A Framework for Understanding the Role of Social Media in Business Intelligence Systems

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ABSTRACT. Social media is having a significant impact on the way major business intelligence software vendors are positioning their product offerings. They have been quick to associate their products with the popular term “Web 2.0”, branding the new releases of their product suites “BI 2.0”. This paper argues that beyond its value as a device to enhance sales and marketing, the functions typically found in Web 2.0 web sites can be usefully applied to BI applications. The paper explores the application and role of Web 2.0 concepts within BI applications. A simple framework is presented that classifies the collaboration that is afforded by Web 2.0 applications. It identifies the functions that are provided in social media platforms to foster user collaboration and contribution. The framework is then used to examine how these forms of collaboration can be used to create more effective and "active" BI applications.

RÉSUMÉ. Les médias sociaux ont un impact significatif sur la façon dont les principaux fournisseurs de logiciels de Business Intelligence positionnent leurs offres de produits. Ils ont rapidement associé leurs produits à l’expression populaire « web 2.0 », qui marque les nouvelles versions de leurs produits « BI 2.0 ». Cet article montre qu’au-delà de sa valeur comme dispositif pour améliorer les ventes et le marketing, les fonctions habituellement trouvées dans le « web 2.0 » des sites web peuvent être utilement affectées à des applications BI. Il examine l’application et le rôle des concepts du « web 2.0 » dans les applications BI. Un cadre simple est présenté qui classe la collaboration offerte par les applications « web 2.0 ». Il définit les fonctions fournies dans les plates-formes de médias sociaux pour favoriser la collaboration et la contribution de l’utilisateur. Le cadre est ensuite utilisé pour examiner comment ces formes de collaboration peuvent être utilisées pour créer des applications de BI plus efficaces et plus « actives ».

KEYWORDS: Business Intelligence (BI), Web 2.0, Social Media, BI 2.0.

MOTS-CLÉS : business intelligence, web 2.0, médias sociaux, BI 2.0.
1. Introduction

Business Intelligence (BI) systems are tools used to support decision-making in organizations. Although the term dates back to the 1950s, current usage began in the 1990s as a new term for what were then known as “Executive Information Systems” (Arnott and Pervan, 2005). BI systems are a class of decision support system (DSS) that allow users to analyze organizational data in an intuitive fashion, typically in the form of interactive reports. BI systems allow users to access integrated, subject-oriented data (Inmon and Hackathorn 1994) contained in a data warehouse or data mart (sourced, usually, from a variety of internal and external data processing systems) to answer a variety of business questions. Data will usually be presented in an interactive “dimensional” structure (Kimball, 1996) (as opposed to the structure typically found in a normalized relational database) that permits the user to navigate through reports by clicking on data items, “drilling-down” to more detailed reports from summaries, as well as constructing their own reports as needed.

Figure 1 illustrates a typical web-based BI system: a report shows the profitability of an organization in the leisure industry by region over time. The data is displayed in tables, bars charts and a stylized gauge. In the example, the user has clicked on the item representing the region Australia in the time period 2009 to obtain a report showing more detail.

BI systems tend to be large-scale when compared to personal DSS (Arnott and Pervan, 2005), usually being deployed at either the departmental or enterprise-wide level. Despite the fact that BI software is designed to support multiple users with each deployment and it is not uncommon for such systems to include functionality to facilitate collaboration, these features are generally poorly designed and hard to use. Typically, the features offered are no more sophisticated than the ability to embed a report or view of data, usually in a non-interactive format, within an email. As a result, these features are not well used and fail to encourage any significant interaction between the users.

In general, BI systems have a poor record in terms of their use (Arnott, 2010). Even though BI is cited by industry analyst firm Gartner (2010a) as a top priority among chief information officers, deployed BI systems are only used by around seven per cent of the people who have access to them (Pendse, 2009). Despite the organizational focus of BI systems, it may be that the poor support for the social aspects of organizational decision-making limits their usefulness. Better support for social aspects of organizational decision-making within BI systems should lead to higher usage rates of those systems, resulting in better return on the investment organizations have made in those systems, and ultimately to better decision making.

This paper explores the potential application of the functions typically associated with so-called “Web 2.0” – here call social media. The purpose of this paper is to develop an argument for the inclusion of social media technologies within BI systems. It does this by developing a framework that classifies the functions provided in social media sites generally to facilitate user interaction and
contributions. It then argues that the social nature of organizations implies that support of collaboration and interaction between end-users of a BI system would be a useful addition to the standard BI system functionality. The paper concludes by exploring the social media functions with the framework to BI systems. Examples are developed to show the feasibility of including each type of social media functionality within a BI system. These show that social media functions can be added to the interface of a BI system allowing better support for the social aspects of organizational decision making.

**Figure 1. A typical BI system interface**

2. Social media

One of the most significant changes in the general use of technology over the last decade has been the adoption of “Web 2.0.” Internet sites such as Wikipedia (http://www.wikipedia.org), Flickr (http://www.flickr.com), and Google (http://www.google.com), along with activities such as blogging (for example, http://www.blogger.com), micro-blogging (for example, http://www.twitter.com) and social networking online (for example, http://www.facebook.com). These, and other sites have been cited as examples of a fundamental change to the use of the Internet prior to 2000 (O’Reilly, 2007).
Internet technologies have had a major impact on the design and use of enterprise information systems. Most enterprise package solutions (such as SAP) have long had web-based interfaces (Woods and Word, 2004). BI software vendors were also quick to realize the value of providing web-based interfaces to allow internet browser based access to data held in a data warehouse (Bhargava et al., 2007). These vendors have also been quick to notice and take advantage of the take up and appeal of the label Web 2.0. The term has been adapted and applied to BI software as BI 2.0 to imply a new and improved business intelligence concept.

Although some view the concept of Web 2.0 as a marketing concept and nothing more, O’Reilly (2007) defends the label as representing a paradigm shift from the old publisher-consumer model of the World Wide Web that dominated in the 1990s to a model where consumers are the primary source of material for a site or tool. This paradigm shift is perhaps better served by a slightly less used moniker: “social media”, which emphasizes the shift of thinking from pushing information out to consumers to supporting a social process of information sharing. With Web 2.0, though, the Internet is considered a platform where content is created and shared by everyone, supported by algorithms and data structures that encourage the packaging and sharing of user-generated content (O’Reilly, 2007).

A number of typical characteristics have been used to describe the nature of social media companies (O’Reilly, 2007). The central theme is the opening up of a service to users to both contribute content, as well as mixing and matching platform components to create new, unanticipated service offerings. For example, a user may incorporate photographs from Flickr, as well as information about where the photographs were taken using Google Maps on their blog. The community of users becomes part of the development effort, both in terms of content contribution, as well as in the design of the platform and its ecosystem. Where the value of a traditional information technology company is vested in the software that they create, a social media company’s value is not just derived from the platform they provide, but from the communities of users they foster and the content that results from their usage. From the user’s perspective, interaction with a service is no longer about a solitary experience, but rather a process of socializing either with established social networks like friends, colleagues or family members, or with new networks of people met through the use of the service.

BI software vendors as well as industry commentators (Elliott, 2007; Raden, 2007, for example) have made similar paradigm-shift arguments regarding what they call BI 2.0. However, current BI tools and systems do not support social interaction or anything beyond basic collaboration between users. While users are typically able to share reports, perhaps by embedding a static view of data within an e-mail attachment, the collaboration functionality is hard to use and as a result has not been widely taken up. The addition of this functionality does not by itself represent the same kind of paradigm shift from a model where the end-user is a data-consumer to one where the end-users are active creators of content, as has been seen with the adoption of Web 2.0.
Elliott (2007) has argued that there is consensus on the definition of the term BI 2.0 by BI software vendors. This consensus may exist in their intentions for future product releases, however it doesn’t yet match the reality of the way BI systems are currently developed and used. While an understanding of the potential paradigm shift that may evolve in the use of BI systems may exist, the term BI 2.0 is really used very loosely, largely as a sales and marketing device to create interest in new product releases. There is no standard outline of the concept similar to O’Reilly’s (2007) outline of the nature of Web 2.0. In most cases, the use of the label BI 2.0 borrows from the concepts behind Web 2.0, but often also includes a variety of technologies du jour such as decision automation, “real-time” data feeds (Raden 2007), sophisticated web-based functionality via AJAX technology, the adoption of the standards of Service Oriented Architecture (SOA) and others. Very few of the current so-called BI 2.0 tools include technologies that support the kind of social interaction that allows the end users to become major contributors to the content of a BI system.

If BI 2.0 is to evolve, and BI systems are to shift from the current paradigm where the end-users consume published data and reports to a social paradigm where those end-users are actively involved in the creation of content (perhaps in the form of analyses, interpretations and insights), an understanding of the nature of the functions provided by social media web sites is required. The next section (3) of the paper developers a classification of the kinds of contributions end-users can make to a social media web site. Later, in Section 5, the paper will examine how that classification applies to BI systems.

3. Classifying user contributions to social media

The purpose of this section is to propose a framework for understanding the kinds of user contributions possible with social media platforms. Broadly, contributions by users are placed into three categories. The first is described in O’Reilly (2007) as a contribution to the “dataset”, but will be referred to here as “contribution of content”. The second category consists of contributions to the social network, and the third consists of contributions by users to the social media platform itself (O’Reilly, 2007). The framework is summarized along with some examples of each type of contribution from three major social web sites (Youtube, Reddit and Twitter) in Table 1.

3.1. Contributions of content

Content contributions can be categorized according to three types. The first of these we call a primary contribution. This refers to an original contribution, typically addressing the main purpose of the social media platform. In the case of a photograph-sharing site like Flickr, a primary contribution by a user is a photograph...
uploaded to their account. The primary contribution may include the photograph itself, as well as metadata such as a title, “tags” describing the photograph, a textual description and data about the technical details of the photograph.

The second type of content contribution we call a secondary contribution. This is typically a response from another user to a primary contribution. With Flickr, the most common secondary contribution is a comment on a photograph. Other secondary contributions available on Flickr include adding a photograph to your list of favorites, adding to the list of tags, and making a note on the image itself, amongst others. Secondary contributions allow for a dialog to develop between users, encouraging communities to form.

The third kind of contribution we call a passive contribution. This comes about through data collected by the platform that the user contributes through standard usage rather than through an explicit contribution as with the previous two types. Often, this data, as well as primary and secondary contributions, is used in aggregate form by the social media platform to add value to the user experience. Algorithms can be used, for example, to show the tags that users apply to photographs as “tag clouds” aiding user searches or exploration of Flickr photographs on a particular topic. Other examples on other platforms include Google’s page rank algorithm, Amazon’s recommendation system and Twitter’s trending topics feature. More simply, some sites simply redisplay information derived from the recording of end-users’ page viewing activity. Amazon is the most notable example of this using functionality that shows “What Other Customers Are Looking At Right Now”.

3.2. Contributions to the social network

In addition to the content of the social media platform, users can contribute to the social network of users itself. Most social media platforms require users to register a unique account with a username, and allow users to identify their pre-existing social networks. We suggest that there are three different types of contributions to the social network: network formation, network administration and socialization.

In some cases, the nature of the social media platform means that there is an overlap between the categories in this section and those described in Section 3.1. In particular, the secondary contributions described above often have a strong social element to them: on some platforms, social interaction is the primary contribution. However, on many platforms there is a class of actions that are primarily aimed at social network formation and maintenance without making direct contributions to the platform’s main data set.

The formation of networks on social media platforms can happen in several ways: users can specify pre-existing connections such as friends, colleagues and family, as well as intra-platform communities. Typically, the latter is in the form of registered groups to which users can subscribe. In the case of Flickr, groups are
usually set up around a particular theme or topic with users attaching selected photographs in their collection to the group “pool.” Networks have a variety of purposes, norms and rules.

The second type of social-network related activity is therefore the administration of social groupings. Initially the user or users who established the group perform this, but overtime the users responsible for performing administrative tasks will grow to include active and respected members of the group. Administrative tasks may include a gate-keeping role, moderation and possible censorship, taking action against group members who violate the norms of the group, as well as policy development.

Not all social networks are explicitly embedded in the structure of the social media platform. Just as in any social setting, groups and networks can form and evolve in a variety of ways, as long as it is possible to form relationships with other users. Groups and sub-groups can even form within explicit groups. Even in such cases, the functions of network formation and administration can still be observed.

The most important social aspects of a social media platform, however, are the acts of socialization that various users perform. As mentioned above, primary or secondary contributions are often social acts, but in some cases a social act is carried out privately or within a context in which the act is not essentially a contribution to the platform directly, but rather a contribution to the social network itself. Examples include discussion forum posts within groups in Flickr, or direct messages akin to email sent privately between users. The messaging feature of the Facebook web site is viewed by some commentators as a likely replacement to e-mail technology (Gartner, 2010b). The primary and secondary contributions, along with social network related activities make up the social fabric of a social media platform. The technology and social networks on a social media platform provide the structure within which the social acts of users take place.

3.3. Contributions to the platform

The third category of contribution is based on “harnessing collective intelligence” and treating users as “co-developers” (O’Reilly, 2007). There are two aspects to this. First, the platform’s design needs to be responsive to the way users want to use the platform. While this is generally true of software design, it is particularly so for a social media platform.

The success of a social media platform depends on people choosing to use it; if the platform doesn’t allow a particular user to use it in the way that they want then they are unlikely to make use of it. This is a challenge for social media platforms because people will use the platform in unanticipated ways as they socialize. An example of this is Twitter’s support for the “@” terminology to refer to another twitter user. This usage came about because users found that they sometimes needed
a way to direct their messages to a particular person, especially in the context of replying in a conversation (Twitter.com, 2008). In an interview with the Financial Times (Garrahan, 2009), a former MySpace executive attributed the decline of that platform to an increased emphasis on advertising that led to a poorer user experience, as well as a less responsive and more bureaucratic process for design changes. If a social media platform fails to adapt to user needs, then users may no longer use it. The fewer people who use the platform, the less attractive it becomes to current and potential users.

Table 1. Framework showing the classes of social media contributions

<table>
<thead>
<tr>
<th>Form of Contribution</th>
<th>Examples from various social media platforms</th>
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<td><a href="http://www.reddit.com">www.reddit.com</a></td>
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<tr>
<td>1. Contribution of content</td>
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<tr>
<td>1a. Primary contribution</td>
<td>– Sharing a video</td>
<td>– Submitting a link</td>
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<tr>
<td>1b. Secondary contribution</td>
<td>– Posting a comment</td>
<td>– Rating a video</td>
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<tr>
<td>1c. Passive contribution</td>
<td>– Rating a comment</td>
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<td>2. Contribution to the social network</td>
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<td>2a. Network formation</td>
<td>– Creating a channel</td>
<td>– Creating “sub-reddits”</td>
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<tr>
<td>2b. Network administration</td>
<td>– Blocking other users</td>
<td>– Deleting submissions</td>
</tr>
<tr>
<td>2c. Socialization</td>
<td>– Sending a personal message (similar to email)</td>
<td>– Deleting comments</td>
</tr>
<tr>
<td></td>
<td>– Sending a personal message (similar to email)</td>
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3a. Contribution to platform design

- Various features added at the request of users
- Introduction of a “not safe for work” tag for risqué links
- Active participation by developers in the community to inform new design decisions
- @user syntax for replies
- Support for #hashtags

3b. Contribution to the platform’s ecosystem

- Applications for video upload
- YouTube access from media and home theatre devices
- Reddit iPhone application
- Browser plugins/scripts to modify the user experience
- Access tools such as TweetDeck
- Twitpic

The second contribution to the platform that a user can make is to develop a third party tool that works with the platform. While this is a much less common contribution than the others described above, such a contribution can have a significant effect on the usability and visibility of the platform. In the case of Flickr, there are a variety of third-party applications that have been developed and endorsed by the official Flickr development team (see http://www.flickr.com/services). Examples of these tools include applications that enhance existing Flickr functionality, such as the ability to upload photographs as a batch, including specification of metadata, as well as applications that extend Flickr to different platforms, such as integration with Twitter or Facebook.

The development of these tools means that the social media platform has a richer ecosystem of applications, extending it to a wider group of users and uses. The fostering of this ecosystem of third-party applications depends on an open standard for interacting with the core services offered by the social media platform. Simple, flexible access through application programming interfaces (APIs) and standard protocols such as RSS and HTTP allow developers to easily work with the data that the platform provides (O’Reilly, 2007). The more flexible and accessible the developer interface to the platform, the richer and more varied the ecosystem and its use will become.

4. An argument for social-media enabled business intelligence

The purpose of this section is to broadly outline an argument in favour of the inclusion of social media features in BI tools. The argument draws on several

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1. See YouTube’s blog (http://youtube-global.blogspot.com/), as well as http://www.youtube.com/testtube where users are encouraged to provide feedback.
important decision-making and organizational theories that emphasise the social aspect of organizational decision-making, as well as drawing on the DSS literature. Section 5 then applies the social media framework developed above in Section 3 to BI tools.

4.1. *Theories of action and decision-making*

The social aspect of decision-making is a key component to understanding all human action including organizational behaviour. The norms, customs, traditions and habits that inform our decisions (along with other empirical and logical factors) are imparted and enforced through social, communicative acts (Habermas, 1984). People will tend to act in accordance with how they see other people act as opposed to official, written norms (Davis and Luthans, 1980).

Communicative acts play several roles in the decision-making process. They act as inputs to decisions as decision-makers consider the implications of social capital (Portes 1998) and provide access to information resources that they do not possess themselves (Nahapiet and Ghoshal 1998; Wasko and Faraj 2005). Decisions are inherently communicative acts: after a decision has been made, this is communicated to the rest of the organization; further, the act of deciding is a communicative act that contributes to a social context (Ćečez-Kecmanović, 1994).

Communication is central to all organizations. Organizational structures, cooperation and collaboration all depend upon social interaction (Orlikowski and Yates, 1994). Orlikowski and Yates proposed the concept of communication “genres” that actors utilise to execute communicative acts. Social media has become an addition to the “genre repertoire” in many organizations for communication and social interaction. The social media framework developed above in Section 3 is consistent with Orlikowski and Yates’ (1994) recommendation that research into the incorporation of a new media into a genre repertoire focus not on the characteristics of the media itself, but rather on the ways in which actors use the media to achieve their goals.

Despite the importance of communication and social interaction in acting in organizational settings (and, therefore by extension, decision-making in organizational settings), the dominant theories of decision-making tend to focus on individual actors. The classical rational choice model (Von Neumann and Morgenstern, 1944) fails to explicitly incorporate social factors, as do phased decision models such as Simon’s (1977). However, other descriptive models explicitly acknowledge the social aspect of decision-making, particularly in regard to the political aspect of strategic, organizational decision-making (see, for example, Eisenhardt and Zbaracki, 1992; Gray and El Sawy, 2010).
4.2. Social capital

The importance of social factors in organizations has been recognized for some time within organizational theory. The concept of “social capital” has been proposed as an alternative to older theories of organizations such as transaction cost theory (Portes, 1998). Nahapiet and Ghoshal (1998) argue that organizations can be considered communities for the purpose of sharing and creating knowledge.

Social capital theory is based on the premise that non-monetary forms of “capital” can provide access to resources, influence and power in a similar way to monetary forms (Portes, 1998). Any theory of organizations that ignores the social networks formed within an organization necessarily ignores a significant component of the organization’s behaviour. While sociability can be shown to have negative as well as positive consequences (Portes, 1998) – social structures can be used as much to exclude as include, for example – understanding how the accumulation, access to and spending of social capital occurs provides an important perspective on why organizations act the way that they do.

4.3. Social learning theory

The central premise of social learning theory is that behaviour is influenced not only by internal psychological and cognitive factors, but also by a social environment (Davis and Luthans, 1980). People’s actions and decisions are influenced in a variety of ways by the actions of others in the social environment. This happens not just through explicit instructions contained in organizational policies, structures or even directives from other actors, but also, and perhaps more importantly, from watching the behaviour of others. “Do as I say, not as I do’ seems unlikely to be followed.” (Davis and Luthans, 1980, p. 284).

When faced with a semi- or un-structured decision problem, decision-makers will draw on the behaviour of others among other sources of information to help them understand what to do. The social environment, therefore, is as much a source of information as any other source typically utilized by BI tools such as data warehouses and other organizational information systems.

4.4. Organizational decision support systems

It follows from the discussion above that understanding and responding to the social factors present in a decision-context is important to decision-makers. Technologies used to support decision-making processes that address the social as well as the logical-empirical factors involved are therefore likely to provide a richer, more thorough level of support than those technologies that focus on the logical-empirical factors alone.
This idea is supported in the information systems literature. The concept of Organizational Decision Support Systems (ODSS) was originally used by Hackathorn and Keen (1981) to refer to systems that support communication and collaboration in decision-making. Santhanam, Guimaraes et al. (2000) describe three technology components to any ODSS: communications for supporting interaction between decision-makers; shared data to inform the decision-making process, and processing that allows for the application of models and other tools for the analysis of the data.

BI systems, however, are not ODSS. Arnott and Pervan (2005) point out that BI tools are really just the modern incarnation of Executive Information Systems (EIS), and Santhanam, Guimaraes et al. (2000) explicitly point out that ODSS are different to EIS. The difference lies in the integrated nature of the decision-processes that ODSS seek to support: while ODSS attempts to support explicit decision-making workflows that cross functional organizational boundaries, BI systems are not developed for any one specific decision problem. That being said, there is some obvious overlap in the concepts of the two types of system – BI systems could be considered a passive type of ODSS (Jelassi et al., 1987).

The label BI 2.0 brings the concept of BI even closer to the concept of ODSS, with ODSS’s explicit acknowledgement of the role of the social in organizational decision settings. The following list of types of ODSS technologies from Sen, Moore et al. (2000), adapted from an original taxonomy in George (1991-1992), can be seen to apply to the idea of a more social version of BI:

1) **Communication.** Technologies used to facilitate and encourage collaboration within and between groups, the organization and other organizations (George 1991-1992).

2) **Coordination.** Technologies used to manage shared resources and tasks (e.g. calendaring systems) (George, 1991-1992).

3) **Decision-making.** Technologies specifically aimed at supporting structured and semi-structured decisions (George, 1991-1992).

4) **Monitoring.** Technologies for summarization of information for senior management, to alert them to problems and opportunities (George, 1991-1992).

5) **Artificial intelligence for filtering/automation.** Technologies (intelligent agents (George, 1991-1992) and other AI (Sen et al., 2000)) to filter out and summarize information. A more active version of monitoring.

6) **Data/Knowledge representation.** Technologies to manage data and knowledge within the system, making it available to other system components and their users (Sen et al., 2000).

7) **Processing and presentation.** Technologies for taking the data within the system and presenting it to the end user (Sen et al., 2000).

8) **Distributed architectures.** Technologies to distribute data storage and presentation to a wide set of geographically disperse groups. This includes...
distributed storage, as well as processing and presentation via channels such as the World Wide Web (Sen et al., 2000).

Current BI technologies already address types 3 (BI is essentially data-based decision support), 4 (dashboards and corporate performance measurement systems), 6 (dimensional modeling and other data structures), 7 (processing and presenting data is a core BI capability) and 8 (BI has always been based on multi-tiered architectures, including data storage in data marts/warehouses through to distribution via the Internet and mobile devices). As mentioned above, the tools also commonly address 1, albeit generally in a poor, ineffective way. If BI 2.0 tools adopt the kinds of technologies seen in the use of social media, then it will also not only be able to support activities related to 2, 3 and 5, but it may also support the activities associated with communication in a much more effective manner.

Borrowing from the technologies of Web 2.0 and social media will allow BI systems to provide better technologies for 1, 2 and 5, as well as improve on the performance of technologies for 3 and 4.

4.5. A conclusion to the argument for social-media enabled BI

The incorporation of social media features into BI tools recognises that social interaction is an important aspect of organizational behaviour and decision-making. By focussing largely on the analytical and non-social aspects of decision-making, BI tools have failed to offer support for a significant component of the decision-making process. While it could be argued that these social aspects can be left unsupported since they happen naturally as part of the social environment within which BI use happens, there is a prima facie case for their support as an explicit part of the BI toolset.

Social-media enabled BI could allow for a more collaborative approach to decision-making, encouraging the development of “communities of interest” around particular decision problems. It can offer an additional communication genre (Orlikowski and Yates, 1994) to add to organizational actors’ genre repertoires – one that these actors are already making use of through existing social-media tools. By taking these already familiar features and incorporating them into BI, BI 2.0 can potentially improve on past efforts at collaborative decision support in the form of group DSS and organizational DSS.

Use of these features further allows for the kind of phenomena described by social learning theory: users can see what other users are doing with the BI tools, see which decision problems are garnering most attention, as well as exerting influence over other organizational actors by allowing them to see what problems and analyses are being performed by that user. Social-media enabled BI can be used to help enhance and direct the social interaction that forms, and is influenced by,
organizational structures. Indeed, such tools may replace some of those structures, or augment others.

Further, the concept of a BI platform that encourages users to contribute to the decision support ecosystem can lead to more adaptive decision support. The adaptive nature of good quality decision support is a central finding of DSS research (Keen, 1980). The ability of a user to craft and customize their own decision support environment should lead to more satisfied users and better quality decisions. The ability to borrow from other BI users, as well as to share with them, could lead to the build-up of social capital.

The true benefits (and pitfalls) of the application of social-media enabled BI, though, are impossible to assess until such tools have been deployed in real organizational settings and research projects undertaken to investigate their impact. The next section seeks to outline what such a tool may look like, and propose a research agenda to investigate the efficacy of BI 2.0.

5. Social-media enhanced BI

The classification of contributions facilitated by the functions in typical social media web sites (shown in Table 1) can be easily adapted to BI systems. Table 2 shows the classes of contributions in the framework and examples of those contributions adapted to a BI system.

Support for communicative acts is the most obvious point of difference between current BI tools and potential BI systems that have been enhanced with social media. As mentioned above, many of the offerings from different BI vendors already have some capability for the sharing of reports, as well as, in some cases, the annotation of and commenting on reports for other users to see. The capabilities are very basic, and in some cases the design is such that they are also difficult to use.

The traditional BI system shown earlier provides an example (see Figure 1). This system does support the posting of comments by end-users. However, these are hidden in a window separate from the report itself, breaking the context. Taking the framework shown in Table 2, the report itself corresponds to a primary contribution, while the secondary contributions (comments on the report) have been moved so that other users may not be aware of them. A well-designed BI 2.0 system, on the other hand, would have the comments placed in a prominent place alongside the report itself, perhaps with the capability for a fully-threaded conversation. Other secondary contributions might also include the ability to vote on comments (eg. like or dislike) so that popular comments are drawn more easily to the attention of other users. Notification of activity on the report, such as someone commenting or replying to a comment, could be sent to the original report creator, as well as other relevant users (such as the author of a comment being replied to, or others who might subscribe to an RSS-style feed). When reports are distributed, it should be
possible to do so in a dynamic manner, similar, say, to a YouTube-hosted video being embedded in a blog post. That is, the sent report either allows for dynamic interaction as an object in something like an email, or, at the least, hyperlinks to the original report. The more active and dynamic the access to the primary and secondary contributions are, the more likely users will interact and take part in the communicative activities supported by the system.

Table 2. The framework applied to business intelligence

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<tr>
<th>Form of Contribution</th>
<th>Examples of contributions when applied to BI “BI 2.0”</th>
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<tr>
<td>1. Contribution of content</td>
<td></td>
</tr>
<tr>
<td>1a. Primary contribution</td>
<td>– Report or data analysis</td>
</tr>
<tr>
<td>1b. Secondary contribution</td>
<td>– Comments</td>
</tr>
<tr>
<td>1c. Passive contribution</td>
<td>– Tags</td>
</tr>
<tr>
<td>– Viewing a report</td>
<td></td>
</tr>
<tr>
<td>2. Contribution to the social network</td>
<td></td>
</tr>
<tr>
<td>2a. Network formation</td>
<td>– Forming workgroups</td>
</tr>
<tr>
<td>2b. Network administration</td>
<td>– Forming interest groups</td>
</tr>
<tr>
<td>2c. Socialization</td>
<td>– Adding/removing users</td>
</tr>
<tr>
<td>– Group moderation</td>
<td></td>
</tr>
<tr>
<td>– Email, chat, messaging</td>
<td></td>
</tr>
<tr>
<td>3. Contribution to the platform</td>
<td></td>
</tr>
<tr>
<td>3a. Contribution to platform design</td>
<td>– Liaison with BI developers</td>
</tr>
<tr>
<td>3b. Contribution to the platform’s ecosystem</td>
<td>– Development of ad hoc DSS “ephemera”</td>
</tr>
</tbody>
</table>

Coordination is less important for BI than it is for ODSS. ODSS are specifically designed for integrated decision processes that require a coordinated workflow, whereas BI systems are often not prescriptive about the ordering and timing of activities. However, social media enabled BI could have the capability to support different groupings of users, either reflecting pre-existing social networks in the organization, or the formation of new groupings based on interests in various topics covered by the BI tool. For example, users from a variety of departments may have an interest in the impact of a marketing campaign for a new product. In this sense, the kinds of social-network contributions supported by social media allow for a kind of coordination of interest, rather than just a coordination of activity in an organization. While it is certainly conceivable that social media style tools could be used to support calendaring and resource allocation, this is more truly the domain of ODSS rather than BI.
Because BI is a passive rather than active (Jelassi et al., 1987) style of decision support, the decision-making process itself is largely prescribed by organizational policies or individual preference. It is up to the user (or developers working on the user’s behalf) to create a supportive decision environment for a specific decision through the creation of reports, analyses and other “ephemera” inherent in an evolutionary decision process (Arnott, 2004). The same kinds of architectural decisions that encourage community contributions to a social media platform’s ecosystem and design also permit a higher level of flexibility in BI architecture than current BI systems. Where decision makers currently tend to utilize spreadsheets for their own ad hoc and flexible decision support, a lightweight, modular BI platform that allowed non-technical users to build their own analytics tools within the platform and then share those creations with others, should encourage them to use the BI system. By sharing these analyses and ad hoc tools with others in a controlled social media environment, as opposed to the standalone nature of spreadsheets on a desktop, many of the problems inherent in spreadsheet use such as security and errors can be addressed.

Intelligent filtering was included by both (Sen et al., 2000) and (George, 1991-1992) to refer to technologies used to automatically find, summarize and filter information. This technology has had limited applicability in BI. While data mining tools (the most obvious example of this kind of technology applied to BI) are relatively mature and widely available, their usage remains a niche application. To a certain extent, the application of artificial intelligence has not seen widespread adoption in BI. Interestingly, a similar phenomenon has been seen in the evolution of the World Wide Web. In addition to Web 2.0 and social media, there has long been a group of advocates for a technology sometimes referred to as Web 3.0, but more commonly referred to as “the semantic web” (http://semanticweb.org). The main focus of Web 3.0 is on the application of metadata schemas to information on the Internet to allow for improved linking and searching. Although not central to the concept, the technologies advocated by proponents of the semantic web tend to rely heavily on automated algorithms to analyze metadata and derive meaning. Social media, on the other hand, seeks to achieve a similar goal, but does so through the use of algorithms applied to human actions: examples include the generation of tag clouds, recommendations on Amazon for purchases made by people who looked at similar products, voting mechanisms and the like. Web 2.0 relies on variations of “human computation” (Von Ahn et al., 2008) that rely on social processes rather than machine learning, and to date is significantly more successful than Web 3.0.

The kinds of algorithms that make use of the data generated by passive and social activities in social media platforms can be used to address the problem of filtering and summarization. Tag clouds could be used to help BI users find useful reports easily. Voting systems can help users find those reports that are currently of importance. Coupled with the social networks that can be formed on a social media platform, a recommendation system could allow a user to see which reports other people that the user “follows” are looking at and what they think is important: for
example, a manager may note that several subordinates are looking at and discussing a certain set of reports and so may also look at and comment on those reports too. Rather than relying on data mining or other intelligent algorithms to find important data in a large data set – many BI systems draw on data from data warehouses containing terabytes worth of data – human computing can possibly achieve the same end more effectively and accurately. The final column of Table 2 summarizes this section, while Figure 2 shows a mockup of what a social media enabled BI system might look like.

Figure 2. A mockup of a BI tool with social media features

6. Concluding comments

This paper has explored the potential role of web based social media within BI systems. A framework that allows the classification of the typical functions found on social media web sites has been developed. The application of this framework to BI has been explored. A case has been made that it is feasible to include social media functions within BI applications. An argument has been developed for the potential value of these functions if they are included in BI systems.

The framework developed has a number of potential uses. First, it provides developers of BI systems with a structured and comprehensive basis for design decisions they make about the use of web-based social media within BI applications. The framework allows BI developers to understand what functions they can use
within their systems, and if they choose to use them, provides a useful framework for understanding how each of the types of functionality might apply to a given system.

The framework also has a role in research. It represents a number of underlying propositions that can be empirically tested:

- The greater extent to which a tool provides support for the affordances outlined in the framework, the more characteristic the tool will be of social media technology.
- The more characteristic the tool is of social media technology, the more likely it is that the tool will support the social aspects of decision making in organizations.
- An improvement to the support of the social aspects of organizational decision-making will improve decision outcomes.

The classification of the framework provides a conceptual foundation that can be used to guide the collection of data aimed at investigating the value of social media functionality within a BI system.

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7. Bibliography


