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Integration of Social Media Technologies with ERP

A Prototype Implementation

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ABSTRACT

Many organizations use social media to enhance collaboration both internally among employees and externally with customers and partners. However, it is not sufficient to just create a presence in some key social environments such as Facebook or YouTube. In order to fully leverage the value of social media, organizations must integrate social media with their business processes, which means new solutions have to be developed that extend existing enterprise systems. In this paper, we present a prototype solution that demonstrates the integration of social media with the order processing process. The implemented solution brings together the embedded best practice processes within an ERP with unstructured data from the social media.

Keywords

Enterprise Systems, Social Media, BPM, ERP, Composite Application, Web Service, SAP

INTRODUCTION

The millennial generation, which refers to people born between 1981 and 2000, prefer to use social media technology to blend their personal and professional life. Therefore, as this generation transitions into the workplace, there is a need to integrate social media into the workplace (Quish, 2010, Prohaska, 2011). This impacts how enterprises interact both in terms of internal communication with employees and external communication with customers and business partners. In order to effectively leverage social media in their organization, the CIOs must adopt a structured framework which could involve a number of phases, namely develop the social media strategy, support the strategy by allocating resources, and implement solutions that leverage social media technologies (Prohaska and Costello, 2012). Early adopters of social media have created a presence in some key social environments such as Facebook or YouTube, akin to a website during the “web era”. However, in order to provide business value to the enterprise, CIOs must develop an environment by weaving together four key technologies, namely cloud computing, context-based computing, pattern-based computing, and social computing (Prohaska, 2011). For example, internal business applications will have to be modified to be context-aware to respond to different mobile devices, and also have the capability to capture data from social media and analyze that data in real-time, before the completion of the business transaction.

Researchers have been exploring ways by which social media can enhance business. (Busquest et al., 2012) using grounded theory and scenarios in uncertainty propose four business models of how an enterprise such as a bank, can leverage social media networks, namely on-line banking, bank a la carte, intermediation, and P2P banking. (Reinhold and Alt, 2012) have defined four basic types of models for using social media with the CRM process:

- As a communication channel in order to provide context, for example, providing information about a product
- As a means to provide content and then gain more market insights by integrating CRM systems with social media content and analyzing this content
- As a channel for transaction through customer touch point in processes such as sales
- As a platform of cooperation, where social media is used to support collaborative processes such as developing and launching new products

Various organizations have used social media to enhance collaboration both internally among employees and with customers. But very few have implemented social media solutions in the context of enterprise business processes. According to the

study conducted by (Saundage and Lee, 2011) relatively very few organizations have used of social media during the order processing process. In this paper, we therefore, focus specifically on the order processing process and show how social media can be used along with an ERP system. We demonstrate feasibility with a proof-of-concept prototype for integrating social media with ERP business process. The structure of the paper is as follows. In the next section, we review some of the theoretical foundations related to our work and in the following section present a layered approach for integrating ERP with social media. In the subsequent section, we discuss the prototype that has been implemented. In the final section, we present some conclusions and suggestions for future work.

SOCIAL MEDIA AND E-COMMERCE

Early research studies reveal that word-of-mouth (WOM) is an important driver in influencing consumer behavior such as the decision to watch a TV show, or choice of buying a product (Godes & Mayzlin, 2004). More recently, social media microblogging tools such as Twitter that support online word of mouth have become increasingly popular. These microblogs that offer sentiment and provide affective reactions towards service and products can provide critical information during decision making and purchasing process (Jansen et al., 2009).

In fact a study performed by OTX Research (OTX Research-reference 37 in “The effects of social media on E-commerce) reveals that two out of every three customers use the information they find through social media to influence their buying decisions. Nearly 67% of customers are likely to pass this information on to other customers, and over 60% trust information they find through social media such as Twitter, Facebook and other social media sites. (Suraworachet et al., 2012) studied the effect of Facebook’s features such as “like” and observed a positive impact on consumer’s attitude to buying products from Facebook-commerce. As a result, researchers are proposing ways to help organizations to effectively monitor and leverage the brand-related conversations that are happening in the social media platforms to further enhance product sales (Kumar, 2012). In summary, social media has served as a new form of word-of-mouth and influence customer decision-making in e-commerce environments. From their study on how social media affects e-commerce from a social impact theory perspective, (Kwahk & Ge, 2012), suggest that:

- Consumers visit websites that have been visited by their friends to look for products. Additionally, if the website gets positive comments, then others will most likely visit that website
- Consumers look for more information before buying a product and use that information as validation for purchase decisions
- Decisions to visit the e-commerce site will positively influence the purchasing decision from the website and lead to a successful purchase

Hence it is important that organizations enhance e-commerce by making them more social. This is evidenced by the large number of both small and big organizations that have embarked on to Social Commerce, which refers to commerce activities facilitated by social media (Curty & Zhang, 2011). Figure 1 shows an example classification of the business processes that are impacted by social media (Saundage and Lee, 2011), (IDC, 2011) and (Zhong, 2012).

We identify five processes, namely Human Capital Management, Co-Innovation Management, Project Management, Marketing and Sales Management, and Customer Care Management. Within each, we identify some of the sub-processes where social media have been used to enhance some activities within the sub-process. Some of these processes predominantly lie within the enterprise and mainly involve the employees while others extend beyond the enterprise and involve customers, partners and other stakeholders. In practice, there is a lot of overlap between the activities across these processes.

Human Capital Management

Enterprises have used social media to enhance some of the sub-processes such as talent acquisition, expert location and social learning. For example, Simpicant is a cloud-based social recruiting platform that provides talent acquisition by leveraging social media. It allows candidates to share interests and engage in conversations with recruiters, and enterprises can form entire talent communities and engage with candidates. Social media facilitates the exchange of knowledge through bridging of otherwise disconnected people (Seebach, 2012). Some of these happen through enterprise social media sites built using tools such as Yammer and Jive. For example, SAP uses Jive to help knowledge collaboration among their employees.

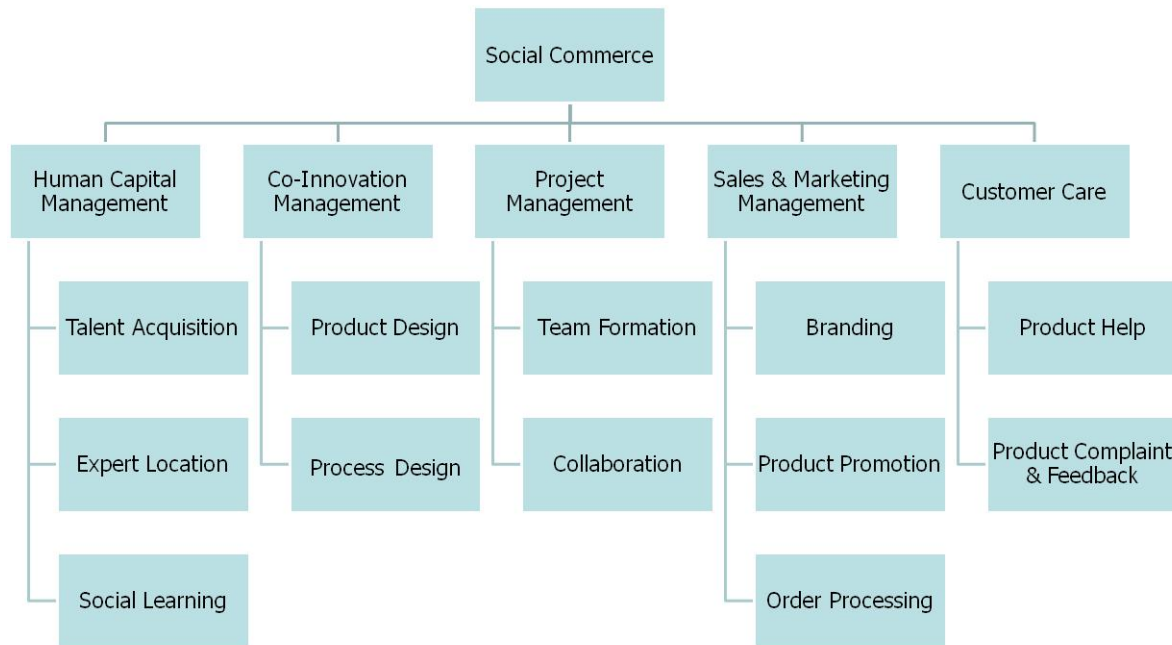


Figure 1 Example Business Processes that Leverage Social Media

Co-Innovation Management

Social media is able to connect diverse people with similar interests such as a specific product. For example, Evonik Industries, which is a specialty chemical company, used social media to generate new ideas about applications for hydrogen peroxide. The suggestions were varied and some could not have been received without the help of social media (IdeaConnection, 2012). Another example is the use of social media to develop and deploy a process collaboration wiki that helps a group of SMEs to collaborate in standardizing and optimizing business processes (Qu et al., 2008).

Project Management

(Scott, 2012) suggests a number of ways in which NASA could use social media such as wikis, blogs and Twitter to manage a number of space flights projects. Most usage of the social media in these scenarios relates to formation of project teams and enhancing the collaboration between the members of the team.

Marketing and Sales Management

Social media is seen as a suitable channel for various processes associated with marketing such as branding, product promotion, etc. For example, Finnair used the social media to renew its brand image (Jarvenpaa, 2012). A number of organizations use Facebook to promote their products (Suraworachet et al., 2012). For example, Walmart introduces products on its Facebook page. Target uses Twitter to present information on daily deals. Delta Air Lines uses Facebook to sell air tickets and increasingly more organizations are setting up e-commerce sites in Facebook.

Customer Care Management

Product and service related complaints and feedback can be channeled through social media such as Twitter and blogs. For example, Starwood Hotels uses Twitter to handle customer complaints and American Airlines uses it to handle lost luggage inquiries (Saundage and Lee, 2011). Many organizations such as banks, software companies use YouTube to provide product information videos.

INTEGRATING ERP SYSTEMS WITH SOCIAL MEDIA: A LAYERED APPROACH

In spite of a lot of examples of organizations using social media, there are very few attempts at integrating social media with enterprise systems such as ERP. Silos of social media applications are bound to lead to spaghetti integration architecture of the past (Lam and Venky, 2010), which are inflexible and difficult to maintain. In order to enhance business value from social media, it is essential to integrate social media into the systems that drive daily work in an enterprise (CITO, 2012). In many cases, the existing social media accelerate communication without providing context. For example, it is more useful for a customer to get “real-time” product related information from social media sites such as Twitter at the moment of buying the

product rather than having to do the product review on the social media platform and then conduct the buying transaction on a separate system. On the one hand, business process discipline must be preserved and on the other, unstructured collaboration must be supported. Many of the best practice process rules are embedded within the enterprise system such as ERP, and must be combined with unstructured data from the social media. Data related to customer and transaction must be created in the enterprise system. One way to support this integration is through the use of a layered approach to extending ERP to social media solutions (Cordys, 2012); see Figure 2. The first layer represents the ERP system. The various business processes in the ERP are exposed as discrete services that can be invoked to perform tasks such as “Creating a Sales Order” or “Checking Product Inventory”. These are core best practice process elements that have been predefined by the ERP vendor. Usually, these are processes that have very low change cycles and can be used as-is by various enterprises. However, these processes do not inherently support agility and hence the need for the second layer which represents the Business Process.

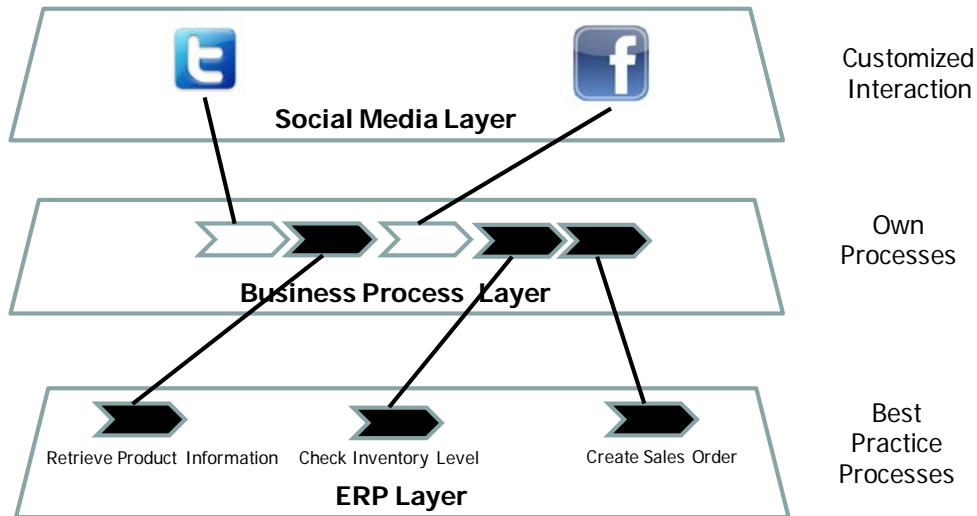


Figure 2 Integration of Social Media with ERP: A Layered Approach

The business process layer orchestrates tasks and information across the ERP and other social media applications along the value chain of the process. The business process designed in this layer can be easily modified without affecting the underlying processes defined in the ERP layer. Customer and revenue facing processes are now loosely coupled with the ERP, and can now include external applications such as social media that were not possible before. The social media layer comprises the various social media applications that are involved in the orchestrated business process. These applications provide users the necessary user interface to conduct business with the enterprise. For example, searching for a product, getting more information regarding the product from the ERP system, obtaining product reviews for the chosen product from social media sites, buying a product by executing the order processing process, giving feedback on the item bought, getting product support from the customer service representative or other customers, etc.

Technology Enablers

In order to implement a solution that integrates social media with ERP, as shown in Table 1 each of the above layers must satisfy a set of requirements and will need technology components to execute those requirements.

	ERP Layer	Business Process Layer	Social Media Layer
Requirements	<ul style="list-style-type: none"> Expose process elements as services using industry standard Execute appropriate process logic when service is invoked Persistent store of transaction information A repository to search and configure the 	<ul style="list-style-type: none"> Orchestrate the business logic that controls the flow of business process Provide persistent store of information for each process instance Define access control for various activities in the process Provide mechanisms to invoke services that are required by an activity in the process 	<ul style="list-style-type: none"> Expose functionality that can be invoked by the business process Allow input and output of data from the social media application

	required services		
Technology Enablers	SOAP Web Services	Composite Applications	REST Web Services

Table 1 Requirement and Technology Enablers

Web Services

A Web Service is defined by the W3 consortium as “A software system designed to support interoperable machine-to-machine interaction over a network” (Booth et. al., 2002). The Web Service uses a standard interface that is described in the WSDL document, which is akin to the Curriculum Vitae of the service. Other applications invoke the Web Service according to the definitions prescribed in the WSDL using SOAP messages over the standard web (HTTP) protocol. Therefore, this design model is also referred to as a SOAP Web Service (SOAP-WS). Enterprise Systems such as ERP, use the SOAP Web Service to expose best practice process elements so that they can be invoked by other applications over the network. For example, in SAP Business Suite, ‘Create Sales Order’ process element is exposed as a SOAP Web Service that relates to the business object ‘Sales Order’ in the context of the “Sales Fulfillment Process”.

More recently, instead of using a SOAP Web Services, organizations such as Amazon, Facebook, Twitter, etc. have been exposing functionality in their applications using REST Web Services (REST-WS). The REST Web Service design model uses a set of architectural principles to design a Web Service that focuses on a system's resources (e.g. access through URI), including how resource states are addressed and transferred over HTTP by a wide range of clients written in different languages (Rodriguez, 2008). Going forward, due to a simpler style, it is likely that REST Web Service will displace the SOAP Web Service.

Composite Applications

Composition is an emerging approach to delivering enterprise solutions by assembling functionality from prebuilt components, which is analogous to getting a prefabricated house assembled rather than having it custom-built (Snabe, et. al., 2009). In order for this to work effectively, the functionality has to be designed in such a way that it can be reused by calling through a service interface such as a Web Service. We can identify three approaches to developing a composite application namely, point-to-point composite, mashup composite, process driven composite (Shankararaman and Lum, 2013). In a point-to-point composite, each application is able to invoke the functionality (service) of the other application through an appropriate service interface. A mashup composite is one that uses content from more than one source that is combined to create a single new service that is displayed to the user through a graphical user interface (Engrad, 2009). A process driven composite application comprises a sequence of activities that invoke functionality in different distributed applications. An activity in the process can be human or automated. Human activities require a human to perform an interactive task through an appropriate user interface such as “Approve a Purchase Requisition”. Automated activities require the invocation of functionality in an application through a service interface, such as a “Create Sales Order” in the ERP. The process driven composite application can be implemented either by coding from scratch or by using a BPM tool.

PROTOTYPE IMPLEMENTATION

In this section we describe a prototype implementation that demonstrates the feasibility of integrating social media with ERP business process by using ERP, Social Media, SOAP-WS, REST-WS and composite application.

Social Media Enabled Business Process

Figure 3 shows the sales process along with the various tasks that a user performs when buying a product from an e-commerce website and how the social media and ERP support this process. The composite application controls the process flow by executing the process logic. The two social media applications used are Facebook (Social Media 1) and Twitter (Social Media 2).

The user triggers the process by logging into the composite application. The user's profile information is retrieved from the Social Media-1 (Facebook) by invoking the REST-WS provided by Facebook. This includes information such as name, gender, user page likes, and the user's friend information (e.g. Friends' name, gender, age, birthday, etc.). Using this information, the composite application will present the user with a list of friends whose birthday fall in the current month and prompt the user to buy gifts for them. Once a user decided to buy a gift, the composite application will retrieve selected products from the ERP which match the profile of the friend. The product recommendations can be based on gender, age, or other profile information, and display the products to the user along with their pictures. The user can then select a particular product, and the composite application will retrieve all comments and reviews pertaining to the chosen product from the

Social Media-2 (Twitter) along with the sentiment analysis based on all “tweets” related to the product. Once the user decides to buy the product, the credit card details are obtained and sent to the Payment Gateway (PayPal) for processing. If the payment is processed successfully, the composite application invokes the “Sales Order Sub-Process”, which invokes the appropriate ERP business process for creating the sales order, delivery note, etc. In addition, the user’s Social Media-1 page (Facebook) is updated with the product that has been purchased.

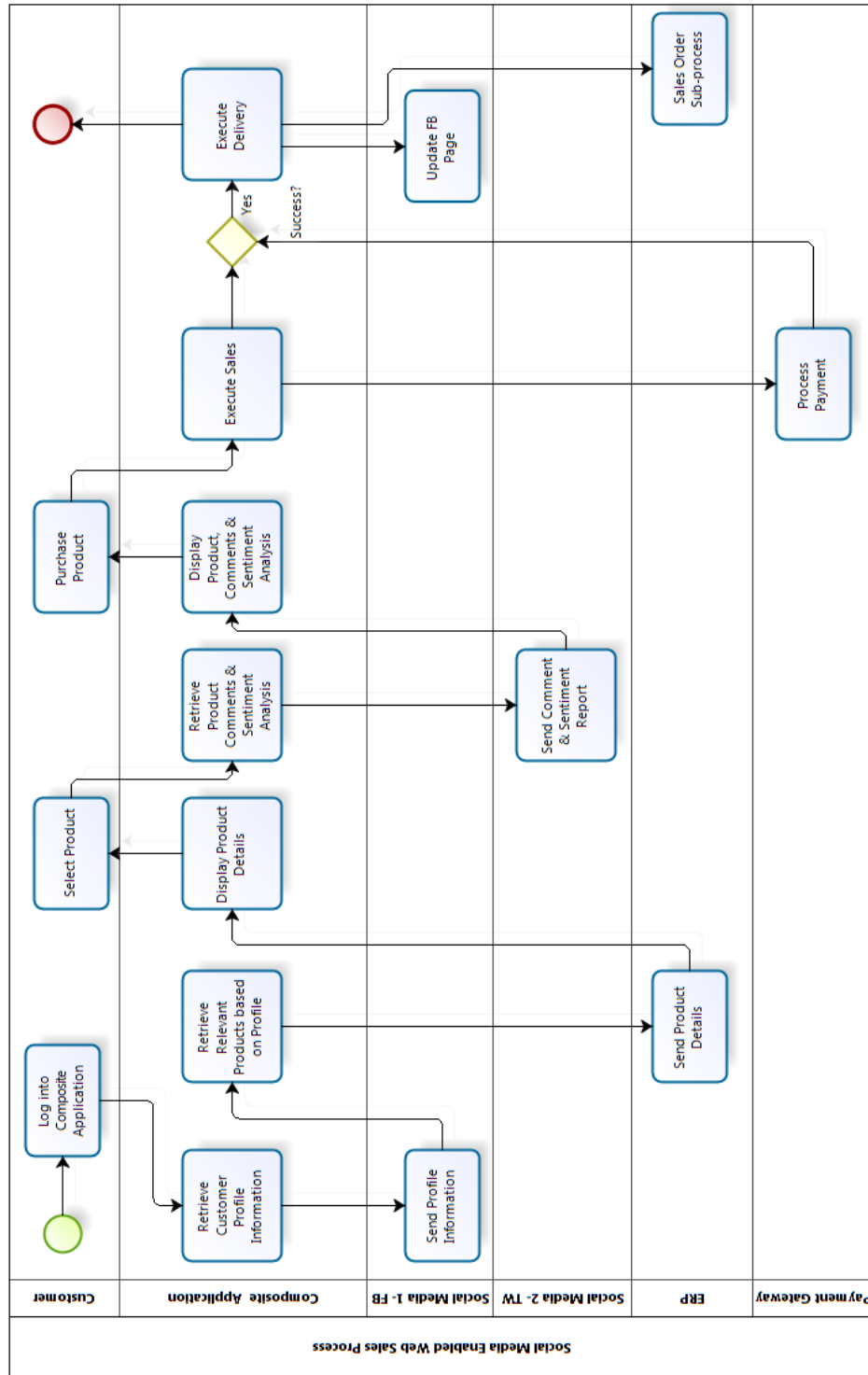


Figure 3 Social Media Enabled Web Sales Process

Solution Architecture

Figure 4 shows the solution architecture for implementing the sales process. The solution architecture mirrors the three layers shown in Figure 2. The composite application was implemented as a web application which contains the process logic. A database stores the process context which comprises three types of information:

- Data retrieved from Facebook, which includes the profile information such as user's likes, user page likes, and the user's friend information
- Data retrieved from Twitter, which includes product tag words and public tweets related to the product tag words
- Process state information, which includes the current state of execution of the tasks and the tasks completed

The Composite Application invokes the functionality from the SAP ERP using the SOAP-WS, and the functionality from Facebook, Twitter and PayPal using REST-WS.

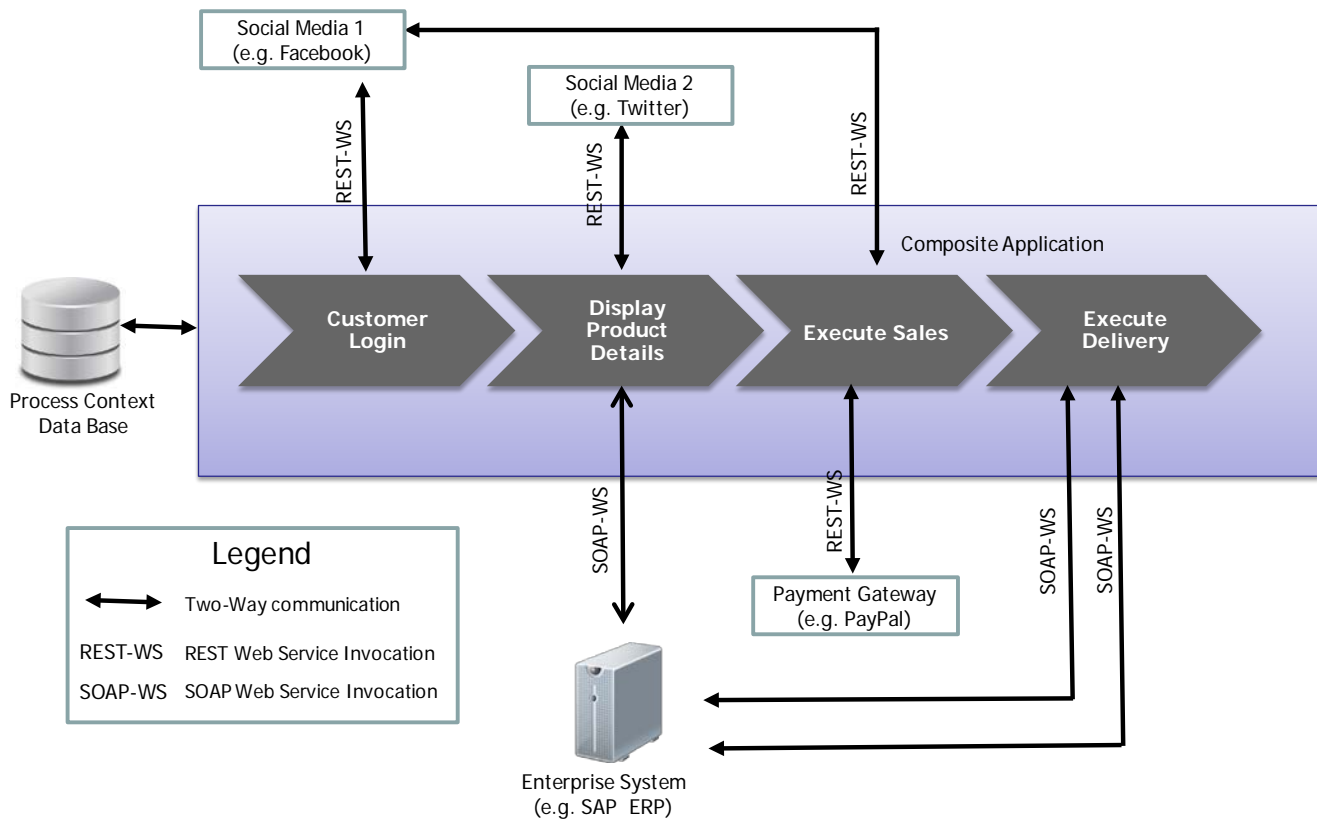


Figure 4 Solution Architecture

From the SAP ERP, the following three functionalities are invoked by the composite application:

- Find Material by ID and Description- This functionality, when invoked, retrieves the product details from the ERP system
- Create Sales Order- This functionality, when invoked, creates the Sales Order in the ERP system
- Create Outbound Delivery With Reference To Sales Order-This functionality, when invoked, creates the Delivery Note document for the transaction in the ERP system

Prototype Evaluation

The evaluation of the prototype focused on demonstrating the feasibility of the solution using an example test case. For brevity, we will only show a few screens of the process. In this test case, we assume the enterprise name is XML Pte Ltd, the user's name is Alberto Ramirez and age is 25. Once the user logs into the composite application through Facebook, the relevant products that match the user's profile are retrieved and displayed (see Figure 5).

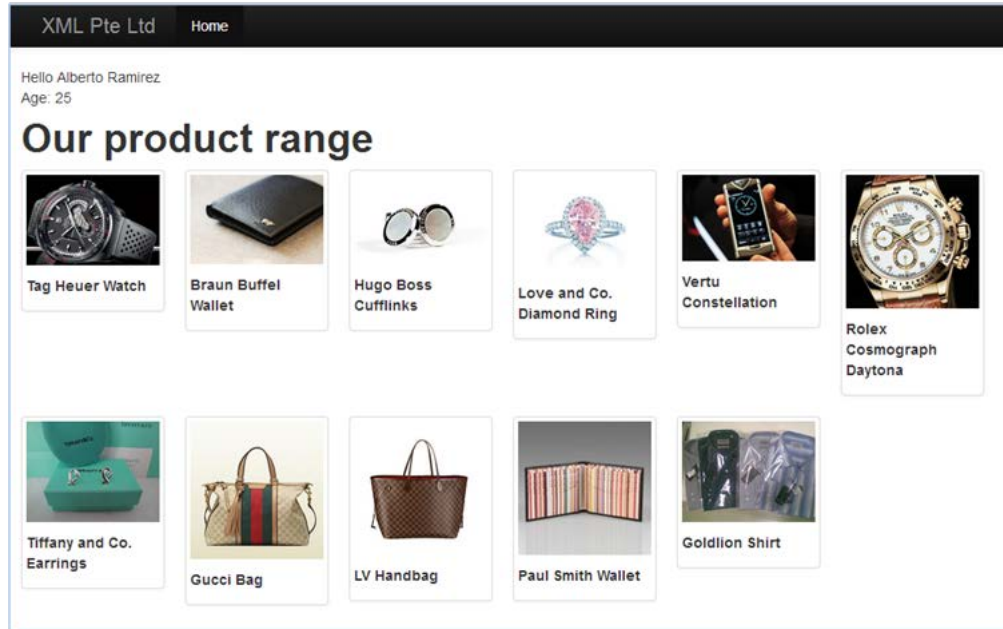


Figure 5 Products Displayed from ERP

Once the user selects the product “Rolex Cosmograph Daytona”, the composite application will display the “Tweets” along with the sentiment analysis for the chosen product (see Figure 6). As seen in this example, there is no very strong positive or negative sentiment for the chosen product.



Figure 6 Sentiment Display for Chosen Product

Once the payment is successful, the sales order is created in the ERP. Figure 7 shows the example sales order for the purchase of the product “Rolex Cosmograph Daytona”.

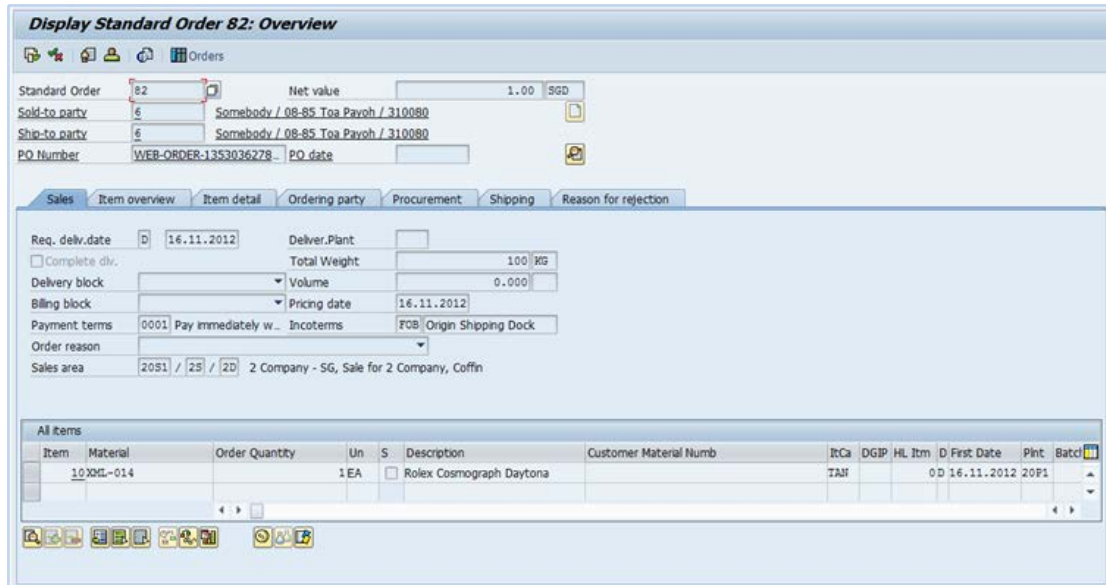


Figure 7 Sales Order Created in the SAP ERP

Conclusions and Future Work

As the millennial generation, who prefers to use social media technology to blend their personal and professional life, transitions into the workplace, organizations will have to develop solutions that integrate social media into the workplace. Moreover, from outside the organization, this generation is the future customer. Hence organizations have to leverage the social media to do business with the future customer. In this context, many organizations have embarked on exploring ways in which social media can be incorporated into their business processes. In this paper, we have presented a proof-of-concept prototype for integrating social media with ERP business process. This prototype is implemented using the composite application design philosophy and technologies such as SOAP and REST-WS.

Following (Saundage and Lee, 2011), we can identify the various phases of a customer buying process. For each phase, we identify the corresponding organization’s business process and customer activities (see Table 2).

	Pre-Transaction	Transaction	Post-Transaction
Organization Business Process	Product and Service Promotion and Branding	Sales	After Sales Support
Customer Activities	Research Compare Select	Transact	Comment Rate Help other customers

Table 2 Customer Buying Process

Our prototype currently provides some support for the customer activities in the Pre-Transaction phase and Transaction phase. From the organization business process perspective, it only supports those in the Transaction phase. Future work will be aimed at extending the prototype to support the organization business process in the Pre-Transaction and Post-Transaction Phase and the customer activities in the Post-Transaction phase. Additionally, in the present prototype, in the Pre-transaction phase, the customer reviews are only provided from one social media namely Twitter. In future, we can extend it to include product reviews from other websites.

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