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ADVOCATING FOR INTEGRATING BUSINESS INTELLIGENCE IN VIRTUAL COMMUNITIES OF PRACTICE

Empirical studies

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Abstract

In the age of information and technology, Virtual Communities of Practice represent a reachable, cost effective and viable solution. For their advantages, they become more popular between the members of the cluster communities that share the same interest.
Virtual Communities of Practice bring together people through online platforms and put them into the collaborative relation, so that they can share, learn, experiment and improve their activity. To this, there is always an informational input came from document resources shared into the community. But the challenge come with the management of this hole information and the use of it in order to go further and use the proper information to obtain knowledge and take decisions.
For this, in our paper, we propose a model of using Business Intelligence into Virtual Communities of Practice, focusing on the advantages that this approach brings not only to the virtual community, but also to the local communities, improving their activities and being an innovation accelerator.

Introduction

According to the literature, Virtual Communities of Practice (VCoPs) have gain the attention of the researchers once the web was founded. They are described as "the union between individuals or organizations who share common values and interests using electronic media to communicate within a shared semantical space on a regular basis" (Akerkar and Aaberge, 2012).

In 2000, Preece mention that a virtual community of practice is composed by four elements: (1) socially interacting people, performing special roles or satisfying their needs, (2) a purpose, which is the reason behind the community, (3) policies to govern people interaction, and (4) a Computer Systems that support social interaction.

The typology and the purpose of virtual communities vary as much as areas of interest that people are focused on. No matter the aim is, playing, chatting, discussing, researching, collaborating, bulletin boards, email groups, etc. can be considered virtual communities that allow people to gather and connect. Also, they are easy to achieve, easy to use, cost effective and viable solutions for anybody who is interested in collaboration on certain subject. For all these, VCoPs received a visible level of attention from the research community in many disciplines like Computer Science, Sociology, Psychology, Health Care and others (El Morr et al., 2012).

Because of their multitude even on the same subject, and taking in consideration the fact that the final aim of every user of a VCoP is related to gathering information, there was identified the need for providing methods to link virtual communities together in a meaningful way. For this, Akerkar and Aaberge propose a framework for semantically interlinked virtual communities called SIVC that can be used for information structuring, export and information dissemination (Akerkar and Aaberge, 2012).

Also, there are studies that focus on the integration of Virtual Libraries into Virtual Communities, in order to add value to the community in terms of knowledge. This because, according to the study "Comparing digital libraries with virtual communities from the perspective of e-quality", the authors compare users' perceptions of digital libraries and VCoPs in terms of information quality, system quality and service quality and find that "users perceive a higher level of e-quality of digital libraries than that of virtual communities" (Yan et al., 2013).

But the challenge come with the management of the entire data contained by the VCoP itself. We consider the collaboration and the informational exchange between the VCoP users a necessary condition to tackle the aim of the community, but not sufficient. We consider that the hole information contained by a VCoP should be managed and utilized for further analysis and depending on the community type, the information extracted from analysis, should be implemented on the decisional process, used for further research, or reused by users as an input on their activity. Moreover, if the VCoP contains a virtual library integrated, the data stream represents a rich source of information that is impetuous necessary to be exploited.

As a solution to this, we propose a theoretical model for integration of Business Intelligence into VCoPs which has the role of getting the next step on analysing the high amount of data that it contain, focusing on the advantages that this approach brings not only to the virtual community by accelerating its success, but also to local communities, by improving their activities and being an innovation accelerator.

Virtual Communities of Practice

Related Work

In 1991 Lave and Wenger introduce the concept of Community of Practice (CoP), developed by E. Wenger itself in 1998 and elaborated with W. Snyder in 2000 in Harvard Business Review studies. Through these, communities of practice are considered groups of people bound together informally by shared expertise and passion for a joint activity, sharing "their experiences and knowledge in free-flowing, creative ways that foster new approaches to problems" (E. Wenger & W. Snyder, 2000).

Similarly, a governance mechanism useful for the organizations operating within knowledge intensive industries, is proposed as "communities of creation" by Sawhney and Prandelli (2000). This concept was further developed so that were introduced concepts such as "Knowledge Community", "Community of Interest", "Learning Community", "Communities of Creation".

At the same time, the development of information and communication technologies, have encouraged the introduction of a virtual dimension within the traditional communities, so that the phenomenon of Virtual Communities of Practice emerged.

VCoPs took attention from the research community firstly in Computer Science, Sociology, Psychology and other disciplines (Preece, 2000), being a form of the social system (Weissman, 2000). For that they present some of the social system's characteristics like causal reciprocity, purpose, design, roles, circumstances, officers, passion, needs, loyalty, and access.

According to Yan, Virtual Communities of Practice „are applications of Web 2.0 technologies that encourage people to participate in the shared generation of content, with the result that members' collaborative work is accumulated to become the

assets of the communities"(Yan et al., 2013). So, for users of a virtual community of practice, „information seeking is their main activity" (Bouty, 2000). Six yaters later, Chiu came with the idea that „the aim of individuals participating in virtual communities is to seek information and knowledge so that problems at work can be resolved" (Chiu et al., 2006).

Knowledge Management into Virtual Communities of Practice

The available researches shows that in the context of Knowledge Management there is a wide variety of different virtual communities that can be construct to form knowledge networks. Virtual knowledge communities are communities where participants capture, access, use, create, and define knowledge (Merali & Davies, 2001), and/or where information is automatically captured to be accessed and shared in-between participants (El Morr et al., 2012).

Virtual communities of practice set up the environement for people located everywhere in the world „who are interested in exchanging on topics or ideas have the chance to get in contact with each other. Even though these methods and tools have been developed in the global environment, today´s requirements for knowledge management communities have changed during the last years". They face the challenge of supporting international cross links and facilitate knowledge transfer activities within organizations and also trying to minimize geographical distance and language barriers between users and overcome intercultural and communicational barriers (Langenberg D., Welker M., 2011).

For this, in paper "Knowledge Management in Virtual Communities", the authors rize the need of a knowledge management (KM) and collaboration service and such a SaaS (Software as a Service) solution is „*KnowledgeCloud*„ a KM system developed by Pumacy. This platform has an architecture based on cloud technologies, providing collaboration-oriented knowledge management as a service, and include functionalities like: file storage, load balancing and monitoring. Data collection and analysis are not provided by this platform.

Business Intelligence

In the last years, the ability to obtain useful information in real time has become an extremely important, even critical factor of success for any activity domain. This because the ever growing competitive climate that is developing in everything that surround us, require quick, intelligent and the right decisions, and the "tool" that enable us by now to do this is Business Intelligence (BI).

Business intelligence "combines products, technology, and methods to organize key information that management needs to improve profit and performance" (Williams&Williams, 2007). BI is not a single product, a technology or a methodology, it is a mechanism composed by these elements in order to offer information assets. It helps those who use it to make decisions and bring improvement and innovation in their activity.

BI took the attention of IT and business communities firstly in the 1990s. One decade later, „business analytics was introduced to represent the key analytical component in BI" (Davenport 2006). According to Chen, „in the last years, big data and big data analytics have been used to describe the data sets and analytical techniques in applications that are so large and complex that they require advanced and unique data storage, management, analysis, and visualization technologies" (Chen H et al., 2012).

Therefore, business intelligence, analytics and big data analytics „have gained the attention of both the academic and the business communities due to the opportunities associated with it", also "is often referred to as the techniques, technologies, systems, practices, methodologies, and applications that analyze critical business data to help an enterprise better understand its business and market and make timely business decisions" (Chen H et al., 2012). In addition to this, business intelligence and analytics „include business-centric practices and methodologies that can be applied to a large variety of applications such as e-commerce, market intelligence, e-government, healthcare, and security" (Chen H et al., 2012).

According to Gartner, the most essential capabilities of BI and analytics are: reporting, ad hoc querys, dashboards, data mining and predicitve modeling, online analitical processing, scorecards, interactive visualization. (Sallam R. L. et al. 2011).

At the begining of the 21st century, „a new era of research centered on text and web analytics for unstructured web contents is established thanks to web intelligence, web analytics, and the user-generated content collected through Web 2.0-based social and crowd-sourcing systems" (Doan et al. 2011, O'Reilly 2005).

In the las years „a new area of Web 3.0 is reveal, a mobile and sensor-based area where the mobile analytics, location and context-aware techniques for collecting, processing, analyzing and visualizing such large scale and fluid mobile and sensor data are still unknown" (Chen H et al., 2012).

Model Approach

The evolution of life, the ever growing needs, the time pressure in a fast society and the huge amount of possibilities put us in front of taking fast, proper and intelligent decisions based on our experience.

And with each experience we have, we leave traces that are important data that reveal our experience. In online, every click is registered and it tell something about us. Coming back to the virtual communities of practice, every action or word that we mark into, represent a source of information that that should not be throw away.
For enterprises, the main goal is to increase revenues and/or reduce costs, in order to improve performance and increase profits. The public sector primary focus is service to citizens, facing budget constraints and using resources wisely in order to support the agency's mission. For marketers the aim is to reveal trends that should help them to stand one step ahead of the competition. Scientists are interested in identifying new horizons of knowledge aimed to help humanity in every aspect of life. The common goal of doctors is to find ways to cure diseases and create a healthier population. People are interested in finding ways to create an easier life for themselves to spend more time with their loved ones, with their hobbies and to discover more about the things they are interested in.
As the activity of new generations gradually move into online, virtual communities of practice become a knowledge tool. An extremly large amount information generated by industries, companies, customers, research, products, etc can be collected from the internet, organized and visualized thanks to the multitude of web mining and text techniques. The huge amount of data contained on VCoPs must be converted into useful information in a timely manner to provide input to all the domains listed above and many others in order to contribute to the wellbeing of the society.
For this, we propose a model (Figure 1) which integrate Business Intelligence into VCoP that supports the hypothesis that any action within the community should be gather and analysed together with others.
The main elements of the model are:

1. the virtual community
2. other transactional databases
3. business intelligence component

The ***Virtual Community of Practice*** take in consideration the main actors: users and applications. Through applications, users create the massive amount of data using the components of the VCoP:
i) *interactions* which consist of work and projects, online learning, online spreading of ideas, reciprocity of information support and service among members
ii) *activities* which consist of discussions, web-seminars, events, mentorship and so, all their aim resuming into sharing expertise
iii) *content* which consist of shared resources and policies, shared documents, documentations and knowledge, virtual libraries

Data generated by all this components represent unstructured data uploaded into a database, and to simplify the model, we take in consideration only the activity from virtual library (eg. actions keyword-based search), which is actually considered generating unstructured data.
Another ***transactional database*** is not necessary to be implemented into the model, but usually we consider it useful. For example, in medical system, concerns of medical staff bounded into a VCoP and signals received from the medical system can rise questions and prove performance or gaps.
The ***business intelligence*** component take the unstructured data, reorganize them, categorize and tune them in order to obtain comprehensive and structured information, transfer them into the data warehouse. On the other side, the structured are extracted, transacted and loaded (ETL) into the data warehouse.
From this point, users can generate standard reports and alerts, or create advanced analytics and predictive analytics like forecasts, predictions, cluster analysis, data regressions, simulations, text analytics, anti-fraud analytics, big data analytics, data mining and others that help them to take proper decisions, to improve their activity, to innovate, to discover new levels of research.

Conclusions
The use of technology reveals us new possibilities to improve our life in every aspect. Communities of people moved from local to online, creating Virtual Communities of Practice so that it help them to cross the geographical boundaries and stay connected and share expertise into a joint activity. Through this, they create valuable assets to the community consisting of huge amount of unstructured data that are generally unused.
For this, business intelligence represent a solution which gather all this information, transform it and put it into friendly form that can be further analysed. Based on this, users can create advanced analytics and predictive analytics in order to forecast, innovate or optimise their activity.
As future research, the model proposed can be tased and validated on a virtual community, also the cost implications of this solution being a subject of interest.

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References

[1] Akerkar, R., & Aaberge, T. (2012). Semantically Linking Virtual Communities. In C. El Morr, & P. Maret (Eds.) „Virtual Community Building and the Information Society: Current and Future Directions" (pp. 192-207)

[2] Bouty I., (2000). "Interpersonal and interaction influences on informal resource exchanges between R&D researchers across organizational boundaries", Academy of Management Journal, Vol. 43 No. 1, pp. 50-65.

[3] Chen H., Chiang R. L. H., Storey V. C., (2012) . Business Intelligence and Analytics: From big data to big impact. MIS Quarterly Vol. 36 No. 4, pp. 1165-1188

[4] Chiu C. M., Hsu M. H., and Wang E. T. G., (2006). "Understanding knowledge sharing in virtual communities: an integration of social capital and social cognitive theories", Decision Support Systems, Vol. 42 No. 3, pp. 1872-1888.

[5] Davenport, T. H. 2006. "Competing on Analytics," Harvard Business Review (84:1), p. 98-107

[6] Doan, A., Ramakrishnan, R., and Halevy, A. Y. (2011). "Crowdsourcing Systems on the World-Wide Web," Communications of the ACM (54:4), pp. 86-96

[7] El Morr C., Maret P., Dinca-Panaitescu M., Rioux M., Subercaze J., (2012). „Virtual Community Building and the Information Society: Current and Future Directions". In C. El Morr, & P. Maret (Eds.) Virtual Community Building and the Information Society: Current and Future Directions (pp. 1-14)

[8] Langenberg D., Welker M., (2011), „Knowledge Management in Virtual Communities", Open Journal of Knowledge Management, Issue III/2011

[9] Lave, J., & Wenger, E. (1991). „Situated learning. Legitimate peripheral participation". New York, NY: Cambridge University Press

[10] Merali Y., & Davies J., (2001). „Knowledge capture and utilization in virtual communities". Paper presented at the proceedings of the 1st International Conference on Knowledge Capture.

[11] O'Reilly, T. (2005). "What Is Web 2.0? Design Patterns and Business Models for the Next Generation of Software," Available on http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html

[12] Preece, J. (2000). „Online communities: Designing usability supporting sociability". USA: John Wiley & Sons Ltd.

[13] Pumacy Technologies. (2011). „Website about Kmmaster". Retrieved February 23, 2011, from www.kmmaster.com

[14] Sallam R. L., Richardson J., Hagerty J., Hostmann B., (2011)."Magic Quadrant for Business Intelligence Platforms," Gartner Group, Stamford, CT

[15] Sawhney, M., & Prandelli, E. (2000). „Communities of creation: Managing distributed innovation in turbulent markets". California Management Review, 42(4), 24–54

[16] Weissman, D. (2000). „A social ontology. New Haven", CT: Yale University Press

[17] Wenger, E. C., & Snyder, W. M. (2000). „Communities of practice: The organizational frontier". Harvard Business Review, 78(1), 139–145

[18] Williams S., Williams N., (2007) „The Profit Impact of Business Intelligence", Morgan Kaufmann Publishers, San Francisco, 2,3

[19] Yan Y., Zha X., Zhang J., Hou X., (2013). „Comparing digital libraries with virtual communities from the perspective of e-quality". Available on www.emeraldinsight.com/0737-8831.htm

Figures

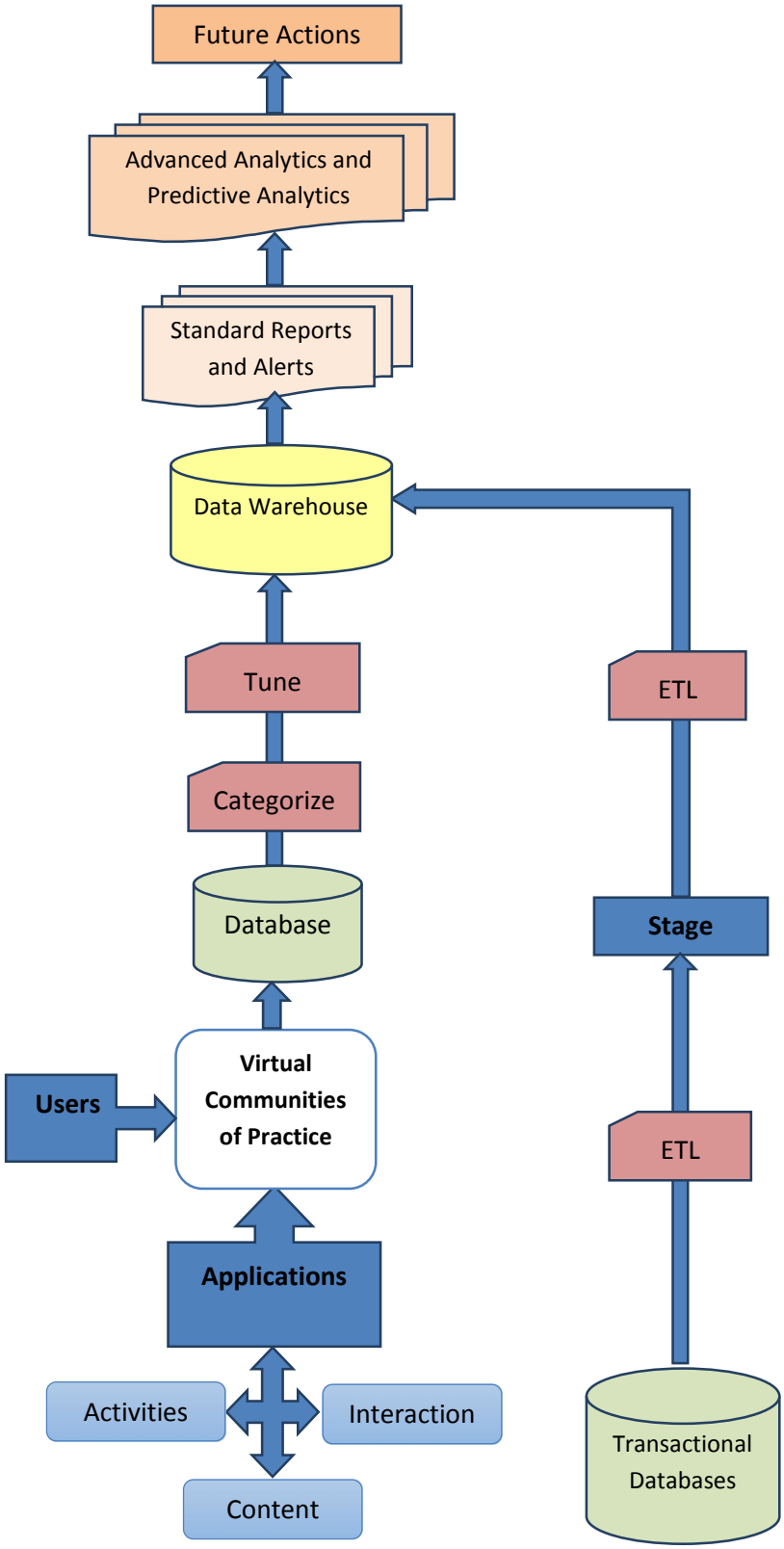

Figure 1 - *Business Intelligence and Virtual Community of Practice Model*