Further technological innovations within the OSN spectrum, such as using avatars or three-dimensional animations, anticipate innovative methods of conducting foresight exercises. The ability to brainstorm, discuss and collaborate through a real-time interactive platform already opens up new modes of foresight practice. As Glenn stated "future participatory systems could include global cyber games with millions of participants to create policy" [35].

The exact potential of cyber games within foresight is unclear, but it might be suitable for particular simulations of scenarios for particular research questions. Recent developments in transposing the properties of OSNs to cyber games could provide even more creative possibilities for foresight.

5.2. Application

In this section, we provide three examples of possible use. The first one is Yahoo! Answers which operates as a large-scale online brainstorming tool by asking forward-looking questions and seeking creative responses to them. The second one is Wikipedia, a prime example of a collaborative intelligence tool to construct an online not-for-profit encyclopaedia. The successful Wikipedia experience shows that a multitude of individual contributions, from both professionals and amateurs, can coagulate into a collaborative intelligence target which may also be established for the foresight community. The third one is the three-dimensional (3D) virtual world 'Second Life' (SL) which attempts to give a first feeling of the potentialities of cyber-games and three-dimensional virtual world to build visions of what the future might be.

5.2.1. Case study: Yahoo! Answers

Foresight is thinking about the future (see Section 1). De facto, everybody devotes time to reflecting about the future in a more or less intense and structured way. The inherent characteristics of OSNs – namely, their open participatory nature, their interactive tools and their ability to archive data – provide various possibilities for developing new forms of *brainstorming* methods. A case to be considered in this respect is Yahoo! Answers, even though it cannot be strictly considered as an OSN (see Fig. 2).

Yahoo! Answers[28] is a service, which allows every registered member to ask a question that may be answered by any other member. Once the responses are collected, there is a vote on the best answer, and the provider is publicly acknowledged. This tool could be more intensively used for foresight practitioners, provided enough answers are provided to generate a discussion. The fact that appropriate

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[28] http://answers.yahoo.com.

questions can trigger the intellect of many individuals is shown in the following example. In 2006, Oxford physicist Stephen Hawking asked the question: "How can the human race survive the next hundred years?" He received more than 25,000 answers. The Yahoo! Team made a pre-selection and Professor Hawking selected the best answer.[29] It is interesting to note that not only single individual responses were received but there was also intense discussion about the visions proposed by the participants. It also gave rise to further forward-looking questions. The Yahoo! Answers set-up can be seen as a massive brainstorming on the problems and solutions of mankind in the next century (Fig. 5).

5.2.2. Case study: Wikipedia

Wikipedia is a prime example of the collaborative work of anonymous volunteers on the web. As of March 2007, Wikipedia offers 4.6 million articles in 100 languages, making it the largest encyclopaedia ever assembled. Approximately one-quarter of the contributions come from non-regular editors. About 27,000 users made at least five edits and about 4000 users made more than 100 edits each during the month of December 2005. Most of the edits to Wikipedia are made available immediately on the web, without formal peer review. This openness allows malicious users to write nonsense and vandalism, but Wikipedia's large community has organised itself to detect and correct such errors. If an entry has already undergone abuse, new entries have to be validated before becoming public. Similarly, Wikipedia's maintenance is also run by volunteers, including software developers and administrators.[30]

As an encyclopaedia, Wikipedia has been criticised for its uneven quality and depth of coverage of various topics, and its unreliability, and for being susceptible to vandalism, systemic bias and inconsistencies. A study published in *Nature* [26] claims that a variety of errors in scientific definitions exist in both Wikipedia and the traditional *Encyclopaedia Britannica*. So far, the difference in accuracy in average science entries was not notable, with four inaccuracies in Wikipedia compared to three in the *Encyclopaedia Britannica*, and, overall, the quality of both was similar. It should be added that *Nature's* findings have been contested by the *Encyclopaedia Britannica*, but this is not the place to elaborate further on the quality of respective entries.

More importantly, Wikipedia, as a conceptual collaborative project, marks a major breakthrough. It is a free service which has been able to grow and sustain itself, relying only on voluntary contributions and private donations. It has prompted users to collaborate and discuss information on a global level, which until few years ago could only be contested by few people. The traditional way, where a restricted and limited number of experts defined terms, has been contested by a large pool of interacting citizens.

This experience demonstrates that active contributors, when acting within a well-structured framework, can achieve control over the objective (here content) with minimal infrastructure and monitoring. They are able to cope with diversity, controversy, and inconsistency, in a self-consistent way.

Such non-harmonised contributions are also common in foresight activities and the experiences from Wiki-type communities should be used to create specific online communities on future-related, and other, topics.

5.2.3. Outlook for the future: Second Life

Second Life (SL) presents a three-dimensional (3D) virtual world, also called "massively multiplayer online role-playing games" (MMORPG), which is developed and owned by its users, referred to as

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[29] http://answers.yahoo.com/question/index;_ylt=AgtdbbYPd.sCb90XYs4WEogjzKIX?qid=20060704195516AAnrdOD. Hawking's question and the responses are listed under the heading "other — social science".
[30] As indicated in the 'about-section' of Wikipedia http://en.wikipedia.org/wiki/Wikipedia:About.
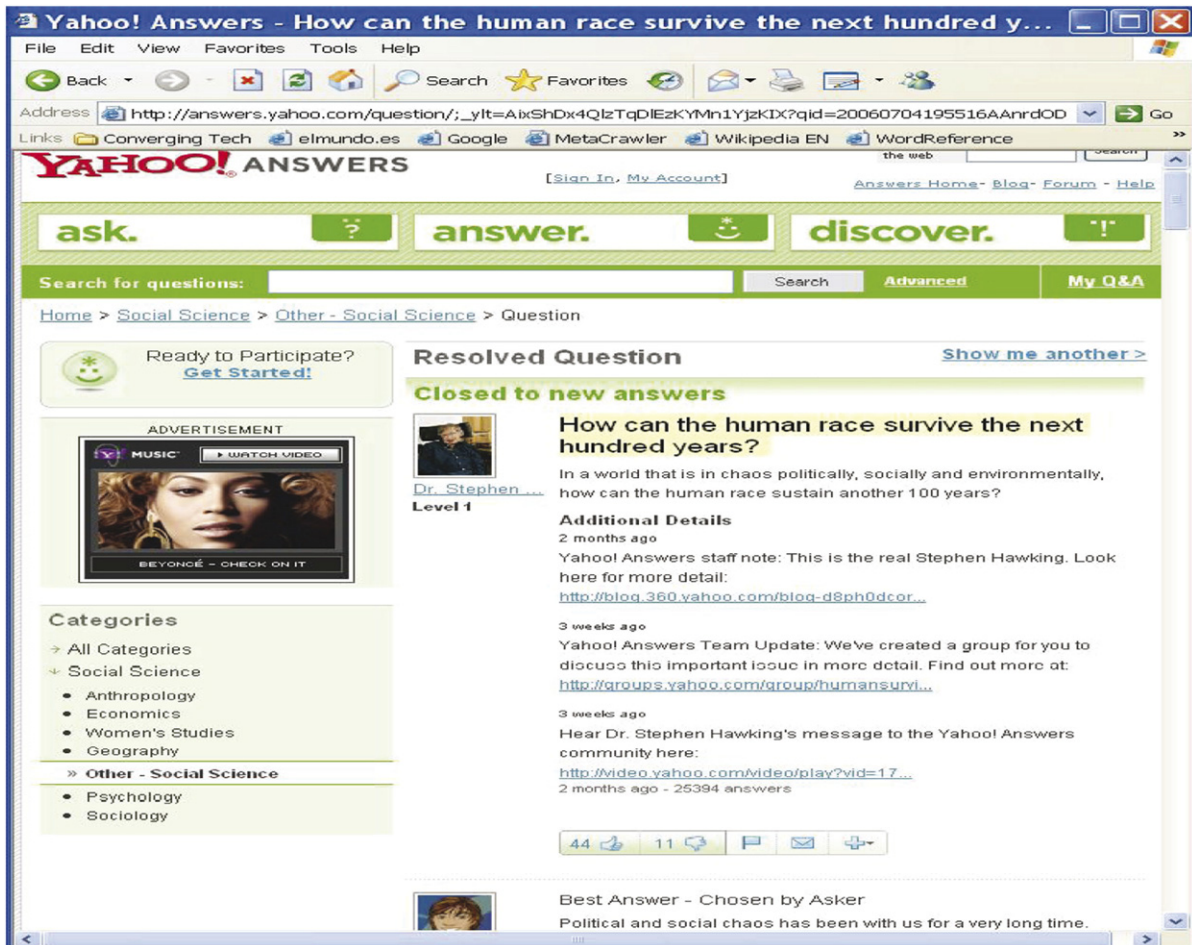
Fig. 5. Yahoo! Answers' front page with Stephen Hawking's question: "How can the human race survive the next hundred years?"

'residents'. SL has around 100,000 active users (February 2007) who interact together online. The inhabitants of SL emulate online real life activities such as attending classes, setting up businesses, going to parties, forming relationships, creating associations and self-help groups. Unlike 3D games, SL does not have points, winners or gaming strategies, but focuses on the interactive life of its residents. Thus, SL is more like a virtual-world OSN than a cyber game (see Fig. 2). The properties of the virtual space are continuously changing according to the advanced level of social networking taking place between the residents. Notwithstanding the open participatory environment, the monetary variable plays a major role and without it, residents are not able to do much. Some organisations, such as car manufacturers, NGOs or political parties already use SL as a platform for organising, training and developing their activities.

We believe that technological developments in this area, where motional avatars can communicate and interact in a real-time, 3D, self-created, *quasi* science fiction world could be of significant use for foresight practitioners. For the first time, these innovative tools would allow foresight practitioners to

make use of real-time interaction, 3D environments and motional avatars. Through these variables, entirely fictitious future scenarios could be simulated, which can be virtually co-habited by the residents under research. These virtual spaces could also act as test-beds to observe potential consequences of contemplated policies.

Prospective modes of foresight practice could be developed and combined based on data derived from 3D real-time interactive environments, forums and events organised within the same *futuristic* environments.

6. Conclusions and remarks

In this paper, the authors suggest that OSNs could be used as a source of information and as a complementary method to conduct futures studies or foresight in particular cases. Foresight has already successfully integrated diverse methodologies and will continue to be open to new possibilities in the future. As the phenomenon and the usage of OSNs are relatively unexplored for foresight purposes, the objective of this paper is to initiate a debate about their potential and limitations, rather than to present firm conclusions.

We are aware that the proportion of the population involved in OSN today is still a marginal number in absolute terms, but – due to the rapid increase in popularity – we consider that this will soon change and the time is ripe to discuss how foresight can make best use of this phenomenon. In our view, OSN can contribute to foresight in three ways.

First, OSNs are tools to enhance creativity through the unprecedented modalities of communication and interaction on a large scale. The possibility of sharing multi-media material produced by their members is already a trigger for disseminating creative works by individuals and, in certain cases, getting it recognised worldwide. In the future, we expect that even more IT-enhanced tools, such as participant-enabled avatars in three-dimensional environments like the ones in SL, could be used – for instance – for creating foresight scenarios in a virtual world. At the moment, these tools are not yet suitable for the settings of traditional scenario-building exercises, but they may be in the future and they could offer the possibility of carrying out large-scale simulations, with many profiles at a reasonable cost.

Second, OSNs share some features with expert systems which would allow the detection and monitoring of emerging changes in social behaviour by analysing recorded exchange of thoughts and opinions among participants. The value of information may – in principle – be amplified by evaluating it in conjunction with other OSN information, such as member profiles, behavioural patterns or lists of contacts or friends. How far this is applicable in practice is unclear. For instance, participant profiles may not always be reliable and targeted to transmit idealised or fake images of their owners.

Anyhow, the changes in communication patterns and the increasing trust within collective communities presented in the text are *per se* examples of emerging social trends that can be detected by OSNs. As similar approaches are already being used in market research for commercial purposes, we are hopeful that some of these experiences may have relevance for foresight.

Third, we propose that OSNs be considered as a means of aligning individual thinking and fostering collective and collaborative intelligence. These are important goals for foresight exercises. The Wiki experience shows that dispersed and inhomogeneous groups can operate and produce excellent results. They do this by auto-regulation of internal thematic controversies with a minimum of operational management. We think that – if a similar suitable framework can be established – OSNs may also provide a meeting point for foresight practitioners and interested individuals. However, designing and running such a tool may not be straightforward. In traditional foresight settings, the coordinator has a reasonable

influence and can steer the discussion towards a given objective. In a less structured and non-hierarchical setting, like OSNs, the role of the coordinator is far less influential. The risk is that discussions may drift away without leading to useable results.

A tested research framework, which could be used as an analytical tool to conduct foresight, is desirable. In this respect, various research methods and alternative approaches should be taken into consideration to get the best possible results. This includes approaches to extracting relevant information, the creation of specific foresight forums, and best practices on how to operate these. One example of a practicality that should be dealt with is the fact that foresight activities are generally defined in time (they have both a starting and an ending), while OSNs have open-ended character, with people sometimes responding with a long time delay. This is not a problem *per se* but poses constraints in setting the boundaries of the research framework. Another question of practice is how far the use of OSNs may infringe the privacy of their members. Although information on the web is voluntarily provided and publicly accessible, there might be ethical concerns about monitoring people's behaviour without their consent (e.g., participants may not want to be part of a research project). Another difficulty is that archived OSN information is largely unstructured; the underlying data are non-codified and difficult to extract. In addition, textual data may be incoherent, contradictory or incomplete, making automatic screening of information unviable.

Using OSNs for foresight purposes may not be easy, but we are confident that its potential makes it worth the effort.

Acknowledgements

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