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HAL Id: hal-01448073
https://inria.hal.science/hal-01448073

Submitted on 27 Jan 2017

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Abstract. A growing number of companies are recognising the benefits of using social media in customer relationship management. At the same time, the consumers' expectations are rising: short response times, individual communication, real interaction with humans, and participation. It is a challenge to observe the many different user activities on many different social media sites. The aim is to reduce the complexity of integrating multiple social media sites with enterprise systems. Therefore, a conceptualisation of user activities in social media is presented. A user activity is a cross-over of an action invoked on an object and a user who acts in a certain context. The 40 user activity types are compared with actual features of ten social media sites. We find out that a substantial share of them can be integrated technically using the social media site's Application Programming Interfaces (APIs).

Keywords: social media, user activities, conceptualisation, integration

1   Introduction

Social media have become a noticeable part of society. This development attracts attention of companies that aim to take advantage of the opportunities, such as improvement of the reputation and marketing efficiency, support cost reduction, and product innovation from co-creation [1–5]. At the same time, consumers benefit from participating companies, e.g. through relationship advantages, interaction and exchange, and influence on business processes. Examples are discounts, special promotions, and the acceleration of the fulfilment of support requests. The many active users perform various actions in social media and create a lot of data therewith. This information overload is a challenge for companies, because the increasing number of content, user profiles, and connections cannot be timely assessed manually [1].

Information systems (IS) are needed to manage the social media initiatives, providing functions to publish, observe and analyse social media data and integrate it with company data [6]. A preliminary step is to identify business-relevant user activities and to process the related data. Examples of user activities are joining groups, placing like- or dislike flags, adding others to the friend list, reading specific texts, watching videos, and changing profile information. These user activities comprise business opportunities

in the form of leads (i.e. potential customers), enriched customer profile information, and a better understanding of interests and markets. Fliess & Nesper [4] state that "activities of customers can be considered as an economic resource". Similarly, Holts [7] highlights that user activities in social media create value and stimulate companies' revenues.

The more social media sites are considered by the company, the higher is the media penetration. Consequently, there is a need to integrate multiple social media sites mutually. However, the social media sites are diverse and facilitate different user activities. Posts, tweets, pins, profiles, groups, and pages, which are posted, tweeted, pinned, modified, added, or viewed, are only a small proportion. There are no common social media data structures, on which the integrations could be built.

Research on user activities in social media is contemporary and there are a number of existing conceptualisations [18–20, 23]. These are valuable to understand the user's motivation of being active and show some features of social media. However, the proposals are inappropriate to guide the implementation of integration software between multiple social media and an enterprise system. For this purpose, the existing conceptualisations are too abstract or they are exemplary and not exhaustive. Especially the related data of the user activities and the technical accessibility had not been researched yet. Our proposed conceptualisation and exploration of user activities closes this gap.

The topic is motivated from practitioners. The research is part of a joint social Customer Relationship Management (CRM) program with scientists and practitioners from companies of the insurance industry. The status quo of the companies shows that social media tools are isolated and not technically integrated into existing CRM systems. Social media monitoring tools are used to capture developments and to extract aggregated metrics, such as number of posts, likes, and age distribution on single sites. Relevant posts can be identified automatically based on tags, keywords, and rules. However, software solutions that recognise business-relevant user activities in multiple social media and invoke adequate business processes automatically are not yet implemented. Profiting business areas are customer service, sales, marketing, human resources, and research and development [3]. A conceptualisation of user activities is useful for designing general integration solutions. The audience are practitioners and researchers of social media and information systems.

Chapter 2 gives the conceptual background. Chapter 3 connects to existing knowledge and related work. The research methodology is presented in chapter 4. Then, the user activity types in social media are described (chapter 5) and compared with actual features of ten social media sites (chapter 6). The final chapter states implications, limitations, and guides further research.

2   Related Work

Web 2.0 is an economic, social, and technology concept of the Internet, which enables users to create content and build a network with other users [8]. The results from user participation, e.g. posts, friend lists, and profiles, are accessible by other parties of the community. As stated in the definition by Kaplan & Haenlein [9], "social media is a

group of Internet-based applications that build on the ideological and technological foundations of web 2.0". We use the term to refer to the sites/platforms that are built on the web 2.0 concept (e.g. Facebook, Google+, and Twitter). The terms "social media site" or "social media sites" are only used when an emphasis on singular or plural is necessary. A basic principle of social media is to connect to others and share information [10]. Social media and enterprise systems are heterogeneous systems, which can be connected through system integration. According to Hasselbring [11], heterogeneity leads to complexity, which is an issue for the integration task.

Küpper et al. [13] show results from a market study of 40 vendor solutions for social media tools. The findings indicate that most tools provide features to capture and analyse aggregated social media data. The capturing and analysis of individual data (i.e. single posts, user profiles, etc.) as well as the integration into enterprise systems is sparse. Similarly, other authors state that the integration of social media with enterprise systems is still insufficient [14, 15]. In particular, Trainor et al. [16] identify a lack of interaction between CRM systems and social media technology. For example, customer data and user data in social media are not interrelated and business-processes are not triggered from incidents in social media automatically.

Atig et al. [17] conceive user activity as the time when the user is active in social media. The authors classify users based on activity profiles and thereby do not differentiate between what the users are actually doing when they are active. Heinonen [18] conceptualises consumers' social media activities based on two dimensions: consumer motivation and consumer input. The consumers' motivation to use social media falls into one of three categories: information processing, entertainment activities, and social connection. The consumer input has three main types, which are consumption, participation, and contribution. The author's framework allows classifying users' activities. For example, "creating and managing a social network" is motivated from the need for social connection and requires creating a profile and linking to friends (productive consumer input). The proposed framework is abstract and does not allow deriving the related data of the activities. Pankong et al.'s [19] ontology for social activities is more concrete. In principle, the ontology is an entity-relationship-model, which shows entities (e.g. users, posts, likes, and topics) and its relationships (e.g. "is a", "has a", and "related to"). Some entities, however, are ambiguous (e.g. reply, retweet, and comment). Besides, the viewing of content is not included in the ontology. The model facilitates a snapshot-view of the social media graph. The circumstances in which the users create the content is not incorporated. This is justifiable considering that the authors focus on existing explicit and implicit relationships of users, similarly to Yang et al. [20]. However, the location and time of an activity are also expedient to determine the business-relevance [21]. Hotho & Chin [22] analyse the circumstances of user activities. Available sensors of a smartphone are used to conceive the current situation of the user (e.g. installed applications, busy status, missed calls count, position from Graphical Position System (GPS) sensor, remaining battery power, and ringtone volume). Richthammer et al. [23] identify 11 online social network (OSN) activities. Examples are "User posts Item/Comment", "User sends messages to Contact/Page", "User is linked to Item/Comment", and "Contact/Page views User's Profile". However, these

are only "fundamental user activities on OSNs" and are not complete. For example, the sharing, deletion and modification of content is not considered.

3   Methods

The literature review follows vom Brocke et al.'s [24] methodology, which comprises three process steps, being (1) definition of review scope, (2) conceptualisation of topic, and (3) literature search. The authors highlight that not only results should be presented, but, to allow replicability, also details about the approach. The scope (1) of the literature review is characterised by six aspects borrowing from Cooper [25] (Table 1).

Table 1. Taxonomy of the conducted literature review (borrowing from [25])

Characteristic	Categories			
(a) focus	research outcomes	research methods	theories	applications
(b) goal	integration	criticism		central issues
(c) organisation	historical	conceptual		methodological
(d) perspective	neutral representation		espousal of position	
(e) audience	specialised scholars	general scholars	practitioners	general public
(f) coverage	exhaustive	exhaustive and selective	representative	central/pivotal

The focus (a) is on existing research results concerning user activities in social media. The goal (b) is to connect to existing knowledge on a conceptual level (c). The perspective (d) can be characterised as neutral representation, because the position is unbiased. Practitioners and researchers of social media are the target audience (e). The results are representative (f) for the IS community, because prominent data sources have been queried.

The conceptualisation of the topic (2) includes a "working definition of [the] key variable(s)" [26]. A keyword search (3) in the databases of AISel, EBSCO, Emerald, IEEE, JSTOR, ProQuest, and Web of Science in the title (TI), topic (TO), abstract (AB), keyword (KW), and full text (TX) fields was applied using the search string: *"social media" AND ("user actions" OR "user activities")*. The initial list of publications has been filtered by reading the titles and abstracts. Relevant papers were analysed based on the full texts. Table 2 shows the numerical results of the keyword searches.

The development of the user activity types comprised a study of features of large, popular social media. The sample of sites for analysis has been selected on the following criteria: (1) large number of active users per month (> 100 m.); (2) English localisation of the platform; (3) availability of a public API; and (4) permission for commercial use. The initial list of contemplable sites has been compiled of studies and rankings of social media [27, 28]. The listed sites have been evaluated against the aforementioned criteria, based on information from press releases, technical notes, terms of use, and responses from enquiries to the providers. Possible user activities

have been gathered by analysis of the features and functions. They have been grouped according to the philosophical idea of family resemblance and following an abstraction-based modelling approach [29, 30].

**Table 2.** Numerical results of the keyword searches

Data source	Search fields	Publications	
		Total	Relevant
AISeL	TI, AB	11	2
EBSCO	TI, AB, KW, TX	22	5
Emerald	TI, AB, KW	30	1
IEEE	TI, AB, KW	4	1
JSTOR	TI, AB, KW, TX	9	1
ProQuest	TI, AB, KW	4	1
Web of Science	TI, TO	4	1
Total[1]			**10**

4 User Activity Types in Social Media

The user activity types shown in Fig. 1. represent the actions that users perform in social media. Activities take place in a context, in which the user is situated, defined by time, location, social media site, device, and application. The combination of an object type and an action is termed a user activity type in social media. The complex graph structure of social media is broken down into an activity log, which contains entries of the form: user u invoked action a on object o (on site s with device d in application p from location l at time t).

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[1] The total number is not equal to the column sum, because duplicates have been counted only once.
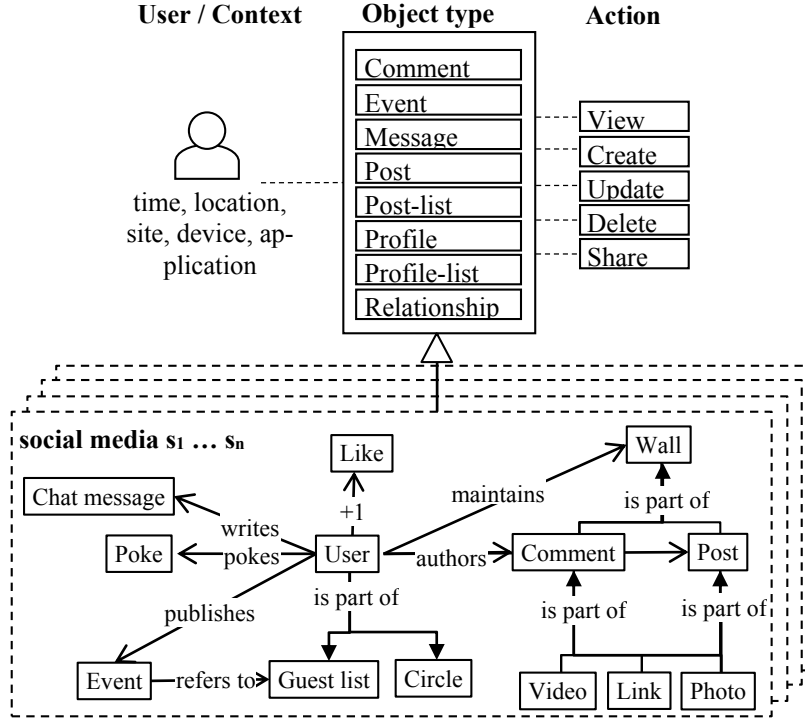
Fig. 1.   User activity types in social media: a combination of context, object type and action

Five actions can be applied to eight object types. All user-generated content results from the Create-, Update-, or Share-action. The content is displayed on the screens of the users' devices via the View-action. The Delete-action removes content. The variety of features across different social media that facilitate the creation, modification and viewing of content is reducible to 8x5 user activity types.

4.1   Social Media Object Types

The idea of family resemblance is adduced to group similar objects. The most proto-typical objects constitute an object type. An object type subsumes all objects, which have most functions and structure in common with that object type, and have least com-monalities with other object types [29].

Kietzmann et al. [31] present a framework of functional building blocks of social media, which are identity, conversations, sharing, presence, relationships, reputation, and groups. The seven blocks are facets of user experience in social media and give an orientation to gather object types and functions. Table 3 identifies social media object types by analysing its structure and functions [32].

Table 3. Technical identity of social media objects

Object types	Structure / data	Functions						
		Identity	Conversations	Sharing	Presence	Relationships	Reputation	Groups
Comment	- contains content (e.g. text, video, audio and image) - refers to another object	○	●	●	◐	○	◐	○
Event	- contains descriptive information about a happening - has a relatedness to time	○	○	○	●	●	◐	●
Message	- contains content (e.g. text, video, audio and image) - has a sender and recipient (list)	○	●	●	◐	○	○	○
Post	- contains content (e.g. text, video, audio and image)	○	●	●	◐	○	◐	○
Post-list	- is a collection of posts	○	●	●	◐	◐	○	◐
Profile	- contains descriptive information about an actor	●	○	◐	●	◐	●	○
Profile-list	- is a collection of profiles	◐	◐	○	◐	●	●	●
Relationship	- connects two objects	○	◐	○	◐	●	●	◐

Legend: Object type is … ○ not enabling the function, ◐ partly enabling the function, ● enabling the function

An object type is enabling a function, if it supports the intention behind the concept of the building block. It is partly enabling, if the intended user experience of the functional building block is a side-effect. An object type is not contributing to a functional building block, if it does not enable the function.

The eight object types may have variants that share similar concepts, but have a different terminology or are used to distinguish the same concept that is used in different contexts on the same site. An example is a Comment, which contains multimedia content and has a parent, which may be a Post, Post-list, Comment or another object type. Some sites use a Comment object type to represent answers, like Tumblr, or a job application, like Xing.

The same object type is also used in different variants on the same social media site, such as on Facebook, where both comments and reviews exist. A Comment primarily contributes to the functional building blocks Conversations and Sharing. An Event object type defines a happening, which has relatedness to time. It can be a birthday party,

a music festival, a meeting, and so on. Events facilitate to meet people (Presence), build communities (Groups), and relate to each other (Relationships). A Message is multimedia content that is addressed to a specified set of receivers. Posts subsume a main content entry found on all social media sites. They may be termed tweet, job, or pin, and engage interaction by allowing adding Comments and Relationships. A Post-list is a collection of Posts. A Profile is a representation of an entity of the real life, such as a person, company, or a community. A Profile-list is a collection of Profiles with possible variants, such as circle, contact list, and friend list. A Relationship connects two other objects. An example is a bookmark, which can be described as a Relationship between a Profile and a Post. The poke feature in Facebook can be treated as a Relationship between two Profiles.

4.2 Actions on Social Media Objects

Table 4 lists actions, which can be invoked on social media objects referring to Hypertext Transfer Protocol (HTTP) methods. HTTP is the underlying, technological protocol of social media sites [33]. Five basic actions on social media objects can be identified. Sharing is something particularly found in social media [31]. The citing of a text phrase or the re-tweet of content on Twitter is an example of the Share-action.

Table 4. Actions on social media objects

Action	Description	HTTP Methods
View	View is triggered when content of an object is loaded and displayed on the user's screen (e.g.: a video is played).	GET
Create	The Create-action occurs when something new is added opposed to the Update-action when a change to an existing object is done by a user.	POST
Update	The Update-action results in a modified, existing social media object.	PUT/ MOVE
Delete	When an object is removed on social media an event with action Delete is raised.	DELETE
Share	The Share-action occurs when existing content, usually originated from another user, is put into a different context or is exposed to additional users on the same platform. It is a copy of an already existing entity.	COPY

5 Empirical Exploration

Table **5** shows the results of the empirical exploration of the user activities in ten social media.

Table 5. Empirical exploration of user activities in social media

Action / Object type	View	Create	Update	Delete	Share
Comment Answer, Recommendation, Job Application, Review	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ○2 ●3 ●4 ●5 ○6 ○7 ●8 ●9 ○10	●1 ○2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ○2 ○3 ○4 ○5 ○6 ●7 ●8 ●9 ○10
Event Meeting, Happening	●1 ○2 ●3 ○4 ●5 ○6 ○7 ●8 ●9 ○10	●1 ○2 ●3 ○4 ●5 ○6 ○7 ○8 ●9 ○10	●1 ○2 ●3 ○4 ●5 ○6 ○7 ○8 ●9 ○10	●1 ○2 ●3 ○4 ●5 ○6 ○7 ○8 ●9 ○10	●1 ○2 ●3 ○4 ●5 ○6 ○7 ○8 ●9 ○10
Message Chat, Fanpost, Gift	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 ○9 ○10	○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 ○9 ○10	○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 ○9 ○10
Post Job, Life event, Pin, Project, Question, Status, Tweet	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ○2 ●3 ○4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ○2 ●3 ●4 ○5 ●6 ●7 ●8 ●9 ○10
Post-list Blog, Board, Page, Photo album, Wall	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ●2 ●3 ●4 ●5 ●6 ●7 ○8 ●9 ○10	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ○2 ●3 ●4 ○5 ●6 ●7 ●8 ●9 ○10
Profile Community, Company, User	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	○1 ○2 ○3 ○4 ○5 ○6 ○7 ●8 ●9 ○10
Profile-list Circle, Contact list, Friend list, Group, Guest list, Partner list	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ○2 ●3 ●4 ●5 ○6 ○7 ●8 ●9 ○10	●1 ○2 ●3 ●4 ●5 ○6 ○7 ●8 ●9 ○10	○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 ○9 ○10
Relationship Bookmark, Favourite, Follow, Invitation, Join, Like, Poke, Rating	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 ○9 ○10	●1 ●2 ●3 ●4 ●5 ●6 ●7 ●8 ●9 ○10	○1 ○2 ○3 ○4 ○5 ○6 ○7 ○8 ○9 ○10

Legend: 1-Facebook, 2-Flickr, 3-Google+, 4-LinkedIn, 5-Meetup, 6-Pinterest, 7-Tumblr, 8-Twitter, 9-Xing, 10-YouTube

Event type is … ○ not existent on the social media site, ● existent on the social media site, ●̲ existent on the social media site, and can be accessed using the API

The APIs of large social media define access options to functions and data using web-services. They include formats and provide methods to publish posts, resolve connections between users, and retrieve comments, for example. Dark underlined numbers signify that the user activity type can be monitored in the specified social media using the provided API. Dark numbers that are not underlined mean that the type exists on the site, but the APIs of the site do not provide access to monitor it. For example, in Facebook a user can view a post. However, this activity cannot be monitored using the public API of Facebook in the recent version of the Graph API V2.1 [34]. On the other hand, it cannot be ruled out that access is included in upcoming versions. Furthermore, using the APIs is not the only access approach to social media data. Instead of using the API, the View-action of own and shared posts can be recognised by linking a Facebook post with external content from a corporate website, where the company can evaluate page requests (by observing the HTTP/1.1 GET-method).

Six user activity types are theoretical constructs, which do not occur in the analysed social media. These are Message/Update, Message/Delete, Message/Share, Profile-list/Share, Relationship/Update, and Relationship/Share. Firstly, a Message is private, because it cannot be shared. Secondly, a Message, once sent, cannot be fetched back, removed, or edited. A Profile-list cannot be shared by others. Access privileges of the Profile-lists are maintained by the owners only. A Relationship does either exist or does not exist. It cannot be modified; but it can be deleted.

The majority (70%) of user activity types that exist on a social media site, can also be monitored using the API and thus can be integrated with enterprise systems using a public, recommended access approach. The View-actions are usually not provided; only Google+ has custom activities, which can be triggered by developers in case an entity is read. On most social media Post/Create is observable by subscription to Post-lists. The Update-, and Delete-actions could be identified by periodic polling, whereby known objects are checked regularly to notice if they are still existent or modified. Comment, Post, Profile, and Relationship exist in all analysed social media. Thus, these are essential object types. Facebook (83%), Google+ (80%), and Xing (80%) feature the most complete set of user activity types. The APIs of Google+, LinkedIn, and YouTube provide the most complete set of access options, covering 95%, 80%, and 79% of applicable user activities of each site.

6   Discussion and Conclusions

The user activity types define user activities in social media. They specify what users do in social media when they create or consume content. Hence, the user activity types advance from existing definitions of user activities that conceive user activity as the time when the user is active in social media [17]. A user activity type is a crossover of a social media object type and an action and takes place in a specific user's context. The object types reveal the underlying structure and data, which large social media sites share. The actions are operations that users perform with an object type. The user-context describes the situation in which the user resides while invoking an action on an object.

The results are useful to design and develop integration software that facilitates to process user activities of multiple different social media sites. Middleware-based solutions require similar structuring of information. The presented user activity types support that purpose, because they allow to consolidate the different user activities of different, large social media sites. There are technical restrictions limiting the feasibility to capture "everything", because some user activity types cannot be captured using the APIs. Moreover, as also highlighted by other authors, users' permission and privacy need to be considered [35]. It must be a major concern of all business-oriented social media initiatives, because of the risk to destroy relationships to customers in case of an accident. An example is unintended data exposure to unauthorised parties. As a result, not every user activity that can be monitored technically should also be tracked.

The user activity types originate from the abstraction of individual features collected from a study of ten social media sites. They have an empirical basis and rely on publicly available data. The issue, caused by the underlying induction of the abstraction, is that the user activity types are only certainly valid for the analysed social media, and are not necessarily generalisable to all available sites.

Further research is encouraged to concretise the user activity types in terms of a canonical data schema, which defines data types and attributes. Based on the detailed level, (business-specific) rules can be proposed for filtering user activities. Monitoring of user activities in social media leads to a reactive system [36]. A fully integrated IS, however, should comprise functions to interact, requiring both directions of a communication. This is not contrary to the research results, but is a possible extension.

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