Empowering Collaborative Business Intelligence by the use of Online Social Networks

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Abstract: Online Social Networks (OSNs) gain more and more attention in nearly all systems or concepts that deal with the exchange of information between human actors. While the analysis process in Business Intelligence systems normally is based on structured and pre-filtered data, OSNs promise a lot of customer insights for companies. On the other hand, OSNs are a common product used by the analysts themselves to interconnect and discuss. Therefore they may serve the inter-human exchange about the analyzed figures and support collaboration of the users. We show how OSNs can support the collaboration and communication in a joint analysis process and prove the feasibility with a small prototype.

1 INTRODUCTION

Business Intelligence (BI) does not follow a single, undisputable definition. It mainly is recognized as the use of concepts, methods and systems that support management decisions (Kemper et al., 2010). In the whole context of Decision Support Systems (DSS), BI systems can be sorted into the category of data-driven DSS (Power, 2011). An often quoted approach for a structure of BI traces back to (Gluchowski, 2001). He distinguishes different scopes of BI regarding the focus of the system (technical or business-driven) and the process phase (data supply or data analysis). We understand BI in its broad scope and therefore include the data gathering, processing and provisioning (summarized under the term Data Warehousing) as well as the data analysis by humans and algorithms (called Data Mining).

The input data has to be put into structures that analysts or deciders use to make and formulate decisions. So the data is reduced, aggregated and (concerning top decision makers) provided on a level that does not explain every single number or deviation to previous reported figures. This creates the need to discuss about individual figures with experts who do have a more detailed or special knowledge of the data. This communication then will lead to deeper analysis and maybe even to a joint decision on how to react to the event. Over the past few years, the term Collaborative Business Intelligence (CBI) has emerged, that describes this co-working in the analysis process. Today, the definition for CBI neither is unanimous, nor is CBI the only term that covers this joint analysis process.

Group decision making has been a major issue for decision makers and decision support system builders and users since the 1980's especially in the field of Operations Research (Vetschera, 1991). The idea although has regained interest with the strong emergence of online social networks (OSNs) in private areas, e.g. facebook, or business cases, e.g. Yammer. According to the Hype Cycle for Business Intelligence 2012, published by Gartner Inc., Collaborative Decision Making (CDM) is presented as an upcoming technology that is supposed to substantially change the understanding and the market of BI systems. In this context CBI enriches BI solutions with social or collaborative capabilities as known from OSNs (Bitterer, 2012), (Dayal et al., 2008), (Muntean, 2012).

Today, OSNs often are considered as huge databases that provide a mass of information about (and from) customers. There are different approaches to analyze the information and to include it into the systems as e.g. (Costa et al., 2012) and (Böhringer and Helmholz, 2011) do. These efforts are characterized by the terms Social Business Intelligence (Hinchcliffe and Kim, 2012) or Social Analytics (Roe, 2011).

While OSNs provide the analysts with a great

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amount of data, the usage of the networks themselves for the analysis process has not been developed very far. Many vendors have released a proprietary solution for communication in their BI applications. Three factors can explain the lack of direct interaction between BI systems and OSNs. First, there would exist the need for a standardized protocol to exchange messages and analysis information over different systems and networks. Second, security issues arise, when alien networks are used. Third, it probably is not in many vendor's main interest, to provide an external access to their systems, because using a best-of-breed-approach instead of a single vendor solution would become easier for companies.

Despite these concerns, we use a small piece of the BI analysis world, namely ad-hoc-reporting, to provide a simple discussion platform over OSNs (which provide a communication platform as well as the needed relationship information) with direct linkage to reported figures. In section 2 we discuss related work to this approach. Section 3 describes the analysis process and the possible points of application. In section 4 we present our findings with a simple solution for collaboration. Section 5 gives an introduction on possible fields for research.

2 RELATED WORK

As stated before, in this paper we focus on Collaborative Business Intelligence and understand it as the joint process of analysis between people in one or more enterprises. The first workflow-oriented proposals, what CBI should consist of, are from (Rasmussen, 1999) and (Collins, 2001). In 2008 (Dayal et al., 2008) described a virtual cockpit for collaborative decision making in enterprises.

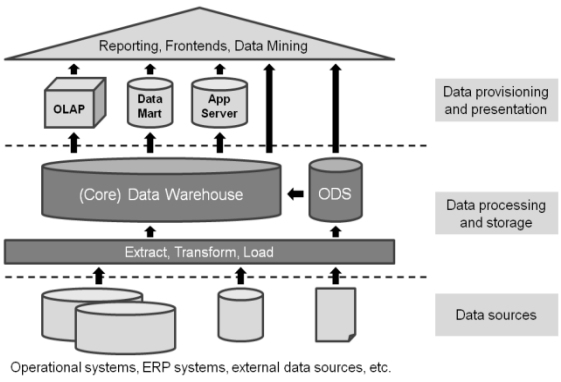

Figure 1: Business Intelligence Architecture.

Since then, OSNs have become a wide-spread product. (Berthold et al., 2010) explicitly mentioned the combination of social software functions and BI applications over an ad-hoc and analysis layer.

Approaches that present a more partner-driven or cross-company view on the collaborative part of CBI come from (Golfarelli et al., 2011). They presented Business Intelligence Networks (BIN), that should provide data over a peer-to-peer network to other users. The authors focus on the technical aspect of OLAP queries rather than on a communicative aspect. (Liu and Daniels, 2012) take this idea, but focus on the analysis itself, rather than on the data supply, and state the benefit of a cross-company analysis. None of the mentioned articles, however, uses existing relationship information from OSNs to let people (interal or external) communicate about figures and reports. To the best of our knowledge, this idea has not been discussed yet.

3 ARCHITECTURE

Business Intelligence applications encompass different levels of data gathering, data processing, data storing, data provisioning, and data presentation (see Figure 1). The following subsections describe the considered architecture of the system that underlies the collaboration process.

3.1 The General Collaborative BI Process

The more the data is processed and structured, the simpler it is for a company to analyze. On the other hand, structuring and filtering leads to possible data loss and to predefined structures that might not be universal, e.g. product hierarchies may even differ from the production department to the sales department. There obviously is a trade-off, regarding structure and interchangeability with other enterprises/ departments, which hardens communication.

We therefore decide between two scenarios. In the first scenario, we have one where everyone can access the same information up to the lowest edited level. In this case, questions may arise, that need detailed fact knowledge about the circumstances of numbers. The communication between the decider and the expert will work on the same basis, only the figure in focus has to be marked.

In our second scenario, the communicating parties are from different companies or departments that may even use different BI systems. They do not

have access to the exact same reports, but at least to the same data. (If this is not the case, data exchange must be a part of the process, see Figure 2.) In the simple case, to ensure a useful communication, it is necessary to define a consensual level of structure and at the specific level a consistent and homogenous definition of the objects in focus. For the actual discussion, this can be understood as meta data. The interchange of this information is a prerequisite to the joint analysis process. From the whole process of collaborative decision making in the sense of CBI, we focus on the connecting and the discussion itself rather than on the data exchange.

Given a BI architecture with two parties, we argue that at a first step the parties must connect and agree on the cooperation. After this, meta data has to be exchanged as far as needed. That concerns the data model, access structures, security issues, and so on. Subsequently, data can be exchanged, if needed and is not already made available, and the analyses can be conducted.

3.2 Using OsNs for Connecting and Discussing

Although some present BI solutions link reports to authors or provide emails in and out the BI system, these functions do not directly provide a basic solution for inter-company or inter-system communication. Since many companies nowadays use social networks[1], it seems natural to use the already built-up relations there for connecting

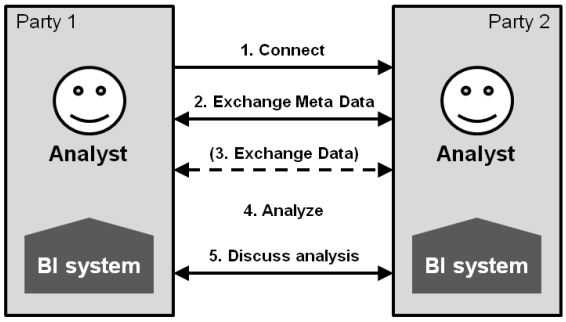

Figure 2: General CBI Process.

people. Our approach uses the existing relations to provide the user with a direct access to the network information. Because many of the networks allow for a direct access to their functions via a programming interface (called API), the relations can be extracted from the network and messages can be sent to other users instantly out of the BI application. The following discussion can also use the same way (as shown in Figure 3), which allows for communication that afterwards can be decoupled from the BI solution.

4 EXEMPLARY SOLUTION WITH PALO AND YAMMER

To prove the feasibility of the idea, we chose two widely used applications in the field of BI and social networking and implemented a prototype of a communications interface. The goal was to be able to select a figure from an ad-hoc-report and to send a question to another user (B) that had to be in the contacts of the first person (A).

We chose PALO as an open-source BI application and used an easily understandable data cube that consists of the dimensions product, region, and month/year. We only took the sales amount as a figure (called fact). One of the features of PALO is its Microsoft Excel-based frontend, which allows for plugin-implementations via Microsoft Visual Basic for Applications. With this plugin, we connected to our virtual company at Yammer, where we used five employees in different departments to simulate a working environment. Yammer offers an API based on JSON, which is a text-based, human-readable data exchange format similar to XML. This allowed for a simple interaction between our application and the social network. The security of the connection itself is provided by SSL and OAuth.

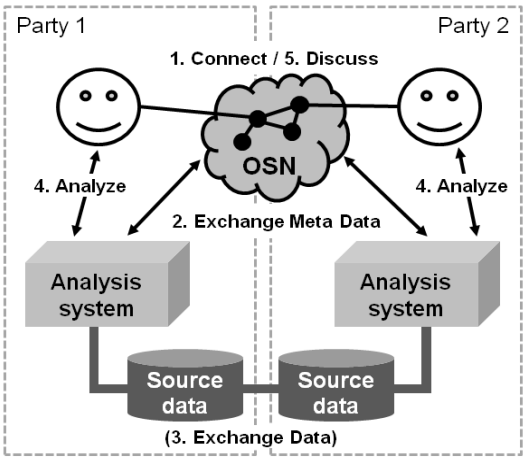

Figure 3: CBI Process with OSN Support.

[1] According to Forbes, 85% of the Fortune 500 companies use Yammer, an enterprise social network. http://www.forbes.com/sites/ilyapozin/2012/06/26/the-rise-of-social-enterprise/, as of 22.10.2012.

When a user sees a figure in the report he does not understand, he is able to right-click on the value and can chose a Yammer contact that he wants to ask about it. The plugin then will send a message to the Yammer account of the other user, serving the information of the data cube, the current chosen dimensions to describe the figure (that is a rudimentary form of meta data), and a text message with the question of user A. User B can then look for new messages and import them. The figure to be discussed can be highlighted in the respective report. B answers the question and A will receive the appropriate text, which can be linked to the report in the same way or just be read via the network user interface. Figure 4 shows a very basic example on how the communication looks like. In our prototype, in fact the dataset is as simple and therefore easy to understand and to implement.

```
<server>localhost/demo
<cube>MyCompany_Sales
<row>product|ACMEprod
<row>region|USA
<col>year|2012
<message>Hi John, can you explain to me why
we lost 5% of our revenue here?
```

Figure 4: Exemplary Question from user to user.

5 CONCLUSIONS

While BI is one of the most thriving concepts in today's enterprises and OSNs, and social media in general, are vigilantly observed, the combination of these two is mostly reduced to using networks as another data source. Then again, collaborative BI gets more and more attention as today's employees use mobile devices and social networks on their own and in their daily work.

Future research should focus on the question how a bigger model of information, data and meta data sharing could look like. Unified data models or very flexible peer-to-peer architectures are aspects that are already being discussed. The question also still stands, how missing data can safely be transferred. Last not least, security issues will have to be discussed. While the communication itself can be encrypted by SSL connections, the data could be client-side encrypted to prevent third parties from understanding possibly captured data.

We showed that the usage of already existing structures can ease up the process of information sharing and that the necessary means for this only lead to small efforts. Future work will show, if OSNs can provide even more support to the decision making process.

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