Customer relationship management in social and semantic web environments

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ABSTRACT

The growing influence of the Internet in current 21st-century everyday life has implied a paradigm shift in terms of relationships between customers and companies. New interaction means in the Web 1.0 have undergone a dramatic change in quantity and quality with the advent of the so-called Web 2.0, the Social Web. The upcoming Web 3.0, the Semantic Web will also impact tremendously in how companies understand Customer Relationship Management (CRM). In this dynamic environment, the present work presents a combination of both Social and Semantic Web Technologies and their application in the particular field of CRM. Tool and technology analysis both prove the challenging opportunities for these cutting-edge innovation trends in the CRM domain.

Keywords: Customer Relationship Management; Ontologies; Semantic Web; Social Web; Web 2.0

INTRODUCTION

The Web is undergoing significant change with regards to how people communicate. A shift in the Web content consumer-producer paradigm is making the Web a means of conversation, cooperation and mass empowerment. Emerging killer applications combine sharing information, social dimension, undermining the very principles where content have relied for decades, namely information asymmetry and top-down content delivery. In this changing environment, companies are also changing the way in which they communicate with their customers.

Thus, the traditional paradigm of Customer Relationship Management (CRM) has also been changed with the emergence of new forms of interaction. CRM has become a research focus in the academic field since Ives and Learmonth (1984) put forward customer relationship life cycle (CRLC) concept. CRM refers to a customer-focused business strategy. There are several definitions of CRM in the literature. Although all CRM definitions differ somewhat, they all focus on such individual and longitudinal buyer-seller relationships that both parties benefit in the relationship established (Sin, Tse, & Yim, 2005). Thus, a good definition to CRM could be the one provided by Dyché (2002) who defines the concept as "The infrastructure that enables the delineation of an increase in customer value, and the correct means by which to motivate customers to remain loyal, indeed to buy again". According to Sinisalo et al. (2007), the origins of CRM can be traced back to the concept of relationship marketing (RM) (Gebert et al., 2003; Zablah et al., 2004). The term RM was initially coined by Berry (1983), who defined it as

attracting, maintaining and - in multiservice organizations - enhancing customer relationships. For a full explanation of RM origins see Osarenkhoe and Bennani (2007). CRM is the outcome of the continuing evolution and integration of marketing ideas and novel available data, technologies, and organizational forms with the goal of engaging in a meaningful dialogue with individual customers (Boulding et al., 2005; Campbell, 2003). While RM does not acknowledge the technology underlying the management of customers, CRM uses technology to implant RM strategies (Ryals & Payne, 2001).

Thomas and Sullivan (2005) pointed out that CRM requires the company to manage and coordinate communication with customers across different media. And the internet is one of the leadings channels today. Due to its potential for interactive communication, the Internet is considered a promising tool for RM in the early 2000 (Thorbjornsen et al., 2002), and more recently (Wang & Head, 2007). As an extension, the internet is one of the leading channels for CRM. Chen and Popovich (2003) cite the internet as a channel to maximize the profitability of customer interactions. For Mendoza et al. (2007), the internet lowers costs, broadens market range and boosts the quality of service. As a result of the importance, the internet as a channel for CRM is a very prolific research field (Fjermestad & Romano, 2003; Wang & Head, 2007; Ngai et al., 2009; Galitsky et al., 2009).

In the environment described, in this paper is studied the interaction of CRM with two technologies that are changing the world through the Internet, namely the Social Web or Web 2.0 and the Semantic Web or Web 3.0. The remainder of the paper is structured as follows. First, it establishes the relationship between the so-called Web 2.0 or Social Web with CRM. Secondly, it explores the connections between the so-called Semantic Web and the CRM universe. The fourth section sets out what can be considered as future trends in the interaction of technology and CRM. Finally, Section 5 discusses the conclusions drawn and the future work to be realized.

WEB 2.0 AND CUSTOMER RELATIONSHIP MANAGEMENT

Social interactions have recently found an exceptional vehicle in the recent breed of user generated content aware technologies encompassed by the coined "Web 2.0" buzzword (O'Reilly, 2007). Web 2.0 technologies as outlined in (Laudon & Laudon, 2006) are exemplified by blogs, namely easy to update websites about a particular subject where entries are written in chronological order, picture-sharing environments such as Flickr or Photobucket, social bookmarking sites such as Del.icio.us, video-sharing such as YouTube or music preferences such as Last FM. Web 2.0, social software, social computing, online communities, peer networking, immersive web... Their meanings overlap, and definitions are somewhat fluid (Parameswaran & Whinston, 2007). But according to O'Reilly (2007) the term Web 2.0 is slightly different in that it includes more technologies within its scope and does not bind itself closely with the social aspect. Table 1 shows some descriptions of Web 2.0 technologies:

Table 1. Web 2.0 technologies (Chui, Miller, & Roberts, 2009)

Web 2.0 technologies	Description	Category of technology
Wikis, commenting, shared workspaces	Facilitates cocreation of content/applications across large, distributed set of participants	Broad collaboration

Blogs, podcasts, videocasts, peer to peer	Offers individuals a way to communicate/share information with broad set of other individuals	Broad collaboration
Prediction markets, information markets, polling	Harnesses the collective power of the community and generates a collectively derived answer	Collective estimation
Tagging, social bookmarking/filtering, user tracking, ratings, RSS	Adds additional information to primary content to prioritize information or make it more valuable	Metadata creation
Social networking, network mapping	Leverages connections between people to offer new applications.	Social graphing

The Web 2.0 phenomenon made the Web social, initiating an explosion in the number of users of the Web, thus empowering them with a huge autonomy in adding content to webpages, labeling the content, creating folksonomies of tags, and finally, leading to millions of users constructing their own webpages (Breslin & Decker, 2007). Logically, the result of this movement was a significant increase in the number of webpages available. According to O'Reilly (2007) a fundamental principle of Web 2.0 is that users add value by generating content through these applications, resulting in network effects among the community of users. This circumstance is instigating more and more organizations to attempt to exploit the gains of Web 2.0. In this new scenario, collaboration and co-creation with customers has emerged through habitual use of Web 2.0, by both companies and clients alike (Vargo & Lusch, 2004).

According to a study by McKinsey consultants (McKinsey, 2007) where 2,847 executives were interviewed, respondents inform that Web 2.0 technologies are strategic and that they plan to increase these investments, moreover, they say they are using Web 2.0 technologies to communicate with customers and business partners and to encourage collaboration inside the company. More precisely, executives inform blogs are also frequently mentioned as a channel to communicate with customers and, in some cases, critics.

This new web offers limitless opportunities for companies to engage their customers (Eikelmann, Hajj, & Peterson, 2008), for example, Southwest airlines's blog has received more than 6,300 comments since it started in April 2006, in response to little more than 250 posts. Rather than ignoring or fearing criticism or opinion generated in Web 2.0 forums, companies should seize Web 2.0 tools to respond and gain competitive advantage (Eikelmann, Hajj, & Peterson, 2008). Studies by Forrester consultancies confirm that CRM applications have adopted the importance of Web 2.0 in CRM environments. These studies indicate that innovative businesses are using Web 2.0 tools to collaborate on sales, customer service, and marketing collateral; connect social networking tools into a business environment to help identify leads better; and utilize community networks to better provide service to customers (Marston, 2008) and that CRM professionals must find innovative ways to engage with emerging "social consumers" (Band, 2008).

In this Internet scenario, Web 2.0 has turbocharged the whole notion of ' word-of-mouth ', circumventing traditional marketing by letting individuals talk directly to each other about their passions, their buying preferences and their pet peeves (Eikelmann, Hajj, & Peterson, 2008). Thus, according to corporate studies, there is an each time increasing volume of commercial CRM tools which incorporate and stimulate the use of social networks for global client management (Marston, 2008; Band, 2008; Maoz, 2008). For example, according to O'Reilly (2007), Salesforce.com demonstrates how the web can be used to deliver software as a service, in

enterprise scale applications such as CRM. Originating from this combination of technologies and philosophies, a number of authors have begun to employ the term "CRM 2.0" or Social CRM (Mohan, Choi, & Min, 2008). A definition of this new term can be found in CRM 2.0 Wiki[1] "CRM 2.0 is a philosophy & a business strategy, supported by a technology platform, business rules, processes and social characteristics, designed to engage the customer in a collaborative conversation in order to provide mutually beneficial value in a trusted & transparent business environment. It's the company's response to the customer's ownership of the conversation". From a technology point of view, CRM 2.0 integrates social media tools into corporate applications: blogs, wikis, podcasts, social networking tools, content sharing tools, user communities… In this new environment, CRM software vendors, must conduct a review of the capabilities and a redesign of their tools to meet these new criteria. Consultants like Forrester, have begun to look at the vendor capabilities in this area, including Web 2.0 tools and applications (discussion threads, wikis, blogs, RSS, social bookmarking, social networking, widgets, mashups, and podcasting) as well as Web 2.0 technology capabilities (XML, AJAX, Flash/Flex and mashup markers, and Web services standards) in their product evaluations (Petouhoff, 2008).

SEMANTIC WEB AND CUSTOMER RELATIONSHIP MANAGEMENT

The arrival of the Semantic Web represents a revolution for the form of access and storage of information. The term "Semantic Web" was coined by Berners-Lee, Hendler, and Lassila (2001), to describe the evolution from a document-based web towards a new paradigm that includes data and information for computers to manipulate. The Semantic Web enables automated information access based on machine-processable semantics of data. The Semantic Web was defined by these authors as "an extension of the current web in which information is given well defined meaning," and can "enable computers and people to work in co-operation better". The Semantic Web provides a complementary vision as a knowledge management environment (Warren, 2006) that, in many cases has expanded and replaced previous knowledge and information management archetypes (Davies, Lytras, & Sheth, 2007). Naeve (2005) states that the Semantic Web has initiated a paradigm shift from "knowledge push" to "knowledge pull", as a result of its advanced capacities for automatic information integration. Similarly, Fensel and Musen (2001) consider the Semantic Web as "a brain for humankind" and some authors have even extended this definition to a "human semantic web" (Naeve, 2005; Vossen et al., 2007).

Formal ontologies (Gruber, 1993) play an essential role in the Semantic Web vision, because they provide structured vocabularies that describe a formal specification of a shared conceptualization. Ontologies were developed in the field of Artificial Intelligence to facilitate knowledge sharing and reuse (Fensel et al., 2001).

The fundamental aim of the Semantic Web is to answer the ever-growing requirement for data integration on the Web. The benefit of adding semantics consists of bridging nomenclature and terminological inconsistencies to include underlying meanings in a unified manner. Given that a universally shared data format is not likely to arise and diffuse, the Semantic Web provides an alternative solution to represent the comprehensive meaning of integrated information and promises to lead to efficient data management by establishing a common understanding (Shadbolt, Hall, & Berners-Lee, 2006). Semantic Web has been named as Web 3.0 (Lassila &

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[1] http://crm20.pbwiki.com/

Hendler, 2007; Hendler, 2008). Technology Journalist Markoff (2006) begun to call this new web applications as Web 3.0.

In recent years, Semantic Web research has resulted in significant outcomes and the adoption of this technology from the market and the industry is becoming closer (Lytras & García, 2008). As a result of this, CRM and semantics are also becoming closer. The benefits of having a unified semantic environment for CRM are, like for other business applications, undeniable. In this environment, particularly in relation to ontologies, in recent years several authors have dealt with the creation of ontologies related to CRM. There are ontologies for Customer Complaint Management (Jarrar, 2008) as well as efforts focus on employees point of view (Van Damme, Christiaens, & Vandijck, 2007), from a universal viewpoint (Magro & Goy, 2008) or from the customer emotions (García-Crespo et al., 2008).

However, it can be said that efforts in the global integration of CRM and semantic web are far from complete. From the commercial point of view, at the present moment, the authors are not aware of any initiative that integrates these two trading technologies. On the research environment, there have been some noteworthy efforts. SEMO can be considered as one of the most comprehensive initiatives (García-Crespo, Colomo-Palacios, & Gómez-Berbís, 2009). The objective of this framework is to exploit the advantages of the Social Web by means of the use of semantic technologies, in relation to CRM. The platform benefits from semantic annotation and classification as well as text analysis (of social web content), relying on techniques taken from Natural Language Processing field.

From the viewpoint of the relationship between the Semantic Web with Web 2.0, Benjamins et al. (2008) pointed out that Web 2.0 systems are complementary to the Semantic Web. According to these authors, many of these Web 2.0 systems are based around the notion of user tagging, involving annotating data (photographs, texts, songs, etc) with user supplied descriptive words or phrases (tags). The crucial difference is that, in the case of the Semantic Web, this metadata is associated with a formal ontology, ensuring the consistent usage of particular tags across users and applications and formalizing the data representation. The extension of the Semantic Web that provides a promising approach to developing tools and applications bridging the gap between social applications and semantics is known as by many authors as Socio-semantic Web (Zacklad, 2003) or as Pragmatic Web by others (Schoop et al., 2006).

Whatever its name, is the formalization of the tagging that provides the so-called Web 3.0 to its full potential. The application of this full potential to the field of CRM is what is still to come, and to describe in the next section.

CRM & TECHNOLOGY FUTURE TRENDS

Unfortunately, new technology is not expected to eradicate unsuccessful CRM systems implementations. The disappointing results from many customer relationship management (CRM) implementations are well documented in both the academic and business press (Richards & Jones, 2008). However, it is believed that new technologies can help the corporate CRM strategy to improve many of its elements. Table 2 shows CRM value drivers defined by Richards and Jones (2008) and its possible interaction with new technologies:

Table 2. CRM value drivers new opportunities

Value Driver	Potential impact of Social Semantic Web technologies

Improved ability to target profitable customers	Social technologies provide a strong feedback source with takes into account customer recommendations, opinions, trends, feelings and sentiment analysis. By organizing and structuring this feedback, knowledge intensive technologies would gather a reliable and intensive data pool for future marketing focus and targeting on the suitable customers.
Integrated offerings across channels	The huge amount of Social Technologies creating and gathering data stemming from different sources ranging from RSS feeds to Twitter-based raw information provide sufficient data to use a lightweight approach of Semantic Technologies (basically, RDF based querying and data extraction) which builds up a corpus of structured offering that can be integrated in a number of channels. Offerings are then expressed like lightweight or shallow ontologies associated to customers and channels.
Improved sales force efficiency and effectiveness	Feedback from the customer is vital to improve sales force efficiency and effectiveness. In a nutshell, they harness the throughput of the organization from an economic viewpoint. By using social technologies, a number of opinions and ratings about that efficiency are market watched and peered over. Classification and rewards of that efficiency driven by the social data are value-added mechanisms.
Improved pricing	Prices are subjective and hence can be highly influenced by Social Technologies. The implicit knowledge would assess the suitability of prices, by creating a more accurate prince range for a particular product based on the customer viewpoint.
Customized products and services	Customization is the most important feature stemming from both Social and Semantic Technologies. Both provide a strong theoretical and practical framework to customize products based on preferences, recommendations and subjective-oriented parameters. Products and services customized through ad-hoc ontologies or Web 2.0 folksonomies are a real-world implementation of the old promise of marketing one-to-one.
Improved customer service efficiency and effectiveness	Emerging customer service efficiency strategies are changing the current business landscape. With the application of Semantic Technologies, service can be improved on a domain basis, such as those services based on science, education and health, especially regarding their adaptability, interoperability and, derived from both of these characteristics, the incorporation of cognitive and reasoning capabilities.
Individualized marketing messages	In the Knowledge Representation research field, ontologies and Semantic Technologies not only use knowledge representation to personalize the messages and make them individual oriented, but also enable the sharing and reuse of knowledge components inside the messages.

Value, brand and relationship equity drive overall customer equity	Despite brand value is a very abstract concept Social Technologies can strongly help to develop the brand from a customer perception standpoint. Coca Cola´s use of Social Networks and the opinions of fans of a particular product to foster ongoing improvement of their products is simply the tip of the iceberg. Brand value remains a challenging field to explore with the help of knowledge-oriented technologies.

In the previous table, we have summarized a number of value drivers and the potential impact of Social and Semantic Web Technologies. In the following section, we discuss future work and challenges of this research work, concluding the paper.

CONCLUSIONS AND FUTURE WORK

Enriching Customer Relationship Management with Social and Semantic Technologies is necessary because of the breakthroughs of applying emerging technologies in a field where scarcity of measures to reveal its importance. In many cases, consuming a specific service from a particular service supplier encompasses a number of opinions, trends, recommendations and features whose implicit knowledge cannot be easily captured. The philosophy of Web 2.0 and the upcoming Semantic Technology leading to the next generation of the Web is to be able to customize, profile-based classify and gain knowledge from the service consumption of the best service according to organizational needs.

In the future, we will focus on experiments in the CRM domain with Social and Semantic Technologies by designing a Methodology for Intelligent Automatic CRM Provision based on Semantics so that customers and providers can benefit from their advantages. Fundamentally, we will develop our framework based on the following requirements for companies or entities:

- Company centric: Companies such as Salesforce.com, providing CRM functionalities, focus on different companies but share a common knowledge portfolio. We will describe semantically companies and focus on them.
- Task centric: There are particular applications the user might want to use. These applications are independent, self-contained and decoupled from other applications. However they do not have to be necessarily task-oriented since they can be billed separately, backed-up separately, and so on. In principle, they behave like traditional applications, completely self-sufficient.
- User accessible: Our framework results can be used with a number of devices and a wide spectrum of users, with different profiles and roles being played both from a developer or business perspective. In general, the access is achieved using a web browser.

Finally, we will also focus on a major concern of Semantic and Social Technologies: data heterogeneity. Semantics of the different CRM information sources must be well-defined. This will radically reduce software data complexity and allow process scaling.

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