Online Social Networks & Social Network Services: A Technical Survey

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Abstract—Online social networks (OSNs), such as facebook, myspace, and linkein, changed internet from a web of contents into a web of people – so called "social web". Although people enjoyed their great facilities for connecting friends or business associates, what OSN actually means still left to be a question: as a phenomenon emerges spontaneously, they share common features with conventional web sites. Therefore, it may not be easy to draw a solid boundary between them. On the other hand, various new services based on OSNs exploded on the internet such as twitter and digg. Considering the diversity of OSNs, a survey on their classification should be meaningful. By comparing OSNs with related concepts in other fields, our paper provides a taxonomy for the insight of what are OSNs (and what are not) and how to classify them. We also circumscribe social network services (SNSs) and how they congregated into various online social network platforms (OSNPs). Since OSN is a rapidly evolving research area, this survey also addresses its notable challenges, technical issues, and future research agenda. To demonstrate, our survey lists and compares existing live OSNPs and under-research prototypes. Finally, related concepts about OSN's counterparts are discussed and a conclusion is given.

Index Terms—Social network, social media, social network service, web 2.0, human factor, information system.

I. INTRODUCTION

Online social networks (OSNs) are taking off recent years. They increased to hundreds of Web sites with billions of users at an unprecedented speed. After becoming a mainstream media in industry and public, government and entrepreneurs recognized the value of OSNs and put efforts to capitalize on them. On the other hand social networks also appears in public discourse. One significant example is social network analysis [32], [44], [15] which became a popular topic and a key technology for broad fields including Information Technology.

Although our main object is to survey OSNs in the sense of technical aspects, when trying to explain OSNs in technical terms, we acknowledge that the problem can never by only technology-driven. Its social nature decides this topic must be a hybrid product of social sciences as well as technologies. We also keep in mind that an even more complex question, why online social networks are acting this way not another, is greatly rely on business and social concerns rather than technologies. Those concerns include: how to build an ecosystem to mirror the real world, how effective collective intelligence [35], how to communicate in positive ways such as learning organization and culture of sharing. Although we

do not suppose to cover them in the survey, we bear in mind that they are ultimate stimulation of researches on OSNs. In Section II an overview of OSN's related social concepts will be given. And in Section VI the highlight differences from OSNs, the fundamental theory of social networking in the team of sociology will be explicated.

To avoid confusion, the survey begin by orienting the reader with background to construct a taxonomy of OSNs by comparing similar counterparts. Our survey firstly trys to answer the question – what are OSNs. To achieve this, in Section II and Section IV, we proposal a taxonomy and retrospectively compare the OSN with other online communites and even pre-internet social networking communities. The main work of our survey are Sections III, IV, and V in which we explicit several key questions:

- What are OSNs compare to conventional online services?
- What different forms of infrastructure and application services on OSNs are available?
- Who are the main players in OSNs and what are they doing?
- What are current developing trends and how successful will they be?
- What new services and technologies of OSNs expected to appear in the future?

In Section V, our discusses cover important research topics in OSNs. This part of survey overviews technical researches from various interests as well as hurdlers: distributed structure, portable information, privacy, security, etc. However, as we will present, how to effectively and positively communicate, share knowledge and collaborate on ONSs still haunts re-searches and the problem per se is beyond the scope of information technology. A case in point was in OSNs, users didn't interest extend networks of friends mostly due to non-technical reasons. Therefore, this survey also reviews some cross-boundary researches such as semantic web and user experience. To contrast and compare, we point out some emerging obstacles of today's OSNs such as tiers in current OSNs are presented with little to no background information. To compensate, in Section V we proposal emerging oppor-tunities: some ideas about the future research agenda. After predicting what OSNs should be, finally our survey makes a conclusion in Section VII.

II. BACKGROUND

Considering years to reach 50 millions users: Radio, 38 years; TV, 13 years; Internet, 4 years; iPod, 3 years. Facebook added 100 million users in less than nine months[1], OSNs enter our life and changed ourselves as a revolutionary. On the other hand, we changed OSNs as well, from its early form which simple provides identify and relationship services to hundreds of services which associate various application with personal data. Social network services (SNSs) gain their popularity and serve more and more granular target markets such like medication, science, education, etc.

Similar clustering effects have been found in many acti-tiviess such as members of an audience or social systems (family ties, school ties, friendships, etc.), biological organisms, the brain (neural interconnections), and especially the Internet. In fact there have been a series of studies of the structure and topology of Internet-based networks including the www, Email, instant messaging, virus/worm propagation, and P2P networks. Before this work identifying and quantifying the Social networking features of the Internet. However, despite there are extensive amount of works on researches of either online communities or off-line social network, they generally not applicable in the context OSNs.

To make things even worse, regarding to the meaning of social network, sociology and computer science lost in translation. In this section, our survey will reflect the develop of OSNs in the past and then explicit the definition of OSNs in application and platform levels.

A. History

Generally speaking, in information technology OSNs is basically a type of web sites who provide social identify and social relationship services: who are you, who do you connect with. To broaden our conceptual view, social network, the concept of social phenomena per se, emerged before internet. Retrospectively the first virtual community without propinquity which we prefer to be called "off line social network", appeared in 17th century: the royal society of London formed a community through letter exchanging. Since then, various virtual communities became less and less geographically binding and more and more based on common interests and activities [16]. Moreover, social networking[2] or relationship initiation [7], as a common phenomenon for human beings, in many aspects, originally existed on online virtual communities [46] before the appear of OSNs. For example, dating sites and community sites supported lists of friends. Although most of those web sites help strangers connect based on shared interests or activities – networking with others, it was not until the turn of the last century, the new type of web sites became recognizable, which extents and maintains pre-existing social networks by encouraging users to create profile and affiliate friends. They are called

OSNs or social network sites interchangeably. Since the turn of the last century, some famous OSNs, such as myspace and facebook were growing in popularity and proliferating. And more important, all the trends of human society drive growth of OSNs: internet capacities, hardware and software features, mobile communication, business model of web 2.0, etc. As the result, OSNs did not only hit the mainstream but also became a global phenomenon [7].

B. What is Online Social Network

Today, OSNs are used extensively as public social interactive and collaboration tools. A OSN distinguished itself in structure and behavior patters from other relationship-initialized information systems such as business relationship managemenet system and collaboration software. According to Weyer's definition [51], interaction on OSNs is "an autonomous form of coordination of interactions whose essence is the trust cooperation of autonomous, but interdependent agents who cooperate for a limited time, considering their partners' interests, because they can thus fulfill their individual goals better than through non-coordinated activities". Based on the definition, OSNs have four notable characters:

- No propinquity
- No persistent connection
- Trust based on interdependent
- Autonomous collaboration.

No propinquity means a actor in OSNs has no or little knowledge about the other actor in the other end of tier (Latent or Weak ties [18]). No persistent connection means actors only keep connections temporarily, unlike relationships in the real world which is more stable. Trust based on interdependent and autonomous collaboration tell us the actors on OSNs has no obligation to serve others, the motivation of collaboration from the awareness of interdependent.

Despite we believe the above characters should be representative to most OSNs, we would also point out the diversity of OSNs may fuzzy those characters. Some OSNs actually focus on strong ties such as linkedIn which serve for close communities who share more real world connections. Whereas OSNs vary widely by application, their key technological features are fairly consistent [7]. For example, most OSNs allow people to articulate friends, publicly display connections and their own profiles. Additionally researches in various fields developed their own taxonomies. Therefore, for better internal consistency, it's elastic to set a hard line between OSNs and general social networks. In our paper, OSNs are defined as web-based services that allow individuals to:

- Construct a public or semi-public profile within a bounded system,
- Articulate a list of other users with whom they share a connection,
- View and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site [7],
- Provide users' online presence to describe their current state and activities [6].

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[1]www.socialnomics.net

[2]Social networking is activity initialed [7]. It a type of activity. While social network is an abstract web connecting people by relationships

C. What is Social Network Service

Except structure and behavior patterns, OSNs also distinguish themselves from traditional web sites by providing various SNSs. Generally speaking, there are two types of SNS. The first type is "organic" SNS, which is people-focused and embeds social network features within. For example, Twitter provides Microblogging [21] which has core value of connecting friends and transferring ideas throughout a group of people. The second type is "hybrid" SNS which is content-focused and combines traditional Internet services and social network by integrating social features. For example, Flickr, a Yahoo's photo sharing web site, combines photo repository and social networking features together. The first type aim to maintenance of pre-existing social networks, help connect people based on common language. While the second type cater to diverse audiences.

All the functions of OSNs are delivered by SNSs. Some of them provides fundamental infrastructures which allow other services to build on. We call them infrastructure SNSs. Another category only serve to specific purpose or application. We call them application level services. Despite the SNSs may vary in their forms, but they share the same goal that is to fulfill human's needs (see figure 1). It is human nature that drives us to social connect each other [22].

III. SOCIAL NETWORK SERVICES

In order to survey OSNs, we found a dilemma to present all websites in a uniform classification. This is partly because there are two concepts – social network services and social network platforms (OSNPs). Those two are logically hierarchic as applications and platforms, but normally used interchangeably. For example, despite most of use agree that twitter is an Online Social Network, but twitter may not be a proper name for

a Social Network Service, in this case, "microblogging" is the service name. In the survey, we intend to use OSNPs to describe the web site which hosts SNSs. To further clarify concepts of OSN, this section will focus on SNSs and the next section will talk about OSNPs.

In our paper, the term, SNSs, means internet services provided by OSNs to *end users*. Similar to other information systems, an OSN congregates a set of services such as email, instant message, and multimedia sharing, etc. However, compared to traditional online services, The services provided by OSN are more user-driven: giving more social context of users, SNS usually means an individual-centered service compared with traditional online community in which services are content-centered or group-centered [40]. Moreover, as we discussed in Section II, SNSs may be "hybrid" products of traditional services. For above reasons, we start by grouping SNSs according to their purposes. Then, we propose a tree map to explicit an taxonomy. We go on to survey specific examples of SNSs according to their classifications (see figure 3) .

Broadly speaking SNSs can be classified into infrastructure services and application services(see Figure 2). Among them, infrastructure services provide most basic and essential information about a social actor's identity, personal information and his/her relationship connections.

- *Social profile*: Social actors' personal information of characteristics such as name, gender, age, etc
- *Social identification*: The unique proof or evidence of identity which is usable to other SNSs
- *Social graph*: A relationship graph mapping of actors' friends and how they're related

Supported by infrastructure services, OSNs provide various applications to facilitate social interactions and impress other people by social presence [5]. The term, 'Social presence', was derived from social present theory [45]. It is originally used to present awareness of the other person in a communication interaction. The interactive is effective if only social presence provides meaningful indication of one person [13]. Thus, application level services can be classified according to their

	Expressing Identity	Status & Self-esteem	Giving & Getting help	Affiliation and Belonging	Sense of community
Blogs	✓	✓	✓		
Video, content sharing, tagging sites (e.g. YouTube, deli.ciou.us)	✓				
Self-forming groups (e.g., Yahoo or Google Groups)				✓	✓
Profile-driven social networks (e.g., MySpace, LinkedIn, Facebook)	✓	✓		✓	
Rating, review sites (e.g., epinions, TripAdvisor)		✓	✓		
Purpose-driven social networks (e.g., SparkPeople, Slashdot, Serma, Communispace)	✓	✓	✓	✓	✓

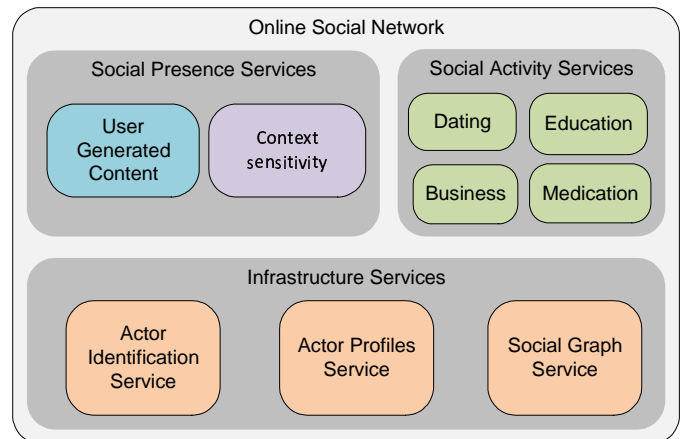Fig. 1.   Human needs vs. social network services

Fig. 2.   Classification of social network services and

purposes:

- *Social interaction*: The services which include online communication of any sort, such as comment, instant message, feedback.
- *Social presence*: Personal stamps created by users for others to indicate their state, log of activities, performance.

The social interaction SNSs are customized by each domain and most of them have no common features. Therefore our survey will put most efforts on discuss services of infrastructure and social presence. In the next section, we will overview each SNSs one by one.

A. Identification and Profile Service

The identity service, as one of core components of OSNs, is critical to users, because it effects others' awareness as well as bolster users' self-esteem, sense of belonging, role, and hierarchy within online communities [47]. Additionally persistent identity is required to build stable connections of friends.

Identities are set of characteristics which separate self from others. Although most OSNs require users to represent themselves authentically [7], most OSNs provides loose identity, for example, in twitter, no identification is required. Loose identity may not reflect users' authentic personality and lead to identity theft or impersonation (see details at Section V. In spite of coarse nature, in most conditions identities of OSN are reliable, because other users can refer signals of profiles and public friend lists to validate them [7]. Moreover, different OSNs may select different strategies to rigid their users. Some of them even encourage users to articulate fake identities or avatars [8].

Fig. 3. Example of social network services

The Profile Service is provided OSNs to present individual's choosing information of identity. It can be updated in specific time and with a particular understanding of audience.

Firstly, the profile service is responsible to create and maintain profiles. For example, Most OSNs ask users to fill out a forms with a series of questions regarding to their personal information which normally include descriptors such as name, sex, age, interests. The profile is generated by answers of those questions. Most OSNs also allow uploading profile photos.

Secondly, the profile service control the visibility of a profile – Profile Closure. It provides individual's fragmented profile according to audiences' discretion. For example, by default, basic profiles on linkedin and facebook are visible to anyone and even crawled by search engines. Therefore, they are visible publicly regardless of whether or not the audience has a connection with the user. Alternatively, The full profile which include sensitive information, such as marriage status and religious views, are only available to either paid account (linkedin) or connected friends (facebook). Facebook and myspace also allow users to choose whether they want their profile to be public or "Friends only". Facebook implied more complex settings for profile closure, for example, user can grand permission to a certain network [3]. The counteract of profile fragment is studied in [4], [31], [**?**], as a technical challenge, it will be discussed in Section V.

Finally, based on current business model [34], most OSNs' profile services have little or no interoperability with one another. Our paper will discuss this issue in details in Section V.

B. Social Graph Service

Social Graph Service is responsible to build, maintain and retrieve ties based on shared affinities. For SGSs, relationship, reputation, and search are three key components of the SGS: How to explicit connections – not only their connection status but also quantitative describe of how users feel about connections such as ebay's reputation system.

To SGSs, one typical usage scenario is searching and extending connected people who share affinities or complimentary capabilities [23]. For example, Alice and Bob belong to a same OSN and interested in politics. They are familiar with one another and trust each other. Providing Alice have to work on a book that requires illustrations, and is looking for a freelancer art. By searching with SGS, Alice could be able to find Bob is connected to Sara, a student of art school. Alice could then approach Sara about the project by sending a connecting request. Referring trust rate on SGS, Sara know that Jim and Bod trust eath other. Then Sara would confirm Alice's request with no hesitation. Finally they will complete a happy and safe business.

1) Connection component: Considering that a sense of affiliation is not equivalent to a true sense of community, connections in SGSs can be either bi-directional or one-directional [7] to present relationship towards either individuals or groups, such as "became a fan" in facebook. To broaden our view, [9] describes multiple relationship types in online communities.

Contrary to popular believe, those researches distinguishes allies and enemies in types of connections semantically. They argued better social network can be achieved by employing multi-typed connections.

Compared to off-line social networks, People use OSNs mostly to reveal hidden relationships and result in connecting people in their extended social networks[18]. An case scenario: Bob and Alice know each other in daily life. In another word they share some offline connections. Alice has a friend, Ted, who works at BIG company as a HR. All of three have profile in Facebook. Presumably Bob need to find a job. By tracking Alice's friends list on Facebook, Bob will have good chance to get a job from Ted. In this case, Facebook plays a role more than an information media. It also extends and maintains relationships to benefit Bob's social activities – seeking a job in our example.

2) Reputation component: To avoid issue of divergent reputation definition [51], in this paper, we simply define reputation as general opinions towards individuals. There are extensive research on mathematical framework [43], [39], [42], [29] for modeling caculatable reputation and how reputation propagate [17]

Despite inferring reputation in OSNs is theoretically possible, applications to infer affinity and trusted third Parties are limited. This may greatly rooted in structures of ONSs which are not fully compatible with trust metrics. For example, Eigen Trust [24], a variation on the PagRank algorithm [41], provide globally accepted trust rating as reputation. It was originally designed for P2P system without considering limitation of OSNs [33]. Despite lots of metrics try to combine personal trust opinion and global reputation by converge former one into a single measure from the whole group, personal aspects are far more complex to express in quantifiable way than multi-agent systems. Because users themselves bear some responsibility to contribute reputation management, most of them are either technical sufficient or would rather spend dedicate time to do so. A negative example is Orkut[3] used to allow people to express feels about fellow friends through a rating system known as karma points and finally abandoned it due to lack of popularity. Therefore, most live reputation systems of OSNs are based on simple models. Testimonials are most popular method for providing member reputation, for example, the number of succeeded trades on eBay, customers' reviews on Amazon.

3) Search component: Search Search refering social graph will leverage performance [12]. Based on development of Web search techniques [10], Searching information on OSNs obey small world search strategies [48]: using local information about their close contacts [1], for example when users search jobs on linkedin, the result will be ordered by degrees which represent social distances to HRs.

Milgram in his experiment [48] also explicit a greedy algorithm for small world search: i will select its neighbor j who is closer to the target t in terms of social distance Y; that is, $Y_{j,t}$ is minimized over all j in i is web of connections. The problem is developed by Kleinberg [26], one his often cited paper proposed a decentralized search algorithm to solve searching in small world with partial information. Kleinberg also provides theoretical foundation by proving efficient searchability in social networks [27]: a simple algorithm that combines information of network connections and social identities can succeed efficiency search.

Another principal character of searching in OSNs is tagging-based. The content semantically annotated for better understanding and searchability, for example, tag cloud has recently been taken by most OSNs. Our paper will discuss this issue in the semantic web part of Section V.

C. Social Presence Services

Most Social Presence Services on OSNs are created by users to enhance their impression, for example, adding multimedia content, or modifying their page's look and feel. Some OSNs, such as facebook and Orkut, allow users to add modules or applications which publish various contents and interactive with others. All those data describe the nature of individuals' presence in the OSNs. The data also enhance their sense of self-worth and stimulate actors to maintain passive interaction within them.

Apart from interactions with their friends on SNs, actors of OSNs tend to precent them by current state and activities. Therefore, OSNs offer different mechanisms to support social presence such as custom messages,online status, listening musics, watched movies, etc. By assembling all that data, other actors can form an overall impression of his/her presence in the OSNs and even some clue in the real world.

There are two type of mechanisms for Social Presence Services. The first type provide social presence by user generated contents, for example, Bob post a microbloging entry said "I am feeling good". The second type, context sensitivity automatically get social presences from individuals' real world context, such as location and time. An case in point is Google Latitude[4], which allows a user to allow connected people tracking their location. The main different between context sensitivity and other interactions is that the attention paradigm reduced to shorter time periods [5]: Compared to interactions such as a direct chat or e-mail, context sensitivity aware friends with no cost of time. In following paragraphs, we will give detailed explain and examples of both types.

1) User-generated Content: One principal character of OSNs is that most contents are user-generated. User-generated Content (UGC) refers to online media content that are produced by end-users. For example, Wikipedia, an web encyclopedia which has 14 million articles[5], are all written and edited by its users who can be anyone with access to the site. Admittedly, UGC services are not necessarily SNSs. Considering that OSNs rely on contents created by its users who update profiles, communicate with friends, and participate in

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[3]www.orkut.com

[4]www.google.com/latitude/
[5]en.wikipedia.org/wiki/Wikipedia

communities, Integrated UGC services could boost the usage of OSNs through improved user engagement. On the other hand, utilizing OSNs to support online collaboration could improve the quality of UGC [20]. Despite normally UGCs can be created with little or no restriction, but monitor and administration are also necessary to avoid offensive content, copyright issues, etc.

Microblogging is a brief text blogging that allows users to send blog in limited length. It is inspired by Cell Phone SMS. It can also update and public multimedia called micromedia such as photos or audio. Its most distinguish character is a variety of means of submitting: web, text messaging, instant messaging, E-mail, etc. Another character is brief: a single sentence or seconds video. By congregating short entities, a logs of the daily events are presented. Two of typical microbloggin OSNs are Twitter.com and rememberthemilk.com.

Social news is a team refers to web services in which users can submit and vote on news stories. Compared to formal news which is published by media agency, Social news are collected and edited by end users. Two of most popular Social News are Slashdot and Digg. Today even media giants such as CNN start to adapt Social News[6].

Social bookmarking is a service used to share, organize, search, and manage bookmarks of web resources, typically a web page. They merely bookmarks that reference web pages rather than web pages per se. Social bookmark services also encourage users add, modify or remove annotations on web pages. Annotated web pages will also be visible to other users who share similar annotations which indicate their similar interests. Cloud of tags is a team used to describe clusters of tags or bookmarks provided to users dynamically according to their interest. Social bookmarking services also provide feeds for their lists of bookmarks to allow subscribers to become aware of new bookmarks [11]. For example, users of Google Reader [7] can either shares and tags interested web pages or subscribe friends feed. Some extra features such as ratings may be added to Social bookmarking services, for example, some researches in semantic web [25], [50] proposal social bookmarking system embedded more semantic means to refer ontology knowledges in the real world such as hierarchical relationships.

Wiki is a collaborative encyclopedia service that allows any user to contribute content by creation and editing web pages. Wikis may serve different purposes such as learning, collaboration, and knowledge sharing. Wiki can facilitate social processes [14] in the sense of rewarding contribution [19]. Wiki softwares are also in corporate intranets, mostly as knowledge management systems, but in term of online services, wikipedia is the most famous and among one of most typical several examples of Web 2.0 services. Wikipedia reached 3 million english articles in August 2009 and enjoyed the title, the biggest encyclopedia in the world.

2) Context sensitivity: Context sensitivity is a set of SNSs provide services considering sensed information of users. It became popular greatly rely on the rise of mobile social network. Contrary to manually implications of personal and contextual information, mobile devices can automatically get users' information by various sensors such as GPS. With mentions of coupling gathered data automatically, such as time coupled with location, or personal coupled with location, a new services could be created. For example, Location sensitivity can provide localized information according to users' location. An other example is personal coupled with health information [38]

D. Social Interaction Services

Unlike social presence services which is content focused, social interaction services are mainly served for helping other people and carrying activities to increase senses of affiliation, belongs, and community.

1) Multiplayer Online Game: MOGs such as Second Life and World of Warcraft, enact social networking processes by providing an avator to game playes. They can be communicate and live along with other players. Some OSNs also provide light weighted MOGs as part of their services.

2) Reviews and Opinions: Online feedback services mainly provides two functions. First, it publishes review to aware public users by publishing reviews and opinions which effect customers decision to buy a certain product. Second, collection review and options from end users by providing them facilities to writing their own personal views such as satisfactions or dissatisfactions. Combined social network with ROS will allow customers to compare products based on reviews from their own connections.

3) Buy and Sell: Buy and sell services such as micropayment provide a system for members to pay for goods real or virtual. It capable of handling arbitrarily small amounts of money. micropayments have to be suitable for the sale of nontangible goods over the Internet. This imposes requirements on speed and cost of processing of the payments: delivery occurs nearly instantaneously on the Internet, and often in arbitrarily small pieces. On the other hand, OSN can easily get reputation reference to support micropayment.

4) Groups: A group is a loosely couple system of mutually interacting interdependent members. But group is more than just the collection of members, groups can be defined by psychological and temporal boundaries, interact with each other, and task and goals [2]. Most online communities grow slowly at first, due in part to the fact that the strength of motivation for contributing is usually proportional to the size of the community. As the size of the potential audience increases, so does the attraction of writing and contributing. This, coupled with the fact that organizational culture does not change overnight, means creators can expect slow progress at first with a new virtual community. As more people begin to participate, however, the aforementioned motivations will increase, creating a virtuous cycle in which more participation begets more participation.

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[6]CNN iReport, www.ireport.com
[7]reader.google.com

IV. ONLINE SOCIAL NETWORK PLATFORMS

This section introduces and compares several popular OS-NPs. Despite there are many main players on our candidate list, we select platform who are distinguished either in there features or ability to represent its own class. One exceptional may be facebook, with more than 250 million active users and nearly half of them login more than once per day. Despite facebook's popular, the potential of OSNs is still far beyond reach and that greatly rely on its divided types and separated target markets. As we will discussed later, such diversity promises us that OSNs plays or will play in almost every aspect of our life.

Generally, OSNPs attempt to provide various SNSs in one platform to achieve diverse requirements. Namely, we category them as general purpose OSNPs such as myspace and facebook and other OSNPs who serve narrower target market called Niche Communities [7], such as linkedin. Their different business models end up divided structures and technical specifications. The rise of OSNs shift the online community from websites dedicated to interests into websites organized around people. According to social sciences, the Web became a ego-network [30] composed by person or the social actor, friends or social ties, and other people who person knows or social alter. Based on different social network components, the second classification perspective is based on various focus. We proposal this by classified OSNPs into three categories:

Social media is a type of OSNP mainly congregated SNSs which aim to mass communication like other news media. Notably traditional news media such as CNN and BBC relay on broadcast (one to many), whereas social media is more decentralized and rely on dialogues between users (many to many).

Social interaction includes various types of combinations between friends or well known such as linkedin or alumni site, entertainment, or virtual worlds such as Second Life, the Sims Online.

Social networking: OSNs focus on social ties. Most common types are date sits such as eHarmony, business relationship sites such as linkeding. *Networking* emphasizes relationship initiation, often between strangers [7].

Admittedly, above classification is somehow fuzzy and some platform may be hybrid of two or more types. One example is linked in. Despite its main function is seeking job - a social interaction platform, networking HR and former colleagues also played important role. Next, we will present several live OSNPs and further explain our points on common or unique characters of OSNPs.

Linkedin is a business-oriented social networking site. Founded in December 2002 and launched in May 2003,it is mainly used for professional networking and became a powerful business service. As of October 2009, LinkedIn had more than 50 million registered users,spanning more than 200 countries and territories worldwide. LinkedIn controls what a viewer may see based on whether she or he has a paid account. LinkedIn allows users to opt out of displaying their network.

Compared other OSNPs, linkedin's business model is unque. It controls what a viewer may see based on whether she or he has a paid account.

Flickr [36] is an image and video hosting website, web services suite, and an OSN. Flickr provides both private and public image storage. A user uploading an image can set privacy controls that determine who can view the image. A photo can be flagged as either public or private. Private images are visible by default only to the uploader, but they can also be marked as viewable by friends and/or family. Privacy settings also can be decided by adding photographs from a user's photostream to a "group pool". If a group is private all the members of that group can see the photo. If a group is public the photo becomes public as well. Flickr also provides a "contact list" which can be used to control image access for a specific set of users in a way similar to social tier tools of other OSNs.

Facebook is the worlds largest social network, with over 350 million active users and half of them visit the site once per day [8]. It basically provides a platform to share a common interest, idea, task or goal that interact in its users where they are able to develop or maintain personal relationships. Moreover, it also provides applications of various services such like social bookmark and instant message. Like other social networks, the site allows its users to create a profile page and forge online links with friends and acquaintances. Facebook launched API for its platform on 2007, providing a framework for software developers to create applications that interact with core Facebook features. But its API put several restrict to access whole of individual's social graph.

Ning is an OSNP for people to create their own social networks, launched in October 2005. Ning competes with social sites like MySpace and Facebook by appealing to people who want to create their own social networks around specific interests with their own visual design, choice of features and member data.[7] The unique feature of Ning is that anyone can create their own social network for a particular topic or need, catering to specific membership bases. At its launch, Ning offered several simple base websites developed internally and by members of a closed beta.Ning has both free and paid options. When someone creates a social network on Ning, it is free by default and runs ads that Ning controls. If the person creating the social network chooses, they can pay to control the ads (or lack thereof), in exchange for a monthly fee. A few other premium services such as extra storage and bandwidth and non-Ning URLs are also available for additional monthly fees. However, Ning does allow developers to have some source level control of their social networks, enabling them to change features and underlying logic.

Realtravel tries to solve the problem – in a collective knowledge system, the aggregate content must be more useful: create aggregate value by integrating user contributions of unstructured content with structured data. RealTravel attracts people to write about their travels, sharing stories, photos,

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[8]http://www.facebook.com/press/info.php?statistics

etc. Travel researchers get the value of all experiences relevant to their target destinations. RealTravel attracts people to write about their travels, sharing stories, photos, etc. Travel researchers get the value of all experiences relevant to their target destinations.

V. RESEARCH TOPICS AND CHALLENGES

A. Key technologies

Broadly speaking, there are two types of concerns in OSN researches: data access issues and data publication-related issues. In this section we will dicuss following types of research topics as well as challenges:

- Distributed architecture
- Fragmented user identity
- Contextual information associated users and possible abuse
- Identity & trust
- Policies within network and Web of trust (*dilemma: usability vs. privacy)
- Deeper adaptive user experiences

We will also cover some challenges from social aspects: Bridging Online and Offline Social Networks, positive interactive.

Distributed architecture: One key question in architecture of OSNs is whether a decentralized architecture is sustainable, profitable, and usable, and consquently what do we stand to lose if we adopt a decentralized architecture. Considering fragmentation of web capabilities how to avoid overhead in processing information on OSNs. And how would that affect standards definition? What is the minimum set of new functionalities that the future web should incorporate? Finally, how can we allow users who may want to deliberately fragment their online identity to do so?

In contrast to the increasingly sophisticated capabilities of services, the fundamental architecture of the Web has not changed much over the past 10 years. Existing social networks usually employ a 'hub and spoke' model, where the website is the hub of all activity within the network, and where there is a *client* and a *server*. Since all traffic must pass through the hub, that site may become a bottleneck. Furthermore, each transaction must pass up one spoke to the hub, and then down another spoke, when the people interacting may be much closer to each other, in network terms, than either is to the hub site.

Services and applications on OSNs have become quite sophisticated in the features they provide. There is the opportunity to create an architecture that distributes the load. Such an architecture would require better interoperability between OSNs and than we have today, and should remove any dependence on an 'always-on' network connection.

However, the hurdles for distributed OSN are great and some of them are fundemental such as incompatible assemblies, different data access APIs, and entity data model required. Despite difficuts, some prototype of distributed OSNs have developed. The appleseed project is an open source OSN

framework that is based on a distributed model. For instance, a profile on one Appleseed website could 'friend' a profile on another Appleseed website, and the two profiles could interact with each other.

Privacy and trust: For SN, something more important are identity and link rather than content. The Privacy issue on OSN can be classifed into three types: identity disclosure, link disclosure and content disclosure.

When using Web-based social networks to refer trust values, most of the information that sociology considers important is not available (e.g., we do not know the history between people, the users own background and how likely they are to trust in general, the familial/business/friend relationship between users). Thus, we must understand trust from only the available information. Privacy is also implicated in users' ability to control impressions and manage social contexts. Boyd (in press-a) asserted that Facebook's introduction of the "News Feed" feature disrupted students' sense of control, even though data exposed through the feed were previously accessible. Some researches argued that the privacy options offered by OSNs do not provide users with the flexibility they need to handle conflicts with Friends who have different conceptions of privacy; they suggest a framework for privacy in SNSs that they believe would help resolve these conflicts.

A case scenario, Jim's solar energy group is comprised largely of journalists, writers, and theorists, while Bob's group is mostly engineers, mechanics, and sales people in the solar energy business. While Jim's group focuses more on political trends, Bob's group engages in detailed discussions of implementation. A member of Jim's group does an interview with an important solar energy engineer for a small magazine, and decides to make this interview available for free on the Internet. So he sends it to the members of Jim's online group, where it is read and discussed. Given the current state of online community, the chances that member's of Bob's group encounter this interview are completely arbitrary, even though its subject matter relates directly to their interests. But with the ASN in place, because of the trusted relationship between Jim and Bob, the interview would automatically be forwarded from Jim to Bob, and would then automatically be forwarded to interested members of Bob's group. The ASN would facilitate the distribution of media between trusted sources who share affinities (while taking all necessary precautions to protect privacy, and filter out unwanted materials).

Ideneity and profile: Most reseraches in this subject focus on enhancing the user security without compromising the usability. The question left is how to mirror online social network with users' real identity?

To answer this question, we need to dive into the reality first – identity mapping and wall barriers. Since each user has many registrations or accounts, the attention is dispersed. Identity on different OSNs exist as separate, isolated islands of discourse, unable to exchange meaningful information, leverage their accumulated knowledge, or connect with other communities that share their concerns. As the user takes a more active role

in the production of contents and even services, and becomes a 'prosumer', this situation leads to a somehow chaotic scenario where a same user is present in an uncountable number of different platforms, taking best-of-breed for any aspect of social interaction or simply following or joining their friends. This situation creates an increasingly inconvenient and uncomfortable situation where users not only own different accounts, each one with a specific set of credentials, but also an increasing amount of personal information scattered through several sites, each with different data usage policies and privacy protection conditions.

There are also several independent initiatives focusing on how to break the wall by providing persistent identity. They first aprreaed as liberty alliance such as Microsoft's .Net identity system named .Net Passport originally and changed into Live Passport. Microsoft had accumulated for its various services, such as the HotMail can MSN Spaces. But such effort faced significant resistance from other companies and users. There is great concern that online identity might become property of a single corporation. Such centralized control would be a devastating. As the reslut vender-neutral identity services emerged, such as OAuth and OpenID. The both provide an open protocol to allow secure API authorization in a simple and standard method. Similarly, OAuth allows using anonymous tokens instead of usernames and passwords as identity. The granularity of permission can be either site leveal or application level, even a defined duration. OAuth can also grant a third party site access to their information stored with another service provider, without sharing their access permissions or the full extent of their data.

Structured data: According to collective intelligence theory from Doug Engelbar: The grand challenge is to boost the collective IQ of organizations and of society. To achieve this the information on the web have to be structured. Semantic Web is used to define information and services on the web, making them possible for the web to 'understand' and satisfy the requests of people and machines to use the web content. According to Tim Berner-Lee, 'The Semantic Web is not a separate Web but an extension of the current one, in which information is given well-defined meaning, better enabling computers and people to work in cooperation.'

One attampt is FOAF+SSL, it is a machine-readable ontology describing persons, their activities and their relations to other people and objects. Anyone can use FOAF to describe him or herself. FOAF allows groups of people to describe social networks without the need for a centralised database. FOAF is a descriptive vocabulary expressed using the Resource Description Framework (RDF) and the Web Ontology Language (OWL). Computers may use these FOAF profiles to find, for example, all people living in Europe, or to list all people both you and a friend of yours know. This is accomplished by defining relationships between people. Each profile has a unique identifier (such as the person's e-mail addresses, a Jabber ID, or a URI of the homepage or weblog of the person), which is used when defining these relationships.

Other efforts include microformats such as XFN and hCard. It is a web-based approach to semantic markup that seeks to reuse existing XHTML and HTML tags to convey metadata and other attributes. This approach allows information intended for end-users , such as contact information, geographic coordinates, calendar events, and the like) to also be automatically processed by software. Unlike formal semantic web which is more complex, the microfomat is light-weighted and easy to implement in even today's web markup languages, for example, HTML5 adapts serval microformats.

Mobile social network: Mobile social network is a concept combining mobile communication and social network. To illustrate the scale of mobile social networking, the number of unique visitors to the Facebook mobile site increased fivefold from 5 million per month in January 2008 to 25 million in February 2009. The latter figure represents 18 percent of Facebook's 120million users (February 2009), a proportion that has gradually increased over time and which vision gain believes will continue to do so in coming years. Social networks with an established presence on the fixed line Internet are clearly benefitting from extending their services over mobile channels.

One obvious advantage of mobile social network is context sensitivity, which means in terms of places, time and people how to make services more information sensitive. Mobile devices can collect more personal information than normal PC such as locations and contacts. By adding various sensors into mobile device, new type applications can go beyond existing domain. Location-based services (LBSs) are among the most popular ones. A location-based service is an information and entertainment service, accessible with mobile devices through the mobile network and utilizing the ability to make use of the geographical position of the mobile device. It can be used in a variety of contexts, such as health, work, personal life, etc. LBS services include services to identify a location of a person or object, such as discovering the nearest banking cash machine or the whereabouts of a friend or employee. LBS services include parcel tracking and vehicle tracking services. LBS can include mobile commerce when taking the form of coupons or advertising directed at customers based on their current location. They include personalized weather services and even location-based games.

Accessibility and user experience: How to deeper and adaptive user experiences is also important practices of making OSNs useful. Homan factor can be explicted in two level. The general user experience and specially UI guidelines for accessibility. Accessibilty means how the information on the OSNs can be correctly built and maintained, in order to all of these users can be accommodated while not impacting on the usability of the site for non-disabled users. User experiences covers wider context, how to capature and better support social activities, for example, people focus or hobby focus The service is not free groups are self-orgnized system in which global patterns emerge from local action and structure subseqeucent local acton.

The challenge in this research in in mapping quantitative measurements of interactions based on network traffic to qualitative analyses of social relationship. It's easy to know what people are doing in the network and it is harder to know why. Most researces are empirical and their fundemental theories are beyond scope of our survey.

VI. RELATED CONCEPTS

As the increase in popularity of OSNs is on a constant rise. Academic research is emerging from diverse disciplinary and methodological of information system that can take advantage of the users' social and personal data., addresses a range of topics, and builds on a large body of social network research. Broadly speaking, researches on social network can be divided into: how to effectively and positively communicate on OSNs,

After Milgram's study revealed small world property in social networks, researches also found social networks shared common characters such as weak ties, power-law and fuzzy boundary. As a sociology concept, social network means a social structure composted by individuals and relationships within them. An online social network or virtual community, however, means a internet-based community and informations system of social network. The idea of social network is both old and new. Although it is a common phenomenon existing in every human interaction, when we talk about Social Web, in this paper, we intend to focus on online social networking sites, which is also called "online social networks" or "virtual communities". But the theory may build on each other.

Before social networking sites, relationships and personal profiles information enterprise group , but millions of user and dynamic nature of OSN. Although social networking sites may various in scale and type of ties (e.g., Alumni social networking websites may more rely on solid and strong relationships within classmates), Social network distinguished itself from other collaboration platforms ware which is built on strong relationships with organizations.

A. Social web

The concept of Social Web that researches expected as the web of people. Six Degrees of Separation, Small Worlds, and Scale-Free Networks to popular belief, OSNs do not only weak tie, but also strength latent tie [49]. Some researches explained why relationships on OSNs are weak ties. And what is positive effect of it: 'communities of interest are defined by their worldviews, and whenever a community of interest rigorously exposes its worldview in a fashion that permits its knowledge to be federated with the worldviews and knowledge of other communities, the whole human family is enriched' – Steven Newcomb. Those research designing for positive social change also found OSNs may differ in purpose, but their architectures and interactive patterns share a lot in common [28]. Such topic has been extensive studied in theoretical works, such as complex network theory [37]. One fact is called Dunbar's number – "theoretical cognitive limit to the number of people with whom one can maintain stable social relationships", is generally accepted to be about 150. However, in a recent

esearch from facebook [**?**], OSNs shared some interesting and similar stats on facebook userss' social behavior patterns.

The 'Six Degrees of Separation' phenomenon was first investigated by Stanley Milgram [35] in 1960 where he addressed letters to a particular stockbroker in New York and gave them to people randomly picked at locations in the United States far away from that of the final receiver. The condition for passing the letter, so that it reaches the addressee, was that one could post it only to people they knew personally by first name. Eventually most of the letters reached the destination and the average number of hops was six. Since then there have been various studies demonstrating how this effect may help people conduct their everyday lives.

This effect, also known as *Small Worlds* or *cale-Free Networks*, has been revisited with analytical techniques starting with the seminal work by Barabasi [16, 17, 18]. Barabasi studied many natural and man-made networks and found that they all exhibit degrees of clustering with hub and spoke topologies and remote links betweens clusters. These real networks are fundamentally defined by a few highly connected nodes but even a very small number of remote links (weak ties) are sufficient to dramatically decrease the average separation between nodes.

B. ERP

Finally, we will explict some systems which is not OSNs but share some characters. ERP systems such as customer relationship management system and human resources managment system are basicly role driven. A user gets a role and a responsability for the the quality of the data in the process. There is no consistence in relashionships. They are initiated by an individual sending a request for participation in a narrowly defined project, and would be forwarded based on express affinities and the recommendations of trusted third parties. The resulting ad hoc community, would dissolve with the completion of the stated objective.

Another similar business system is groupware which is a software systems such as email, calendaring, text chat, wiki, and bookmarking belong to this category. Despite the notion of collaborative work systems which are conceived as any form of human organization that emerges any time that collaboration takes place, whether it is formal or informal, intentional or unintentional. In normal terms, it means business softwares and not public accessible OSNs.

VII. CONCLUSION

The work described above are an ongoing dialogue for both practitioners and researchers. The new social network services emerge every day. The platform we analysised adjust themselves continuously. Methodologically, we can only make causal claims is limited by a snapshot of the development of Oline Social Networks. Our work surveys the web services combining social networks and information system leverage the advantages of each type of system. We noticed most current Online Social Network only implemented very simple model of social network and that can not mirror the richfulness

of real world complexity. On the other hand, due to either technology restrictions or as well as business concerns, the big players in the market can not or would not to open their platform to achieve the fully potiential of OSNs. We hope our survey can advocate a furture research agenda to melt the gap.

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