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Title	A categorisation framework for a feature-level analysis of social network sites
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Publication date	2016-06-16
Original Citation	O'Riordan, S., Feller, J. and Nagle, T. (2016) 'A categorisation framework for a feature-level analysis of social network sites', Journal of Decision Systems, 25(3), pp. 244-262. doi: 10.1080/12460125.2016.1187548
Type of publication	Article (peer-reviewed)
Link to publisher's version	https://www.tandfonline.com/doi/full/10.1080/12460125.2016.1187548 - 10.1080/12460125.2016.1187548
Rights	© 2016 Informa UK Limited, trading as Taylor & Francis Group. This is an Accepted Manuscript of an article published by Taylor & Francis in Journal of Decision Systems on 16 June 2016, available online: http://www.tandfonline.com/10.1080/12460125.2016.1187548
Download date	2026-11-04 02:19:11
Item downloaded from	https://hdl.handle.net/10468/9010



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A Categorisation Framework for a Feature-Level Analysis of Social Network Sites

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Abstract

Social media (SM) have enabled new forms of communication, interaction, and connectivity that affect individuals on a personal and professional level. But SM is a broad term that encompasses a wide range of technologies with both distinct and shared capabilities. In addition, while there is an agreed upon definition of these systems, a comprehensive list of features and their affordances does not exist. Hence, this study sought to create a feature-level categorisation framework for analysing the use of social network sites (SNS). This categorisation was undertaken using the concept of affordances, which framed the high-level characteristics as well as distinct SNS features, to better understand the divergence in SNS capabilities and inform the study of different types of SM. The framework was created from an analysis of the literature on SNS affordances and a system investigation into three types of SNS (Facebook, YouTube, and Twitter). The comprehensive review was undertaken using two families of SNS affordances (social and content affordances) identified in the literature to categories and compare the platforms. The study reveals a diverse collection of features which afford behaviour in six areas of activity: profile building, social connectivity, social interactivity, content discovery, content sharing and content aggregation. Finally, the framework provides a basis from which the usage and management of SM within organisations can be more rigorously investigated.

Keywords: Social Media, Social Network Sites, Affordances, Categorisation Framework, System Features.

Introduction

Since the start of the last decade, the progression of the web has been influenced by user appropriations with an emphasis on interactive and participatory behaviours (boyd and Ellison, 2007; Russo and Peacock, 2009; Kaplan and Haenlein, 2010). These behaviours have been enabled by technologies termed social media (SM), defined as Internet-based applications that facilitate the creation, organisation, and sharing of information online (Russo and Peacock, 2009; Kaplan and Haenlein, 2010). SM stand apart from other technologies by facilitating its users to interact (Riegner, 2007; Jarrett, 2008); transforming online communication and collaboration patterns (Hoegg et al., 2006). SM include: blogs, wikis, social bookmarking sites, social network sites, and content sharing communities (Coates, 2003; Bryant, 2006; Dalsgaard, 2006; Chatti et al., 2007; Green and Hannon, 2007; McLoughlin and Lee, 2008). However, SM have evolved rapidly through the introduction of new features, which blur the distinction between the different types of applications (Kane et al., 2014).

To better understand and study SM it is important that both the shared and distinct features of these systems are identified and categorised, so that research is better positioned to address the range of tools available and how to manage them. Indeed, more transparency about the available data dimensions and how these can be combined is needed to yield accurate insights into the multi-facetted phenomenon of SM use in enterprises (Behrendt et al., 2014). However, it has been argued that the application of current social network theories to online social networks is limited in that new and unknown aspects could impact on the analysis of SM (Kane et al., 2014). In addition, while there is an agreed upon definition of SM, a comprehensive list of features and affordances does not exist. Hence, this paper presents a categorisation framework to aid in SM analysis. The framework categorises SM, using the theory of affordances with a feature-level comparison across three types of social network sites (SNS). An affordance is 'the design aspect of an object which suggests how the object should be used' (McGrenere and Ho, 2000p. 1). They are a combination of perceived and actual properties of an object, and from this perspective affordances provide strong clues about functionality – offering a variety of capabilities (Norman, 2002). Thus, the SNS analysis undertaken provides a comprehensive review of three SNS based on two categories of affordances identified in the literature: (1) social affordances (concerning the social acts that are made possible by the system) and (2) content affordances (concerning the access and management of information and content within the network). This categorisation serves to distinguish the divergence in

system capabilities, while providing a framework with which to analyse SNS and SM features at a high-level for understanding systemic patterns (affordance-level comparison) and a low-level for understanding the unique details of a system (feature-level comparison).

The remainder of the paper is structured as follows. In the next section, we define the phenomenon of interest SM and SNS, and discuss our conceptual grounding (affordances). The literature is reviewed to conceptualize two general families of SNS affordances: social and content. This is followed by a description of the study's methodology, before presenting the findings for both the social and content affordances. The paper concludes with a discussion of the findings and suggestions for future research.

Theoretical Background

Social Media and Social Network Sites

Within the domain of SM, the widespread adoption of SNS is particularly notable (Lewis et al., 2008). The term 'social networking sites' is associated with specific sites like Facebook, MySpace, and Bebo. However, in a broader sense, SNS can be defined as web-based services that allow individuals to: (1) construct a public or semi-public profile within a bounded system; (2) articulate a list of other users with whom they share a connection; and (3) view and traverse their list of connections and those made by others within the system (boyd and Ellison, 2007, p. 211). SNS provide an online space for the creation of personal information profiles and tools for interacting and exchanging content (O'Riordan et al., 2011). SNS enable users to shape both their own experiences and those of others, providing an environment for interaction, collaboration, feedback, conversation, and networking, while also being flexible and modular (McLoughlin and Lee, 2007; Russo and Peacock, 2009). These 'egocentric' networks are often structured around an individual at the centre of their own community; not according to topics or content (boyd and Ellison, 2007). SNS have experienced an extraordinary growth in popularity, notably Facebook, which has over 1.3 billion active users of which 48% use Facebook on any given day (Statistic Brain, 2014a). These sites enable connections between new/unknown individuals, but more often than not, enable connections between a person's existing extended social network (boyd and Ellison, 2007). Through SNS, users create and share a wide variety of user-generated content (UGC) and embed content from other SM and web sites (boyd and Ellison, 2007; Agichtein et al., 2008; Sledgianowski and Kulviwat, 2009).

As well as dedicated SNS; UGC-focused web sites (e.g. YouTube; Flickr) increasingly supply social networking features, enabling their users to share content in a social setting (Kumar, 2009). Indeed, SNS functionality is beginning to appear in desktop software as well, such as Apple's iTunes music player (Apple, 2010). A further example is that of Twitter, a microblogging tool and SNS. Twitter was one of the fastest-growing SNS in 2009 with 105 million registered users by April 2010 (Rui et al., 2010). In 2014, Twitter had over 640 million users with 58 million tweets posted per day (Statistic Brain, 2014b). These sites have a number of technological capabilities that support a wide range of interests and practices (Liu, 2007). This is because they share a number of technical features while conversely supporting unique capabilities (boyd and Ellison, 2007; Liu, 2007; Beer, 2008). The various capabilities include: self-presentation in an online profile, the accumulation of connections, the ability to post comments on pages and profile pages, joining virtual groups based on common interests, and also the ability to learn about each other's hobbies, interests, music tastes, and romantic status through a profile (Rosen and Sherman, 2006; Ellison et al., 2007; Trusov et al., 2009). In some cases, they also support instant messaging, blogging, and the exchange of photos and videos (boyd and Ellison, 2007). As a result, SNS may vary in functionality and user base and will depend on system design intentions and user interactions (Liu, 2007; boyd and Ellison, 2007). With this adaptability it is important to investigate the features of SNS and understand how these features compare across different SNS platforms. Though an SNS may share a particular capability, it may not be comparable in the context of data analytics or for understanding user behaviour. The following section investigates SNS and categorises them based on a number of affordances identified in the literature.

Categorising SNS using Affordances

Affordances describe the properties of an object that facilitate actions for a particular user (Gaver, 1991; McGrenere and Ho, 2000). Affordances result 'from the mental interpretation of things, based on our past knowledge and experience applied to our perception of the things about us' (Norman, 1988p. 219); they are the *potential uses* of an artefact as perceived by a user (Markus and Silver, 2008). IT artefacts are developed according to a set of pre-identified requirements, but unintended functionality often arises after user engagement (Norman, 1988). By investigating SNS through the lens of affordances, research can better understand how these

digital communication networks develop through 'the needs, values, and interests of people' (Castells et al., 2006p. 28).

SM in general and SNS in particular, can be differentiated from other web-based services and applications by the presence of a number of unique capabilities. Hence, the literature on SNS was synthesised and classified resulting in a number of SNS affordances divided into two types: *social* and *content* affordances. The social affordances involve the individual and their network, and concern the social acts that are made possible by the system. These affordances facilitate users to build a profile, and connect and interact with other users in the SNS. The social affordances are categorised into *profile building*, *social connectivity*, and *social interactivity*. Content affordances rely on the existence and use of social affordances and are a subset of the social affordances and their capabilities. They concern the access and management of information and content within the social network environment. Content affordances include *content discovery*, *content sharing*, and *content aggregation*.

Social Affordances

The *profile building* affordance facilitates users of an SNS to manage their unique profile and organise their personal information; this profile (re)presents their public identity (Acquisti and Gross, 2006). Through these spaces the user can access the majority of the sites functionality, giving users the ability to manage their experience. Individuals manage social presence (i.e. the accessibility of a user and their connections) via this visible public or private space (boyd and Ellison, 2007; Kietzmann et al., 2011). A profile will usually consist of descriptors such as name, age, gender, location, interests, a list of friends, and a personal information section (boyd and Ellison, 2007; Kietzmann et al., 2011), it may also include the ability to display a profile photo, add multimedia content, modify the profile's look and feel, and add modules (applications) that enhance the profile (boyd and Ellison, 2007). Profile building is used by an individual to present themselves to others and undertake a role in a specific online space.

Social connectivity affords the linking of individuals in a system, through both commonly held information (resource connectivity) and social contacts. In these systems individuals are placed in the centre of their own community with a visible list of connections and a profile page displaying personal information (Acquisti and Gross; 2006, boyd and Ellison, 2007). These personal network systems enable visibility of user actions and provide point-to-point communication for users (boyd and Ellison, 2007). The relationship of connections may

vary according to the social network system and the following types are facilitated (Marlow et al., 2006; boyd and Ellison, 2007): (1) reciprocal: two-way connection and (2) following: one-way connection. Two-way connections require a bidirectional tie, where both users have access to the shared network and must confirm the relationship (boyd and Ellison, 2007; Kietzmann et al., 2011). One-way connections are unidirectional and enable users to be loosely coupled in a social network (Naaman et al., 2010). Social network relationships will range from the known to the unknown and may be based on a number of different factors; whether work-related contexts, shared interests, a previous network etc. (Ellison et al., 2007). These differing relationships may impact on how users interact and are therefore noteworthy (Kietzmann et al., 2011).

Social interactivity refers to the potential for users to communicate with social connections. Within a network, communication consists of comments, posts, electronic mail, instant messaging, and rating. Human interaction is the basis for the links that are formed in social networks (Rybski et al., 2009). Communication can be synchronous or asynchronous and differs across the medium in which people interact. These methods of interaction are either public or semi-public and posted messages may be open to the entire community (indirect) or restricted to a user's designated contacts (direct) (Naaman et al., 2010) Some of the main intentions for interactivity include (Java et al., 2007; Naaman et al., 2010): conversations between users, opinions/complaints, recommendations, comment/anecdote, statements and random thoughts, information/content sharing, self-promotion, questions, and presence maintenance.

Content Affordances

Content discovery affords the ability to find and encounter content within the social network system. The primary method of finding content in an SNS is to navigate through the network, browsing content that has been posted or recommended by other users; additionally users can undertake a keyword-based search for textual or tagged content (Mislove et al., 2006). Social media has been recognised as a tool that enhances serendipitous encounters and increases a user's opportunity for chance discoveries (Piao and Whittle, 2011). This discovery is facilitated through different mechanisms in an SNS (Mislove et al., 2006; Cha et al., 2007): (1) *featuring*; popular or interesting content displayed on a homepage, (2) *search results*; searching within a network for key terms, (3) *links between content*; grouping content based on characteristics, (4)

external links; links to external websites and content, (5) *social network*; connection shared content, (6) *recommendations*; based on activity, interests and/or history, and (6) *specific applications*; topic specific applications.

Content sharing refers to the potential for information dissemination along the social links in a social network. People contribute photographs, videos, links, information, opinions, reviews *etc*. (Kumar, 2009). Content may be shared from external sources or is propagated from internal discoveries (i.e. resharing or reposting) (Cheng et al., 2014). These social exchanges are known as 'social cascades' (or word-of-mouth exchanges) and have the ability to reach different nodes in a social network spreading 'content, ideas, or information widely and quickly' (Cha et al., 2009, p. 721). Sharing is facilitated with known connections or open comments to the entire community. Users may discover content in the social network from these social cascades.

Content aggregation affords users to syndicate and aggregate content. Aggregation is described as the bringing together of multiple content sources into one interface or application (Dalsgaard, 2006). It involves collecting material from many sources and using it for personal needs (McLoughlin and Lee, 2007). In terms of social connectivity SNS users 'follow', 'friend', 'like' or 'subscribe' to other profile pages. This act aggregates content from these pages into an activity feed for the user (Naaman et al., 2010). User contributions are extremely important in these environments and designers build features to encourage such activities (Burke et al., 2009). A 'content feed' or 'activity feed' has become the customary way of aggregating user contributions and sharing them across a network of connections (Burke et al., 2009).

Based on this taxonomy of social and content affordance concepts, derived from the literature, we operationalize our research objective in the form of three research questions:

(1) What are the instantiations of the social affordances of SNS?
(2) What are the instantiations of the content affordances of SNS?
(3) How do the social and content affordances compare across the SNS?

System Investigation Method

To address the research questions and document the instantiations of SNS affordances, a system investigation was conducted on three SNS to produce a system inventory. The system investigation was implemented in two parts: (1) *Documentation Analysis*: content analysis of system help guides for end-users and (2) *System Analysis*: walkthrough of system functionality

to validate data in documentation analysis and explore features of the system. The user/help documentation of three SNS were reviewed in order to understand system features and their design based on system developer perspectives and the signals specified to end-users. Key themes were assigned to each feature and the social and content affordances were used to categorise and organise the data (cf. Eisenhardt, 1989, Hair et al., 2007). Content analysis 'is a research technique for making replicable and valid inferences from text (or other meaningful matter) to the contexts of their use' (Krippendorff, 2004p. 18). The use of data coding in this study enabled accurate analysis and reduced large amounts of data into a smaller number of analytic units, facilitating understanding of local incidents and interactions (Eisenhardt, 1989). Data reduction where raw data is selected, focused, simplified, abstracted, and transformed (Miles and Huberman, 1994) was employed during content analysis. The strategy for collecting and analysing the data comprise the following steps:

(1) Examine system documentation for intended functions and feature lists.
(2) Code data under headings: document type, feature name, feature description, affordance types, and researcher comments.
(3) Extract relevant features from coded data and categorise vis-a-vis social and content affordance types.
(4) Undertake a feature and theme comparison across selected SNS.
(5) Apply hierarchies to system features – identifying the key features and their sub-features.
(6) Investigate the key feature categorisation across all SNS to identify similarities and differences.
(7) Conduct system analysis based on findings and explore system functionality to validate key feature categorisation.

Three SNS were selected from a list based on: (1) page rank (using data from Alexa.com), (2) type of SNS, and (3) registered users. Three different types of SNS were selected and are top visited sites on the Web; their rank determined based on a calculation of average daily visitors and page views (Alexa, 2011). Facebook is an SNS built around an individual's personal network. Facebook facilitates users to connect and share information with a bounded group of connections. YouTube is a video sharing site with built-in social networking features. YouTube's primary focus is the viewing and sharing of videos. Twitter is a micro-blogging tool

that enables users to discover up-to-date content and to share content with a group of followers. Twitter tracks content trends and facilitates people to interact on a global level.

The three SNS differ in the way content is shared and organised, but are all general in nature, i.e. do not have any specific criterion for the type of content shared. The SNS chosen have a large base of registered users, which demonstrates their popularity and influence. The demographic is wide in range but is typically associated with ages 18-54 (KissMetrics, 2011, YouTube, 2011). Table 1 displays information including global rank, type, description, and estimated registered/unique users of each site.

Site (Rank)	SNS Type	Description	Users
Facebook (2)	Social Network	Connects people to share links, videos, information, content, etc.	800m +
YouTube (3)	Video Sharing	Enables users to upload, tag and share videos in a social setting.	800m +
Twitter (9)	Micro-blog	Real-time information network for discovering latest content.	400m +

Table 1. Social Network Site Page Rank and General Statistics

Social Affordance Findings

Profile Building Features

Profile building affords user to manage and organise their personal profile pages through features that facilitate editing personal information and further control through external sources and mobile applications. The profile building affordance has five technical features (as displayed in Table 2): (1) the ability to manage/edit a profile, (2) profile updates, (3) location tagging, (4) external profile building, and (5) mobile application. What is significant about the selected SNS is the ability to link profiles to external sources (like other SM sites). A user creates an online identity through their chosen SNS and applies this persona to other online activity. A profile will typically include: a profile picture, username, location, general interests, a list of connections, and additional personal information. During the comparison of the three SNS, it was evident that the role of the profile varies.

FEATURES	TWITTER	YOUTUBE	FACEBOOK
Profile Building			
Manage/Edit Profile	– Avatar – Bio – Design – Handle/Real Name – Profile Picture	– Channels – Homepage – Hometown/Location – Insight – Subscriptions	– Add Applications – Comments/Messages/Posts/Notes – Join Pages/Groups/Networks – Profile Photo/Information/Content – Like/Tag/Places/Events
Profile Updates	– Email Notifications – RSS Feed/OAuth	– Email Notifications – YouTube Newsletter	– Email Notifications – Internal Notifications
Location Tagging	– Geotagging/Geolocation	– Video Location	– Places
External Profile Building	– @Anywhere – Buttons/Widgets – Connections (applications)	– Auto-share – Embed/Share Content – YouTube Direct/Facebook/Twitter	– Instant Personalisation – Linking to Twitter/External Login – Social Plugins
Mobile Application	– Mobile Application – Mobile: Short Code/Sleep Time	– Mobile Application	– Facebook Mobile Texts – Mobile Applications
Social Connectivity			
Connecting	– Follow	– Add Friend – Subscribe	– Add Friend – Like Pages/Community Pages
Connection Search/ Suggestions	– Browse Interests – Find Friends – Recommendations – Search	– Recommended Channels – Search Channels	– Connection Search – Friend Finder – People you may know – Recommended Pages
Connection Lists/Groups	– Lists	-	– Join Groups/Networks – Friend Lists
Social Interactivity			
Asynchronous Communication	– @Mention/@Reply – Direct Message – Tweet/Retweet – Automated Tweet	– Bulletin Posts/Channel Comment – Video Posts – Video Comment – On-site messaging system	– Comments/Posts/Notes – Messages (Text/Video) – Pages/Community Pages/Groups – Like/Tag/Places/Events
Synchronous Communication	-	-	– Chat/Group Chat/Video calling
Rating/Liking	– Favourite	– Favourite – Like/Dislike	– Like
External Interactions	– Facebook Application – Share/Link (External)	– Auto-share – Share/Embed Content	– Share/Link (External)

Table 2. Social Affordance Categorisation

The Twitter profile displays relevant information about a user and includes the profile picture, real name, username, and user information (short 'bio') positioned above a section that contains: 'Tweets', 'Favourites', 'Following', 'Followers', and 'Lists'. Clicking on the 'Tweets' sections will display a chronological list of tweets made by that user. Depending on privacy settings, a user may have a section on their personal profile named 'Requests' displaying any requests to follow the user's tweets (if privacy settings are set to 'protected'). The counts associated with a user's profile are included: number of tweets, number of people followed by user, number of followers, and number of inclusions in lists. When a user views another profile, the shared connections are displayed on the right above recommendations to similar profiles. A user's Twitter profile can be personalised using external websites that offer a number of different background pictures and displays.

YouTube enable users to create 'channels'. Within these channel pages there is a profile section with a mix of user information and statistical data. The default profile includes a profile picture, username, real name, channel views, total uploads, age, joined date, latest activity, subscribers, and country. Other items that can be included by the user are: channel description, website, interests, music, books, etc. Though this section is labelled profile, the entire channel functions as the profile and can be personalised by the user with modules and backgrounds. Modules that are placed on the channel page include: videos, other channels, subscriptions, subscribers, friends, channel comments, event dates, recent activity, and moderator.

Facebook, in contrast with Twitter and YouTube, has a more complex profile, with the ability to add additional information and content. A profile may appear differently to various people, based on the privacy settings of the user. The profile described here is one with no privacy settings or one based on a mutual connection. The profile includes the profile picture, real name and some general information including: relationship status, date of birth, work information, education information, current location, hometown, and gender. The profile page displays a user's wall where both the user and other connections have posted messages including: status updates, photos, links, videos and/or questions (in chronological order). The profile displays the user's friend lists and other profile section options. These sections include: wall, information, photos, notes, and friends. The Facebook profile cannot be personalised by the user with regards to the display and background of the page, unlike the other two sites – each Facebook profile is uniform across the network.

The analysis reveals that Twitter has the most basic profile feature consisting of a few descriptors and a timeline of chronological tweets, while, the Facebook profile enables semantic links to be formed between a user and their interests (e.g. 'liking' pages and content). In both Twitter and YouTube, the profile is less important than the content that a user shares, whereas Facebook emphasises the profile as a focal point. In all three, increased self-disclosure results in a richer environment for a network, i.e. the more metadata, the more accessible relevant content is.

Social Connectivity Features

Social connectivity refers to the ability to connect with other users in the network. Connectivity in this context ranges from direct connections between users, connections through content (e.g. pages; groups), and the ability to find connections and control these relationships. The findings reveal three associated technical features (as displayed in Table 2): (1) connecting, (2) connection search/suggestions, and (3) connection lists/groups. These connections are an extremely important aspect of a social network, as they enable users to access the content and activity of others through the network ties. Thus, without a connection to others in a network, there is limited value in having a profile. The three SNS enable particular types of connections.

In Twitter the leading relationship is unidirectional; many one-way connections are formed based on a shared interest. Individuals can 'follow' profiles and it is not necessary to follow back. Twitter relationships may be known or unknown, direct or indirect, and may often be related to a particular area of interest. In addition, Twitter enables users to form indirect ties by creating 'lists', aggregating content from a number of sources. In this way, users do not have to follow each other to access content in the network; creating lists facilitates users to create a timeline without a direct connection.

In YouTube the connection between users normally comprises unidirectional 'subscribing'. Subscription-based connections create a link between a user and a channel's content. Subscribers are updated about activity on a channel and users can subscribe to any number channels. YouTube also facilitates bidirectional relationship via friend requests. However, where Facebook encourages a user to know their connections, it is not necessary in YouTube. These friend connections are not emphasised in the YouTube system, as it is not necessary to have a profile or to form connections in order to access YouTube content. Thus social connectivity is not essential in YouTube. YouTube's recommendation system enables a

user to find content based on both direct and indirect connections as well as suggestions based on browsing history and network activity.

In Facebook the main type of connection enabled is the reciprocal relationship, i.e. you must accept a 'friend' request. This relationship usually signifies a known connection. Facebook is automatically a private personal network and routinely asks users if they 'know' requested connections and what type of relationship is shared. In order to become friends on Facebook and share information it must be a two-way connection. The unidirectional connections facilitated in Facebook enable a user to follow interests and people (often public figures) not a part of their existing network.

Social connectivity is evident in all SNS but the connection possibilities have differing significance. Facebook and YouTube support both forms of connectivity relationships, reciprocal and unidirectional. However, each type is promoted more in one SNS over the other. Facebook promotes existing reciprocal relationships as the main type of connectivity, where YouTube and Twitter promotes following users (whether known or unknown) based on content contributions. Facebook is more social network-focused, constructed around users and their personal information and list of connections, while YouTube and Twitter are content-focused and are built around user interests.

Social Interactivity Features

Further links are formed in social networks through social interaction. These links are possible because of social connectivity. Social interactivity is therefore a result of social connectivity and is the communication between two or more individuals in a network. Social interactivity affordances have four technical features associated (as displayed in Table 2): (1) asynchronous communication, (2) synchronous communication, (3) rating/liking, and (4) external interactions. The communication features enable users to post updates or share content via different mechanisms in the site. It is important for users to be active and engaged with their social network to create value in the system. Hence, users that are more likely to interact will provide content for the activity feeds, and enable other users to discover content. The rating feature in SNS has two functions, to indicate satisfaction with a piece of content and to create a link between the content and a user. Users create these links by 'liking' or 'favouriting' pages and/or content.

Twitter interaction is basic but has evolved with user appropriation. Posts are quite short (140 characters max.) and they make use of specific characters that enrich interactions. Tweets may contain a handle or 'mention' (e.g. @username – which directs the message to someone), a hashtag (e.g. #topicofinterest – which tags keywords to a tweet and enables them to be searched for and aggregated), or a link to an external website or content. Hashtags and mentions enable users to link content and users together, creating semantic data within the system, facilitating future content discovery and aggregation. Users can also retweet other people's posts further propagating the content to a wider audience. Direct messaging is also available in Twitter which is a private message to a user. Favoriting a post will save the post into a 'favorites' timeline and indicate to others if a tweet has been favorited. It also indicates to others when a tweet has been retweeted and by whom.

YouTube is primarily a video sharing site that enables users to create videos and post them on the network. Users can comment on video content, rate it, and share/embed it externally. YouTube allows users to comment under channels and video content, which are open to the YouTube community. A channel owner can write bulletin posts, which are directed only to their subscribers and people who view their channel. Facebook and YouTube both enable users to 'like' posts, which unlike Twitter, does not aggregate these posts together. How many people have liked a post/video is displayed, helping to promote it in the network via search or activity feeds.

Facebook has the widest range of asynchronous communication because of the number of features provided to a user; the main method being 'status updates' and the ability to comment on and rate these updates. Users can also share blog posts (notes), ask questions, upload video messages, tag users to content/places, organise events, interact with a group and manage group documents, be involved in a community through pages and groups, and post comments and updates (including photos, links, videos etc.). People can be 'tagged' in posts, enhancing connectivity. Facebook also enables synchronous communication with an instant messaging function (chat and group chat) and through video calling (Voice over Internet Protocol). The act of 'liking' in Facebook differs from the other two sites, as liking serves as a mechanism to form connections (not based on reciprocal friendship connections) but through liking pages of interests, public figures, movies, TV shows, music, status updates, comments, pictures, etc. This act forms a connection between the content and a user's profile and further enhances profile building (e.g. liked content is displayed in the activity feed and added to the

profile information). When a Facebook user has an ‘interest’ connection in common with an existing ‘social’ connection the relationship is displayed for both users to see.

The analysis reveals that the fundamental instances of social interactivity vary across the three SNS. Though most forms of interactions are supported, the nature of the websites and the intentions for use differ. Where Facebook and YouTube are media rich, Twitter is more concerned with conversations and linking external information. They have since added the ability to view multimedia within the Twitter stream, but because of the length of tweets, the use of links to external sources play an important role. Facebook displays photos and videos, but like Twitter also directs users to the original source of specific content. In Facebook, an individual is at the centre of the interaction, with varying motivations for interacting with their community – whether it is maintaining social presence or sharing content. YouTube is based on video contributions, not on the direct interactions between users in the system. Twitter also promotes content over social aspects but social connectivity is essential to help the content reach a wider audience; tagging is an essential part of these interactions creating a huge array of content around specific topics and enhancing the ability to locate it, which impacts on the content discovery affordance. Facebook has emulated this capability by enabling users to tag people in status updates and since 2013, linked hashtags (still dependent on privacy settings)

Content Affordance Findings

Content Discovery Features

Content discovery is the ability to locate and access information and content in a social network. The findings reveal that the content discovery affordance has four associated technical features (as displayed in Table 3): (1) aggregated content discovery, (2) directed interaction discovery, (3) content search, and (4) external access to content. To organise user activity and content, SNS use activity feeds of aggregated network content which facilitate users to browse for updates. Most activity feeds are in chronological order but can sometimes be filtered by the user. Content posted to the network may be viewed internally or externally to the system, depending on the format and platform.

Facebook has the most limited search feature. It allows users to search for people and pages, but searching for content is often limited on the privacy settings of the content sharer’s profile. Content in Facebook is only accessible through specified connections and specific

aggregation (generally system-based aggregation). In contrast, Twitter and YouTube enable users to search for network content whether a connection has been formed or not. In YouTube publicly shared content can be accessed and viewed by anyone (even if no profile or connection exists), in this way, YouTube is primarily a media sharing site, with social networking features available. Facebook and Twitter require a profile and connection in order to access content via personal activity feeds. Though Twitter allows external users to search for network content, the real value exists in building a timeline based on following profile pages.

The ability to 'tag' content is enabled in all three SNS and plays a role in the search feature of each SNS. Tagging differs in the three SNS. YouTube 'tags' describe the content in a video for searching purposes. In contrast with Twitter and Facebook, it is not used in comments or posts for linking people and content. Facebook enables users to tag people or pages into photos, posts, places, videos, notes, activities, sports, education and work, etc., creating more relational data. Twitter 'tags' aggregate content into streams of updates and allow people to find content easily and link to that content. Information is propagated across the network with the semantic linking of data and is the main form of discovery (especially in Facebook and Twitter) next to active searching (more relevant to YouTube).

Content Sharing Features

Content sharing is the potential for information dissemination along the social links in a network. Content sharing is enabled through social interactivity. The findings reveal that the content sharing affordance has two associated technical features (as displayed in Table 3): (1) interactions/network content and (1) externally shared content. An SNS provides a user with the capability to share content, whether information, opinions, recommendations, links, videos, photos, and so on. The features that enable content sharing are aligned with the features that enable social interactivity. Specifically, content sharing is enabled through posts and updates by a user in a variety of formats, which includes the ability to share/embed this content to/from external sources. The type of content sharing in all three SNS differs. More specifically, Twitter and Facebook interactions are posts to the surrounding network. In contrast, the main contribution by users in YouTube is the uploading and sharing of video content; the majority of users' comments concern opinions about videos rather than direct interactions with connections. These comments are open to everyone and are not intended for content sharing purposes.

FEATURES	TWITTER	YOUTUBE	FACEBOOK
Content Discovery			
Aggregated Content Discovery	– Timelines (Tweets/Retweets/ @Replies/Favorites/Lists)	– Charts/Featured/ Spotlight/Trend – Browse/Category/Topics – Recommendations/Suggestions – Subscriptions/Favorites	– News Feed – Related Posts – Wall
Directed Interaction Discovery	– @Mention/@Reply – Lists – Tweet/Retweets/Top Tweets	– Annotations – Bulletin Posts	– Applications – Comments /Messages/Posts/Notes – Pages/Community pages/Groups
Content Search	– #Hashtags/ Trends – Browse Interests – Searches/Saved Searches	– Search – Browse	– Search
External Access of Content	– RSS Feed – Widgets	– Citizen Tube – Creators' Corner Blog – YouTube Facebook/Twitter	– Share/Link (external) – Social plugins
Content Sharing			
Interactions/Network Content	– #Hashtags – @Mention/@Reply – Favorite – Tweet/Retweet – Promoted/Auto Tweet	– Annotations – Bulletin Posts – Description – Favorite – Live-Streaming	– Applications – Comments /Messages/Posts/Notes – Like/Tag/Places – Pages/ Community pages/Groups – Photos/Videos
External Sources of Content	– Buttons/Widgets – Applications – RSS Feed/OAuth	– Share/embed content – Auto-share	– Share/Link (external) – Social plugins
Content Aggregation			
Aggregated Content/Activity Feeds	– #Hashtags/Trends/ Top Tweets – @Reply/Favorites/ Retweet – Lists – Saved Searches – Timeline	– Annotations – Browse/ Category/Topics – Charts/Featured/ Spotlight/Trend – Favorites/Playlists – Recommendations/Suggestions – Subscriptions	– Applications – Comments /Messages/Posts/Notes – Like/Tag/Places – Pages/Community pages/Groups – News Feed/Wall – Photos/Videos
External Aggregation of Content	– Buttons/Widgets – RSS Feed/OAuth – Applications	– Citizen Tube – YouTube Facebook/Twitter	– Share/Link (external) – Social plugins

Table 3. Content Affordance Categorisation

The three SNS also differ in the way that content is shared/embedded. YouTube enables users to share video content in the network. In addition, YouTube enables users to share this video content to external sources via email, other SNS, or external websites, etc. Moreover, YouTube video content can be embedded into external websites for viewing. External links are generally not shared on the YouTube platform, instead YouTube videos are embedded and shared in other SNS. Likewise, Twitter enables tweets to be embedded as a picture on an external web page. However, unlike YouTube and Twitter, Facebook posts (from private profile pages) cannot be shared externally or embedded into external websites, unless it is from an open public page.

Content Aggregation Features

Content aggregation is the ability for users to syndicate and aggregate content in a network. It involves collecting material from a number of sources based on a user's personal profile. Content aggregation has two technical features associated with it (as displayed in Table 3): (1) aggregated content/activity feeds and (2) external aggregation of content. Users of SNS have the capacity to create lists and groupings of content and users. These lists create a stream of content for an individual, based on preferences. All three sites employ a form of activity feed. Activity feeds involve the ability to aggregate content either based on social or content links, and are either system or user-generated. This feature is one of the most important ways for users to access content in SNS and will be the primary way of discovering content in an SNS. It is dependent on the choices that a user makes with regard to their activity levels, profile building, and the connections they have made. Facebook utilises a 'News Feed' of user activity updates. Twitter employs a 'Timeline' which aggregates all of the tweets of selected profiles chronologically. YouTube has a variation of these activity feed 'Themes' and involves not just activity streams of a user's subscribed channels, but also other recommendations based on a user's history and interests. These activity feeds keep people on SNS up-to-date with their connections and organises the content into manageable displays for browsing and locating interesting information.

Most activity feeds are in chronological order but can be filtered using other key terms. The three sites all employ a form of activity feed under different names. Facebook filters the news feed of a user based on social connections and liked pages, and organises it based on 'top stories' of posts deemed most relevant/popular. Users can filter this newsfeed based on 'most

recent', specific pages, connections, or relationships. Twitter employs a 'Timeline' which aggregates all of the tweets of followed profiles chronologically. These timelines are on the homepage and a number of filtering options are available: (1) Timeline (all followed profiles), (2) @Mentions (all tweets where the user is referenced), (3) Retweets (by others, by a user, and a user's tweets retweeted by others), (4) Searches (saved searches with specific topics), and (5) Lists (lists created by user or followed by user). On the Twitter profile page there are a number of timelines also, including: (1) Tweets (all tweets/retweets by user), (2) Favorites (all tweets marked as favorite), (3) Following (list of followed profiles), (4) Followers (list of followers), and (5) Lists (lists created by user or followed by user). YouTube in contrast has a system generated activity feed for the main YouTube homepage, based on recommended videos and user activity, but also enables a user to sign in and view specific activity feeds based on subscriptions and further recommendation aspects. The user's personal activity feed is on their homepage, but a feed is also available on YouTube's official homepage, and another next to viewed videos.

Another form of aggregation is the 'favorites' feature in Twitter and YouTube. Tweets can be favorited in Twitter and aggregated into a list on the user's profile page. Videos in YouTube can also be favorited which aggregates videos into a favorites playlist. Videos can be liked and disliked by users and is used to signal video popularity and impacts on activity feed recommendations. Facebook 'liking' creates a link between the user and content/page which builds the user's profile, however in some cases content is not aggregated. For instance a user can 'like' a comment, photo, or video, which just signifies appreciation and keeps user's update-to-date on the activity concerning the content. However, users can also like page, groups, and networks, and it automatically aggregates the page's updates to the user's newsfeed. In addition, tagging has become an essential feature for the aggregation of disparate sources in Twitter. Hashtags enable users to categorise tweets based on relevant keywords. Based on these keywords tweets can be searched for easily and aggregated into a list for a user.

To summarise, Facebook and Twitter are organised based on the historical evolution of user contributions, whereas YouTube creates a snapshot of a user's interest based on browsing history and trends in the system (with or without social connectivity). While a user's direct connections are crucial to the activity feed of Facebook and Twitter, YouTube's activity feed does not necessarily require that type of connectivity. YouTube's homepage includes recommendations and the ability to explore content based on genre or topic. Trends are a good

way of discovering content in Twitter and YouTube, as popular topics are tracked and aggregated. YouTube and Twitter both promote the exploration of content, where Facebook is more tightly coupled with a user's social network.

Discussion and Conclusions

This research proposes affordances as a useful model for studying SNS and the existence of six types of affordances was defined from the literature. Twenty types of features were aligned with the affordances from a system investigation into three SNS. These features have been further refined into a general SNS system inventory displayed in Table 4 in the Appendix (listing each technical feature and a description of its functionality with examples of the general SNS instantiations). By understanding which features afford particular behaviours, the system inventory can be used in future research to understand the usage of these applications within organisations. What is evident from the findings is that all three SNS share similar capabilities for use in different contexts. The systems seem to be evolving to replicate the features provided by other social networks, whilst supporting diverse use intentions. YouTube is principally a video sharing site, but it also enables most of the features provided by the other SNS. Similarly, Twitter is a micro-blogging tool that has been enhanced through the connections of people and content, and the ability to drill-down into the content and extract relevant information from vast amounts of data. The creation of semantic data through tagging enables people to share and retrieve large amounts of content daily. This emergent use of Twitter has enabled it to be a rich medium for finding relevant personalised information. Facebook has underlying differences to the other two SNS; primarily used for creating links with known connections. However, Facebook has begun to create additional ways to add semantic data to content, creating further ties between individual nodes in a network.

All three SNS displayed similar affordances provided by varying features and differing intended purposes. The two families of affordances (social and content) are relevant to the study of SNS by enabling research to view SNS services through their social capability and the capability to manage, share and find content. The study suggests that there is a relationship between the social and content affordances, in particular, the capability to find and connect to other people (social connectivity) is important to the success of social network systems and is the foundation of the other SNS affordances: social interactivity, content discovery, content sharing, and content aggregation. Content aggregation is also a crucial feature for discovering

and sharing content amongst a network, where content sharing is facilitated by the social interactivity affordance. This finding is in line with past studies of Information Communication Technology (ICT) affordances and the concept of core and tangential (i.e. secondary) affordances (Lee, 2010). In both social and content affordances there are hierarchies of affordances (McGrenere and Ho, 2000) or nested affordances (Gaver, 1991). These hierarchies consist of core affordances that lead to the optional use of other secondary affordances. For example, the aggregation of content is a core affordance of content discovery, and a secondary affordance is the ability to post a reply on content displayed in activity feed. The social and content affordances are also applicable to the eight types of affordances outlined in past studies of traditional communication mediums, such as telephone, video-conferencing, two-way chat, email, and letter (Clark and Brennan, 1991; Olson and Olson, 2000; Lee, 2010).

Affordances of SNS differ to those of traditional media where concepts such as: (1) co-presence (same physical environment), (2) visibility (visible to each other), and (3) audibility (speech) are represented differently in the online space of SNS. Social presence is used in SNS to show people are available and willing to connect and engage; it is afforded by social connectivity, social interactivity and profile management. Videos and video messaging are also employed, adding audibility to certain mediums. (4) Contemporality (message received immediately) is addressed in SNS through the use of activity feeds, with constant updating of directed posts and comments, but gives the user control over when the message is viewed. In SNS (5) simultaneity (both speakers can send and receive) and (6) sequentiality (turns cannot get out of sequence) are evident; users can post and receive messages, and it is automatic that sequentiality exists in this online format; especially evident in the posting mechanisms and the use of the chronological activity feeds. Finally, (7) reviewability (able to review other's messages), and (8) revisability (can revise messages before they are sent) include the ability to rate and comment on other's posts, while in the online space all original content can be revised prior to posting.

The findings in this study can be used in future research to investigate actual use and emergent behaviours, as well as the factors affecting affordances and the design aspects of SNS. The system inventory has been a necessary step for future investigations of SNS due to the fact that while there is an agreed upon definition of these systems, a comprehensive list of features and their affordances does not exist. With the categorisation framework this comprehensive list has been created as well as a shared language for researchers and practitioners to further

investigate the use and design of SM applications. In addition, this study has provided a complete overview of three different types of SNS, all very popular and all with different underlying intentions. These systems share similar affordances within their given contexts and have a wide variety of capabilities, whilst also tailoring to specific user's needs and goals. The study also adds to the body of knowledge around affordances and highlights its utility in analysing applications such as SM.

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Appendix

Affordance	Technical Feature	Functionality	Instantiations
Social Connectivity	Connecting	Ability to connect to a person or page	Follow, add friend, subscribe, join/like pages
	Connection Search/ Suggestions	Ability to search for a connection or view connection suggestions	Connection search, suggestions/recommendations
	Connection Lists/Groups	Ability to connect to a group or network or to assemble a group	Make lists, join networks/groups
Social Interactivity	Asynchronous Communication	Ability to interact and communicate directly to an individual or open to a community asynchronously	Post, comment, message, tweet, retweet, like, tag, places, events
	Synchronous Communication	Ability to interact in real time to an individual or a group	Chat, video calling
	Rating/Liking	Ability to rate communications or content	Like, dislike, favorite
	External Interactions	Ability to interact with a community using an external technology or source	Autoshare, embed, share, link, applications
Profile Building	Manage/Edit Profile	Ability to manage/edit the profile information and content, and design	Profile information, tagging, liking, multimedia content, display, uploading content
	Profile Updates	Ability to receive updates about profile activity	Email notifications
	Location Tagging	Ability to display location of posts/content/person	Geotagging, places
	External Profile Management	Ability to manage profile information from an external source or link accounts for automated updates	External applications
	Mobile Application	Ability to access the site and perform functions from a mobile application	Mobile applications
Content Discovery	Aggregated Content Discovery	Ability to see content shared via an organised aggregated content feed based on specific criteria	Timelines, newsfeed, wall, trends, recommendations, topics
	Directed Interaction Discovery	Ability to see and interact with the content shared by the community including direct and indirect interactions	Posts (all forms), direct messages, lists
	Content Search	Ability to search or browse for specific content/people	Search, browse
	External Access of Content	Ability to access content within the site that is from an external source	Links, applications
Content Sharing	Interactions/Community Content	Ability to share content/information in a number of ways	Posts (all forms), direct messages, lists
	External Sources of Content	Ability to share from an external source and with an external source to the social network	Links, autoshare, widgets, social plugins
Content Aggregation	Aggregated Content/Activity Feeds	Ability to access and/or create aggregated forms of content for the management of large amounts of information	Timelines (all forms), content feed, newsfeed, wall, trends, recommendations, topics
	External Aggregation of Content	Ability to access and/or create aggregated forms of content external to the social network	Links, autoshare, widgets, social plugins

Table 4. General SNS System Inventory