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Performance management in the age of Social Media

Yulia Sidorova

Supervisor
prof. Michela Arnaboldi

Co-ordinator of the Research Doctorate Course
prof. Paolo Trucco

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1 INTRODUCTION

1.1 Premise

The present Doctoral Thesis, titled "Performance management in the age of Social Media", has been developed during 3 year period from January 2013 to December 2015. The research has been supported from 2014 by Scuola InterPolitecnica grant that permitted to broaden area of investigation and compare performance management practices supported by social media on European level. Furthermore, in 2015 researcher became part of CIMA project that aims to develop and deepen investigation in this field, specifically comparing Italian, UK and Russian realities with both business and non-profit organizations.

The wide geography of investigation was reached thanks to collaboration with 3 universities: Technical University of Delft, Business School of University of Edinburgh and University of Technology of Sydney. From late 2013 I have actively collaborated with Prof. Hans de Bruijn and prof. Haiko van der Voort. In August 2014, I have spent 1 month in Sydney collaborating with prof. David Bedford developing theme Big Data and Social Media in performance management. While in 2015 I have spent 6 months in the Business School of University of Edinburgh working with prof. Neil Pollock.

The 3 year timeframe and geographical diversity (among Italy, covering companies operating all over Italy, and Holland, Russia, UK) devoted to the analysis of intriguing and dynamic Social Media application within performance management practices combined with in-depth analysis of single companies and significant amount of the field work shedding the light on multidimensional perspective, paving the way for the obtainment of results meant to serve both the academic and the practitioner communities.

The present Doctoral Thesis' objective is to investigate performance management in the age of social media. The social media is fast-changing and volatile reality, bringing new opportunities and risks for managers that requires development of new frameworks and analysis models to support performance management systems, performance measurements and management activities of companies.

The Doctoral Thesis is structured as follows:

Introduction chapter provides an overview of the research and empirical context supported by a selective review of performance management literature and the significant research steam the present Thesis touches upon and brides are descried, in the light of the open issues. This framing introduction opens a discussion providing roadmap of the Doctoral thesis, starting with the overall objective and four research questions.

The following **4 summary chapters** provide summaries of the consecutive studies developed through the 3 year period. The studies aim to response to the open issues in the performance management literature proposing analytical models and frameworks deriving from the in-depth overview of literature and empirical analysis.

The conclusions and future development chapter aims to provide specific discussion of the results and "file rouge" of findings, highlighting contribution of the scientific papers collected within the performance management in the age of social media, restating the work of Thesis' value for researchers and managers, as well as its core strengths and limitations; directions for future research developments are individualized.

The full papers published or submitted could be find in the **Annex** to the Doctoral Thesis.

1.2 Research context

By 2019, spending of the company on digital and social media is expected to account for more than 50% of overall media spending, primarily due to the growing number of connected consumers (the growth rate is 20% per year), the expansion of mobile telephony, and elevated mobile broadband adoption (McKinsey, 2015). The social media diffusions is incomparable to any other media: "it took 13 years for television to reach 50 million users, while the Internet took only 3 and Facebook soared to 50 million users in 1 year, Twitter only 9 months. Today, there are 2.4 billion online users" (McCaughey et al., 2014: 576). According to survey of the University of Michigan's School of Information over 65% of Americans have at least one account on social media and over 52% of population uses regularly several social media platforms. Facebook became most popular site among users – 79% in 2014.

Apart from individual use, this mounting interest has been seized upon by many companies all over the world and across different sectors (HBR, 2012). "It's no longer a choice of whether or not you are on social. You've got to be there. And if you're there, you have to have governance" said Callison, Global Marketing and Corporate Affairs Compliance Executive of Bank of America in her interview to Forbes (November, 2015). The Business Times also published an article focusing on use of social media analytics within the companies and found out that "executives in nearly every industry are looking for ways to reap value from analytics… but to keep up with these new media leaders… must learn new skills and seize the opportunities presented by al this data." (The Business Times, October 19, 2014, by Charlie Kim, Rasmus Wegener and Florian Hoppe).

Interest is high, but big and small companies are now facing numerous challenges in the process of social media adoption and employment, starting from organizational issues (Deloitte, 2014), in

relation to which new key roles are emerging and changing, like Chief Information Officer, Digital director, to data scientist and data designer (McKinsey, 2014). Furthermore, the process of adoption and employment requires specific technical tools and systems (for example Radian6[1]) to support social media process: data collection, analysis, measurements and presentation to managers (IBM, 2014).

Accounting associations in Europe and America (European Accounting Associations, American Accounting Associations and Chartered Institute of Management Accountants) also address these urging questions of business world with aim to consolidate business and theoretical knowledge in new modes and models to face this interdisciplinary challenge. American Accounting Association devoted in 2015 conference named "Accounting IS Big Data" exploring how Big Data and specifically social media influence accounting practices. The interest to social media and its impact on financial professionals is growing from 2011 "the management accounting functions will need to analyze and report real time information to support business growth, profitability and real time digital marketing" (CIMA report, 2011).

The researchers in performance management have also stepped in this lively discussion on social media implications on reporting, performance measurements and dissemination procedures (Balakrishnan et al, 2014; Lee et al., 2015; Miller and Skinner, 2015). Miller and Skinner (2015: 222) highlighted that "changes in information technology, the media and securities markets interact to affect the ways information about firms is produced, disseminated, and processed". While Brown et al. (2015: 276) focused on understanding how interactive technologies and the real-time, low-cost information from mobile communication impact managers in their decision-making.

Recent literature applies a twofold approach towards social media, as an object to be controlled and as a source of in-depth information. Organizations are increasingly endorsing social media as part of their business activity (Richardson, 2009; Jin, 2012; Berthon et al., 2012; Roblek et al., 2013; Chikandiwa et al., 2013; Guinan et al., 2014) and, with the use of these media, risks and opportunities relating to performance management are entering the picture. On the one hand, social media activities expose companies to higher risks, for example to their reputation. Social media becomes itself a technology to be controlled, given the possible problems that can arise from instant, mass communication and the need to set new boundaries to delimit the action of company employees (Smith, 2012; Keitzmann et al., 2011; Noble et al., 2012; Fuduric and Mandelli, 2014). Marketing literature name social media an alternative media channel and tool for client relationship management (CRM) (Rapp et al, 2013; Trainor et al., 2014; Gopinath et al., 2014; Henning-Thurau et al. 2015,

[1] http://www.salesforce.com/

Srinivasan et al., 2015; You et al., 2015). Social media was also named tool for internal and external collaboration and knowledge sharing (Vuori and Okkonen, 2012; Lorenzo-Romero et al., 2014).

On the other hand, managers stem opportunities coming from the immediacy of the information (Berthon et al., 2012) and ability to forecast (Brazel et al., 2009; Gopinath et al., 2014, Henning-Thurau et al., 2015). These measures grasp timeliness information, but also its sentiment towards company and its products, related topics and specific features (Diakopoulos et al., 2010; Zhang et al 2012; Peters et al., 2013; Einwiller and Steilen, 2014; Swani et al., 2014). This, in turn, can lead to the improvement to existing products, services and a better understanding of end-customers (Heydebrand, 2009; Kaplan and Haenlein, 2010; Dutta, 2010; Hanna et al., 2011; Haefliger et al., 2011; Gamboa and Goncalves, 2014), through the development and application of specific indicators based on social media information (Romero, 2011, Bajaj and Russell, 2010, Sashittal et al., 2012).

For the purpose of my work I have focused on the social media as a source of information. In this regard current studies recognize that social media is particularly valuable for customer analysis, as a source of in-depth information for further clients' penetration (Rust and Huang, 2014) and for improving communication and service (Boyd and Gessner, 2013; Bakshy et al., 2011; Phang et al., 2013). Yet, only a few authors have highlighted how social media can provide relevant information for assessing more holistically company performances (Hoffman and Fodor, 2010; Bonsón and Ratkai, 2013; Peters et al., 2013). Some researches started to explore the relationship between indicators based on social media and different financial performance of a company, for instance assessing a company's performance on the stock markets through valence[2] analysis on social media (Vega, 2006; Ghiassi et al., 2013; Smailović et al., 2013; Li et al., 2014). Social media performance measurements were widely adopted by companies in different departments (Bughin, 2008; Bruhn et al., 2012; Field and Chelliah, 2012; Trainor et al., 2014). Indeed, marketing, communication, research and development, human resources departments lead the use of social media measurements to influence the audience, its valence and improve service for the customers.

These works started to touch the surface of large phenomena: social media applications generate a large corpora of data that companies can exploit to measure and manage their performance through feed-back, planning and decision making. In this context my study aims to contribute to interdisciplinary management research and answer the urge call for understanding of how companies deal with social media information and performance management (Jeacle and Carter,2014; Meller et al., 2014). The research question of this study is *how social media and specifically information derived from these sources are changing performance management.*

[2] Valence is "tone or preference of the comments (typically expressed in positive/negative/neutral)" (You et al., 2015: 19).

Starting from this main research question a focused but interdisciplinary literature analysis was carried out in order to understand the state of the art and define more specific research objectives. The analysis of previous studies evidenced four major gaps in respect of social media as source of information for performance management, presented in the following table.

Study	Authors	Issue
1	Hanna et al., 2011; Martini et al., 2014; Raford, 2015; Brambilla et al., 2014; Ngai et al., 2015	**Fragmented performance measures and methods** in different disciplines: marketing, information technology, management and public
2	Hanneman and Riddle, 2011; Jin et al., 2012; Shelton and Skalski, 2014; Balahur, 2014	Social media performance measures for **specific managerial control activities**: decision-making, planning and feedback
3	Jeacle and Carter, 2011 and Scott and Orlikowski, 2012; Suddaby et al., 2015	**Social, organizational and technical aspects** of the company influence adoption of social media within managerial control
4	Cho et al., 2009; Davison 2009; Yigitbasioglu and Velcu, 2012; Nguyen et al., 2014	Ability of company to present and communicate social media performance measurement metrics to **create value**

Table 1: Open issues in the literature

The first issue arises from the attempt to adapt performance measurement techniques to social media information (SMI). Prior contributions from marketing, information technology, public relations and management scholars evidence the absence of the overall perspective on the measurement metrics and methods for SMI. In this stream, researchers have focused on specific elements of performance management systems: measurement metrics and procedures (Daly and Haahr, 2009; Hanneman and Riddle, 2011; Kadushin, 2012; Nikolopoulos et al., 2013; Shelton and Skalski, 2014; Balahur, 2014), or specific performance monitoring tools (Bennett et al., 2009; Brzozowski, 2009; Jin et al., 2012). Several authors underlined that further research is required to develop systematic approach (Schoen et al., 2013) and shed light on "how informal learning data can be harvested from […] social media" adopting methods and relevant metrics (Raybourn, 2013, p. 10). This study aims to address this theoretical gap and fragmented approach to performance measures and methods in management system.

Further to more technical features, second study is focused on another unexplored area that is the use of social media information in business practices and managerial activities. Several scholars highlight that social media metrics are used for assessment of customer relationship management or collecting new ideas for research and development (Diakopoulos et al., 2010; Zhang et al 2012; Peters et al., 2013; Einwiller and Steilen, 2014; Swani et al., 2014). Other studies provide a specific focus of social media information use, such as market predictions (Mislove et al., 2012), positioning on the stock exchange (Ghiassi et al., 2013), analysis of competitors and recognition of the behavior of other players (Dutta, 2010; Haefliger et al., 2011). The contribution of Kaplan and Haenlein (2010) offers

a broader perspective, examining, in more general terms, the potential contribution of SM information in decision-making processes. However, this study omits other two pillars from management control cycle, such as planning and feedback. This is leading to the second question, whether SMI are able to support all specific activities? The prior studies provide fragmented understanding on the use of social media measures and holistic overview is still lacking.

The third issue underline in the academic literature is connected with the attributes of social media and information derived from these sources and their difference with traditional financial data (Nam and Kannan, 2014; G opinath et al., 2014; You et al., 2015). These attributes (large corpora of unstructured data, velocity, variety) require particular settings within company to assure adoption and employment of social media information. This evidences another theoretical issue about settings required to employ social media within organizational structure of a company. Current literature recognizes two common dimensions for employment of social media information: technological and social (Scott and Orlikowski, 2012; Peters et. al, 2013; Blankespoor et al., 2014). The technological component accounts for the technical aspects of social media, being based on Web 2.0 fostering user generated content, connectivity and collaboration (O'Reilly, 2005; Kaplan and Haenlein, 2010). The social dimension is a direct consequence of the technical characteristics, and it refers to the ability of the technological platform to support the interactivity and real time communication. These particular characteristics of social media data imply several challenges for management and accounting practices adopted for traditional organizational data. They affect collection, use and management of this information and calculative practices. Further in-depth understanding of settings and their different configurations is required to adopt social media information within a company and its managerial processes.

The fourth stream of the literature underlines that social media information is related to the acceptance of the information through the process of data collection and analysis, and finally the creation of new knowledge. Previous studies in accounting (Speier, 2006; Matilal and Hopfl, 2009; Justesen and Mouritsen, 2009; Yigitbasioglu and Velcu, 2012) have evidenced that the acceptance and use of information is related to the way through which data are communicated and visualised, considering the type of managers reading the data (Cho et al., 2009; Davison 2009; Yigitbasioglu and Velcu, 2012). Furthermore other researchers underline the difficulties connected with understanding these large corpora of data, its reliability, representativeness and dissemination inside organization (Boyd and Crawford; 2012; Ferrara et al., 2014; Bianchi and Andrews, 2015). In order to create value is not enough to properly collect, analyse and choose innovative ideas from social media platforms, but also present to managers and receive approval for their implementation (Dong and Wu, 2015). This highlights another important issue of understanding how performance measurements based on social

media information able to create added value for managers (Nguyen et al., 2014) and support managerial control practices.

These theoretical calls represents 4 consecutive questions:

1. How academic from different disciplines investigate social media performance measurements? What is the state of the art of methods, metrics tools and process to account for social media proposed by recent studies in management, information technology, marketing and public sector?
2. How social media information transforms performance management system, measurement methods and metrics? Which managerial activities they able to support?
3. How organizational and technical dimensions of social media information are differently embodied in performance management systems and impact on a company calculative practices and managerial activities?
4. How a company can create value from SMI for performance management?

The following table demonstrates the development of the 4 consecutive studies: name of article, method, academic journal and submission status.

#	Name	Method	Details	Journal	Status
1	Performance measures and social media: new requirements for metrics and methods	Literature review	• Review in management, information technology (IT), marketing and public relations journals • Scopus data base • Snowball approach • Final selected papers: 51 • Pattern analysis	Measuring Business Excellence	Revise & resubmit
2	Social Media and Performance Measurement Systems: towards a new model?	Multiple Case study	• 8 companies from different industries • Social media analysis • 12 interviews with owners of social media process • Qualitative analysis based on PMS frame	International Journal of Productivity and Performance Management	Published
3	Calculative social media practices in telcos: unraveling their connection with the social and technological dimensions of social media	Multiple Case study	• 4 companies from telecommunication sector • Social media analysis • 25 interviews with owners of social media process and users of SMI • Qualitative analysis based on sociomateriality frame	Accounting, Auditing & Accountability Journal	Submitted
4	Creating value from Social Media Data	Single Case study	• Telecommunication proactive user of SMI • Social media analysis • Direct observations • 21 interviews with owners of SMI process and users of information • Nvivo 10 coding and qualitative analysis based on Bhimani & Willcocks frame (2014)	Annual Congress of European Accounting Associations	Submitted

Table 2: Articles outline

With the first study provides an extensive literature analysis of interdisciplinary literature from management, information technology, marketing and public relations to develop a state of art PMS framework for monitoring social media and to capture changes related to PMS metrics and methods. Second study aims to explore how social media is transforming current performance measurement systems (PMS) of the companies, their measuring methods, metrics and application in accounting practices. The empirical evidence is based on 8 case studies – companies of different size and sector to provide a holistic view on the phenomenon. The results of the second study highlighted that the adoption and use of social media are industry specific and I focused in the third study on 4 telecommunication companies in Italy, recognized to be one of the leaders in employment social media information for its accounting and managerial activities. This study explores organizational and technical dimensions of social media information employment through calculative practices, key performance indicators and reporting. The fourth study investigates the value of social media information for company's activities and managers. The comparison analysis of the four telecommunication companies in the third study underlined the requirement of in-depth understanding of social media information processing (collection, analysis and distribution among departments), type of information dissemination and mechanism to create knowledge. Therefore, this study is based on a single in-depth case study (21 face-to-face interviews) with one of the most proactive users of SMI.

The four consecutive studies contribute to management accounting literature providing an overview of the evolutionary process of social media information adoption within companies proposing new theoretical lens to approach this innovative phenomena in its transformation process. Still either business, neither academia have no unique configuration in terms of management accounting, technology, organization issues to employ social media information and ensure performance. Therefore, this study provide results based on the empirical evidence from broad range of companies in most mature business sectors.

The introduction chapter is organized as follows: sections 1.3, 1.4, 1.5 and 1.6 provide a summary of the 4 consecutive studies highlighting theoretical background, method and main results. The section 1.7 draws general conclusions, highlighting the studies contribution in responding to the overall research question, complemented by limitations of research and future perspectives.

1.3 Summary of study 1 – "Performance measures and social media: new requirements for metrics and methods"

A PMS represents a valuable and longstanding tool to plan and understand how activities are performed by individuals or organizations (Choong, 2013). It has been widely implemented in private, nonprofit and public organizations to monitor organizational achievements and supports decision making, motivate individuals and provide external accountability (Behn, 2003). A wide variety of activities are measured and controlled through PMS with social media representing one of the last challenges. Indeed the widespread diffusion of social media in the last years have stimulated organizations endorsing these tools, posing as a challenging issue their ability to use these social technologies (e.g. Hanna et al., 2011).

Social media can be defined as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0" (Kaplan and Haenlein, 2010:61). They broadly refer to social networks, blogs, wikis, photo sharing, video sharing platforms or virtual games (Kaplan and Haenlein, 2010). Even though each of these applications has its own characteristics, social media are characterized by three main distinctive features (Peters et al., 2013). Real time communication. Social media users have the possibility to communicate real time, also pushing companies to remain connected the entire day on social channels to maintain interactions with their customers. Many-to-many interactions. Communications on social media is extensive rather than one to one, increasing the virality of the message with respect to offline traditional media. User generated content, which concerns the fact that users are directly in charge to provide content on social media rather than playing a passive role of receiving information.

The widespread adoption of social technologies by organizations has introduced the need to monitor social media activities, hence calling for a specific PMS. The paramount importance to measure social media is recognized in several disciplines, The marketing literature acknowledged that: "SNS [social networking site] need to be evaluated for their effectiveness…the development of the right metrics is paramount for marketers" (Michaelidou et al., 2011: 1155). The management studies stressed the importance for companies to understand if they are using their social media effectively (Hanna et al., 2011). IT scholars are interested in the development of new techniques to quantify impacts of social data (e.g. Chen et al., 2012). The public relations literature underlined the importance to quantify the ability to interact effectively with customers through social channels (Waters, 2009). The practitioner contributions also underline the primacy for companies that embark in social media initiatives to understand where they are going (IBM Global Business Service, 2011).

This study aims at understanding the required changes for a PMS in order to support social media measurement, tackling both metrics and methods for obtaining these metrics. Specifically, the following research questions are addressed: what are the challenges in PMS metrics to measure social media? What are the challenges in PMS methods to accomplish these social media metrics? To address these questions, study is conducted based on a literature review on management, information technology (IT), marketing and public relations journals.

The review of literature followed three fold methodology. The first step consisted of searching academic articles using a combination of keywords: Social media; Performance measure; Indicator; Metric; Facebook, Twitter, YouTube, LinkedIn; Data analysis, data collection. The Scopus search engine was adopted, later complemented by a snowball approach to review citations of the retrieved papers in order to identify further appropriate material not emerged with the keywords search. As a second step consisted of identifying the relevant studies to include in the review on the basis of two criteria: a clear reference to metrics or methodology; papers had to be published in refereed journals, conference proceedings or published books in order to increase the quality of the contributions. Following these criteria, 51 relevant papers were selected for the analysis. During the third step, to guide the framework development, key items were charted from the retrieved papers distinguishing between social media metric and social media method. This organization of the papers provided a summary of the current state of the art about PMS and social media, which supported the definition of a PMS framework for social media analysis. Summarising, the distinctive social media features of real time, many-to-many interactions and user generated content (Peters et al. 2013) demand a revision of a PMS, which needs to face challenges coming from these different parties.

The proposed framework is composed of three main elements: Control object, which represents what is measured by the PMS; metrics that concern indicators to quantify the control object; methods that refer to the approaches to retrieve and analyze data to feed the PMS. They comprise both data collection and data analysis methodologies.

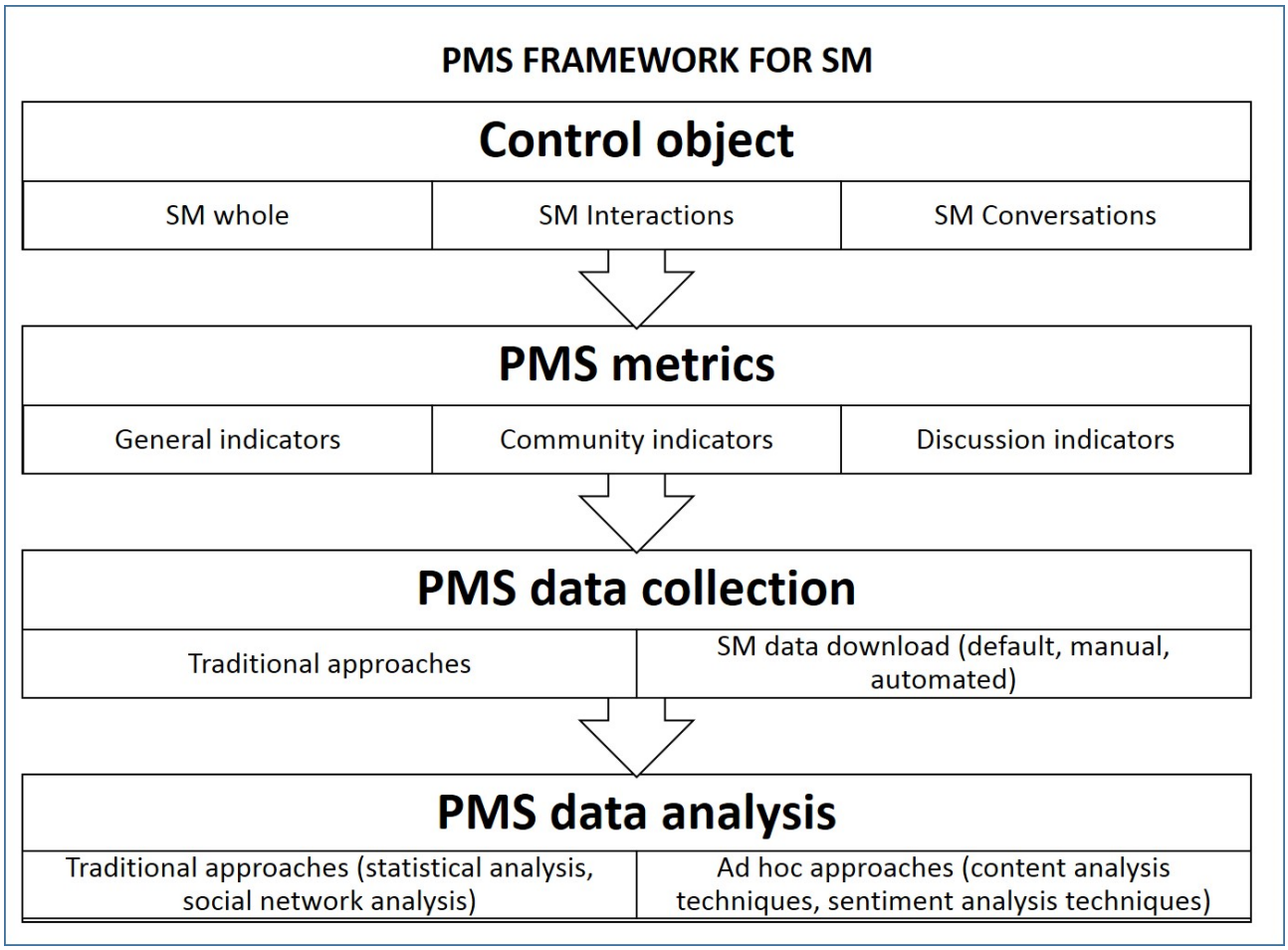

Figure 1: PMS framework for social media

Following this framework, it is the control object that drives what has to be measured (metrics) and how to collect and analyze data (methods). The control object can be of three different types: the whole social media; social media interactions and social media conversations. Depending on what has to be measured, metrics and methods are different.

PMS metrics can vary from general indicators, community indicators and discussion indicators depending on the control object. General indicators provide a synthetic evaluation of social media as a whole in terms of profitability of the social media investment and structure of the social network, in particular: social media ROI (Fisher, 2009; Powell et al., 2011; Romero, 2011; Kaske et al, 2012; Crumpton, 2014); multiplexity, centrality, density, closeness (Coulter and Roggeveen, 2012; Ellison and Boyd, 2013; Kane et al., 2014). They allow, for example, to identify who is the influencer, intended as the node in the network with a predominant role to influence the others (Li et al., 2014; Bernabé-Moreno et al., 2015). Community indicators evaluate social media interactions quantifying the number of people reached through social channels and their level of interactivity. Awareness, also called reach, quantifies the ability of an organization to broadcast information to users through social media (Hoffman and Fodor, 2010; Agostino, 2013; Cosenza, 2014). Discussion indicators aim to

measure the object of control of dialogues that occur on social media (Herring, 2010; Waters et al., 2009; Diakopoulos et al., 2010). Sentiment indicators concern feelings and opinions of people and quantify sentiment, as positive, neutral or negative, associated with social media conversations (Asur and Huberman, 2010; Zhang et al 2012).

PMS methods need to be distinguished between data collection and data analysis. Methods for data collection depends from the typology of indicators. The general indicators do not require specific approaches to collect data, while the computation of community and discussion indicators demands ad hoc approaches for data collection. From literature, three main approaches for social media data collection have been identified: default data collection, consisting of accessing already given information from social media platforms (van Dam and van de Velden, 2015; Ngai et al., 2015); manual data collection (Farrugia et al., 2012; Snead, 2013; Sebate et al., 2014; Swani et al., 2014); and automated data collection based on web crawling procedures (Kwak et al., 2010; Choi et al., 2012; Atkinson et al., 2015; Ferrara et al., 2014). Recent trends in data collection methods try to assure richness and precision of the collected data to simplify and improve the further data analysis, giving rise to web harvesting approaches to collect data simultaneously from several social media platforms (Ferrara et al., 2014) or mixing data collection approaches.

Methods for data analysis aim to transform the collected unstructured data from social platforms into usable data to compute social media indicators. Traditional statistical techniques such as correlation, regression or cluster analysis (Dzvapatsva et al., 2014), and network theory approaches, that identify the most influential figures or strong and weak interconnections (e.g. Li et al., 2014), have been complemented by novel methods. These novel methods are extensions of longstanding data mining techniques (Ngai et al., 2009) and comprise content and sentiment analysis, supporting the computation of content or sentiment indicators respectively. Content analysis is a technique that permits to code text and extract meaning applying natural language processing and tagging in order to reduce large volumes of data (Stemler, 2001; Bhardwaj et al., 2014; Larson and Watson, 2013; Bunescu and Mooney 2007; Agichtein et al., 2008; Buckley et al., 2014). Sentiment analysis supports the computation of sentiment indicators through the identification of opinions contained in social media data (Thelwall et al., 2010; Nguyen et al., 2014). Automatic techniques to classify the polarity of a text comprise Supervised Machine Learning Methods, Unsupervised Methods and Semi-supervised methods (Neri et al, 2012; Paltoglou and Thelwall, 2012; Hu et al., 2013; Xianghua et al., 2013).

This study provides a comprehensive view of social media measurement, overcoming the limitation of current studies that focus specifically on a detailed set of indicators or a specific methodology. The main contribution of this research is the theoretical development of a PMS framework to monitor

social media, which encompasses both available metrics and methods. This framework provides implications for both academics and practitioners.

From an academic perspective, the contribution of the PMS framework is threefold: first, social media metrics highlight an evolution in performance indicators; second, the PMS method section of the framework highlights the importance of data collection and data analysis methodologies; third contribution relates more in general to risks associated with the PMS framework, in particular the privacy settings , the collection of unreliable data and the limited storage capacity to conserve the huge amount of users' generated data.

From a practitioner perspective, this paper provides a roadmap that can serve managers to evaluate their social media activities. The proposed framework has a double function. On the one hand, it provides managers with a sequence of steps to be performed in order to measure social media: from the identification of the control object, to the definition of the most appropriate metrics and the most suitable data collection methodology. On the other hand, this framework suggests a list of implementable metrics to quantify social media and related methodologies to retrieve data. This is not obvious given that extant contributions on PMS metrics and methods are fragmented, and a unique, comprehensive framework is missing.

The main drawback of this study is the pace at which social media evolve, which makes it difficult to have an updated overview of both PMS metrics and methods. The provided a framework is based on theoretical contributions available until 2015, which undoubtedly require to be periodically updated.

1.4 Summary of study 2 – "Social Media and Performance Measurement Systems: towards a new model?"

Social media (SM) is defined as group of internet-based applications, "including collaborative projects, micro-blogs/ blogs, content communities, social networking sites, and virtual worlds", that are based on Web 2.0 and allow an exchange of user-generated information (Kaplan, 2012, p. 129). Over recent years, there has been an explosion in SM use, with the number of users growing annually by a significant 20% and now reaching more than one billion (McKinsey, 2013). Apart from individual use, this mounting interest has been seized upon by many companies all over the world and across different sectors (HBR, 2012). SM applications generate a large corpus of data that companies can exploit to measure and manage their performance, delineating the need for a new Performance Measurement System (PMS) model. PMS is intended as a process for quantifying action efficiency and effectiveness, by "understanding of the factors, both internal and external to the organisation, that facilitate and inhibit the introduction of new measures" and optimize their use to support organizations in their decision-making and achieving desired performance (Kennerley and Neely, 2002, p. 217). While practitioners and the consultancy industry have been very active in providing contributions on the role of social media data in measuring performance ("Open data", McKinsey, 2013), academic research is still in its infancy in this area.

Prior literature on the topic of PMS, without using the PMS label, provides an important contribution to the use of SM information in supporting decision-making processes. The majority of these studies have a specific focus, such as market predictions (Mislove et al., 2012), positioning on the stock exchange (Ghiassi et al., 2013), analysis of competitors and recognition of the behaviour of other players (Dutta, 2010; Haefliger et al., 2011). Only the work of Kaplan and Haenlein (2010) offers a broader perspective, examining in more general terms the potential contribution of SM information in decision-making processes. This research presents an interesting early view of the link between SM information and the decision-making cycle, but only offers general advice on the adoption of SM. The aim of this paper is to contribute to this area by analysing how SM information impacts on PMS, addressing two aspects: firstly, PMS technical features, in terms of indicators and measurement processes; secondly, the use of indicators within business processes.

Based on the prior research this study provides an overall framework for PMS, considering SM as a new variable. The framework is distinguished into two parts (Franco-Santos et al., 2012): (1) *components* and (2) *use*.

The first area of the framework addresses the technical aspects of performance measurement: indicators and measurement method. The indicators are divided by nature of content, i.e. punctuated

and text-derived (Pang and Lee, 2008), and typology of information source, i.e. paid, owned or earned (Hanna et al., 2011). The measurement method consists of five important phases: 1) setting up phase, to define clear objectives for the analysis and choice of the SM area; 2) data gathering phase, consisting of source analysis and choice of applicable techniques for analysis, data extraction and data cleaning; 3) data analysis phase, which directly depends on the type of data: statistical and network theories are applied to structured and quantitative data, and content analysis to unstructured data; 4) measurement phase, involving the development and calculation of indicators based on structured and unstructured information; 5) composition, representation and frequency of reports; although this phase appears similar to traditional PMS, the availability of tools to visualise SM data may also have an impact on reporting.

The second area of the framework concerns the use of social media indicators, in terms of PMS, to support the organisations' decision-making, in particular: planning, performance analysis and revision of action (Kennerley and Neely, 2002). Using these phases, it is possible to carry out the uses reviewed in the previous section, highlighting the differences and added value of SM indicators compared to traditional systems.

This empirical study of the impact of SM on PMS is based upon a case study methodology, making it is possible to investigate the complexity of organisational processes in a real-life context (Yin, 2009, 2014). A case study method is consistent with recent claims made regarding this type of investigation in performance and measurement systems (Masquefa, 2008; Chenhall et al., 2011; Ulgen and Forslund, 2015; Kumar et al., 2015), and with studies on social media management (Worrell et al., 2011; Haefliger et al., 2011). In this research, an explorative case study of eight companies was adopted with a clear objective to investigate SM use for performance measurement (Barratt et al., 2011). These case studies allow to generalise and develop the theory (Eisenhardt, 1989) while, at the same time ensuring that they can be applied to qualitative data analysis. In order to gain a more balanced view of SM use, interviews were carried out with companies from several different firms operating in the technology, telecommunications, manufacturing and consultancy sectors.

This research explores the role of social media in measuring performance, and it proposes a preliminary framework that covers both the technical features of the PMS and its use. According to this framework, eight cases were studied, showing that SM have an actual impact on the PMS and, more in detail, how SM are incorporated to enhance performance measurement. The results of face-to-face interviews pointed out both the variations and the similarities between the cases, allowing patterns of adoption and use to be outlined.

Regarding the "components" part and considering both the indicators used and the measurement methods adopted by the companies, three configurations emerge, labelled *simplified, focused* and

ample. The *simplified* components configuration involves cases BEV and CONS that adopt simple punctuated metrics derived from the SM platforms (e.g. TweetStats, Facebook insights, etc). The *focused* components configuration involves two cases, MANU and ITA, which apply a larger number of indicators based on punctuated and text-derived metrics, but simple methods of analysis. The remaining four cases are included within the *ample* components configuration, and use both punctuated and elaborated text-derived indicators. The methods of analysis of SM information are complex and based on internal company IT systems or the expertise of external analysis provider.

Three main configurations can also be seen for the "use" aspect; these are labelled: *random, object-oriented* and *refined.* CONS belongs to the *random* use configuration, it observes SM sources and uses information for general performance analysis, without it being linked to any precise objectives. The *object-oriented* use configuration includes four companies (MANU, BEV, ITA and DATA). They use SM for one or more specific objectives (brand, products and services) and take SM information into account for planning, performance analysis or revision of action. Other companies (TELCO, ICT and SOFTW) generate a *refined* use configuration that employs SM information as part of an integrated process of control. Based on these configurations, it has been developed a matrix (Figure 2) that graphically represents the positions of the eight cases, based on their "use" and "components".

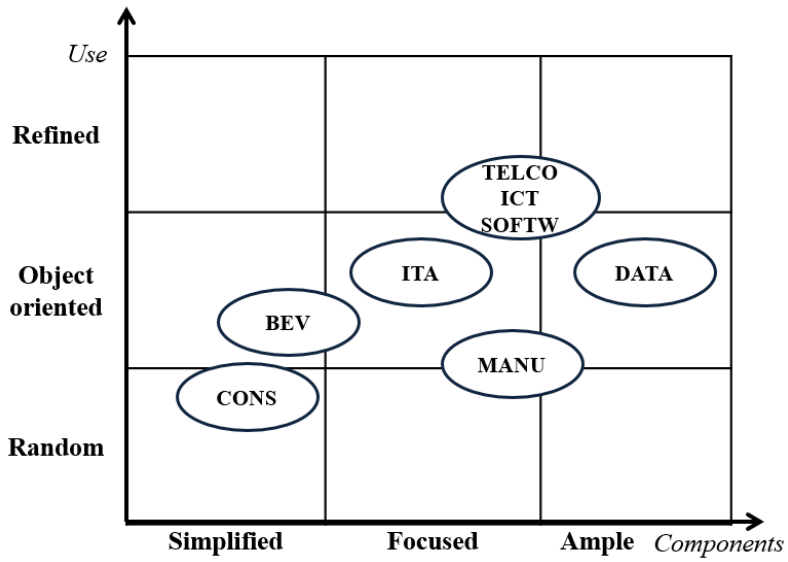

Figure 2: Company/case use of Social Media

Analysing this figure, it is possible to identify three major patterns, putting together technical adoption (components) and use: beginners – cases BEV and CONS; selective – cases MANU and ITA; and transversal – cases TELCO, ICT, SOFTW and DATA. The beginner use represented by cases BEV and CONS is the starting point of SM development, as a new resource providing useful managerial information for many organisations. Selective use (cases MANU and ITA) is defined by

an object-oriented use of SM, mostly in Marketing, Human Resources and Sales. Each department treats SM information and indicators according to their requirements and lack an overall view of the companies' performance. The transversal use of SM information and tools (cases TELCO, ICT, SOFTW and DATA) is highly correlated to the core business of the company, which is why these include IT developers and communication companies, both having the necessary knowledge to use SM, as well as the capacity and instruments to analyse and manage SM platforms.

The aim of this paper is to analyse how SM information impacts on PMS, addressing two main aspects: PMS technical features, in terms of indicators and measurement processes; and the use of indicators within business processes. This research responds to the theoretical calls (Schoen et al., 2013, Raybourn, 2013) and proposes an evolutionary image of SM adopted in a systematic way to align measures and their possible uses on different levels within SM implementation. These findings suggest that at this early stage companies can adopt a variety of approaches of SM employment within the scope of a PMS. Nonetheless, companies underline that SM have become an important variable of PMS even if not directly included within the systems. The holistic framework proposed in this study helps to assemble different metrics, measurements and indicators based on SM information in order to complement traditional PMS.

The theoretical contribution adds to the discussion on new information use within PMS and it highlights the necessity of adapting the existing wealth of performance management system theory and improving specific elements in the cross-use of social media information. In this research, this was achieved by structuring the indicator metrics and developing a complete measurement method based upon a variety of steps proposed in literature (Wang and Lin, 2011; Ceron et al., 2013; Doerflinger and Dearden, 2013).

From the practitioners' point of view, this research provides a rich background of indicator construction procedures, measurement methods and the general adoption of social media as a new variable within a company. This research provides a roadmap that clearly states the main benefits of SM information in controlling cycle operations: flexibility and time to react to changes. The study stresses the benefits of SM indicators and highlights the necessary conditions to use such innovative instruments for achieving companies' objectives.

One of the most important limitations concerns the company selection process, and specific studies by industry may provide very interesting results. Among these case studies it has been observed that information technology companies led the way in the use of SM information for both internal and external management systems. Another interesting area is that of telecommunications, which here was presented in only one case. As well as the above, other companies worthy of deeper study could include consumer product companies, especially those selling products closely associated to human

emotions. In-depth research by industry can provide different visions, and group the different approaches used by companies, to address this situation within their performance management systems. These results can provide several models of how to adopt SM within a particular industry, taking into account each sector's requirements, providing benefits and improving performance.

1.5 Summary of study 3 – "Calculative social media practices in telcos: unraveling their connection with the social and technological dimensions of social media"

Social media are continuously diffusing all around the world, not only as individual device, but also as a valuable tool for companies (e.g. Kaplan and Haenlein, 2010; Ngai et al., 2015). Marketing and sales departments have been pioneers in exploiting social media data for their daily activities, receiving through social media immediate feedbacks on their reputation, campaigns, products and services (Pardo et al., 2013). Social media data have attracted the interests, from not only businesses, but also from government and public organizations to improve their services and better organize their work (e.g. Stamati et al., 2015).

Two main features characterize social media: the technological and the social dimensions given that social media 'employ mobile and web-based technologies to create highly interactive platforms via which individuals and communities share, co-create, discuss, and modify user-generated content' (Kietzmann et al., 2012, p. 241). The technological dimension is located in the web platform that is the backbone of social media, supporting real time interactions among users. The social dimension is instead related to connections, although virtual, among individuals, communities and organization, which have the possibility to establish dialogue moving beyond the one-way information flow.

The main implications of these two social media features for companies lie in the availability of massive data, often known as big data (George et al., 2014; Gandomi and Haider, 2015), mainly about customers that were not even imaginable in the past. However, unlike traditional data, social media data are massively generated in different formats from audios and videos to pictures and unstructured text on a web platform and generated by users in real time (Kietzmann et al., 2011), rendering their extraction and analysis far from being straightforward (Costa et al., 2012).

These social and technological dimensions of social media data inevitably influence traditional accounting practices, which mainly rely on traditional financial and non-financial data, often organized into dashboards or scorecards at periodic intervals. Several implications for accounting are expected, but limited evidence is provided from accounting literature (few exceptions comprise Jeacle and Carter, 2011 and Scott and Orlikowski, 2012; Suddaby et al., 2015). Yet studies about social media are emerging in other literature streams, such as marketing, general management and information system literature, which suggest only indirectly accounting implications. This paper aims to consolidate the fragmented discourse on social media and accounting by exploring how social media are reconfiguring accounting practices in the telecommunication industry. Specifically, two main questions are here addressed: 1) what are the (new) calculative practices, in terms of KPIs (Key

Performance Indicators) and reports associated with social media? and 2) how do organizational and technical aspects related to social media are intertwined with these calculative practices?

The theoretical perspective of sociomateriality has been here adopted to frame the analysis given its purpose to conceive the social and the technological as ontologically inseparable (Orlikowski, 2007; Orlikowski and Scott, 2014). Following this approach, calculative social media practices are considered entangled with the social dimension of the organizational roles in charge to manage this data and the technological backbone of social media, leading to a reconfiguration of the calculative practices currently in use. This perspective of sociomateriality is not new to management accounting studies (e.g. Wagner et al., 2011; Pollock and D'Adderio, 2012). It has been considered here particularly useful to exploit how social media are reconfiguring accounting practices given that the technology of data continuously generated by social media is entangled with the organizational roles that decide how to download, interpret and make sense of data, influencing therefore the final accounting result.

Evidence to support this argument are derived from a multiple case study in four Telco Italian companies that use social media data in their business activities. Telecommunication sector has been chosen due to the crucial role that companies competing in this industry pay to social media data (Reinartz et al., 2004). The revolution of information is leading to revolution in the telecommunication service (Rust and Huang, 2014). Researchers had the possibility to explore the social technology selected by the companies, the variation in the accounting practices to manage these new data, problems and opportunities emerged during social media management. Results provide evidence on the reshaped role for accounting, with four different configurations that have been identified, which differ in terms of calculative practices, technology and social issues behind social media data. Albeit these differences, some common trends related to accounting have been also identified and discussed.

Results provide evidence about how accounting practices in the four Telco companies have been reshaped by the performativity of social media networks, their users, and their entangled technological and social components.

The adoption of social media in the four Telco companies was associated with the introduction of new KPIs in order to evaluate social media activity and the contribution of social media data in supporting the organizational activities. It has been found that all the four companies introduced new indicators in order to evaluate and manage social media. These indicators can be grouped into four main categories: traditional indicators reconfigured for social media; indicators automatically provided by social media platforms; indicators related to the sentiment of online conversation and indicators about users and the social media networks. The first category of indicators concern

traditional indicators, simply applied to social media platforms. These measures include 'time to response', 'efficiency of response' and 'social media ROI' (Return on Investment). All the four companies highlighted time to response and efficiency of response as a crucial aspect for them. The second category of indicators concerns KPIs automatically generated from social media platforms. They comprise the following: number of followers, likes, shares, comments, talking about and reach of the population, which are differently computed according to the specific social media. The third group of performance measurement comprises sentiment indicators to evaluate the opinion about online conversations on social media channels. While all the companies perform a sentiment analysis about the perception of the whole company, a systematic sentiment analysis about the perception of products and services is exploited only in Telco-1 and Telco-2. Telco-4 and Telco-3 also adopt sentiment indicators, but they are applied only on specific needs rather than on a continuous basis. The last group of indicators is related to KPIs about users and their network, whose aim is to quantify relationships and interactions within the network of social media users. These indicators include network mapping, influencers, connections (strong and weak ties) and cluster analysis. Interviews in all the four companies highlighted the complexity to perform these types of analysis. Telco-4 and Telco-3 do not apply these indicators, unless in exceptional cases, such as marketing campaigns tailored for specific target customers (geo-location and age). At the same time, also Telco-2 and Telco-1 do not perform systematically these analysis, but only on demand after specific advertisement campaigns or actions by the company.

Together with the development of new KPIs, also the reporting structure has changed in terms of type of documents produced, but also in terms of time horizon of these reports. There are different configurations of the reporting among the four companies, which move from real time to periodic and on request reports. One of the principle cause of such difference are the recipients of these social media reports, moving from marketing to the board of directors.

These new calculative accounting practices associated with the introduction of social media have emerged being associated with a revised new time-frame, but also to a new combination between new calculative data and existing practices, although with different nuances from one company to another. The diffusion of social media and the adoption of new calculative practices to exploit social media data was strictly intertwined with to technological and social aspects of social media.

The social aspects relate to organizational issues in terms of the new organizational roles emerging in order to support these new calculative social media practices. In this respect, differences were found between the four companies ranging from a digital hub organizational configuration (concentration of all people working on social media in one place) to co-workers (who dedicates part of their job to social media tasks connected to their principal role). The interesting finding is that three

out of the four companies externalize the activity of data download and analysis to dedicated companies with technological and statistical expertise. Even though, Telco-2, Telco-4 and Telco-3 totally outsource the analysis of social media information, but they have introduced a person supervising and monitoring the work of external companies, while Telco-1 directly employs people from agency inside their department. These empirical findings provided evidence about the intricate relationship between the technological and social component of social media, which inevitably affected the development of calculative social media practices.

The empirical analysis about social media calculative practices and the related organizational and technical issues associated with the four companies led to the emergence of different accounting configurations, which passed from being real time and internally driven to on-demand and externally driven (see Table 2).

	Real time, internally driven	**Alert based, internally supervised**	**Periodically based, Externally driven**	**On demand, Externally driven**
Company name	Telco-1	Telco-2	Telco-3	Telco-4
Calculative practices	Full set of KPIs Real time analysis	Full set of KPIs Alert-based analysis	Traditional and sentiment KPIs Periodically-based reports	Traditional and sentiment KPIs On-demand reports
Organizational roles	Social media function as a hub inside the company	Social media as part of the digital online department	Social media team inside the marketing department	Social media team under communication
Technical issues	Internal data analysis	Outsourced data analysis, but with an internal supervision	Outsourced with a dedicated person	Outsourced

Table 3: Accounting configurations

Differences in these accounting practices are visible, not only in terms of KPIs and reporting (i.e. calculative practices), but also with respect to the technical and social issues associated with social media. The first issue concerns the marginal role of accountants in dealing with calculative social media practices. New expertise are emerging in terms of data analysis and data management, strictly depended on the technology of the social media platform, but these expertise are under the supervision of organizational functions other than accounting. The second issue concerns the role of technology, which emerged being strictly connected to calculative social media practices. The computation of social media indicators cannot occur without the technological support. In this context, new competences about data management and IT-technologies are required, posing a problem about where to position these competences inside the organization (organizational role intertwined with the technical one). The solution adopted seems to be to externalize this activity leaving to someone outside the organization the technological work to data download. The third issue is related to the

nature and timing of calculative social media practices. With respect to the nature of calculative practices, results revealed that KPIs related to social media data are mainly non-financial rather than financial with the unique exception of social media ROI. Moreover, the technological dimension of social media allows to derive information about users and the network, or sentiment, which are difficult to be transformed into money, leading to a prevalence of non-financial data. With respect to the timing of social media practices, social media KPIs are moving towards real time monitoring, posing several challenges at the level of data management, storage and interpretation.

This study explores calculative social media practices in Telcos by addressing two research questions: what are the (new) calculative practices, in terms of KPIs (Key Performance Indicators) and reports associated with social media? and 2) how organizational and technical aspects related to social media are intertwined with these calculative practices. These questions are driven by the need to unravel the intricate relationships that is emerging from literature between the social and technological dimensions associated with social media (Kietzmann et al., 2012), which does not find an adequate support in the accounting literature yet.

The empirical analysis, relying on the socimateriality lens and, in particular, on the conceptualization of the social and the technological dimension as intertwined (Scott and Orlikowski, 2012), allowed to identify four main configuration for social media calculative practices: real time, internally driven; alert-based, internally supervised; periodically based, externally driven; on-demand, externally driven. Differences among these four configurations are related to KPIs and reports, technological and social aspects. KPIs and reports move from a real time-base to a computation on demand. Technological aspects strongly affect the computation of KPIs, leaving company to choose either to develop these technological capability inside or to externalize the computation of social media data. Strictly connected to this technological issue, the social dimension concerns the organizational role in charge to manage these calculative social media practices, which move from a standalone department that acts as a digital hub to a team inside the communication group mainly based on people working part-time on social media.

This study adds to extant literature about sociomateriality, the role played by accounting practices in the social media era, where the technology and the social cannot be separately analyzed (Wagner et al., 2011; Pollock and D'Adderio, 2012). It also contributes to the accounting literature providing an in-depth understanding on how the technological, organizational and accounting components are strictly interviewed with social media.

This paper has also some practical implications. It provides a detailed map of social media adoption with Telecommunication practices enabling specific sociomaterial characteristics: technological (data analysis), organizational (configurations) and calculative practices (key performance indicators, and

reports). The paper focuses on Italian Telecommunication companies and does not explore how social media are reconfiguring accounting practices in other industrial sectors or in other countries. An explorative or comparative study could provide more in-depth understanding on how social media changes the technological accounting components. All these aspects demands for further investigation into how accounting can support this activities or if new roles should be introduced to perform these emerging needs.

1.6 Summary of study 4 – "Creating value from Social Media Data"

Web 2.0 and specifically social media platforms are widely adopted among diverse companies in different "account forms" (Risius and Beck, 2015): employment of new staff members, sales planning, development of new products, official disclosure of accounting documentation and handling customers relationships. The current studies in marketing and information technology are leading this research with interests of scholars laying beyond the analysis of social media management, and addressing also social media as a source of "big data". This information is said to be "likely to generate exciting changes in the scenario planning and decision-support field in the coming decade" (Raford, 2015).

Several scholars underlining that social media data is unique source of immediate news, understanding reaction of public towards new legislation, an alternative to the exit poll for elections and quality assessment of products, services, in particular meal in a restaurant or a hotel (Tumasjan et al., 2010; Jeacle and Carter, 2011; Kavanaugh et al., 2012; Freberg et al., 2013; Kim et al., 2015). Researchers investigate benefits of these data for business, organizations and government (Korschun and Du, 2013; Bianchi and Andrews, 2015). Yet, many of them acknowledge value of social media information for operational activities and innovation, still a lot of questions remain answered. Researchers underline the difficulties connected with understanding these "big data", reliability, representativeness and dissemination inside organization (Boyd and Crawford; 2012; Ferrara et al., 2014; Bianchi and Andrews, 2015). In order to create value is not enough to collect, analyse and choose innovative ideas from social media platforms, but also present to managers and receive approval for their implementation (Dong and Wu, 2015). The privacy and ethics questions are other important issues that researchers and companies are struggling with (Clark et al., 2011; Curtis, 2014). The value of social media data (SMD) remain controversial. This is mainly due to the fragmentation of previous researchers, which do not address the problem of "value" for companies in a holistic way. In this paper addresses this gap, by analysing the value of SMD in a complete way considering that the value for user is determined by several elements: the process through which data are collected and processed; the way through which data are communicated and the agent preparation to read and use the data. Drawing on the framework developed by Willcocks & Whitley (2009), following refined to the sphere of Big Data (Bhimani and Willcocks, 2014), the research investigated a case of advanced use of SMD: TELCO company. TELCO (anonymous name) is a large telecommunication company operating in Italy and was chosen after a preliminary phase in which several companies were screened through 21 face-to-face interviews, direct observations, reports provided by TELCO, and secondary sources. TELCO was selected as exemplary of its advanced processing and use of SMD and its

enterprise wide diffusion among different agents. The data were analysed by an iterative process using QRS NVivo 10 coding to identify patterns relating to process of SMD (Whillcocks and Whitley, 2009), its value together with the organizational and knowledge creation issues using the multiple source of evidence (Anderson-Gough et al., 2005; Jorgensen and Messer, 2010).

The findings are articulated in four sections. The first one presents the SM organizational configuration of TELCO, consisting of a corporate organizational unit, positioned under Communication business unit and labelled Data Intelligence department (DID). DID includes three teams: data analysts, social client relationship and managers or strategic planners. The department has a hub role to analyze, proceed and communicate results of SMD.

The second section are SMD and how they are generated in the attempt to face expectations and needs of diverse business divisions. The social media data collection and processing is complex and diversified; further to the human network described above, DID uses more than 10 different applications and platforms. The reporting processes do not have unique structure and vary significantly based on expectations of the final user, but also in relation to the moment in time, due to the evolving situation and new projects. The three types of reports were identified: informative and acknowledgement, department-specific and thorough reporting.

The third section focuses on the use of this information by agents (managers), highlighting how they differently react and endorse SMD in their activity. The three types of reports are unevenly used across company. The informative reports represents a starting, entry point for managers, while department-specific reports are real sources of information and tools for managerial activities based on specific exigence, presented through visualization tools and mix of structured and unstructured information. The thorough reports respond to specific call from agents at certain time period (hour, day or week). TELCO managers have concerns and evaluate SMD differently. For some managers the timing is very important (from immediate to monthly), for some only department-specific reports are interesting (specific issues and in-depth analysis).

The fourth section sheds light on the knowledge from SMD and challenges for management. DID staff working a lot on the transformation process and collaboration with other departments to make SMD understandable and usable. Their work consists of several aspects: collecting expectations, better understanding of agents' perceptions, but also better presentation of information. However, significant effort and investment in creation of DID and new process of SMD dissemination across company, some of employees stay reluctant and do not use this data in their decision making processes.

The results section has evidenced a complex process for attempting to generate value from SMD across the company. Starting from results and the initial theoretical framework a revised model for

SMD process is proposed, where two main revisions are embodied: the pervasive interaction and time impact.

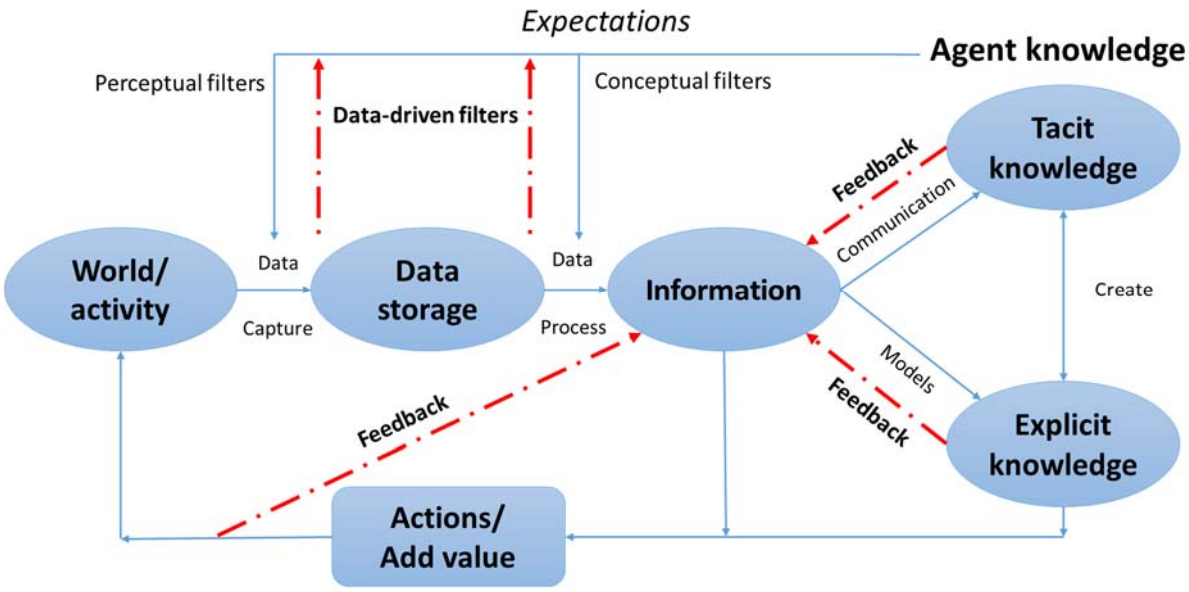

Figure 3: revised framework for Social Media Data

The revised framework highlights that interaction plays key role for SMD, represented, though schematically in Figure 3, with the bidirectional links between components of the system, agent and final output, emphasizing routes of the information flows: from agent to process, from process to agent, and introducing new supporting elements of relationships (data-driven filters, models and communication modes). The reasons for the need of higher interaction is firstly related to the nature of SMD. SMD are based on a fuzzy flows of information derived from a variable set of users. Understanding the real need of departments and managers is the only way to get the most useful information. The empirical evidence from the case study highlighted also how the interaction is enacted in the attempt to create value through feedback, focused meetings or even in the form of temporary space (physical facility of monitoring room with all SMD indicators in real time and round table between employees) to respond to the crisis situations.

The second variation emerged from results is relation to time. The velocity of SMD is considered one of its major characteristics (Rust and Huang, 2014; Gandomi and Haider, 2015). The case demonstrated a more complex situation, where time and its management needs a broader conceptualization. This flexibility helps to capture different issues from SMD body of data: immediate reaction on advertisement, trend of attitude towards service, perception by "youth" clients or comparison between results of current and past year. The time variable significantly affects also communication and visualization for agents. In particular the real time monitoring introduce in

accounting the "monitoring room", a physical control room with screens where operator can constantly watch at signals, which becomes a center for crisis management.

To conclude, taking as point of reference work of Bhimani and Willcocks (2014) emphasizing the role of Big Data and business analytics activities in finance reporting and management accounting consequences, this study contributes to the management accounting theory proposing a revised framework for SMD process within organization, highlighting its particular configuration for knowledge and value creation. It responds to the call of Nguyen et al (2014) in knowledge acquisition process from SMD and value creation according to different employees' perception, providing a model to connect agent's requirements and information technologies to retrieve tacit and explicit knowledge for further managerial activities. This model helps to overcome the problems of the agent attitude (Vuori and Okkonen, 2012) and increase motivation of agents though delivery of tailored, timely information.

From practitioners perspective this research provides a thorough model for SMD processing, ensuring substantial results and propositions for value creation for different management accounting activities across the company. This overall perspective allows the adoption, application and modification of the model according to diverse requirements of managers and companies. The detailed overview of the reporting procedures and crucial issues of timing and communication, represents a roadmap for the analytics departments or people working with outsourcing agencies.

Further research can extend this study in several ways. In particular, future research can look into the individual agent's characteristics and skills to identify portfolio of SMD open employees. The empirical evidence is provided from proactive user of SMD, different results could be obtained from companies in transition process or from other industry. Another important issues stays uncovered is effectiveness of this innovative information compared to traditional information types.

1.7 Conclusions and future developments

The four studies collected in this thesis are contributing to answer the overall research question *how information derived from social media are changing performance management*. Prior literature (Balakrishnan et al, 2014; Lee et al., 2015; Miller and Skinner, 2015) investigated how SMI transforms some of the PMS components in a fragmented way, addressing issues such as reporting, dissemination procedures or return on the investment measurement. Notwithstanding an overarching analysis of the impact of SMI on PMS is missing, which is instead important to understand the overall frame going through data collection, analysis, use, leading to the creation of knowledge from SMI and its employment to support managers. The main findings of the papers may be articulated around three connected issues: performance measurements, processes and interaction between technical, social and organizational issues (see Table 4).

Enhancement	1 study	2 study	3 study	4 study
Performance measurements	Indicators type from the academic perspective (quantitative and qualitative)	Use according to different levels of adoption	Type and use for different PMS	Diversity of indicators and their evolution
Process of data collection and analysis	Methods for various types of SMI	Impact of outsourcing or insourcing of SMI collection and analysis	Identification of organizational models: digital hub, digital responsible + outsourcing, complete outsourcing	Evolution and characteristics of hybrid configuration
Interaction between technical, social and organizational issues	Not individualized	Classification of technical and organizational according to different SMI adoption stage	Further classification within unique industry	Technical and organizational choices are intertwined

Table 4: Overview of research results

The first component is related to SMI performance measurement, intended as a single indicator, or system of indicators based on SMI to monitor various objects of managerial control. The rapid growth of new media and performance measurement still lacks of common language for managers, contrary to traditional financial metrics, like revenues or return on investment. The first paper proposes a new classification based on the in-depth review of interdisciplinary literature. The findings of the first paper underlines that indicators based on social media are evolving towards more text-based, subjective measures brining to managers new dimensions of analysis, like sentiment or ability to individualize relations between online users. The empirical evidence from the three remaining papers

confirms this theoretical finding and underlines the strict link of SMI performance measures with the final use in feed-back, planning or decision-making activities (Rust and Huang, 2014). The fourth study affirms the possibility to develop standardized set of SMI indicators, suggested by several marketing and information technology studies (Romero, 2011; Kaske et al, 2012; Crumpton, 2014). Instead it proposes to introduce frequent collaboration with final user to obtain meaningful results for managerial activities. This finding responds to the call of Nguyen et al. (2014) in knowledge acquisition process from social media and value creation providing a model to connect manager's requirements and information technologies to retrieve performance measurements for further managerial activities. Furthermore, the fourth study proposes a model for SMI that helps to overcome the problems of the employee attitude (Vuori and Okkonen, 2012) and increase motivation of agents through delivery of tailored, multiple layers of analysis (whole network, group of customers or geographical location) and timely (hour, day, week or even years) indictors.

The second area of findings is related to the process of data collection and analysis. In the first paper I propose a framework that underlines the importance of data collection and data analysis methodologies, which were underemphasized in previous PMS studies. The first and second paper findings recognizes the relevance to measure social media by joining, not only performance measurement competences, but also IT skills, which are necessary in order to fully understand how to retrieve and analyze huge amount of social media data in real time. Starting from this results, the empirical evidence from the third and fourth paper investigates possible configurations for this process and balance between internal and external competences required. Both at the practinioners and academic level (Lee, 2012; Gao et al., 2014; Songchang et al., 2015) the methodology in collecting data from external sources and text mining are still open field.

The third area of findings contribute to the discussion of Wagner et al. (2011) and Pollock and D'Adderio (2012) on intertwined social and the technological dimension for SMI that covering social and technical aspects (programs, data bases) interrelation to analyse SMI. The second paper highlights that also an organizational dimension is required for the employment of SMI within managerial activities. The empirical findings from the second and third paper highlights that interrelation of the three components is required for adoption and employment of social media information within any company. Moreover, the employment of SMI within PMS requires the strategic guide for the intertwined dimensions. The third and fourth study within telecommunication industry evidence that the approach to social media measurements is often stimulated by proactive users within the company. In other cases the management leaded this process to seize an opportunity of new large corpora of information and introduced new departments, teams or specific people within different departments to work on social media tasks.

The theoretical contribution of this research mainly addresses management and accounting literature, adding to lively discussion on performance measurement systems and employment of social media data for managerial activities, supporting decision-making, planning and feed-back. In the era of big data managers are exposed to the large corpora of various information (words, pictures, videos or even symbols) with high speed. This study aims in filling in gap identified by Suddaby et al. (2015:66) that highlighted the "absence of ethics and norms in the language of professional expertise" for social media information. This is why it is important to understand the thorough process of SMI employment to support managers. This became a critical issue not only for a single manager or company, but also for public administration and governments (Picazo-Vela et al., 2012; Jeacle and Carter, 2014; Meller et al., 2014; Gandomi and Haider, 2015) searching for effective and reliable way to understand and adopt social media data.

From practitioners perspective, the four consecutive studies provide a thorough and detailed overview of social media information adoption and employment within performance management, management control and accounting practices, including roadmap to evaluate social media activities: the first study proposes set of tools to apply social media toward specific objective inside company; indicators construction procedures and measurement methods aligned with specific use in the second study. The third study roots the employment of social media based on enabling specific sociomaterial characteristics: technological (data analysis), organizational (configurations) and calculative practices (key performance indicators, and reports). Furthermore, the fourth study proposes a model for SMI processing, ensuring substantial results and propositions for value creation for different management accounting activities across the company. This overall perspective allows the adoption, application and modification of the model according to diverse requirements of managers and companies. The detailed overview of the reporting procedures and crucial issues of timing and communication, represents a roadmap for the analytics departments or people working with outsourcing agencies.

Every research has its limitations. In my study the empirical evidence of the second study is based on 8 companies in different industries and countries, but the interviews have been conducted only with the already using social media and information. While the third and fourth studies are specific to telecommunication industry in Italy, which is leading industry in adoption and use of SMI. Further research can extend this study in several ways. An explorative or comparative study could provide more in-depth understanding on how social media changes the performance management, social and technological accounting components in companies within transition process or from other industries. Additionally, future research can look into the individual manager's characteristics and skills to

identify portfolio of social media information open employees. Another important issue stays uncovered is effectiveness of this innovative information compared to traditional information types.

2 ANNEX

2.1 Study 1 - Performance measures and social media: new requirements for metrics and methods

In journal Measuring Business Excellence, status – revise and resubmit

Authors

Deborah Agostino
Assistant Professor, Department of Management, Economics and Industrial Engineering, Politecnico di Milano, Milan, Italy

Yulia Sidorova
Ph.D. candidate, Department of Management, Economics and Industrial Engineering, Politecnico di Milano, Milan, Italy

Corresponding author: Deborah Agostino
The specific contribution of Yulia Sidorova consisted in the literature analysis, in particular for technological, managerial and marketing perspectives, and writing of the article, undersupersion and in collaboration with Deborah Agostino.

Abstract

Purpose – This paper focuses on social media performance measurement. The widespread development of social technologies has required organizations to monitor their ability using these tools, but extant Performance Measurement System (PMS) contributions are limited and fragmented. A PMS framework to monitor social media is here proposed to capture changes related to PMS metrics and methods.

Design/Methodology/Approach – This is a qualitative research based on a literature review of papers in management, information technology, marketing and public relations.

Findings – A PMS framework in the social media era is theoretically derived, which represents an operating tool that highlights the required changes for performance metrics and methods to monitor and control social media.

Originality/Value –The PMS framework contributes to the academic literature by integrating in a unique model the available approaches for social media measurement and identifying future research directions. The framework also supports practitioners dealing with social media, providing them with a roadmap on how to assess their ability using social technologies.

Keywords Performance Measures, Social media, Metrics, Methods

Paper Type Research paper

2.1.1 Introduction

A Performance Measurement System (PMS) represents a valuable and longstanding tool to plan and understand how activities are performed by individuals or organizations (Choong, 2013). It has been widely implemented in private, nonprofit and public organizations to monitor organizational achievements and supports decision making, motivate individuals and provide external accountability (Behn, 2003). A wide variety of activities are measured and controlled through PMS with social media representing one of the last challenges. Indeed the widespread diffusion of social media in the last years have stimulated organizations endorsing these tools, posing as a challenging issue their ability to use these social technologies (e.g. Hanna et al., 2011; McCaughey et al., 2014). Over 65% of Americans have at least one account on social media and over 52% of population uses regularly several social media platforms (Survey of the University of Michigan's School of Information, 2015). Social media, broadly referred to as online tools based on social interactions and user generated content (Kaplan and Haenlein, 2010), are hence an object to be measured and controlled. The Business Times published an article focusing on use of social media analytics within the companies and found out that "executives in nearly every industry are looking for ways to reap value from analytics… but to keep up with these new media leaders… must learn new skills and seize the opportunities presented by al this data." (The Business Times, October 19, 2014, by Charlie Kim, Rasmus Wegener and Florian Hoppe). The interest to social media and impact on financial professionals is emerging from 2011 "the management accounting functions will need to analyze and report real time information to support business growth, profitability and real time digital marketing" (CIMA report, 2011). The practitioners study highlights that companies employed digital initiatives "boast a profit margin of 43 percent" (McKinsey & Company, 2015: 1). The growing interest in this field realized by American Accounting Association that devoted in 2015 conference named "Accounting IS Big Data" exploring how Big Data and specifically social media influence accounting practices. Although this recognized need, if and how PMSs might change in terms of available metrics and methods in order to support the evaluation of social media is mainly unexplored.

The prior contributions both from practitioners and academic scholars evidence the absence of the overall perspective on the measurement metrics and methods of social media information. The researchers have focused on specific elements of performance measurement systems: metrics and procedures (Hanneman and Riddle, 2011; Nikolopoulos et al., 2013; Shelton and Skalski, 2014; Balahur, 2014), or specific performance monitoring tools (Bennett et al., 2010; Brzozowski, 2009; Jin et al., 2012). Several authors underlined that further research is required in to develop systematic approach (Schoen et al., 2013) and shed light on "how informal learning data can be harvested from […] social media" adopting methods and relevant metrics (Raybourn, 2013, p. 10). This paper aims

at understanding the required changes for a PMS in order to support social media measurement, tackling both metrics and methods for obtaining these metrics. Specifically, the following research questions are addressed: what are the challenges in PMS metrics to measure social media? What are the challenges in PMS methods to accomplish these social media metrics? To address these questions, we conducted a literature review on management, information technology (IT), marketing and public relations journals. The main contribution of this paper is the development of a PMS framework for social media that provides a comprehensive view of social media measurement, overcoming the limitation of current studies that focus specifically on a detailed set of indicators or on a specific methodology.

The paper is structured as follows. Section two highlights the importance to measure social media; section three describes the methodology of analysis, while section four discusses the dimensions of the proposed PMS framework. Finally, academic and managerial implications are presented.

2.1.2 Literature review: the importance to measure social media

Social media can be defined as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0" (Kaplan and Haenlein, 2010:61). They broadly refer to social networks, blogs, wikis, photo sharing, video sharing platforms or virtual games (Kaplan and Haenlein, 2010). Even though each of these applications has its own characteristics, social media are characterized by three main distinctive features (Peters et al., 2013):

- Real time communication. Social media users have the possibility to communicate real time, also pushing companies to remain connected the entire day on social channels to maintain interactions with their customers.
- Many-to-many interactions. Communications on social media is extensive rather than one to one, increasing the virality of the message with respect to offline traditional media.
- User generated content, which concerns the fact that users are directly in charge to provide content on social media rather than playing a passive role of receiving information.

The widespread adoption of social technologies by organizations has introduced the need to monitor social media activities, hence calling for a specific PMS. Even for marketing and media agency social media became one of main means for communication, promotion, retention and penetration (Forbes, 2015). Numerous consulting firms underline the importance of these data for companies to assess performance (Bain, 2015, Deloitte, 2013). Furthermore, in April 2013 U.S. Securities and Exchange Commission (SEC) issued a report that permit companies "use social media outlets like Facebook and Twitter to announce key information in compliance with Regulation Fair Disclosure" (SEC, 2013). The practitioner contributions also underline the primacy for companies that embark in social

media initiatives to understand where they are going (IBM Global Business Service, 2011). The paramount importance to measure social media is recognized in several academic disciplines:

- the marketing literature acknowledged that: "SNS [social networking site] need to be evaluated for their effectiveness…the development of the right metrics is paramount for marketers" (Michaelidou et al., 2011: 1155);
- management studies stressed the importance for companies to understand if they are using their social media effectively (Hanna et al., 2011);
- IT scholars are interested in the development of new techniques to quantify impacts of social data (e.g. Chen et al., 2012);
- the public relations literature underlined the importance to quantify the ability to interact effectively with customers through social channels (Waters, 2009).
-

Summarising, the distinctive social media features of real time, many-to-many interactions and user generated content (Peters et al. 2013) demand a revision of a PMS, which needs to face challenges coming from these different parties. The next section explains in details the methdology applied to provide holitsitc overview on social media metrics and measurements withing PMS.

2.1.3 Method

This is a conceptual study that adopted a qualitative methodology based on a literature review in order to develop a PMS for social media. We performed this review following three main steps. The first step consisted of searching academic articles using a combination of keywords:

- Social media;
- Performance measure;
- Indicator;
- Metric;
- Facebook, Twitter, YouTube, LinkedIn;
- Data analysis, data collection.

We did not include phrase "social network", which is in the most studies referred to the network theories in social studies also covered by information technology and management scholars.

Initially, the search engine Scopus was adopted. We have chosen information technology, marketing, public relations and management outlets to find studies covering relevant arguments defined by the key words. The initial search resulted in total of 190 papers. We have complemented by a snowball approach later to review citations of the retrieved papers in order to identify further appropriate material not emerged with the keywords search. We have added another 23 papers by using snowball

approach. As a second step, we identified the relevant studies to include in the review on the basis of two criteria. First, a clear reference to metrics or methodology for analysis had to be included in the paper, given the purpose of our research to identify the available metrics and methods for social media measurement. Second, papers had to be published in refereed journals, conference proceedings or published books in order to increase the quality of the contributions. We have read and analyzed the abstracts of the 213 papers, and adopting the criteria we selected 59 papers. Afterwards, we did in-depth reading of complete papers and papers adopting snowball approach. Finally, following our two criteria, we selected 51 papers relevant for the analysis.

During the third step, to guide the framework development, we charted key items, defined by the key words, from the retrieved papers distinguishing between social media metric and social media method. This organization of the papers provided a summary of the current state of the art about PMS and social media, which supported the definition of a PMS framework for social media analysis.

2.1.4 Framework

This section proposes a PMS framework for social media measurement starting from results derived from the literature review (see Annex I). The proposed framework is composed of three main elements:

- Control object, which represents what is measured by the PMS;
- Metrics that concern indicators to quantify the control object;
- Methods that refer to the approaches to retrieve and analyze data to feed the PMS. They comprise both data collection and data analysis methodologies.

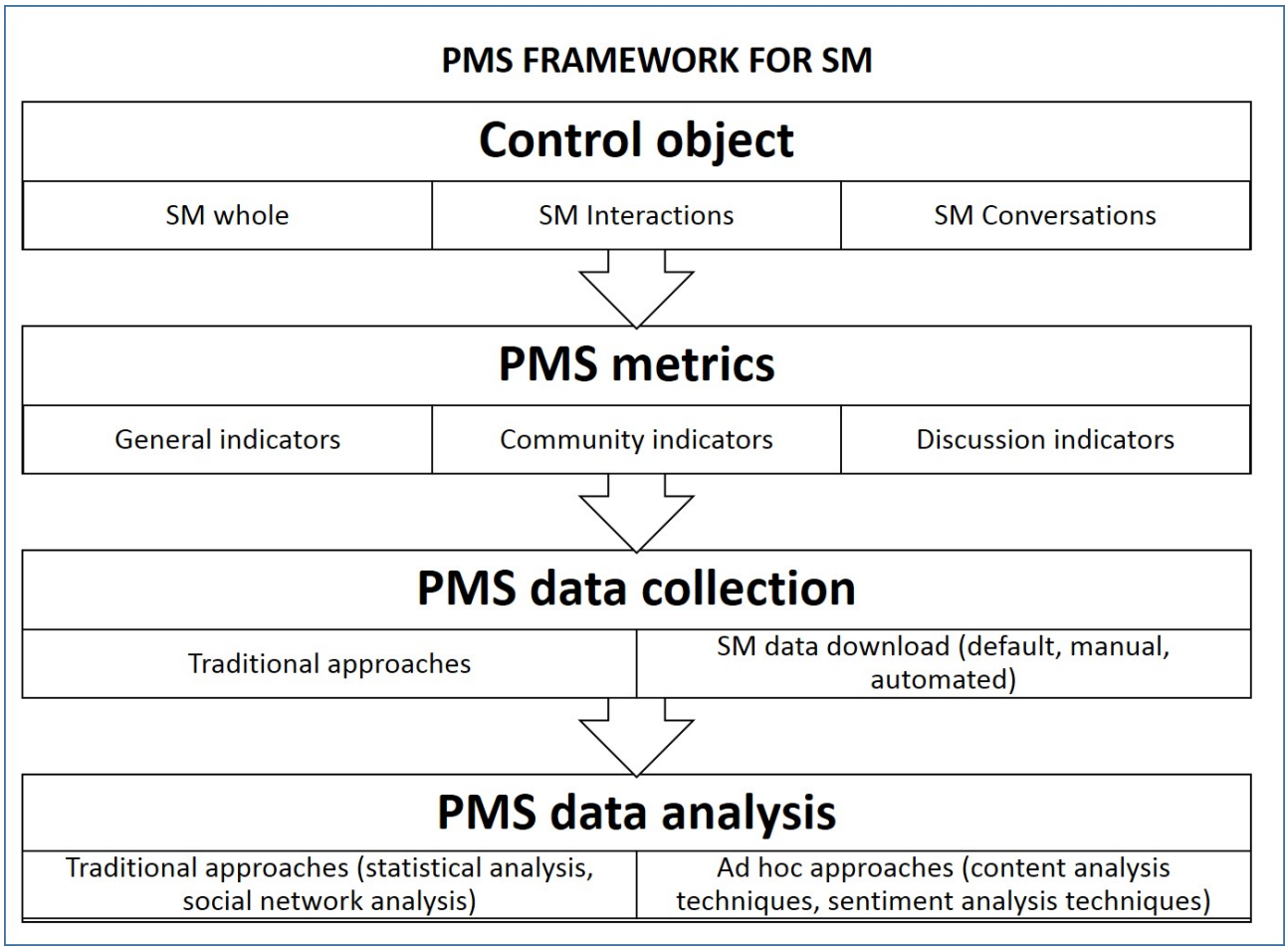

Figure 4: PMS framework

Following this framework, it is the control object that drives what has to be measured (metrics) and how to collect and analyze data (methods). The control object can be of three different types: the whole social media; social media interactions and social media conversations. Depending on what has to be measured, metrics and methods are different (Table 1).

CONTROL OBJECT	**METRICS**	**METHODS**	
		Data collection	**Data analysis**
Social media as a whole	General indicators: • Social media ROI • Multiplexity • Density • Centrality • Closeness	Traditional approaches	• Statistical analysis • Network analysis
Social media interactions	Community indicators: • Awareness • Engagement • Word of mouth • Virality	Ad hoc social media data download: • Default • Manual	• Statistical analysis

		• Automated	
Social media conversations	Content indicators: • Relevance • Uniqueness Sentiment indicators: • Subjectivity • Polarity • Sentiment divergence metrics		Content analysis techniques: • Natural Language Processing • Semantic Web Sentiment analysis techniques: • Supervised classification • Semi-supervised classification • Unsupervised classification

Table 5: **PMS metrics and methods**

PMS metrics

PMS metrics can vary from *general indicators*, *community indicators* and *discussion indicators* depending on the control object.

General indicators provide a synthetic evaluation of social media as a whole in terms of profitability of the social media investment and structure of the social network. They are derived by indicators traditionally used to evaluate organizations: the metric is, therefore, the same, but the object of control has shifted from the organization to social media as a whole. A foremost indicator in this area is represented by social media ROI (Fisher, 2009; Powell et al., 2011; Romero, 2011; Kaske et al, 2012; Crumpton, 2014), defined as the "Holy Grail" of social media (Fisher, 2009). The traditional formula adopted by companies to evaluate the Return On Investment (ROI) is suggested for the quantification of the social media ROI, providing a synthetic evaluation about the ability of the organization using social media. Other general indicators support the evaluation of the network structure of social media users. These indicators are mainly derived from network theory and applied to social networks to assess the structure of the whole social network. The starting point of these metrics is that every network is characterized by a set of nodes connected by ties. Moving from this conceptualization, a set of indicators has been developed, such as multiplexity, centrality, density, closeness (Coulter and Roggeveen, 2012; Ellison and Boyd, 2013; Kane et al., 2014). They allow, for example, to identify who is the influencer, intended as the node in the network with a predominant role to influence the others (Li et al., 2014; Bernabé-Moreno et al., 2015).

Community indicators evaluate social media interactions quantifying the number of people reached through social channels and their level of interactivity. Their object of control is narrowed to interactions that occur on social media rather than the whole network. These indicators are mainly discussed in marketing and public relations literature and comprise: awareness, engagement, word of mouth, and virality.

Awareness, also called reach, quantifies the ability of an organization to broadcast information to users through social media (Hoffman and Fodor, 2010; Agostino, 2013; Cosenza, 2014). Engagement measures the ability of an organization to establish dialogue and interactions with social media users (Hoffman and Fodor, 2010; Agostino, 2013; Bonsón and Ratkai, 2013). It is based on the quantification of responses to social media posts. Word of mouth (Hoffman and Fodor, 2010) evaluates the ability of social media users to communicate their opinion to other users, hence contributing to foster the popularity of a post. Virality (Bonsón and Ratkai, 2013) is a proxy for the intensity of propagation of a message posted on social media.

Unlike general indicators, the computation of these indicators requires the collection of specific social media data, such as: the number of "Likes", "Fans" or "Shares" for Facebook or the number of "tweet", "retweet" or "reply" for Twitter. Furthermore, metrics per each of these indicators change according to the specific social platform. For example engagement is calculated counting the number of replies on Twitter, the number of comments on Facebook and the number of subscribers on YouTube (Hoffman and Fodor, 2010; Agostino, 2013).

Discussion indicators aim to measure the object of control of dialogues that occur on social media. They are mainly derived from the IT literature and aim to quantify, usually through numbers, the content and sentiment of social media conversations. Studies on content indicators suggest identifying categories to classify images, themes, features, links, exchanges and languages that occur in social media conversations (Herring, 2010). For example, Waters et al. (2009) identified 30 items to classify posts on Twitter accounts of nonprofit organizations. Within the journalism field, two indicators were developed: relevance, which quantifies the importance of a given word, and uniqueness, which quantifies the occurrence of a word or sentence (Diakopoulos et al., 2010).

Sentiment indicators concern feelings and opinions of people. These indicators quantify the sentiment, positive, neutral or negative, associated with social media conversations. A variety of measures can be found to quantify the sentiment of conversations and the debate on the most appropriate metric is still open. Asur and Huberman (2010) proposed a subjectivity and polarity ratio, by focusing specifically on Twitter. The former assesses the level of subjectivity of tweets by calculating the ratio between the number of positive and negative tweets with respect to the neutral

ones. The latter quantifies whether the sentiment is mainly positive or negative by computing the ratio between tweets with positive sentiments and those with negative ones. Starting from the importance of "assessing opinions, evaluations, speculations, and emotions in free text" (Zhang et al 2012: 3), a set of sentiment divergence metrics have been proposed, by identifying formulas to quantify the rating (to quantify the importance) and the review (to reflect consumers' opinions) of each comment on social media.

PMS methods

PMS methods need to be distinguished between data collection and data analysis.

Methods for data collection

While general indicators do not require specific approaches to collect data, the computation of community and discussion indicators demands ad hoc approaches for data collection. From literature, three main approaches for social media data collection have been identified.

The first approach is default data collection (van Dam and van de Velden, 2015; Ngai et al., 2015). It consists of accessing already given information from social media platforms, usually offered for free by the social media provider. For example, Twitter analytics (https://analytics.twitter.com) or Facebook Insights, (Facebook statistics) provide companies with the possibility to access and download some information about their own social page or their popularity over the time.

The second approach concerns manual data collection, intended as the physical collection of unstructured texts and other social media data such as numbers of "Followers", "Posts", "Shares" or "Likes" from social media platforms. Some studies (e.g. Snead, 2013; Sebate et al., 2014; Swani et al., 2014) rely on manual data collection in order to gather information about the interactivity level of a social page. This approach implies a time consuming process (Farrugia et al., 2012), which is feasible for platforms with low number of users or for specific data collection purposes.

The third approach, automated data collection (Atkinson et al., 2015), is a recent trend based on the development of an automated procedure to gather systematically social media data. The most common methodology to retrieve social media data is based on a web crawler, which is an automated program that retrieves web pages and their content for further use (Pinkerton, 1994). Crawlers have developed since 1990s (e.g. Chakrabarti et al., 1999), but algorithms to query the web have recently evolved to address the scaling problem of today's big data. The approaches for crawling social media data can be classified into two main categories: crawlers that rely on ad hoc API (Application

Programming Interface), and crawlers that rely on HTML scraping (Ferrara et al., 2014). The difference is on how the query on the social media platform is defined. Each social media platform directly offers the first category of ad-hoc API, such as Twitter API or Google Social Graph API (e.g. Kwak et al., 2010; Choi et al., 2012). This approach guarantees high performance, but at the same time the quantity of downloadable data is constrained by the policies defined by the social media platform. For example, the Twitter API allows to send only 150 requests per hour and to download a maximum number of 1500 tweets per query. The second category of HTML scraping still allows to download social media data but without relying on any service offered by the social media provider (Marres and Weltevrede, 2013). On the contrary, a rule is developed to query autonomously the web page. With respect to the approach based on API, HTML scraping does not have any limitation on the quantity of information that can be extracted, but its requests can be blocked by the social media provider.

Recent trends in data collection methods try to assure richness and precision of the collected data to simplify and improve the further data analysis, giving rise to web harvesting approaches to collect data simultaneously from several social media platforms (Ferrara et al., 2014) or mixing data collection approaches. For example, van Dam and van de Velden (2015) proposed a specific methodology for Facebook based on a mix of default and automated data collection procedures to support companies with their marketing activities.

Methods for data analysis

Methods for data analysis aim to transform the collected unstructured data from social platforms into usable data to compute social media indicators. Traditional statistical techniques such as correlation, regression or cluster analysis (Dzvapatsva et al., 2014), and network theory approaches, that identify the most influential figures or strong and weak interconnections (e.g. Li et al., 2014), have been complemented by novel methods. These novel methods are extensions of longstanding data mining techniques (Ngai et al., 2009) and comprise content and sentiment analysis, supporting the computation of content or sentiment indicators respectively.

Content analysis is a technique that permits to code text, mainly by counting word frequency in order to reduce large volumes of data (Stemler, 2001). This technique existed long before the diffusion of social media (e.g. Krippendorff, 1980), but novel approaches are emerging to deal with the huge amount of social media data: Natural Language Processing (NLP) and Semantic Web Approaches (SWA).

The NLP is "a mechanism to extract useful information from the conversational data from the social media channels" (Bhardwaj et al., 2014: 106). This approach has "the general objective to create algorithms capable of 'understanding' natural language through techniques ranging from the simple manipulation of strings to the automatic processing of natural language inquiries" (Larson and Watson, 2013: 3). Several studies have been found to mine social media data through the adoption of NLP algorithms (e.g. Bunescu and Mooney 2007; Agichtein et al., 2008; Buckley et al., 2014).
The second approach of SWA extracts meaning from social media data by adopting "labels (via marking up, tagging, or annotating) that follow an agreed-upon reference model, be it a common nomenclature, dictionary, taxonomy, folksonomy, or ontology that represents a specific domain model" (Markines et al., 2009; Sheth and Nagarajan, 2009; Shet et al., 2010; Brambilla et al., 2014). The difference between NLP and SWA is purely technical: NLP approaches are based on implicit algorithms that code text on the basis of similarities between words while SWA is an explicit approach that searches for the specific match between two set of words (Sobkowicz et al., 2012). A further step in content analysis is to complement these techniques with further social media features, such as the geolocalization (Bernabé-Moreno et al., 2015) delivering in this way content indicators per each specific place.

Sentiment analysis supports the computation of sentiment indicators through the identification of opinions contained in social media data (Thelwall et al., 2010; Nguyen et al., 2014). It is usually performed by two consecutive tasks: identification of the opinion and identification of its polarity, either positive, negative or neutral (Pang and Lee, 2008). Automatic techniques to classify the polarity of a text comprise Supervised Machine Learning Methods, Unsupervised Methods and Semi-supervised methods.
Supervised techniques "require a training set of texts with manually assigned polarity values and, from these examples, they learn the features (e.g. words) that correlate with the value" (Neri et al, 2012: 920). This technique requires a manual phase to train the system to identify the polarity of a predefined set of words and then it will continue automatically to assign polarity to the text (Bravo-Marquez et al., 2014).
Unsupervised techniques do not require any prior training phase, but a predefined lexicon that allows to score the text as positive, negative or neutral (e.g. Paltoglou and Thelwall, 2012; Hu et al., 2013; Xianghua et al., 2013). In between these two techniques, semi-supervised techniques "address the polarity classification by expanding an initial set of sentiment words through synonyms and antonyms retrieved by thesauruses" (Fersini et al., 2014: 27). Although the purpose of these techniques is always the same, they differ in the approach adopted to assign polarity to text: supervised approaches require

an initial training phase, while unsupervised ones start from a predefined lexicon without the need of a training phase. Recent research started exploiting hybrid approaches that combine machine learning techniques with linguistic co-referencing methods in order to improve the quality of the analysis (Atkinson et al., 2015).

The main limit of these techniques is the language given that they classify the sentiment of a text in one language only. More recent studies have developed sentiment analysis approaches that exploit simultaneously multiple languages (e.g. Wan, 2011; Yan et al., 2014), which are particularly relevant for social media given the coexistence of several languages in the same platform.

2.1.5 Discussion and conclusion

This study provides a comprehensive view of social media measurement, overcoming the limitation of current studies that focus specifically on a detailed set of indicators or a specific methodology. The main contribution of this research is the theoretical development of a PMS framework to monitor social media, which encompasses both available metrics and methods. This framework provides implications for both academics and practitioners.

From an academic perspective, the contribution of the PMS framework is threefold. First, social media metrics highlight an evolution in performance indicators, which are evolving towards more text-based and subjective measures. Discussion indicators, supporting the evaluation of social media dialogues in terms of what people say and their feelings, sign a breakthrough in social media measurement by introducing the importance to quantify words rather than numbers.

Second, the PMS method section of the framework highlights the importance of data collection and data analysis methodologies, something underemphasized by previous PMS studies. It recognizes the relevance to measure social media by joining, not only performance measurement competences, but also IT skills, which are necessary in order to fully understand how to retrieve and analyze huge amount of social media data in real time.

The third contribution relates more in general to risks associated with the PMS framework. Given that one of the main feature of social media is represented by the user generated content, some drawbacks can emerge during the data collection process. These risks comprise the difficulty to access social media data because of the privacy settings issued by users, the collection of unreliable data associated to the provision of fake information by the users and the limited storage capacity to conserve the huge amount of users' generated data.

From a practitioner perspective, this paper provides a roadmap that can serve managers to evaluate their social media activities. The proposed framework has a double function. On the one hand, it provides managers with a sequence of steps to be performed in order to measure social media: from

the identification of the control object, to the definition of the most appropriate metrics and the most suitable data collection methodology. On the other hand, this framework suggests a list of implementable metrics to quantify social media and related methodologies to retrieve data. This is not obvious given that extant contributions on PMS metrics and methods are fragmented, and a unique, comprehensive framework is missing.

Furthermore, the necessity of computational techniques to collect and analyze data underlines the relevance of technical competences on statistics and information technology. These requirements need to be considered when selecting the figure in charge to manage social media, who should have not only managerial competences, but also statistical and IT skills. These features raise the issue about the organizational unit in charge of managing this activity, which is not obviously represented by the marketing area. On the contrary, a new organizational role might appear with ad hoc competences on social media measurement.

The main drawback of this study is the pace at which social media evolve, which makes it difficult to have an updated overview of both PMS metrics and methods. We have provided a framework based on theoretical contributions available until 2015, which undoubtedly require to be periodically updated.

2.1.6 References

Agichtein, E., Castillo, C., Donato, D., Gionis, A. and Mishne, G. (2008), "Finding high-quality content in social media", in *WSDM '08 Proceedings of the 2008 International Conference on Web Search and Data Mining*, pp.183-194.

Agostino, D. (2013), "Using social media to engage citizens: a study of Italian municipalities", *Public Relations Review*, Vol. 39 No.3, pp. 232-234.

Anand, A., Begonha, D. and Caldo, G., (2015), "Lessons from digital telcos: Five initiatives to improve business performance", McKinsey & Company.

Asur, S. and Huberman, B.A. (2010), "Predicting the future with social media", in *Proceedings of Web Intelligence and Intelligent Agent Technology (WI-IAT), IEEE/WIC/ACM International Conference*, pp. 492 – 499.

Atkinson, J., Salas, G. and Figuerao, A. (2015), "Improving opinion retrieval in social media by combining features-based coreferencing and memory-based learning", *Informatics Science*, Vol. 299, pp. 20-31.

Balahur, A. (2014), "Computational approaches to subjectivity and sentiment analysis: Present and envisaged methods and applications", *Computer Speech & Language*, Vol. 28(1), pp.1–6.

Belbey, J., (June 29, 2015), "Communicating and using social media in a regulatory environment", Forbes.

Bennett, J., Owers, M., Pitt, M. and Tucker, M., (2010), "Workplace impact of social networking", *Property Management*, Vol.28 Iss.3, pp.138–148.

Bhardwaj, N., Shukla, A. and Swarnakar, P. (2014), "Users' Sentiment Analysis in Social Media Context using Natural Language Processing", in *Proceedings of The International Conference on Digital Information, Networking, and Wireless Communications* (DINWC2014), pp. 103-111.

Behn, R.D. (2003), "Why Measure Performance? Different Purposes Require Different Measures", *Public Administration Review*, Vol. 53 No. 5, pp. 586-606.

Bernabé-Moreno, J., Tejeda-Lorente, A., Porcel, C., Fujita and H., Herrera-Viedma, E. (2015), "CARESOME: A system to enrich marketing customers acquisition and retention campaigns using social media information", *Knowledge-Based Systems*, Vol. 80, pp. 163–179.

Bonsón, E. and Ratkai, M. (2013), "A set of metrics to assess stakeholder engagement and social legitimacy on a corporate Facebook page", *Online Information Review*, Vol. 37 No. 5 pp. 787 – 803.

Brambilla, M., Dell'Aglio, D., Della Valle, E., Mauri, A. and Volonterio, R. (2014), "Enriching Live Event Participation with Social Network Content Analysis and Visualization", in *The Semantic Web: ESWC 2014 Satellite Events*, Lecture Notes in Computer Science 2014, pp 159-170.

Bravo-Marquez, F., Mendoza, M. and Poblete, B. (2014), "Meta-level sentiment models for big social data analysis", *Knowledge-Based Systems*, Vol. 69, pp. 86-99.

Brzozowski, M. J., (2009), "WaterCooler: exploring an organization through enterprise social media", in Proceedings of the ACM 2009 international Conference on Supporting Group Work, ACM, New York, pp.219-228.

Buckley, S., Ettl, M., Jain, P. Luss, R., Petrik, M., Ravi, R.K. and Venkatramani, C. (2014), "Social media and customer behavior analytics for personalized customer engagements", *IBM Journal of Research and Development*, Vol.58 No.5/6, pp.7:1-7:12.

Bunescu, R. and Mooney, R. (2007), "Extracting Relations from Text: From Word Sequences to Dependency Paths", in A. Kao and S.R. Poteet (Eds.), *Natural Language Processing and Text Mining*, Springer, pp.29–44.

Chakrabarti, S. van den Berg, M. and Dom, B. (1999), "Focused Crawling: A New Approach to Topic-Specific Web Resource Discovery", in *Proceedings of the 8th International WWW Conference*, Toronto, Canada, May 1999.

Chen, H., Chiang, R.H.L. and Storey, V.C. (2012), "Business Intelligence and data analytics: from big data to big impact"; *MIS Quarterly*, Vol. 36 No.4, pp.1165-1188.

Choi, S., Park, J. and Park, H.W. (2012), "Using social media data to explore communication processes within South Korean online innovation communities", *Scientometrics*, Vol. 90, pp. 43-56.

Choong, K.K. (2013), "Understanding the features of performance measurement system: a literature review", Measuring Business Excellence, Vol. 17 No. 4, pp. 102-121.

Crumpton, M.A. (2014),"Accounting for the cost of social media", *The Bottom Line: Managing library finances*, Vol. 27 No. 3, pp. 96 – 100.

Cosenza, V. (2014), *Social Media ROI*, Milano: APOGEO.

Coulter, K.S. and Roggeveen, A. (2012) “Like it or not: Consumer responses to word-of-mouth communication in on-line social networks”, *Management Research Review*, Vol. 35 No. 9, pp.878 – 889.

Diakopoulos, N., Naaman, M. and Kivran-Swaine, F. (2010), “Diamonds in the Rough: Social Media Visual Analytics for Journalistic Inquiry”, in *IEEE Conference on Visual Analytics Science and Technology* (IEEE VAST 2010), Salt Lake City, Utah, USA, 2010, pp. 115-122.

Dzvapatsva, G.P., Mitrovic, Z. and Dietrich, A.D. (2014), “Use of social media platforms for improving academic performance at Further Education and Training colleges”, *Journal of Information Management,* Vol.16 No 1, pp.1-7.

Ellison, N.B. and Boyd, D. (2013), “Sociality through Social Network Sites”, in W.H. Dutton (Ed.), *The Oxford Handbook of Internet Studies*, Oxford: Oxford University Press, pp. 151-172.

Farrugia, M., Hurley, N., Payne, D. and Quigley, A. (2012), “Social Network Construction in the Information Age: Views and Perspectives”, In I. Ting, T. Hong, & L. Wang (Eds.), *Social Network Mining, Analysis, and Research Trends: Techniques and Applications,* Hershey, PA, pp. 131-155.

Ferrara, E., De Meo, P., Fiumara, G. and Baumgartner, R. (2014), “Web data extraction, applications and techniques: a survey”, *Knowledge Based Systems*, Vol. 70, pp. 301-323.

Fersini, E., Messina, E. and Pozzi, F.A. (2014), “Sentiment analysis: Bayesian Ensemble Learning”, *Decision Support Systems*, Vol. 68, pp.26-38.

Fisher, T. (2009), “ROI in social media: a look at the arguments”, *Journal of Database Marketing & Customer Strategy Management*, Vol. 16, pp. 189 – 195.

Hanna, R., Rohm, A. and Crittenden, V.L. (2011), “We’re all connected: the power of the social media ecosystem”, *Business Horizons*, Vol. 54, pp. 265-273.

Hanneman, R.A. and Riddle, M., (2011), “A Brief Introduction to Analyzing Social Network Data”, *Sage Publications*, London.

Herring, S.C. (2010), “Web Content Analysis: Expanding the Paradigm”, In Hunsinger, J., Allen, M. and Klastrup, L. (Eds.), *International Handbook of Internet Research*, Dordrecht: Springer, pp. 233-249

Hoffman, D. L. and Fodor, M. (2010), “Can You Measure the ROI of Your Social Media Marketing?”, *MIT Sloan Management Review*, Vol. 52 No.1, pp40–49.

Hu, X., Tang, J., Gao, H. and Liu, H. (2013), “Unsupervised Sentiment Analysis with Emotional Signals”, in *Proceedings of the 22nd international conference on World Wide Web*, pp. 607-618.

IBM Global Business Service, (2011), "From social media to social CRM", *IBM institute for Business Value*, Executive Report, June 2011.
Jin, Y., Lin, C.Y., Matsuo, Y., Ishizuka, M., (2012), "Mining dynamic social networks from public new articles for company value prediction", *Springer-Verlag*, Berlin.
Kaplan, A. and Haenlein, M. (2010), "Users of the world, unite! The challenges and opportunities of social media", *Business Horizons*, Vol. 53 No. 1, pp. 59—68.
Kane, G.C., Alavi, M., Labianca, G. and Borgatti, S.B. (2014), "What's Different about Social Media Networks? A Framework and Research Agenda", *MIS Quarterly*, Vol. 38 No. 1, pp. 274-304.
Kaske, F., Kűgler, M. and Smolnik, S. (2012), "Return on Investment in Social Media – Does the Hype Pay Off? Towards an Assessment of the Profitability of Social Media in Organizations", in *Proceedings of 45th Hawaii International Conference on System Sciences*, pp. 3898-3907.
Kim, Ch., Wegener, R. and Hoppe, F., (October 19, 2014), "Media's blockbuster business tool: Big Data", *The Business Times* (http://www.businesstimes.com.sg/opinion/medias-blockbuster-business-tool-big-data).
Krippendorff, K. (1980). *Content Analysis: An Introduction to Its Methodology*. Newbury Park, CA: Sage.
Kwak, H. Lee, C., Park, H. and Moon, S. (2010), "What is Twitter, a social network or a news media?", In *Proceedings 19th International Conference on World Wide Web*, ACM, Raleigh, North Carolina, USA, 2010, pp. 591–600.
Larson, K.M. and Watson, R.T. (2013), "The impact of Natural Language Processing-Based textual analysis of social media interactions on decision making", *ECIS 2013 Completed Research*. Paper 70.
Li, J., Peng, W., Li, T., Sun, T., Li, Q. and Xu, J. (2014), "Social network user influence sense-making and dynamics prediction", *Expert Systems with Applications*, Vol. 41, pp. 5115-5124.
Markines, B., Cattuto, C., Menczer, F., Benz, D., Hotho, A. and Stumme, G. (2009), "Evaluating similarity measures for emergent semantics of social tagging", in *Proceedings of the 18th international conference on World wide web*, pp. 641-650.
Marres, N. and Weltevrede, E. (2013), "Scraping the social? Issues in live social research", *Journal of Cultural Economy*, Vol. 6 No.3, pp. 313-335.
Mccaughey, D., Baumgardner, C., Gaudes, A., Larochelle, D., Wu, K.J., Raichura, T. (2014), "Best practices in Social Media", *Social Science Computer Review*, Vol.32(5), pp.575-589.

Michaelidou, N., Siamagka, N.T. and Christoduulides, G. (2011), "Usage, barriers and measurement of social media marketing: An exploratory investigation of small and medium B2B brands", *Industrial Marketing Management*, Vol. 40, pp. 1153-1159.

Milewicz, C. and Saxby, C. (2013), "Leaders' social media usage intentions for in-bound customer communications", *Management Research Review*, Vol. 36 No. 9, pp.849 – 867.

Neri, F., Aliprandi, C., Capeci, F. and Quadros, M. (2012), "Sentiment Analysis on Social Media", in *Proceedings of the 2012 International Conference on Advances in Social Networks Analysis and Mining,* pp. 919-926.

Ngai, E.W.T., Xiu, L. and Chau, D.C.K. (2009), "Application of data mining techniques in customer relationship management: A literature review and classification", *Expert Systems with Applications*, Vol. 36 No. 2, pp.2592-2602.

Ngai, E.W.T., Taoa, S.S.C., Karen K.L. and Moon, K.K.L. (2015), "Social media research: Theories, constructs, and conceptual frameworks", *International Journal of Information Management*, Vol. 35, pp. 33-44

Nguyen, T.T., Quan, T.T. and Phan, T.T. (2014), "Sentiment search: an emerging trend on social media monitoring systems", *Aslib Journal of Information Management*, Vol. 66 No. 5 pp. 553 – 580.

Nikolopoulos, S., Zafeiriouc, S., Patras, I. andKompatsiaris, I., (2013), "High order pLSA for indexing tagged images", *Signal Processing*, Vol.93, Iss.8, pp.2212-2228.

Palmer, D., Mahidhar, V., Galizia, T. and Sharma, V., (2013), "Reengineering Business intelligence, amplify social signals", Deloitte University Press.

Paltoglou, G. and Thelwall, M. (2012), "Twitter, MySpace, Digg: Unsupervised Sentiment Analysis in Social Media", *ACM Transactions on Intelligent Systems and Technology*, Vol. 3 No. 4, pp.1-19.

Pang, B., and Lee, L. (2008), "Opinion mining and sentiment analysis", *Foundations and Trends in Information Retrieval*, Vol. 1 No. 1–2, pp.1–135.

Peters, K., Chen, Y., Kaplan, A. M., Ognibeni, B. and Pauwels, K. (2013), "Social Media Metrics — A Framework and Guidelines for Managing Social Media", *Journal of Interactive Marketing*, Vol. 27, pp. 281-298.

Pinkerton, B. (1994), "Finding what people want: Experiences with the WebCrawler", In *Proceedings of the 2nd International World Wide Web Conference* (Chicago).

Powell, G.R., Groves, S.W. and Dimos,J. (2011), *ROI of Social Media: How to improve the return on your social marketing investment*, John Wiley & Sons: New York.

Raybourn, E.M., (2013), "A new paradigm for serious games: Transmedia learning for more effective training and education", *Journal of Computational Science*, Vol.5, Iss.3, pp.471–481.

Romero, N.L. (2011), "ROI. Measuring the social media return on investment in a library", *The Bottom Line*, Vol. 24 No.2, pp. 145-151.
SEC, (April 2, 2013), press release, "SEC Says Social Media OK for Company Announcements if Investors Are Alerted".
Sebate, F., Berbegal-Mirabent, J. Cañabate, A. and Lebherz, P.R., (2014), "Factors influencing popularity of branded content in Facebook fan pages", *European Management Journal*, Vol.32 No.6, pp. 1001-1011.
Senior, J., (2015), "Creating value from Big Data through advanced customer analytics", Bain & Company.
Shelton, A.K. and Skalski, P., (2014), "Blinded by the light: Illuminating the dark side of social network use through content analysis", *Computers in Human Behavior*, Vol.33, pp.339-348.
Shet, A. and Nagarajan, M. (2009), "Semantics-Empowered Social Computing", *IEEE Internet Computing*, Vol. 13 No. 1, pp.76-80.
Sheth, A., Thomas, C. and Mehra, P. (2010), "Continuous Semantics to Analyze Real-Time Data", *IEEE Internet Computing*, Vol.14 No. 6, pp. 84-89.
Snead, J.T. (2013), "Social media use in the U.S. Executive branch", *Government Information Quarterly*, Vol. 30 No.1, pp. 56-63.
Schoen, H., Gayo-Avello, D., (2013), Metaxas P.T., Mustafaraj E., Strohmaier M., Gloor P., "The power of prediction with social media", *Internet Research*, Vol.23 Iss.5, pp.528 – 543.
Sobkowicz, P., Kaschesky, M. and Bouchard, G. (2012), "Opinion mining in social media: Modeling, simulating, and forecasting political opinions in the web", *Government Information Quarterly*, Vol. 24 No. 4, pp. 470-479.
Stemler, S. (2001), "An overview of content analysis", *Practical Assessment, Research & Evaluation*, Vol. 7 No. 17, available at http://pareonline.net/getvn.asp?v=7&n=17 (accessed 19 December 2014).

Survey of the University of Michigan's School of Information (http://www.pewinternet.org/2015/01/09/social-media-update-2014/)

Swani, K., Brown, B.P. and Milne, G.R. (2014), "Should tweets differ for B2B and B2C? An analysis of Fortune 500 companies' Twitter communications", *Industrial Marketing Management*, Vol. 43 No. 5, pp. 873-881.

Thelwall, M., Wilkinson, D. and Uppal, S. (2010), "Data Mining Emotion in Social Network Communication: Gender Differences in MySpace", *Journal of the American Society for Information Science and Technology*, Vol. 61 No. 1, pp. 190-199.

van Dam, J.W. and van de Velden, M. (2015), “Online profiling and clustering of Facebook users”, *Decision Support Systems*, Vol. 70, pp. 60-72.

Wan, X. (2011), “Bilingual co-training for sentiment classification of Chinese product reviews”, Computational Linguistics, Vol. 37 No. 3, pp. 587–616.

Waters, R.D., Burnett, E., Lamm, A. and Lucas, J. (2009), “Engaging stakeholders through social networking: How nonprofit organizations are using Facebook”, *Public Relations Review*, Vol. 35 No.2, pp. 102-106.

Xianghua, F., Guo, L., Yanyan, G. and Zhiqiang, W. (2013), “Multi-aspect sentiment analysis for Chinese online social reviews based on topic modeling and HowNet lexicon”, *Knowledge Based Systems*, Vol. 37, pp. 186-195.

Yan, G., He, W., Shen, J. and Tang, C. (2014), “A bilingual approach for conducting Chinese and English social media sentiment analysis”, *Computer Networks*, Vol. 75 Part B, pp. 491-503.

Zhang, Z., Li, X., and Chen, Y. (2012), “Deciphering word of mouth in social media: Text-based metrics of consumers reviews”, *ACM Transactions on Management Information Systems*, Vol.3 No.1, pp. 1-23.

2.2 Study 2 - Social Media and Performance Measurement Systems: towards a new model?

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Authors:

Yulia Sidorova
Ph.D. candidate, Department of Management, Economics and Industrial Engineering, Politecnico di Milano, Milan, Italy

Michela Arnaboldi
Full Professor, Department of Management, Economics and Industrial Engineering, Politecnico di Milano, Milan, Italy

Jacopo Radaelli
Research fellow, Department of Management, Economics and Industrial Engineering, Politecnico di Milano, Milan, Italy

Corresponding author: Yulia Sidorova

Structured Abstract:

Purpose – The objective of this paper is to analyse how social media (SM) influence performance measurement systems (PMS), examining changes in measurement methods, performance indicators and their application.

Design/methodologies/approach – The framework of the research was constructed to cover the technical component of PMS (measurement methods and indicators) and the use of the information obtained from SM. Empirically, the study is based on a set of case studies in eight companies.

Findings – The study findings offer a theoretical and empirical framework to evaluate PMS in the era of social media. It provides a classification of SM metrics, key performance indicators correlated to their use within different departments belonging to eight companies, highlighting the benefits and threats of SM information for PMS.

Research limitations/implications – The limitation of this study is the diversity of industries included into the multiple-case study. We choose cases with the aim of providing a broader view on the impact of SM on PMS. However, the results show the dependency of use and type of measurement on certain industries, requiring future research focused on specific sectors or PMS aspects.

Practical implications – The paper provides a map of SM information measurement methods and use, which allows companies to position themselves and examine PMS evolution.

Originality/value – The results of the paper propose a holistic model, employing social media as a new variable in PMS.

Keywords: Performance measurement systems, Social Media

Article Classification: Research paper

2.2.1 Introduction

Social media (SM) is defined as group of internet-based applications, "including collaborative projects, micro-blogs/ blogs, content communities, social networking sites, and virtual worlds", that are based on Web 2.0 and allow an exchange of user-generated information (Kaplan, 2012, p. 129). Over recent years, there has been an explosion in SM use, with the number of users growing annually by a significant 20% and now reaching more than one billion (McKinsey, 2013). Apart from individual use, this mounting interest has been seized upon by many companies all over the world and across different sectors (HBR, 2012). SM applications generate a large corpus of data that companies can exploit to measure and manage their performance, delineating the need for a new Performance Measurement System (PMS) model. PMS is intended as a process for quantifying action efficiency and effectiveness, by "understanding of the factors, both internal and external to the organisation, that facilitate and inhibit the introduction of new measures" and optimize their use to support organisations in their decision-making and achieving desired performance (Kennerley and Neely, 2002, p. 217). While practitioners and the consultancy industry have been very active in providing contributions on the role of social media data in measuring performance ("Open data", McKinsey, 2013), academic research is still in its infancy in this area.

Prior literature on the topic of PMS, without using the PMS label, provides an important contribution to the use of SM information in supporting decision-making processes. The majority of these studies have a specific focus, such as market predictions (Mislove et al., 2012), positioning on the stock exchange (Ghiassi et al., 2013), analysis of competitors and recognition of the behaviour of other players (Dutta, 2010; Haefliger et al., 2011). Only the work of Kaplan and Haenlein (2010) offers a broader perspective, examining in more general terms the potential contribution of SM information in decision-making processes. This research presents an interesting early view of the link between SM information and the decision-making cycle, but only offers general advice on the adoption of SM. The aim of this paper is to contribute to this area by analysing how SM information impacts on PMS,

addressing two aspects: firstly, PMS technical features, in terms of indicators and measurement processes; secondly, the use of indicators within business processes.

Our research was carried out using a multiple case study (Stake, 1995). Eight cases were analysed taking information from several sources, which included documents, web analyses, internal reports and face-to-face interviews with key players involved in processing and using SM data. The results highlight a variety of approaches in both designing the PMS and using data, revealing an "evolution" of PMS in the SM era. The eight cases have also proved that there is no holistic approach even at company level, ultimately specific departments (e.g. marketing; research and development, human resources) are developing their use of SM.

To illustrate these results, the paper is organised as follows: section 2 provides a broad prospective on existing literature about PMS and SM; section 3 proposes a framework to integrate SM with PMS; section 4 explains the methodological approach for empirical investigation; section 5 presents the results of the case studies and, in section 6, the research results are discussed and the overall conclusions presented.

2.2.2 Literature review: PMS and SM

The aim of the literature analysis is to provide a broad overview of the existing contributions on SM and PMS and identify the issues and gaps in this field. There are only a limited number of academic articles specifically addressing PMS in the age of SM (Denning, 2011; Boyd and Gessner 2013) and, while they mention PMS, the articles focus on sub-areas rather than on PMS as a system. Denning (2011) concentrated on marketing and client relationship management, proposing that SM information should be implemented within PMS to measure the company's ability to perform and deliver both value and customer satisfaction. Boyd and Gessner (2013), on the other hand, studied how SM information derived from an "internal Facebook" group could be adopted to measure employee performance, and therefore achieve a fair evaluation and ensure their well-being.

Similarly to these research works, other studies tackle the contribution of SM information in measuring and managing performance more indirectly. For the purposes of our research, it was

essential to carry out a more extensive review of these studies. Guided by the definition of PMS provided earlier (Kennerley and Neely, 2002), we analysed the current state-of-the-art by focusing on three areas: performance indicators; measurement process; the use of SM indicators.

Regarding indicators, a first stream of papers explore the metrics for measuring the effectiveness of SM sources in responding to client requests, spreading viral information, etc. (Burton and Soboleva, 2011; Coulter and Roggeveen, 2012; Logan et al., 2012; Bonson and Ratkai, 2013; Rohm et al., 2013). These studies usually focus on owned SM sources (i.e. sources owned by companies, their websites, collaborative platforms, blogs by employees speaking in their company's name, accounts on Facebook, Twitter, etc.) and paid SM sources (i.e. sources acquired externally by payment, advertisements on websites, posts in blogs, reviews in on-line magazines and fora, etc.) (Hanna et al., 2011). Some studies propose simple metrics linked to SM participation, such as the number of "likes" and "followers" (Witek and Grettano, 2012). More refined indicators are proposed to monitor the structure of SM networks, measuring the degree of centrality, stakeholder closeness and betweenness (Daly and Haahr, 2009; Hanneman and Riddle, 2011; Kadushin, 2012). Finally, some traditional indicators, such as return on investment (ROI), have been re-adapted to calculate the return for companies on their SM investment (Bell, 2012; Romero, 2011; Malthouse et al., 2013).

A second stream of research has developed and experimented with indicators on SM network dynamics (user, information flows). In this case, the indicators are based not only on owned and paid sources, but also on earned sources (i.e. sources belonging to third parties, where data is generated by people talking directly about the company, product or service). Researchers here have developed metrics about the level and speed of diffusion of information across social networks (Kazama et al., 2012; Bakshy et al., 2012; Malthouse et al., 2013); users' influence on company brands, products and services through SM sources, for example Twitter, Facebook, blogs, fora, etc. (Bakshy et al., 2011; Phang et al., 2013; Flanagin and Metzger, 2013; Campo-Avila et al., 2013).

The studies presented so far propose metrics based upon structured and punctuated information (quantitative measurement of social networks properties and flows), yet many other scholars have

studied the potential of extracting value from the analysis of content provided and exchanged by SM users. In this case, text-derived indicators are built starting from the computational treatment of qualitative information, i.e. opinions, sentiment and subjectivity in text that occurred as a direct response to the surge of interest for a specific objective or for the company in general (Pang and Lee, 2008). Specifically, several researchers have concentrated their studies on the analysis of indicators concerning sentiment (positive, neutral or negative) expressed by the end-users (Kalampokis et al., 2013; Schoen et al., 2013) or associations or on trend analysis for a specific product, service or objective (Ceron et al, 2013). Other researchers, addressing initiatives carried out within the organisation, propose indicators based on the employees' text communication, with an attempt to trace their relationships and the circulation of information through internal SM systems (Joshi et al, 2012; Raybourn, 2013; Deparis et al., 2014).

Regarding the measurement procedures of SM indicators, there are fewer managerial contributions, as management researchers prefer to see the data collection process and analysis as a black box (Wang and Lin, 2011; Ceron et al., 2013). Only a few marketing scholars have addressed the problem of measurement methodologies. For example, Bell (2012) has proposed a method for analysing unstructured SM data targeting specific company objectives. Other methodologies for implementing SM solutions were developed by Bajaj and Russell (2010), who proposed an information aggregation model combining text mining and semantic analysis for more reliable and tailored results. Notwithstanding, further to these studies, significant research has been carried out by information technologies scholars, who analysed SM information and its particular requirements in terms of collection and analysis (Vercellis, 2009; Nikolopoulos et al., 2013; Shelton and Skalski, 2014; Balahur, 2014). A thorough analysis of these papers is beyond the scope of our work, although some issues relevant to PMS measurement procedures are highlighted here. The first issue is related to the initial step of the measurement procedure - set-up - that is, the identification and choice of SM areas for further analysis. SM areas are represented by a specific country or countries using the same language and geographically close, which use different SM platforms that substitute or complement

each other. For example, in China, several internationally diffused platforms are forbidden and replaced by local equivalents (Li, 2014). In different geographical areas, different languages are used, as this has a direct impact on the capability of analysing content and sentiment, as for many expressions there is no direct translation in English (Unnamalai, 2012; Khan et al., 2014). The second important issue is the need to "clean" the data collected from SM in order to use the information in further analyses and guarantee its reliability (Vercellis, 2009). When indicators rely on unstructured information, specific procedures are needed that depend upon the nature of the content: text (Shelton and Skalski, 2014), images (Nikolopoulos et al., 2013), exploring sentiment (Balahur, 2014) or user identity (Motoyama and Varghese, 2009).

The third area addressed in this literature review is the use of SM indicators in decision-making processes. Some studies analyse the use of SM information in planning, for predicting market situations, by providing real-time data, or the behaviour of other players, by expanding the scope of analysis (Mislove et al., 2012). Jackson (2011) and Bruhn et al. (2012) have investigated the interference of SM information, looking at how this information can influence a company's brand and share values, with the power of improving or worsening a company's position. Other researchers have explored the potential of SM information in measuring and analysing company performance. Jin et al. (2012) proved, through an experiment-based study, that there is a correlation between SM usage (measured as the number of conversations and expressed sentiments for a company or sector) and creation of value within a company. Bradbury (2011), in his article "Data mining with LinkedIn", highlighted the power of LinkedIn and other professional social media platforms to construct indicators about companies' competitive intelligence and their employees' profiles and competencies, with emphasis on the most successful, i.e. a self-developing ranking system. Booth and Matic (2011) went further, linking performance analysis with action revision. They investigated how to map and make use of influencers in social media to shape the perception of corporate brands, measured as a numerical rating of the influencers in a SM conversation about a particular company, product or service, obtained by an index valuation algorithm. An important use of SM measures in HRM is to

monitor performance and satisfaction of personnel. Based on case studies, Bennett et al. (2009) looked at the importance of social networking, which can be measured as the number of projects being carried out within virtual teams, showing how it improves communication and relationships between employees and, therefore, the greater likelihood of achieving desired performance. Brzozowski (2009) has explored how these instruments are driving employees' perceptions of their workplace, simplifying communication and collaboration and leading to achieving the company's objectives.

The number of studies tackling social media and PMS has been steadily growing over the past decade. However, the researchers have been focused on the specific fragments of PMS, i.e. measurement metrics and procedures (Daly and Haahr, 2009; Hanneman and Riddle, 2011; Kadushin, 2012; Nikolopoulos et al., 2013; Shelton and Skalski, 2014; Balahur, 2014), or specific performance monitoring (Bennett et al., 2009; Brzozowski, 2009; Jin et al., 2012). The literature review aimed to analyse these previous studies about social media and PMS that are not capable of providing a comprehensive reference for PMS in the age of social media. Several authors underlined that further research is required in this field to explore SMI systematically (Schoen et al., 2013) and shed light on "how informal learning data can be harvested from […] social media" within companies (Raybourn, 2013, p. 10).

2.2.3 Framework

The aim of this paper is to investigate the impact of SM on PMS in terms of measurement methods, performance indicators and use. Based on the prior research analysed in the previous chapter, this section provides an overall framework for PMS, considering SM as a new variable. The framework is distinguished into two parts (Franco-Santos et al., 2012): (1) *components* and (2) *use.*

2.2.3.1PMS and SM: components

The first area of the framework addresses the technical aspects of performance measurement, which comprises *indicators*, proposing a classification linked to the use of social media; and *measurement methods*, analysing the steps needed to obtain the indicators from SM.

On the basis of previous research, SM indicators are here distinguished according to two aspects: the nature of the content (Pang and Lee, 2008) and the source of information (Hanna et al., 2011). The nature of the content refers to the type of information used to build the indicators, which are divided into punctuated and text-derived indicators (Pang and Lee, 2008). The source of information refers, instead, to the different types of SM applications, which are divided into paid, owned or earned (Hanna et al., 2011). Table 1 illustrates the indicators classified according to the two aspects, giving examples.

	Punctuated (examples)	**Text-Derived (examples)**
Paid sources	Number of articles Views	Rank in search engines/ Popularity Frequency of keywords terms
Owned sources	Number of subscribers Traffic generated (number of active actions)	Rank of features Frequency of most used terms
Earned sources	Number of users Number of comments	Number of new ideas Sentiment of discussions

Table 6: Indicator classification

The second component of PMS is a measurement method. Currently, there is no single methodology for constructing performance indicators from SM; this situation leads to various problems in applying and interpreting metrics across companies, and even within the same company (Doerflinger and Dearden, 2013). Based on our analysis of literature, we propose the following major steps for the measurement process represented in Table 2. Previous research identified five important phases: 1) setting up phase, to define clear objectives for the analysis (e.g. sentiment on product launch) and choice of the SM area (e.g. geographical area, specific sources, language); 2) data gathering phase, consisting of source analysis and choice of applicable techniques for analysis, data extraction and data cleaning; 3) data analysis phase, which directly depends on the type of data: statistical and network theories are applied to structured and quantitative data, and content analysis to unstructured data; 4) measurement phase, involving the development and calculation of indicators based on structured and unstructured information; 5) composition, representation and frequency of reports; although this phase appears similar to traditional PMS, the availability of tools to visualise SM data may also have an impact on reporting.

Phase	Description
Setting-up	Conceptual phase, which involves defining the parameters needed for the analysis • objectives • choice of the SM area (geographical, available sources, language)
Data gathering	Collecting and validating data: • source analysis (paid, owned, earned) • choice of techniques for the analysis • data collection • data cleaning
Data analysis	• structured data analysis and statistics, network analysis • unstructured data analysis of content and sentiment to obtain relevant and structured information
Indicators measurement	Indicators measurement and calculation
Monitoring and reporting	• composition of reports • visualisation of results • setting the periodicity

Table 7: Measurement method

This measurement path is not intended to be a practical guide, but a reference to be used in the empirical analysis of case studies, in order to explore how companies actually face the measurement issue.

2.2.3.2 SM information use

The second component of the framework concerns the use of social media indicators, in terms of PMS, to support the organisations' decision-making. Specifically, we refer to three main decision-making phases where PMS can potentially provide support: planning, performance analysis and revision of action (Kennerley and Neely, 2002). Using these phases, it is possible to carry out the uses reviewed in the previous section, highlighting the differences and added value of SM indicators compared to traditional systems.

The first use of SM indicators is for planning. Traditionally, PMS supports decision-makers in simulating the impact of different plans and checking their coherence with the company's objectives and strategies. Previous studies highlighted the potential role of SM indicators to enhance the PMS function in this phase and, particularly, within competitive positioning: constant benchmarking with competitors, including for specific products or services; identification of market or sector trends on SM; simulation of acceptance of products or services through SM channels, suggesting that customers compare different prototypes on SM platforms (Mislove et al., 2012; Bradbury, 2011). It emerged

that the main users of this information for planning activities are Marketing, Research & Development and Human Resources (Leonardi and Barley, 2010; Kumar and Lease, 2011), as they have information about the market situation and customer expectation in real time.

The second type of use concerns performance and variance analysis. Traditionally, performance analysis in PMS is used to capture the trend of a company's results and to monitor the difference between planned and actual performance through variance analysis (forecasted over actual sales; planned over actual turnover of employees, etc.). Using SM information, it is possible to carry out variance analysis rapidly, with the status of the current situation being given through qualitative (content and sentiment) and quantitative measures (no. of advertisements for a specific product that are "shared" correlated to the sales of that product), therefore not only addressing the company's expected performance over its actual performance, but also providing analysis concerning its competitors and forecasts (Bradbury, 2011; Jin et al., 2012).

After completing the performance analysis phase, the next step in PMS is revision of action, which takes into consideration both internal and external perspectives. Based on the traditional measurements of client and employee satisfaction (surveys, no. of product returns, no. of complaints), companies take action to improve the quality of products, services, replies to complaints, etc. Revision of action, in PMS based on SM platforms, makes taking immediate action possible, not only for a single unsatisfied client, but for many clients experiencing the same problem, as SM information is open. SM indicators potentially trace problems through comments, reviews in blogs, advice and opinions in fora or Twitter for a specific product or service (Brander, 2011; Gummerus et al., 2012), signalling the problem to the person responsible in the company and replying immediately. From an internal company perspective, internal SM systems make project development and co-creation easier, by addressing questions to the right person or receiving a desired answer from the whole community (internal notice boards).

Table 3 summarises these uses with examples of related indicators.

Phase	Examples of Use	User	Examples of indicators
Planning	Benchmarking applied to competitors, products, services	Marketing & communication Human resources	Number of "Friends" on Facebook Number of "Followers" on Twitter Profile updated on LinkedIn
	Trend analysis Simulation on the market	Research & Development	Clusters of ideas generated on SM Features selected according to on-line surveys and customer comments
Performance Analysis	Benchmarking applied to market and competitors	Marketing & communication Human resources Research & Development	Monitoring the number of friends/followers over time with respect to competitors and the average
	Identification of changing patterns and new trends	Marketing & communication Human resources Internal communication	Monitoring the polarity of comments relating to the theme or object of interest, perception of the market
Revision of action	Actions on specific objects (i.e. internal or external actors)	Marketing & communication Human resources Research & Development Internal communication	Number of responses on posts or announcements Sentiment of responses
	Corrective actions on model variables (internal purpose)	Internal communication	Number of responses by company to stakeholders' questions

Table 8: Impact of SM KPIs on the control cycle

2.2.4 Method

This empirical study of the impact of SM on PMS is based upon a case study methodology, making it is possible to investigate the complexity of organisational processes in a real-life context (Yin, 2009, 2014). A case study method is consistent with recent claims made regarding this type of investigation in performance and measurement systems (Masquefa, 2008; Chenhall et al., 2011; Ulgen and Forslund, 2015; Kumar et al., 2015), and with studies on social media management (Worrell et al., 2011; Haefliger et al., 2011). In this research, an explorative case study of eight companies was adopted with a clear objective to investigate SM use for performance measurement (Barratt et al., 2011). These case studies allow us to generalise and develop the theory (Eisenhardt, 1989) while, at the same time ensuring that they can be applied to qualitative data analysis. In order to gain a more balanced view of SM use, interviews were carried out with companies from several different firms operating in the technology, telecommunications, manufacturing and consultancy sectors.

The organisations were chosen following a preliminary analysis of their websites, in order to establish how they use social networks, giving preference to companies that use social media actively. Multiple inclusion criteria were used to select the companies: they must use at least three social networks in an active manner and own fan pages; they must have a significant number (over one thousand) of "likes", "tweets", "followers", "comments", "shares", etc.; they must have their own web-platform and blog. We created a list of possible case studies, consisting of twenty companies and got in touch with all twenty. The eight agreed to participate in our research.

The main element of our study was face-to-face interviews (Goldman and McDonald, 1987; McCracken, 1988). These interviews were carried out using a semi-structured protocol, addressing four areas of analysis: the adoption of social media, organizational roles involved in the process, PMS components and PMS use (as defined in the framework section). In total, ten interviews were carried out with eight respondents. A second round of interviews with multiple respondents was performed with two companies, DATA and SOFTW, to clarify several details, insure richness of the findings and increase reliability (Barratt et al., 2011). In terms of participants, the interviewees were selected according to their relative ownership of responsibility for the social media information flows within the organisation, and, therefore, involved a mix of people from marketing, information technology and management. Below is the summary table of the selected companies and interviewees:

Company	Industry	Country	Description	Number of employees[3]	Department	Position of interviewees
MANU	Manufacturing	Italy	Multinational company with headquarters in Italy producing rubber products	2 000 – 10 000	Digital Media	Director of Digital Media
BEV	Alcoholic drinks	Italy	Italian company working in the internal alcoholic drinks market	0 – 500	Marketing and Advertising	Assistant Brand Manager
TELCO	Telecommunications	Italy	Multinational operator with headquarters in UK, operating globally	2 000 – 10 000	Online Consumer Division	Manager of Online Division
ICT	Information Technology and Software	Italy	Multinational IT company with headquarters in USA, producing computers and programmes	500 – 2 000	Research and Development	Research Manager

[3] Range of number of employees in the companies' subsidiary where the interviews took place.

CONS	Consultancy	Russia	International American consultancy company, operating globally	2 000 – 10 000	Marketing and Business Development	Marketing SM Manager
SOFTW	Information Technology, Hardware and Software	Russia	Multinational American company, mainly producing software	500 – 2 000	Digital Lead, Marketing Organisation	Head of Digital Marketing
ITA	Information Technology	Italy	Italian company providing IT based solutions on local market	0 – 500	Public Relations & Communications	Content and Community Manager
DATA	Data Intelligence	Italy	Italian Data Intelligence company operating in consultancy and the development of IT solutions	0 – 500	Management	Head of the company

Table 9: Case study summary

Each interview lasted between 45 and 90 minutes, according to the respondents' available time. All the interviews were recorded and transcribed, and each transcript was analysed separately by each author before discussing the results jointly. The results of transcription analysis were compared with the theoretical framework and different patterns were identified for how SM are adopted within the PMS and control cycle activities. Additional information was collected through multiple sources, and included the analysis of documents from the websites of the companies; their annual reports and other official documents; social media reports (usually not available to the public) provided by companies and social media platforms' statistics. The procedures for information collection (both external from social media and internal provided by company), as well as the face-to-face interviews (semi-structured list of questions, interview transcription and steps of analysis) were replicated in all eight case studies to ensure reliability of the findings and conclusion section.

The results of the research provide a continuous comparison between the eight case studies (Glaser and Straus, 1967) following the proposed framework. We have used the multiple sources of evidence and viewpoints (Meyer, 2001) to construct a taxonomy of SM use and to identify three main patterns in the discussion section. Triangulation of all the information (Yin, 2014) gathered during the interviews, cross-case analysis (Stake, 1995) and additional materials have been used to prepare the conclusion and discussion section of the paper.

2.2.5 Results

The results section is composed of two sections, components and use of the framework. The analysis provides an overview of the current impact of social media on PMS and the application of such tools within companies. These sections illustrate these findings, providing a cross-case perspective.

2.2.5.1 Components

The first results area relates to the components associated to the technical implementation of SM within PMS. Table 5 illustrates the indicators used by companies, highlighting the type (punctuated and text-derived), examples of metrics and the SM platform adopted.

Company	Type of Indicator	Indicator examples	SM platform
BEV	Mainly uses of punctuated indicators from both owned and paid sources	# "Likes" # "Friends" # "Followers"	Facebook Youtube Twitter Instagram
CONS	Mainly uses of punctuated indicators from owned sources, less from paid source. Manual elaboration of text-derived indicators	# "Likes" # "Friends" # "Comments" Pays attention to who is commenting and how (positively/negatively)	Facebook Twitter LinkedIn *Less used* YouTube, Google+
MANU	Punctuated indicators from all types of sources, text-derived indicators for the significant events, specific objectives	# "Likes", # "Friends" # "Followers" # "Comments" Sentiment analysis and Opinion mining based on popularity	Facebook Twitter YouTube, LinkedIn Blog Pinterest, Instagram
ITA	Punctuated indicators from all types of sources, text-derived indicators for a limited number of important issues	# "Likes", # "Friends" # "Followers" # "Comments"	Facebook Twitter YouTube, LinkedIn Blog, Foursquare
TELCO	Text-derived indicators and punctuated indicators to analyse traffic and SM places of concentration from all types of sources	Sentiment Opinion mining # "Likes", # "Friends" # "Followers" # "Comments"	Facebook, Twitter, LinkedIn Google+, Blogs, Fora, Platforms *Less used* YouTube, Instagram
ICT	Text-derived indicators and punctuated indicators to analyse traffic and SM places of concentration from all types of sources	Sentiment Opinion mining # "Likes" # "Friends" # "Comments"	Twitter, Yammer LinkedIn Blogs, Fora *Less used* Facebook, Google+
SOFTW	Text-derived and punctuated indicators to analyse general "talk about" company and particular events, to express sentiments and provide numeric significance based on types of sources	Sentiment Opinion mining # "Likes", # "Friends" # "Comments"	Facebook, Fora, Blogs Twitter, Internal SM LinkedIn, Odnoklassniki VKontakte

DATA	Text-derived and punctuated indicators to analyse particular events, express sentiments and provide numeric significance based on types of sources	Sentiment Opinion mining # "Likes" # "Friends" # "Comments"	Facebook, Twitter, YouTube Google+, Pinterest Foursquare, Instagram, Blogs Fora

Table 10: Indicators and metrics for cross-case analysis

Cases are listed in the table according to similar features. The first two companies, BEV and CONS, only adopted a punctuated type of indicator derived from the most common platforms, such as Facebook, Twitter, LinkedIn, etc. These companies explained that their choice of metrics was based upon its simplicity of adoption. BEV and CONS stated that this approach is used for their own fan pages, and also for advertisements published on other SM sources. They underlined that these indicators are easy to understand and use because of their correlation to the specific analysis objective. However, these indicators do not explain the causes of low or high popularity measured by the number of "likes" or "shares" and further analysis of content is required. Next are MANU and ITA, which use a broader variety of indicators from owned, paid and earned sources. During their interviews, MANU highlighted that it is important for them to know if a significant number of people are talking about their products on earned platforms. Both MANU and ITA are also interested in text-derived indicators, as these make it possible to understand what people are saying about specific products and what sentiment they feel about SM-based marketing campaigns, with the content providing both numeric results and possible causes. The other four cases use text-derived and punctuated information from the most common platforms in an equal measure, but they also add special platforms for particular topics of interest. SOFTW agreed that both numeric and content indicators are required to understand who, what and how frequently are people talking about the company or a specific product. Using these types of indicators, answers can be given to all four questions, covering all sources of SM information from owned to earned, and action can be taken if necessary.

The second part of the *components* analysis involves the measurement method for data collection and elaboration. Table 6 provides a cross-case overview of SM data measurement methods, taking into

account the five stages defined in the framework. Cases are listed according to their similarities within the data collection and analysis methods.

Company	Setting-up	Data gathering	Data analysis	Indicator calculation and measurement	Reporting & Monitoring
BEV	Specific SM campaign for product	Source analysis of most diffused SM Platform tools for data collection	SM platform tools Statistics Variation	Punctuated indicators based on quantitative analysis of structured data represented in numbers and their variation analysis connected to the objectives	Driven by marketing campaign, reporting and monitoring are infrequent
CONS	Specific objectives (brand, trend, communication of recent activities)	Source analysis of most diffused SM Platform tools and analytics platforms for data collection	SM platform tools Statistics Variation Manual analysis	Punctuated indicators based on quantitative analysis and manual identification of who is saying what about the company or a particular service	Driven by marketing campaign, or on request of managers
MANU	Specific objectives (products)	Source analysis of most diffused SM Platform tools and analytics platforms for data collection	SM platform tools Statistics Variation Manual analysis	Punctuated indicators based on quantitative analysis, and text-derived indicators based on manual qualitative analysis, if punctuated indicators alert significantly change	Monthly reporting, as a part of marketing report. SM monitoring driven by campaigns
ITA	Specific objectives SM area (language)	Source analysis of area Data collection and data cleaning are carried out by external agency	Statistics Variation Content (clustering, main themes) Sentiment	Punctuated and text-derived indicators calculated based on quantitative analysis of structured data and qualitative analysis of unstructured information	Monthly reporting Weekly monitoring More frequent during specific campaigns
DATA	Specific objectives SM area (language)	Source analysis of area Data collection based on internally developed tools and algorithms, specific programmes	Statistics Variation Network analysis Content Sentiment	Punctuated indicators based on quantitative analysis of structured data, text-derived indicators based on qualitative analysis of unstructured information using different methodologies, from network analysis to content, clustering and sentiment	Monthly reporting More frequent during campaigns Daily monitoring
ICT	Specific objectives SM area (language, areas)	Source analysis of area Internally developed data collection tools for quantitative and qualitative analysis	Statistics Variation Network analysis Content Sentiment	Punctuated indicators based on quantitative analysis of structured data, text-derived indicators based on qualitative analysis of unstructured information, recognition of network configuration, in-depth analysis of content and sentiment	Weekly reporting Daily monitoring
TELCO	Specific objectives SM area (language, area inside and outside country)	Source analysis of area Platform tools for quantitative analysis, external agency for qualitative analysis	Statistics Variation Network analysis Content Sentiment	Punctuated indicators based on quantitative analysis of structured data Text-derived indicators based on qualitative analysis of unstructured information, network configuration, trend analysis, analysis of content, clustering and sentiment	Daily or Weekly reporting to all involved departments Daily monitoring Hourly monitoring if required
SOFTW	Specific objectives	Source analysis of area	Statistics Variation	Punctuated indicators based on quantitative analysis of structured data, text-derived indicators based	Daily or Weekly reports to all

	SM area (language, area inside or outside country)	Data collection and data cleaning are done internally based on algorithms, specific programmes	Network analysis Content Sentiment	on qualitative analysis of unstructured information, analysis of network, correlation between quantitative and qualitative analysis, based on content and sentiment, recognition of trends and predictions of future on-line situations	involved departments Daily monitoring Hourly monitoring if required

Table 11: Cross-case analysis by measurement method

The first three companies, MANU, BEV and CONS, use a simplified measurement methodology and do not have a data analysis phase. This depends on the type of metrics mainly adopted by companies, where only quantitative analysis of structured data is required. In the case of BEV and CONS, interviewees highlighted that the analyses of sources are crucial and data collection are carried out using the analytic tools belonging to the SM platforms. In the case of MANU, the interviewee stressed that, when quantitative data shows significant changes, they apply the next step to analyse qualitative data and this is done manually. The reporting and monitoring phase is not well defined in any of the three cases. Interviewees agreed that reports are issued when required (focus on SM, specific SM campaigns or to signal some significant changes to SM sources that can impact on the company). This type of reporting and monitoring can potentially lead to high risks in term of reputation, as comments and negative issues brought up by customers and SM users remain unanswered.

The remaining five cases put in place the complete measurement methodology, including data analysis, to calculate both punctuated and text-derived indicators. These companies started their analysis by identifying the SM area. In the SOFTW case, the interviewee drew attention to the fact that each specific market has its own "main" SM platforms, i.e. in Russia, VKontakte and Facebook are equivalent and both should be included in the analysis. He also confirmed that, for a certain market, two languages can be used for text-derived metrics, with Russian being the main language in this case and English the secondary language. This is also valid for other cases where analyses are carried out in Italian and English. However, this decides the specific requirements for further data gathering and analysis. All companies confirmed that specific tools and even external agencies are

required to carry out data collection, data cleaning and data analysis for text-derived indicators. DATA, ICT and TELCO put special attention on data being available within the company for further use and that frequent reporting is a must. The level of detail in these reports depends on the final recipient, and can vary from general quantitative information to the detailed sentiment analysis for a specific feature in a product. The ability of companies to provide different types of reports is closely connected to their technical knowledge. Therefore, the ICT, SOFTW and DATA cases are significantly more advanced than ITA and TELCO. The latter two cases use external partners to perform certain types of analysis. The monitoring systems implemented help to avoid some of the drawbacks of the first two cases (BEV and CONS) and lead to better results and performance.

2.2.5.2 Social media use

The second area of results relates to the actual use of SM information in the decision-making process. The following table summarises the cross-case analysis based upon the aspects highlighted in the framework: use and phase (planning, performance analysis and revision of action) which are aligned with examples of information user.

Company	**Example of Use**	**Phase**	**User**	
			Department	**Organisational Role**
CONS	Public awareness Recruitment monitoring	Performance Analysis	Marketing & communication	Specialist in marketing
MANU	Sales forecasting Product awareness Product feedback monitoring Public awareness	Planning Performance Analysis Revision of Action	Marketing & communications Human resources	Specialists Managers Department head
BEV	Sales forecasting Product awareness Product feedback monitoring Public awareness	Planning Performance Analysis Revision of action	Marketing & communication Human resources R&D	Specialists Managers Department head
ITA	Customer monitoring Sales forecasting Product awareness Product feedback monitoring Public awareness Benchmarking	Planning Performance Analysis Revision of Action	Marketing & communication Human resources R&D	Specialists Managers Department head
DATA	Customer monitoring Sales forecasting Product awareness Product feedback monitoring Public awareness Benchmarking	Planning Performance Analysis Revision of Action	Marketing & communication Human resources R&D Internal communication	Specialists Managers Department head Country manager

TELCO	Product co-creation Product awareness Product feedback monitoring Customer monitoring Recruitment monitoring Public awareness Benchmarking	Planning Performance Analysis Revision of Action	Marketing & communication Human resources R&D Internal communication	Specialists Managers Department head
ICT	Product co-creation Product awareness Product feedback monitoring Customer monitoring Recruitment monitoring Benchmarking Social BPM	Planning Performance Analysis Revision of Action	Marketing & communication Human resources R&D Internal communication	Specialists Managers Department head
SOFTW	Product co-creation Product awareness Product feedback monitoring Customer monitoring Recruitment monitoring Public awareness Social BPM Benchmarking	Planning Performance Analysis Revision of Action	Marketing & communication Human resources R&D Internal communication	Specialists Managers Department head

Table 12: Cross-case analysis by use

The first CONS case shows the unstructured use of SM, employed mainly to observe and listen on SM platforms, in order to analyse information about the company and its services. The interviewee explained that they are screening SM platforms and, in most cases, do not carry out any further action, so, to provide an example, for the purpose of recruitment, the company only publishes open job vacancies. The person responsible for SM information is a marketing employee; SM data is reported to the head of the department on his/her request.

The following companies, MANU, BEV, ITA and DATA, use social media information for defined purposes and support only some phases in the control cycle. These companies represent an intermediate stage of SM adoption. SM information helps to provide answers to concrete and well-defined questions. MANU and BEV use this information for a specific product type. In these companies, the Marketing department is also the main owner of the data, although an important part of SM data analysis is carried out for R&D and Human Resources, with the final users of the information being heads of departments, managers and marketing specialists.

The last three case studies, TELCO, ICT and SOFTW, have some features in common with the previous cases, insomuch as the departments own the data and there are end users; it does, however,

differ significantly, as SM data cover all control cycle phases. These companies have implemented an overall vision of SM and use SM instruments for both external and internal sources of information. This approach leads to further synergy from cross-departmental SM data use and provides management with a complete picture of SM activity and its influence over the company's performance.

Summarising, the results of the case studies show that the analysis of SM information, in dealing with a specific type and large volumes of data, requires special competencies and tools. For this reason, there is an obvious comparative advantage for companies with internal IT departments, while others prefer to carry out this type of analysis externally. In reality, the case studies show how a multinational company with an IT background implements internal solutions that focus on the needs of each department. There is, however, a discrepancy between the implementation of specific SM solutions and their integration within the entire performance system. In the consultancy and manufacturing cases, SM is used for communication and marketing purposes, but is rarely part of the R&D department. Even in the case of the ICT and telecommunications companies, this information is barely used by the controllers.

2.2.6 Discussion

This research explored the role of social media in measuring performance, and it proposes a preliminary framework that covers both the technical features of the PMS and its use. According to this framework, eight cases were studied, showing that SM have an actual impact on the PMS and, more in detail, how SM are incorporated to enhance performance measurement. The previous section pointed out both the variations and the similarities between the cases, allowing patterns of adoption and use to be outlined.

Regarding the "components" part and considering both the indicators used and the measurement methods adopted by the companies, three configurations emerge, here labelled *simplified, focused* and *ample*. The *simplified* components configuration involves cases BEV and CONS. The main

feature of this configuration lies in its straightforward approach to SM. Companies adopt simple punctuated metrics to measure specific marketing campaigns every now and again. Methods are derived from the SM platforms (e.g. TweetStats, Facebook insights, etc.), and do not include any particular features; only on the odd occasion is sentiment and content analysis carried out manually. The *focused* components configuration also involves two cases, MANU and ITA, which apply a larger number of indicators based on punctuated and text-derived metrics. However, methods to analyse text-derived indicators are still simple and do not permit big data sets to be processed. Analysis is concentrated on quantitative measures based on statistic models and the adoption of specific analytic platforms (e.g. Salesforce, Google analytics). The remaining four cases are included within the *ample* components configuration, and use both punctuated and elaborated text-derived indicators. The methods of analysis of SM information are complex and based on internal company IT systems or the expertise of external analysis provider.

Three main configurations can also be seen for the "use" aspect; these are labelled: *random, object-oriented* and *refined.* One company (CONS) belongs to the *random* use configuration, it observes SM sources and uses information for general performance analysis, without it being linked to any precise objectives. The *object-oriented* use configuration includes four companies (MANU, BEV, ITA and DATA). They use SM for one or more specific objectives (brand, products and services) and take SM information into account for planning, performance analysis or revision of action. Other companies (TELCO, ICT and SOFTW) generate a *refined* use configuration that employs SM information as part of an integrated process of control. Based on these configurations, we have developed a matrix (Figure 1) that graphically represents the positions of the eight cases, based on their "use" and "components".

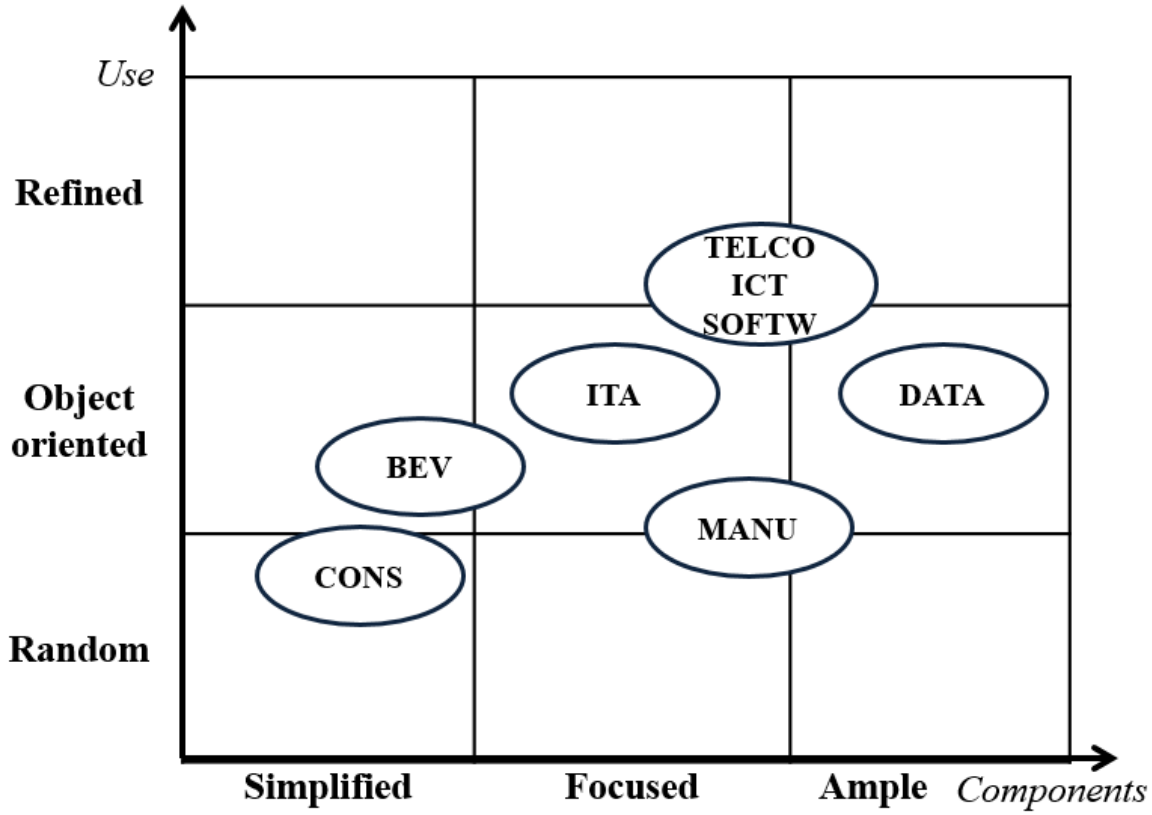

Figure 5: Company/case use of SM

Analysing this figure, it is possible to identify three major patterns, putting together technical adoption (components) and use: beginners – cases BEV and CONS; selective – cases MANU and ITA; and transversal – cases TELCO, ICT, SOFTW and DATA. The beginner use represented by cases BEV and CONS is the starting point of SM development, as a new resource providing useful managerial information for many organisations. The worldwide access and visibility of company's actions require specific attention from users of this source, and this requires the company to carry out additional work and investment in order to acquire the necessary skills and knowledge related to SM, and define clear SM objectives for the company. In both cases, the interviewees underlined that, for younger generations, SM are among their main sources of information and communication, and they have to be on board. Companies start from observation and quantitative analysis to acquire a better understanding of the source and its functions in terms of their needs. MANU, for selective cases, and TELCO and DATA, for transversal cases, named this as an initial stage in the adoption of SM.

Selective use (cases MANU and ITA) is defined by an object-oriented use of SM, mostly in Marketing, Human Resources and Sales. Each department treats SM information and indicators according to their requirements and lack an overall view of the companies' performance. The interviewees highlighted that they use specific measures for particular company objectives, but some of the results must be shared with other departments, so that they can be aware of market trends in issues regarding the company's reputation. The approach followed by these companies quite common in the current market, but any subsequent development depends both upon the results achieved and business strategy, as adopting elaborated metrics and complex techniques requires specific analytical programmes and technical expertise.

The transversal use of SM information and tools (cases TELCO, ICT, SOFTW and DATA) is highly correlated to the core business of the company, which is why these include IT developers and communication companies, both having the necessary knowledge to use SM, as well as the capacity and instruments to analyse and manage SM platforms. The processes of communication within and without the company have been established during the companies' development based both on listening and analysing what is happening on SM, and direct responses according to customer and stakeholder needs. The management of these companies is particularly attentive to SM and performance, focusing on their core activities and direct use of SM data.

2.2.7 Conclusions

The aim of this paper is to analyse how SM information impacts on PMS, addressing two main aspects: PMS technical features, in terms of indicators and measurement processes; and the use of indicators within business processes. This research responds to the theoretical calls (Schoen et al., 2013, Raybourn, 2013) and proposes an evolutionary image of SM adopted in a systematic way to align measures and their possible uses on different levels within SM implementation. Our findings suggest that at this early stage companies can adopt a variety of approaches of SM employment within the scope of a PMS. Nonetheless, companies underline that SM have become an important variable

of PMS even if not directly included within the systems. The case studies confirm that SM indicators provide additional information with respect to the traditional sources used in PMS, helping to mitigate drawbacks of traditional indicators and improve companies' performance, because of SM indicators timeliness and long-term orientation. Therefore, the holistic framework proposed in this study helps to assemble different metrics, measurements and indicators based on SM information in order to complement traditional PMS.

This study provides a theoretical contribution to the discussion on new information use within PMS and it highlights the necessity of adapting the existing wealth of performance management system theory and improving specific elements in the cross-use of social media information, which provides new indicators aligned to social media and requires specific measurement and calculation procedures. In our research, this was achieved by structuring the indicator metrics and developing a complete measurement method based upon a variety of steps proposed in literature (Wang and Lin, 2011; Ceron et al., 2013; Doerflinger and Dearden, 2013).

From the practitioners' point of view, this research provides a rich background of indicator construction procedures, measurement methods and the general adoption of social media as a new variable within a company. The proposed taxonomy can help practitioners to identify their current position in SM use and further actions required to strength it. In particular, what type of technologies and methodologies for data analysis could be adopted for the improvement of social media data collection and analysis aligned with usage focus of these metrics within a company. This research provides a roadmap that clearly states the main benefits of SM information in controlling cycle operations: flexibility and time to react to changes. The study stresses the benefits of SM indicators and highlights the necessary conditions to use such innovative instruments for achieving companies' objectives.

The concluding remarks of the research are completed by stating the limitations of the research and proposing future studies. One of the most important limitations concerns our company selection process, and specific studies by industry may provide very interesting results. Among these case

studies we observed that information technology companies led the way in the use of SM information for both internal and external management systems. Another interesting area is that of telecommunications, which here was presented in only one case. As well as the above, other companies worthy of deeper study could include consumer product companies, especially those selling products closely associated to human emotions. In-depth research by industry can provide different visions, and group the different approaches used by companies, to address this situation within their performance management systems. These results can provide several models of how to adopt SM within a particular industry, taking into account each sector's requirements, providing benefits and improving performance.

2.2.8 References

Bajaj, A., Russell, R., (2010), "AWSM: allocation of workflows utilizing social network metrics", Decision Support Systems, Vol.50(1), pp.191-202.

Bakshy, E., Hoffman, J.M., (2011), Mason W.A., Watts D.J., "Everyone's an Influencer: Quantifying Influence on Twitter", WSDM'11, Hong Kong, China, available at: http://misc.si.umich.edu/media/papers/wsdm333w-bakshy.pdf (accessed December 2013).

Bakshy, E., Rosenn, .I, Marlow, C., Adamic, L., (2012), "The Role of Social Networks in Information Diffusion", proceedings of the 21st international conference on World Wide Web, ACM, Lyon, France, pp.519-528.

Balahur, A. (2014), "Computational approaches to subjectivity and sentiment analysis: Present and envisaged methods and applications", Computer Speech & Language, Vol.28(1) pp.1–6.

Barratt, M., Choi, T.Y. and Li, M. (2011), "Qualitative case studies in operations management: trends, research outcomes, and future research implications", Journal of Operations Management, Vol. 29 No. 4, pp. 329-342.

Bell, G., (2012), "Interview with Marshall Sponder, author of Social Media Analytics", Strategic Direction, Vol.28(6), pp.32–35.

Bennett, J., Owers, M., Pitt, M., Tucker, M., (2010), "Workplace impact of social networking", Property Management, Vol.28 Iss.3, pp.138–148.

Bonson, E., Ratkai, M., (2013), "A set of metrics to assess stakeholder engagement and social legitimacy on a corporate Facebook page", Online Information Review, Vol.37 Iss.5, pp.787–803.

Booth, N., Matic, J.A., (2011), "Mapping and leveraging influencers in social media to shape corporate brand perceptions", Corporate Communications: An International Journal, Vol.16 Iss.3, pp.184–191.

Boyd, N., Gessner, B., (2013), "Human resource performance metrics: methods and processes that demonstrate you care", Cross Cultural Management: An International Journal, Vol.20 Iss.2, pp.251–273.

Bradbury, D., (2011), "Data mining with LinkedIn", Computer Fraud & Security Vol.2011, Iss.10, pp.5-8.

Brander, M., (2011), "Processing Social Media Posts in Contact Centers", Thesis, available at http://publications.theseus.fi/bitstream/handle/10024/30653/Brander_Marjo.pdf.pdf?sequence=1 (accessed November, 2013).

Bruhn, M., Schoenmueller, V., Schafer, D.B., (2012), "Are social media replacing traditional media in terms of brand equity creation?", Management Research Review, Vol.35, Iss.9, pp.770-790.

Brzozowski, M. J., (2009), "WaterCooler: exploring an organization through enterprise social media", in Proceedings of the ACM 2009 international Conference on Supporting Group Work, ACM, New York, pp.219-228.

Burton, S., Soboleva, A., (2011), "Interactive or reactive? Marketing with Twitter", Journal of Consumer Marketing, Vol.28 Iss.7, pp.491–499.

Campo-Avila, J., Moreno-Vergara, N., Trella-Lopez, M., (2013), "Bridging the gap between the least and the most influential Twitter users", Procedia Computer Science, Vol.19, pp.437-444.

Ceron, A., Curini, L., Iacus, S.M., Porro, G., (2013), "Every tweet counts? How sentiment analysis of social media can improve our knowledge of citizens' political preferences with an application to Italy and France", New Media & Society, 1461444813480466.

Chenhall, R.H., Kallunki, J.P., Silvola, H., (2011), "Exploring the relationships between strategy, innovation and management control systems: the roles of social networking, organic innovative culture and formal controls", Journal of Management Accounting Research, Vol.23, No.1, pp.99-128.

Coulter, K.S., Roggeveen, A., (2012), "'Like it or not': consumer responses to word-of-mouth communication in on-line social networks", Management Research Review, Vol.35 No.9, pp.878-899.

Daly, E.M., Haahr, M., (2009), "Social Network Analysis for Information Flow in Disconnected Delay-Tolerant MANETs", IEEE Transactions on Mobile Computing, Vol.8, No.5, pp.606-621.

Denning, St., (2011), "The essential metric of customer capitalism is customer outcomes", Strategy & Leadership, Vol. 39 Iss. 4, pp.12-18.

Deparis, E., Abel, M.H., Lortal, G., Mattioli, J., (2014), "Information management from social and documentary sources in organizations", Computers in Human Behavior, Vol.30, pp.753-759.

Doerflinger, J., Dearden, A., (2013), "Evolving a software development methodology for commercial ICTD projects", Information Technology and International Development, Vol.9, No.3, pp.43-60.

Dutta, S., (2010), "What's Your Personal Social Media Strategy?", Harvard business review, November 2010, pp.1-5.

Eisenhardt, K. M. (1989), "Building theories from case study research", Academy of Management Review, Vol.14, No.4, pp.532–550.

Emerald (2012) "Are big banks engaging their stakeholders in a dialogue?: A Sophistication Index (SI) of multinational banks shows the extent of social media and Web 2.0 adoption in their corporate reporting", Strategic Direction, Vol.28 Iss.6, pp.7-10.

Flanagin ,A.J, Metzger, M.J., (2013), "Trusting expert- versus user-generated ratings online: The role of information volume, valence, and consumer characteristics", Computers in Human Behavior, Vol.29, pp.1626–1634.

Franco-Santos, M., Lucianetti, L., Bourne, M., (2012), "Contemporary performance measurement systems: A review of their consequences and a framework for research", Management Accounting Research, Vol.23, Iss.2, pp.79-119.

Ghiassi, M., Skinner, J., Zimbra, D., (2013), "Twitter brand sentiment analysis: A hybrid system using n-gram analysis and dynamic artificial neural network", Journal Expert Systems with Applications: An International Journal, Vol.40, Iss.16, pp.6266-6282.

Glaser, B., Strauss, A., (1967), The Discovery of Grounded Theory, Aldine Publishing Company, Hawthorne, NY.

Goldman, A., McDonald S.S, (1987), The group depth interview: Principles and Practice, Englewood Cliffs, NJ, Prentice Hall.

Gummerus, J., Liljander, V., Weman, E., Pihlström, M., (2012), "Customer engagement in a Facebook brand community", Management Research Review, Vol.35 Iss.9, pp.857 – 877.

Haefliger, S., Monteiro, E., Foray, D., von Krogh, G., (2011), "Social Software and Strategy", Long Range Planning, Vol.44, pp.297-316.

Hanna, R., Rohm, A., Crittenden, V.L., (2011), "We're all connected: The power of the social media ecosystem", Business Horizons, Vol.54, pp.265-273.

Hanneman, R.A., Riddle, M., (2011), A Brief Introduction to Analyzing Social Network Data, Sage Publications, London.

Harvard Business Review (2012), "The New Conversation: Taking Social Media from Talk to Action", survey, available at http://static.hbr.org/hbrg-main/resources/pdfs/tools/16203_HBR_SAS%20Report_webview.pdf (accessed November 2013).

Jackson S.E. (2011), "The value of weak connections", Journal of Business Strategy, Vol.32 Iss.5, pp.51-53.

Jin, Y., Lin, C.Y., Matsuo, Y., Ishizuka, M., (2012), Mining dynamic social networks from public new articles for company value prediction, Springer-Verlag, Berlin.

Joshi, P., Bartolini, C., Graupner, S., (2012), "T@gz: Intuitive and Effortless Categorization and Sharing of Email Conversations", in proceedings to World-Wide Web conference 2012, Lyon, France, ACM.

Kadushin, Ch,. (2012), Understanding Social Networks: Theories, Concepts, and Findings, Oxford University Press, New York.

Kalampokis, E., Tambouris, E., Tarabanis, K., (2013), "Understanding the predictive power of social media", Internet Research, Vol.23(5), pp.544-559.

Kaplan, A.M., (2012), "If you love something, let it go mobile: Mobile marketing and mobile social media 4x4", Business Horizons, Vol.55, Iss.2, pp.129-139.

Kaplan, A.M., Haenlein, M., (2010), "Users of the world, unite! The challenges and opportunities of Social Media", Business Horizons, Vol.53, Iss.1, pp.59-68.

Kazama, K., Imada, M., Kashiwagi, K., (2012), "Characteristics of information diffusion in blogs, in relation to information source type", Neurocomputing, Vol.76 (1), pp.84-92.

Kennerley, M., Neely, A,. (2002), "A framework of the factors affecting the evolution of performance measurement systems", International Journal of Operations & Production Management, Vol.22 No.11, pp.1222-1245.

Khan, F.H., Bashir, S., Qamar, U., (2014), "TOM: Twitter opinion mining framework using hybrid classification scheme", Decision Support Systems, Vol.57, pp.245-257.

Kumar, A., Lease, M. (2011), "Learning to Rank from a Noisy Crowd", HCOMP in proceedings of SIGIR'11, ACM, Beijing, China.

Kumar, S., Heustis, D., Graham, J.M, (2015),"The future of traceability within the U.S. food industry supply chain: a business case", International Journal of Productivity and Performance Management, Vol. 64 Iss 1 pp. 129 – 146.

Leonardi, P.M., Barley, S.R., (2008), "Materiality and change: Challenges to building better theory about technology and organizing", Information and Organization, Vol.8, pp.159-176.

Li, C. (2014), "A tale of two social networking sites: How the use of Facebook and Renren influences Chinese consumers' attitudes toward product packages with different cultural symbols", Computers in Human Behaviour, Vol.32, pp.162-170.

Malthouse, E.C., Haenlein, M., Skiera, B., Wege, E., Zhang, M., (2013), "Managing customer relationships in the Socia Media Era introducing the Social CRM House", Journal of Interactive Marketing, pp.270-280.

Masquefa, B., (2008), "Top management adoption of locally driven performance measurement and evaluation system: a social network perspective", Management Accounting Research, Vol.19, pp.182-207.

McCracken, G. (1988), The long interview. Sage Publications, Newbury Park, California.

McKinsey (2013), "Open data: Unlocking innovation and performance with liquid information", report available at http://www.mckinsey.com/insights/business_technology/open_data_unlocking_innovation_and_performance_with_liquid_information (accessed January 2014).

Meyer, C.B., (2001), "A case in case study methodology.", Field Methods ,13(4), pp.329–352.

Mislove, A., Viswanath, B., Gummadi, K.P., Druschel, P., (2010), "You Are Who You Know: Inferring User Profiles in Online Social Networks", in proceedings to WSDM'10, ACM, New York City, New York, USA

Motoyama, M.A., Varghese, G., (2009), "Crosstalk: scalably interconnecting instant messaging networks", 2009 Proceedings of the 2nd ACM workshop on Online social networks, ACM, Barcelona, Spain, pp.61-68.

Nikolopoulos, S., Zafeiriouc, S., Patras, I., Kompatsiaris, I., (2013), “High order pLSA for indexing tagged images” Signal Processing, Vol.93, Iss.8, pp.2212-2228.

Pang, B., Lee, L., (2008), “Opinion Mining and Sentiment Analysis”, Foundations and Trends in Information Retrieval, Vol.2, Iss.1-2, p.1-135.

Phang, C.W., Zhanga, Ch., Sutanto, J., (2013), “The influence of user interaction and participation in social media on the consumption intention of niche products”, Information & Management, Vol.50, Iss.8, pp. 661-672.

Raybourn, E.M., (2013), “A new paradigm for serious games: Transmedia learning for more effective training and education” Journal of Computational Science, Vol.5, Iss.3, pp.471–481.

Rohm, A., Kaltcheva, V.D., Milne, G.R., (2013), “A mixed-method approach to examining brand-consumer interactions driven by social media”, Journal of Research in Interactive Marketing, Vol.7, pp.295-311.

Romero, N.L,. (2011), “ROI. Measuring the social media return on investment in a library”, The Bottom Line: managing library Finances, Vol.24, Iss.2, pp.145-151.

Schoen, H., Gayo-Avello, D., (2013), Metaxas P.T., Mustafaraj E., Strohmaier M., Gloor P., “The power of prediction with social media”, Internet Research, Vol.23 Iss.5, pp.528 – 543.

Shelton, A.K., Skalski, P., (2014), “Blinded by the light: Illuminating the dark side of social network use through content analysis”, Computers in Human Behavior, Vol.33, pp.339-348.

Stake R.E. (1995), The art of case study Research, Sage Publications., Thousand Oaks CA.

Ulgen, V.S., Forslund, H. (2015), “Logistics performance management in textiles supply chains: best-practice and barriers”, International Journal of Productivity and Performance Management, Vol. 64 No. 1, pp. 52-75

Unnamalai, K. (2012), “Sentiment Analysis of products using web”, proceedings in International Conference on Modelling optimization and computing, Elsevier, TamilNadu, India, pp.2257-2262.

Vercellis, C. (2009) Business Intelligence, in Business Intelligence: Data Mining and Optimization for Decision Making, John Wiley & Sons, Ltd, Chichester, UK.

Wang, Sh., Lin, J.Ch. (2011), “The effect of social influence on bloggers' usage intention”, Online Information Review, Vol.35, No.1, pp.50-65.

Witek, D., Grettano, T. (2012), “Information literacy on Facebook: an analysis”, Reference Services Review, Vol.40 Iss.2, pp.242 – 257.

Worrell, J., Wasko, M., Johnston M. (2011), “Social network analysis in accounting information system research”, International Journal of Accounting Information Systems, Vol.14, Iss.2, pp.127-137.

Yin, R.K. (2009), Case Study Research, Sage, CA.

Yin, R.K. (2014), Case Study Research; Design and Methods, Sage Publishing, London.

2.3 Study 3 - Calculative social media practices in Telcos: unraveling their connection with the social and technological dimensions of social media

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Authors

Deborah Agostino
Assistant Professor, Department of Management, Economics and Industrial Engineering, Politecnico di Milano, Milan, Italy

Yulia Sidorova
Ph.D. candidate, Department of Management, Economics and Industrial Engineering, Politecnico di Milano, Milan, Italy

Corresponding author: Yulia Sidorova

Abstract

Purpose (mandatory). This paper aims at exploring calculative social media practices in Telcos (Telecommunication companies), in terms of Key Performance Indicators and reports, associated with the endorsement of social media and the connection of these practices with the organizational and technical dimensions of social media.
Design/methodology/approach (mandatory). The theoretical lens of sociomateriality supports the interpretation of the findings through the conceptualization of the social and the technological components of social media as ontologically inseparable. Accounting implications are derived from a multiple case study in four Italian Telco companies that adopt social media.
Findings (mandatory). Results highlight four different accounting configurations in the social media era, which move from being real time, internally driven to being on-demand, externally driven. Although the variety of the identified configurations, some common trends have been highlighted: calculative practices are becoming non-financial and real-time based; accountants play a peripheral role in managing social media calculative practices, which reside in the hands of social media professionals; calculative practices are entangled with the technological structure of the social media, whose management is externalized.
Research limitations/implications (if applicable). The paper focuses on Italian Telecommunication companies and does not explore how social media are reconfiguring accounting practices in other industrial sectors or in other countries. However, this is a first steps towards the exploration of accounting implications derived from social media.
Practical implications (if applicable). The paper provides a classification of current social media accounting configurations in terms of calculative practices, technological and social issue, which can serve managers inside the organization better understanding and configuring their accounting and social department, and the relationships between these two realms.
Originality/value (mandatory). This study contributes to the accounting literature and provides an in-depth understanding on how technological, organization and calculative components of accounting are transformed by social media through the sociomateriality lens.

Keywords: Social media, accounting, calculative practices, technology, organization, sociomateriality

Paper type: Case study

2.3.1 Introduction

Social media are continuously diffusing all around the world, not only as individual device, but also as a valuable tool for companies (e.g. Kaplan and Haenlein, 2010; Ngai et al., 2015). Marketing and sales departments have been pioneers in exploiting social media data for their daily activities, receiving through social media immediate feedbacks on their reputation, campaigns, products and services (Pardo et al., 2013). Social media data have attracted the interests, from not only businesses, but also from government and public organizations to improve their services and better organize their work (e.g. Stamati et al., 2015).

Two main features characterize social media: the technological and the social dimensions given that social media 'employ mobile and web-based technologies to create highly interactive platforms via which individuals and communities share, co-create, discuss, and modify user-generated content' (Kietzmann et al., 2012, p. 241). The technological dimension is located in the web platform that is the backbone of social media, supporting real time interactions among users. The social dimension is instead related to connections, although virtual, among individuals, communities and organization, which have the possibility to establish dialogue moving beyond the one-way information flow.

The main implications of these two social media features for companies lie in the availability of massive data, often known as big data (George et al., 2014; Gandomi and Haider, 2015), mainly about customers that were not even imaginable in the past. However, unlike traditional data, social media data are massively generated in different formats from audios and videos to pictures and unstructured text on a web platform and generated by users in real time (Kietzmann et al., 2011), rendering their extraction and analysis far from being straightforward (Costa et al., 2012).

These social and technological dimensions of social media data inevitably influence traditional accounting practices, which mainly rely on traditional financial and non-financial data, often organized into dashboards or scorecards at periodic intervals. Several implications for accounting are expected, but limited evidence is provided from accounting literature (few exceptions comprise Jeacle and Carter, 2011 and Scott and Orlikowski, 2012; Suddaby et al., 2015). Yet studies about social media are emerging in other literature streams, such as marketing, general management and information system literature, which suggest only indirectly accounting implications. This paper aims to consolidate the fragmented discourse on social media and accounting by exploring how social media are reconfiguring accounting practices in the telecommunication industry. Specifically, two main questions are here addressed: 1) what are the (new) calculative practices, in terms of KPIs (Key Performance Indicators) and reports associated with social media? and 2) how do organizational and technical aspects related to social media are intertwined with these calculative practices?

The theoretical perspective of sociomateriality has been here adopted to frame the analysis given its purpose to conceive the social and the technological as ontologically inseparable (Orlikowski, 2007; Orlikowski and Scott, 2014). Following this approach, calculative social media practices are considered entangled with the social dimension of the organizational roles in charge to manage this data and the technological backbone of social media, leading to a reconfiguration of the calculative practices currently in use. This perspective of sociomateriality is not new to management accounting studies (e.g. Wagner et al., 2011; Pollock and D'Adderio, 2012). It has been considered here particularly useful to exploit how social media are reconfiguring accounting practices given that the technology of data continuously generated by social media is entangled with the organizational roles that decide how to download, interpret and make sense of data, influencing therefore the final accounting result.

Evidence to support our argument are derived from a multiple case study in four Telco Italian companies that use social media data in their business activities. Telecommunication sector has been chosen due to the crucial role that companies competing in this industry pay to social media data (Reinartz et al., 2004). The revolution of information is leading to revolution in the telecommunication service (Rust and Huang, 2014). Researchers had the possibility to explore the social technology selected by the companies, the variation in the accounting practices to manage these new data, problems and opportunities emerged during social media management. Results provide evidence on the reshaped role for accounting, with four different configurations that have been identified, which differ in terms of calculative practices, technology and social issues behind social media data. Albeit these differences, some common trends related to accounting have been also identified and discussed.

The paper is organized as follows. Section two introduces the issue of social media data, discussing the strict connection with the social and technological dimensions. Section three analyzed the contribution of the sociomateriality perspective to provide insights to interpret findings. Section four details the methodology of analysis, while section five discusses results, highlighting four different accounting configurations for social media. These results lead then to the last section in which a future research agenda is proposed.

2.3.2 Literature review

2.3.2.1 Social media as the entanglement of the technological and the social dimension

Social media broadly refer to a set of online tools based on the foundation of Web 2.0 that allow a set of users to interact along dyadic ties. Several definitions can be found in literature about what social

media are (e.g. Peters et. al, 2013; Blankespoor et al., 2014), but although the different nuances of the terminology they have two common pillars: the technological dimension and the social dimension (Scott and Orlikowski, 2012).

The technological component of social media concerns the online platform on which social media are constructed and work. They are funded on Web 2.0 (O'Reilly, 2005; Kaplan and Haenlein, 2010) as contrapposed to traditional tools based on Web 1.0 such as email or website. While traditional Web (Web 1.0) was intended to support static and mono-directional communication (Berners-Lee et al., 1994), Web 2.0 is based on the ideas of user generated content, connectivity and collaboration (O'Reilly, 2005). Users generated content refers to the possibility for social media users to upload contents, such as text, photos or videos, becoming active generator of knowledge rather than passive receivers. Connectivity is related to the establishment of a virtual network of users, which is going to substitute face-to face interactions, while collaboration concerns the possibility to share knowledge in a peer to peer network (Wikipedia is the typical example of collaboration social-media based).

Relying on the same technological pillars of the Web 2.0, the term social media comprise different platforms including social networks, video or photo sharing platforms, or microblogging platforms (Kaplan and Haenlein, 2010; Kietzmann et al., 2011). Social network, such as Facebook or Google+ are online platforms to facilitate the exchange of opinions among users relaying on a variety of formats (i.e. videos, photos, text). Video and photo sharing platforms, such as YouTube or Instagram and Pinterest are specifically devoted to sharing videos and photos respectively, while microblogging platforms, whose typical example is Twitter, facilitates interactions on a micro-length of 40 characters.

The social dimension of social media is a direct consequence of the foundation of the Web 2.0 and it refers to the ability of the technological platform to support the interactivity and real time communication. On the one hand, the connectivity and collaborative technological features are inevitably connected with the possibility for users to interact, moving from a one-way to a two ways communication flow. This allows, not only users to communicate among peers, but also organization to establish a dialogue with customers, increasing the engagement with their clients (Floreddu et al., 2015). On the other hand, social media data are continuously produced, being available in real time (Kaplan and Haenlein, 2010; Kietzmann et al., 2011; Gruber et al., 2015), which means that data are generated at a higher frequency than in the past. This requires companies to revise traditional data collection procedures in order to be able to continuously download content generated by users in real time.

The technological and social dimensions of social media render data generated by these platforms a powerful source of knowledge for companies, which can be able to make decisions relying on a wider

set of information directly generated by their customers (McAfee and Brynjolfsson, 2012; Gandomi and Haider, 2015). At the same time, the particular characteristics of social media data potentially imply several challenges for accounting, from how to evaluate social media to how to collect, use and manage social media data, which are expected to differ from accounting practices adopted for traditional organizational data.

2.3.2.2 Social media and accounting implications

Nowadays, literature on social media data and their use is growing exponentially (e.g. e.g. Ngai et al, 2015), but contributions in the accounting field are still limited. Extant literature about social media and accounting can be divided into two main streams: studies in the accounting field that specifically address social media, providing a direct contribution on the topic accounting/social media, and studies in fields other than accounting that, among the other results, provide indirect contributions to the accounting field.

The first stream about specific contributions from the accounting field on social media is now emerging and available studies are to date rather limited (Jeacle and Carter, 2011 and Scott and Orlikowski, 2012; Suddaby et al., 2015). Jeacle and Carter (2011) focuses on TripAdvisor as a main example of an online ranking system feed and used by users, with the purpose to understand if and how this user-generated ranking based on the technology of the Web 2.0 shaped accounting. They found that TripAdvisor, being regarded as an expert system, 'is a calculative practice that engenders trust; it offers its users the objectivity and rationality of hard numbers' (Jeacle and Carter, 2011, pag. 305). They centered their discussion on the contribution of online ranking system in facilitating trusts and reshaping the role of accountants. Maintaining TripAdvisor as the focus of the analysis, Scott and Orlikowski (2012) explored how online rating systems change relations of accountability providing evidence that ranking mechanisms become 'power-charged', redistributing relationships of accountability on a larger based dominated by users. They claimed that 'online accountability is based on special claims of the wisdom of the crowds and collective intelligence produced by social media' (Scott and Orlikowski, 2012: 39). Finally, the paper by Suddaby et al. (2015) posed the attention on the change in the accounting expertise generated by social media. The authors, investigating four accounting firms, found a clear separation between social media professionals and accounting practices together with a widespread diffusion of a 'near complete absence of ethics and norms in the language of professional expertise' (Suddaby et al., 2015: 66). These papers illuminate the accounting knowledge by posing emphasis on the reconfigured role of accountants that has become influenced by social media professionals and by social media users with their ranking and online comments. Less

evidence is instead provided on how calculative practices change and their relationship with the technological and social dimensions of social media.

The second stream about contributions in fields other than accounting provides a wide spectrum of insights potentially powerful for the accounting field. These insights are related to KPIs (Key Performance Indicators) that can be adopted to evaluate social media, and accounting activities that can be supported by social media information, which include decision-making, planning and feed-back, and external accountability.

The first insights are related to KPIs for social media, which comprise both adjusted traditional indicators and ad hoc social media KPIs. Adjusted traditional indicators refer to traditional performance indicators, such as ROI (Return On Investment) or engagement measures, whose formula has been adjusted to suit social media characteristics. A foremost indicator is represented by the so called social media ROI (Hoffman and Fodor, 2010; Blanchard, 2011; Weinberg and Pehlivan, 2011; Cosenza, 2012), that has the purpose to evaluate the return on social media investment. It is based on the simple idea 'to translate all 2.0 communication into money' (Romero, 2011, pag.146) in order to evaluate if the social media activity by the organization has generated a positive financial impact. Another group of traditional indicators comprises engagement measures that aim to quantify the strength of relationships between the company and its customers generated by social media. In this respect indicators of engagement, awareness, word of mouth, popularity have been revised in order to suit the new social media reality (Hoffman and Fodor, 2010; Agostino, 2012; Bonson and Ratkai, 2013; Peters et al., 2013; Swani et al., 2013; Sabate et al., 2014).

Ad hoc social media indicators comprise those measures that have been specifically proposed to evaluate social media. The development of these indicators starts from the premise that social media are different from other media and therefore ad hoc approaches are required (Michaelidou et al., 2011; Peters et al., 2013). These measures comprise sentiment and content indicators, whose purpose is to extract knowledge from the unstructured set of social media data. Content indicators aim to classify topics of social media conversation, that are usually available in the format of images, themes, features, links, text that occur in social media conversations. These indicators have discussions on social media as object of control. Performance measures in this respect mainly include a word count of the frequency of appearance of a certain word or topic in conversations, often corroborated by indicators of statistical validity of the coding (e.g. Sing and Jain, 2010; Naaman et al., 2011; Waters and Jamal, 2011; Einwiller and Steilen, 2014; Swani et al., 2014).

Sentiment indicators maintain social media unstructured data as object of control, but they have the purpose to assign a polarity, usually positive, neutral or negative, to a certain sentence (Montoyo et al., 2012). Performance measures appear also in this case very often in terms of word count about the

occurrence of a certain positive, negative or neutral opinion in a given dataset (Go et al., 2009; Jansen et al., 2009; Burnap et al., 2013; Ghiassi et al., 2013; Smailović et al., 2013; Yu et al., 2013; Khobzi and Teimourpour, 2014). Yet the approach to performance measures is more complex given that a classifier is required in order to assign polarity to unstructured text in an automated way.

As far as the support to decision making is concerned, some studies looked into the detail of how information coming from the social media can help in strategic decisions, analysis of market situation and recognition of behavior of other players (Heydebrand, 2008; Kaplan and Haenelein, 2010; Dutta, 2010; Haefliger et al., 2011). These studies revealed that social media information provides additional data with respect to the traditional information sources. Therefore, the complementary use of social media information with traditional organizational data could be a valuable support to decisions-making process. For what concern the accounting activity of planning and feedback, some authors explore the adoption of social media data to support predictions with some empirical evidence coming from applications in the stock market (Ghiassi et al., 2013). Some more technical studies instead are specifically focused on the quantitative approach to implement predictive analytics (Mislove et al., 2012), leading to assume a potential support from social media data to the planning and feedback activities that characterize the control cycle. Finally, the third activity of the control cycle concerns external accountability. In this respect, social media information have emerged fruitful to support specific companies' ranking, brand perception, reputation risk and improvement of stakeholders' relationships (Golbeck and Hendler, 2004; Jackson, 2012; Bruhn et al, 2012).

These studies provide valuable insights on the type of KPIs that can be adopted to measure social media, some insights on how accounting activities of planning, measuring and accountability can be aided by social media data. Yet a few evidence exist on these KPIs (Key Performance Indicators) interact with accountants and the relationships between these practices and the social and technical aspects related to social media.

2.3.3 Framework: sociomateriality

The theoretical lens we adopted to explore how social media are reconfiguring accounting practices is represented by sociomateriality (Orlikowski, 2007; Orlikowski and Scott, 2014). According to its proponents (Orlikowski, 2007; Orlikowski and Scott, 2014), sociomateriality conceives the social and the technical as ontologically inseparable. There is no preference for either the technology or the human side, but they are interrelated. In this respect, it has been acknowledged that 'Such an alternative view asserts that materiality is integral to organizing, positing that the social and the material are constitutively entangled in everyday life. A position of constitutive entanglement does not privilege either humans or technology (in one-way interactions), nor does it link them through a

form of mutual reciprocation (in two-way interactions). Instead, the social and the material are considered to be inextricably related — there is no social that is not also material, and no material that is not also social' (Orlikowski, 2007, p. 1437).

This perspective of sociomateriality is not new to study management accounting practices (e.g. Wagner et al., 2011; Pollock and D'Adderio, 2012). It has been considered here particularly useful to exploit the relationship between social media data and accounting practices given that the technology of data continuously generated by social media is entangled with the users/accountant that decides how to download, interpret and make sense of data, influencing therefore the final accounting result. Following this perspective, accounting practices derived from social media can be conceptualized as sociomateriality practices, characterized by an entanglement between the social (people in charge of managing the data) and the technology (the data generated by the system, the system itself and the technical approaches to download and analyse data). This gives rise to a new relationship between the social and the technological realm that can shape calculative accounting practices in terms of KPIs and reports.

Calculative practices refer to numerical operations (Miller, 2001), which allow activities of individuals to became manageable and 'governed at a distance' (Miller and O'Learly, 1987). Within the social media sphere, these calculative practices become inevitably intertwined with the technological sphere of the social platforms itself. Indeed, together with the social media diffusion, new approaches to download and analyse social media data have been developed (e.g. Gandomi and Heider, 2015) underlying the importance for accountants to consider how to retrieve real time data from social platforms and how to make sense of these unstructured texts (coding). These approaches are strongly rooted in statistic and informatics knowledge with advanced crawling and data mining techniques representing the most common area of exploration (e.g. Costa et al., 2012; Lee, 2012; Gao et al., 2014). Calculative practices will be here explored not only with reference to hard numbers (i.e. KPIs), but also considering reports. By exploring the content of reports, the receivers and the related frequency, it is possible to investigate the social dimension related to the generation of new social media data. Moreover, reports are intended to make readable the technical issues associated with social media data download and analysis, bridging the gap between the technology of social media and the competences of managers. Following the sociomateriality perspective, it is impossible to separate the technology from social issues, rendering therefore necessary to explore these two dimensions simultaneously. This sociomateriality conceptualization led us to investigate calculative practices together with the technological dimensions of social media and the associated social relationships.

2.3.4 Method

This paper adopts a qualitative methodology of analysis based on a multiple case study in order to investigate the implications of social media for accounting. The qualitative methodology has been selected since considered appropriate to describe and interpret complex human phenomenon, often in the words of selected individuals, called informants (Heath, 1997). Moreover, this qualitative research is rooted in an interpretive paradigm aimed at exploring socially meaningful actions through the direct detailed observation of people in natural settings in order to arrive at understandings and interpretations of how people create and maintain their social worlds (Neuman, 2000). In our specific case, the aim is to explore how managers inside organizations use social media data and their relationships with accounting practices.

The choice of a multiple case study is instead justified by its contribution in supporting in-depth exploration of practices in use, and for deriving comparative explanations for complex phenomena (Eisenhardt and Graebner, 2007; Yin, 2014). One of the advantages of this methodological approach is the possibility to combine data from different sources, such as interviews, observations and archives, to achieve triangulation (Denzin, 1978). Hence, data collected from interviews were continuously cross-referenced with data from other sources, and crosschecked against insights from similar cases in the sample, enhancing the internal validity and reliability of the case-study material. Specifically, we conducted a case study in four Italian Telco companies, characterized by different size and different approaches to social media (see Table 1).

Name of the company	Size (#employees)	Location (HQ)	Social media adopted	Date of social media introduction (on FB)	Indicators Facebook Twitter
Telco-1	53000	Rome	Facebook, Twitter, YouTube, Google+, blog, LinkedIn, Instagram	2008	FB#likes 1,8 million FB #talking about 11k TW #followers 413k TW#tweets 84,5k
Telco-2	6500	Milan	Facebook, Twitter, YouTube, Google+, interactive platform, LinkedIn, Instagram, blog	2010	FB#likes 1,4 million FB #talking about 7k TW #followers 321k TW#tweets 114k
Telco-3	3400	Milan	Facebook, Twitter, YouTube, Google+, LinkedIn, Instagram	2009	FB#likes 98k FB #talking about 3k TW #followers 40k TW#tweets 69k
Telco-4	6900	Rome	Facebook, Twitter, YouTube, LinkedIn, Instagram	2010	FB#likes 853k FB #talking about 5,3k TW #followers 87,5k TW#tweets 44,5k

Table 13: Telecommunication companies overview

Telco-1 is another significant Telco player with 53,000 employees. The adoption of social media started in 2008 with a Facebook page of the company. However, the exploitation of social media platforms for company's activities started after 2010. Now, company has mostly two million likes on Facebook and four hundred thousand followers on Twitter. This company intensively uses different social media channels, but mostly exploits the traditional ones like Facebook, Twitter, YouTube, LinkedIn and Google+. Facebook and Google+ are used for communication purposes, while Twitter have a dedicated "help" account for the client relationship activities.

Telco-2 is one of the leader of Telco at the Italian level. It employs 6,500 people, having the headquarter in Milan. The company adopted the first social media in 2010, moving gradually towards the endorsement of all the main social media, namely, Facebook, Twitter, YouTube, Google+, but also LinkedIn, Instagram and a corporate blog. The company uses social media to support diverse activities, starting with communication, co-creation activities through on-line platforms, focus groups on Facebook and a client relationship service both on Twitter and Facebook. This company diversifies social media use according to the platforms properties; for example, YouTube is exploited for video materials (advertisements, interview with employees, promotion videos) and LinkedIn for recruitment of personnel.

Telco-3 is a follower of social media exploitation, for the first time introduced social media channel in 2009, but until 2012 was using social media artificially, like a showcase for advertisements. The company uses the major social media platforms and invests a lot in the development of comprehensive activities to ensure its online presence and coherence with other traditional channels. Back in 2010 the company's management did not want to use social media channel for CRM activities, but the request from customers were so high that it cannot avoid this aspect and introduced a specific social media hashtags and even a Twitter account to provide a support service to its customers. This company has started to explore other opportunities proposed by social media and analysis of the end-users comments.

Telco-4 employs 6900 people and entered social media world in 2010. However, the company started to actively use social media two years ago and have succeeded in providing good clients support service, as well the marketing and communication department are using it for advertisement and engagement with clients. The large number of likes and followers on social media confirms the importance dedicated by company to this channel and activities performed there.

In each company, we interviewed the organizational roles in charge to manage and use social media data together with accounting roles when they played a significant role in the process of social media use. In total we conducted 25 interviews, which lasted on average one hour (Table 2). The interviews covered the following topics: the type of social media adopted, the reason behind social media

adoption, the type of use of social media data, indicators, reporting and targets related to the use of social media data and associated problems and opportunities. Through these interviews we had the possibility to gain a preliminary comprehensive view about the implications of social media within organizations.

Name of the company	N. of interviews	Roles interviewed
Telco-1	10	Head of communication
		Head of Digital Department
		Manager of social media strategy
		Manager of social media analytics group
		Data scientist
		Social media CRM operator
		Manager of "yourth" products
		Communication manager
		Customer experience manager
		Application developer
Telco-2	4	Head of Social Media
		Specialist of data analysis
		Financial controller
		Risk manager
Telco-3	9	Social media manager (Marketing)
		Duty Manager (CRM)
		Manager of Social (Analyst)
		Manager of Internal Communication (HR)
		Business Process Manager
		Online Self Care
		Social media employee
		Advertising manager
		Risk manager
Telco-4	2	Head of social media
		Digital analyst

Table 14: Interviewees summary

Insights from interviews were complemented with additional data sources: reports and documents from each company and observations during internal companies' meetings. The companies provided internal reports and documents on social media that consist of the individual companies' performance about their social media platforms: the number of followers, active participants, sentiment and content analysis. We also rely our empirical analysis on direct observation by personally participating at the work of digital departments within Telco-1 and Telco-3. In Telco-1, we participated in the daily monitoring of social media in real time, which included the following steps: task assessment, review of first results, application of different methodologies and choice of graphical representation of social media data. In Telco-3 we actively participated in reviewing current reports provided by the external company in charge to retrieve and analyse data. During this meeting, a comparison was performed

between the report provided by the external company and reports prepared internally by social media analyst followed by a discussion about possible ways for improvement. Additionally we revised their social media accounts of the four companies, and compare the approach with the interviews statements (i.e. the tone of communication, correctness of responses, timeliness).

We have used the above mentioned multiple source of evidence (Meyer, 2001) to identify different patterns of social media highlighting the calculative practices together with the social and technological issues. The triangulation of all the information (Denzin, 1978; Yin, 2014) gathered during the interviews, cross-case analysis (Stake, 1995) and additional materials have been used to prepare the results and discussion section of the article.

2.3.5 Results

Results provide evidence about how accounting practices in the four Telco companies have been reshaped by the performativity of social media networks, their users, and their entangled technological and social components. This section is organized around three main sections. The first section discusses the new accounting practices that have emerged after the social media introduction in terms of KPIs and associated new reports. The second section explores the technological and organizational issues associated with the new emergent calculative social media practices. The last section instead critically discusses the emergent empirical evidence from the four cases, identifying four main configurations of accounting practices reshaped by the social media.

2.3.5.1 Calculative social media practices: KPIs and reports

The adoption of social media in the four Telco companies was associated with the introduction of new KPIs in order to evaluate social media activity and the contribution of social media data in supporting the organizational activities (see Table 3).

Type of indicator / Company name	**Telco-1**	**Telco-2**	**Telco-3**	**Telco-4**
Time to response	X	X	X	X
Efficiency of response	X	X	X	X
Social media ROI	X	X	X	X
#followers per SM	X	X	X	X
#likes	X	X	X	X
#shares	X	X	X	X
#comments	X	X	X	X
Talking about	X	X	On demand	On demand
Talking about	X	X	On demand	On demand
Sentiment company	X	X	X	X

products	X	X	On demand	X
services	X	X	On demand	On demand
Network mapping	On demand	On demand	-	-
Influencer	On demand	On demand	-	On demand
Strong ties	On demand	On demand	-	-
Weak ties	On demand	On demand	-	-
Cluster analysis	X	X	On demand	On demand

Table 15: Key Performance Indicators

We found that all the four companies introduced new indicators in order to evaluate and manage social media. These indicators can be grouped into four main categories: traditional indicators reconfigured for social media; indicators automatically provided by social media platforms; indicators related to the sentiment of online conversation and indicators about users and the social media networks.

The first category of indicators concern traditional indicators, simply applied to social media platforms. These measures include 'time to response', 'efficiency of response' and 'social media ROI' (Return on Investment). All the four companies highlighted time to response and efficiency of response as a crucial aspect for them, as underlined by the Duty Manager at Telco-3:

> "When someone writes something on Facebook, we need to guarantee a reply within 2 hours. This is our policy and we are evaluated on this. If the post is about something we can manage within our team, then we just provide a reply. If instead, it is a more complex question, we turn this request to the responsible department, but still we need to guarantee a reply within 4 hours. That's crucial because we know that other Telco players have better performance" (Duty Manager, Telco-3)

This rapidity of the answer should be counterbalanced by the effectiveness of the reply, given that it is then ask to customers to rate the received service on a Likert scale from 1 to 10, a practice common for all the four Telco companies. Moreover, all of them perform benchmark analysis on these parameters with competitors and a trend analysis about the evolution of these issues over time. In addition, Telco-1 and Telco-2 compare the results coming from traditional sources and social media, with additional analysis of customer categories. Finally, the social media ROI is another traditional indicator computed for social media, which represents the unique financial measure that is calculated with the aim to quantify the money provided by social media.

The second category of indicators concerns KPIs automatically generated from social media platforms. They comprise the following: number of followers, likes, shares, comments, talking about and reach of the population, which are differently computed according to the specific social media.

All the four companies were found collecting these data because of their high availability for free, as underlined in Telco-4:

> "These are immediate indicators that could be immediately collected from the social media simply by accessing the platform. Social media providers know that companies particularly care about these data and some of them, such as Twitter, propose to download the some additional analysis overtime or by specific argument, of course not for free."
> (Digital analyst, Telco-4)

These indicators provide extensive numeric information about the performance of the company online, helping to understand whether a certain advertisement is successful or if a new product is popular. This information about the quantity of people on the platform and initial reaction of followers have been acknowledged by the Head of the Digital Department in Telco-1 representing the starting point for more in-depth analysis based on traditional data. All the four companies underlined they care about these quantitative numbers since they are all interested in enlarging their auditorium (i.e. quantity of followers) for reaching larger numbers of actual and potential customers.
The third group of performance measurement comprises sentiment indicators to evaluate the opinion about online conversations on social media channels. While all the companies perform a sentiment analysis about the perception of the whole company, a systematic sentiment analysis about the perception of products and services is exploited only in Telco-1 and Telco-2. In this respect, the head of Social Media at Telco-2 argued:

> "When we want to understand if for example the new spot is appreciated by our customer, we perform a sentiment analysis on social media. It is the cheapest way to make surveys and this is fantastic! Then, if we obtain some results and want much more details, we continue our analysis going back to traditional focus groups, but the sentiment on the social media provides us an immediate feedback."
> (Head of Social Media, Telco-2)

Telco-4 and Telco-3 also adopt sentiment indicators, but they are applied only on specific needs rather than on a continuous basis. For example when they want to evaluate the perception of specific products or services in a specific time period, providing an alternative, non-biased vision of consumers on the topic of interest, sentiment indicators are applied.

The last group of indicators is related to KPIs about users and their network, whose aim is to quantify relationships and interactions within the network of social media users. These indicators include network mapping, influencers, connections (strong and weak ties) and cluster analysis. Interviews in all the four companies highlighted the complexity to perform these types of analysis. Telco-4 and

Telco-3 do not apply these indicators, unless in exceptional cases, such as marketing campaigns tailored for specific target customers (geo-location and age). At the same time, also Telco-2 and Tim do not perform systematically these analysis, but only on demand after specific advertisement campaigns or actions by the company.
Together with the development of new KPIs, also the reporting structure has changed in terms of type of documents produced, but also in terms of time horizon of these reports (see Table 4).

Type of report	Telco-1	Telco-2	Telco-3	Telco-4
Real time data	Monitoring room	No real time data, but alert for crisis situations	None	None
Daily report	For internal use, or monitoring a specific event	For internal use	None	For internal use based on general parameters
Weekly report	Trend analysis and benchmarking to the interested departments	KPIs on request on a specific campaign or product to the interested departments	Overall sentiment indicators for marketing campaigns	Benchmark for product and services
Monthly report	Some KPIs as part of the communication report	Some KPIs as part of the online department report	Some KPIs as part of the marketing report	Some KPIs as part of the communication report
On request report	Detailed vertical report on specific issue or during specific period			

Table 16: Reports

As far as the type of reports is concerned, new documents have been produced in order to synthesize KPIs from social media and provide overtime analysis for managers. There are different configurations of the reporting among the four companies, which move from real time to periodic and on request reports. One of the principle cause of such difference are the recipients of these social media reports, moving from marketing to the board of directors.
Telco-1 is the unique company among the four that performs a real time data analysis together with daily, weekly, monthly and periodical reports. As far as the real time data is concerned, the head of social media underlined the following:

> "We have a monitoring room, where on big screens the main indicators about social media are continuously projected, together with comparisons with traditional media (newspapers, radio). For example, we provide a real time service during football matches on Twitter and we use this room to map Twitter posts and the sentiment of each post, making statistics about the perception of people during the football match." (Head of Social Media, Telco-1)

However, only the team of the social media department can access this monitoring room with real time data; other departments in the company receive periodical reports, which can be daily, weekly

or monthly depending on their needs. Indeed quarterly meetings are organized on request with the head of each department by the social media team in order to understand their need of social media data. Then, on the basis of their requests reports are prepared and periodically submit to these people. Usually, daily data are used internally within the digital department, while weekly reports are those requested with benchmark and trend analysis.

Telco-2 does not work on monitoring real time data, as underlined by the social media manager:

> "We do not monitor real time data, but we just receive an alert when something is wrong. We have an external company that monitors in real time our conversations on social media delivering us a daily reports with statistics. However, we receive an immediate alert if something is dangerous, for example, when complaints obtained from the sentiment analysis from customers on a new offer are dramatically increasing. In this case, we receive an immediate alert without waiting until the day after to have the report of the day before." (Social media manager, Telco-2).

Telco-4 also receives a daily report form an external company in charge to analyse data containing the main trends of the day before, but without having any alert system. In addition, weekly reports are prepared by the social media department divided by topic of interest (product or services) together with a monthly report that is instead delivered, as part of the communication report, to the board of directors.

In all the four companies, daily reports are an operative tool for managers working with social media, while weekly reports are projected for the managers of the departments (research & development, human resources, public relationship). Monthly reports are usually included in other larger documents providing a briefly overview of results, main success and difficulties, broader comparison with traditional media, and among the different social media channels. Finally, all the companies have vertical reports on request to provide in-depth analysis of specific arguments defined in advance by the head of departments. These reports usually includes detailed information of the analysed argument, population (geo-location, gender, age), benchmark analysis with closest competitors and trends on the market. These reports are prepared to respond to a specific question or to provide an alternative vision.

These new calculative accounting practices associated with the introduction of social media have emerged being associated with a revised new time-frame, but also to a new combination between new calculative data and existing practices, although with different nuances from one company to another.

2.3.5.2 Calculative social media practices: the social and technological dimensions

The diffusion of social media and the adoption of new calculative practices to exploit social media data was strictly intertwined with to technological and social aspects of social media (see Table 5).

Issue	Telco-1	Telco-2	Telco-3	Telco-4
Organizational social media configuration	Social media as a standalone department that acts as a digital hub	Social media as part of the digital online department	Social media as a team inside the marketing department	Social media as a stand alone group inside the communication department
Technological aspects	Managed internally with the support of an external company	Managed externally, but supervised internally by an IT scientist	Managed externally, with an employee devoted to external relationship	Managed entirely externally

Table 17: Organization issues

The social aspects relate to organizational issues in terms of the new organizational roles emerging in order to support these new calculative social media practices. In this respect, we found differences between the four companies ranging from a digital hub organizational configuration (concentration of all people working on social media in one place) to co-workers (who dedicates part of their job to social media tasks connected to their principal role). Telco-1 reshaped its organizational structure after social media introduction, by creating a new organizational function, called 'Social communication and web analysis', that acted as a digital hub:

> "Our department is configured as a star structure, working like a hub. People working on social media are concentrated in my department, which receives information from the web and seeks to find new insights, makes analysis and prediction generating new knowledge for other departments" (Social media manager, Telco-1)

Telco-2 also has an online department specifically devoted to social media activities. This department is in charge of all the web activities including, among the others, social media management and monitoring. The social media team is specifically composed by three full time persons working as data analysts under the supervision of a senior analyst, together with five co-workers that manage the whole web, including website and applications. Hence, for these people only a part of their job is social media related.

Telco-3 does not have a department entirely devoted on social media, but it has a team inside the marketing department who is in charge to social media management. These team comprise only one full time person and one data analyst specifically devoted to social media, while the remaining people are co-workers simply dedicating some part of their activity to social media. More specifically, six people in the CRM team together with one people from the marketing and one from the human

resource use to devote some of their time to manage social media in terms of posting content, hiring personnel and caring customers.

Telco-4 has a structure similar to Telco-3, being organized with co-workers supervised by two people working full time on social media. In this company, co-workers belong to the communication and public relations department given that social media is strictly connected with the purpose to increase the customer care and the engagement with the already existent customer base.

Technical issues are strictly intertwined with these social aspects as it is visible from the technical choices of all the four companies. The main technological aspect correlated with social media calculative practices is represented by the computational and technological complexity associated with the data download and data analysis ad clearly underlined by the social media manager in Telco-1:

> "In 2009 this department was created with the name of 'social media management'. Now, we have turned our name into 'social communication and web analysis, because the real added value about being on social media is represented by data analysis and data mining in order to extract new knowledge from all the data generated by users. But to do this, you need to know statistical algorithm to understand how to use data, but also IT-competence to download data from the platform." (Social Media Manager, Telco-1)

Social media managers in the remaining three Telco companies, who highlighted the complexity behind data download and the subsequent data analysis, also provided similar comments. According to the Social media manager in Telco-2:

> "The complexity is strictly connected to the type of performance you want to obtain. For example, for the sentiment analysis, if your are satisfied to simply receive a plus one or minus one as a general comment about your reputation, this is quite simple. If you instead want some more detailed data about the opinion with respect to a specific topic, then statistical competences and computational IT skills are required, and we want this level of detail." (Social Media Manager, Telco-2)

According to the Head of Social Media in Telco-4, the complexity is related to the creation of a unique database for customers:

> "Our dream is to merge the information we have in our CRM (Customer Relationship Management) database with those provided on social media. If our customer mail us, we can easily go back to his profile having all his information, but if someone posts a comment on social media, we know his name, but it is to date impossible to link his name to our customer database. The joining of these two couple of information would be precious in order to enrich our customer database with additional details about his preferences, opinions and comments provided by social media" (Head of Social Media, Telco-4)

As underlined by these comments, the complexity resides, not behind the calculative computation, but behind the technological structure of the social media, that inevitably affect how social media indicators are computed. The interesting finding is that three out of the four companies externalize the activity of data download and analysis to dedicated companies with technological and statistical expertise. This was underlined by the Social Media Manager at Telco-3:

> "We do not have the internal competences to download and mine the huge amount of data generated by our social media. We need to be sure to have reliable social media data and cannot run the risk to leave this activity to not prepared people. We prefer to spend money for an external company, but having more reliable data because of their competences. (Social Media Manager, Telco-3)

The name of the external consulting company in charge of data download and data mining is different among the four Telcos, although the service provided is the same: continuous download of social media data and elaboration of data into readable reports and dashboard through infographics. Telco-2, Telco-4 and Telco-3 totally outsource the analysis of social media information, but they have introduced a person supervising and monitoring the work of external companies.

The unique company that manage social media data internally is Telco-1, whose manager underlined the strategic role of this activity, which represents the reason why internal competences have been developed over the years. However, Telco-1 as well employs an outsourcing agency to work inside the company with their team, to co-create and elaborate methodologies for analysis, apply new graphical interpretation of data.

These empirical findings provided evidence about the intricate relationship between the technological and social component of social media, which inevitably affected the development of calculative social media practices.

2.3.5.3 Accounting configurations in the social media era

The empirical analysis about social media calculative practices and the related organizational and technical issues associated with the four companies led to the emergence of different accounting configurations, which passed from being real time and internally driven to on-demand and externally driven (see Table 6).

	Real time, internally driven	**Alert based, internally supervised**	**Periodically based, Externally driven**	**On demand, Externally driven**
Company name	Telco-1	Telco-2	Telco-3	Telco-4

Calculative practices	Full set of KPIs Real time analysis	Full set of KPIs Alert-based analysis	Traditional and sentiment KPIs Periodically-based reports	Traditional and sentiment KPIs On-demand reports
Organizational roles	Social media function as a hub inside the company	Social media as part of the digital online department	Social media team inside the marketing department	Social media team under communication
Technical issues	Internal data analysis	Outsourced data analysis, but with an internal supervision	Outsourced with a dedicated person	Outsourced

Table 18: Accounting configurations

Differences in these accounting practices are visible, not only in terms of KPIs and reporting (i.e. calculative practices), but also with respect to the technical and social issues associated with social media.

The real time, internally driven configuration was found in Telco-1. This configuration is characterized by a real time data analysis that occurs in a dedicated monitoring room. This real time analysis is realizable because of the development of internal competences to mine and download the data, although a support by an external consulting company is required. Because of this internal development of technical and social media competences, the calculative practices can serve, through ad hoc-periodical reports, the needs by other organizational departments, giving rise to a social media function that acts as a hub inside the organization.

The alert-based, internally driven configuration is represented by Telco-2, where a full set of KPIs is collected, but the main feature is that these measures are not monitored in real time, but on an alert-based system. This means that data are continuously downloaded, but the system provides a warning only if some initial settled conditions about the threshold values of KPIs are not respected. This is possible thanks to the support of an external consulting company in charge of the computational and technical issues, which works with the closely support of internal people from the social media function.

The periodically-based, externally driven configuration is represented by Telco-3, where calculative social media practices comprise traditional KPIs adjusted for social media and sentiment analysis. These measures are performed only on a periodical base, which is daily for the social media team, but weekly and monthly for the remaining departments. Moreover, computational and technical issues are demanded to external companies, which are simply supervised by an internal employee.

Finally, the on-demand externally driven configuration, which is the case of Telco-4, is characterized by the computation of traditional KPIs and sentiment analysis that are performed on demand, when particular analysis about new products or services want to be conducted. In this specific case, an initial perception from the social media users is gained with these KPIs that are then complemented

by traditional analysis such as focus groups or traditional surveys. As far as the technical and organizational issues are concerned, the management of the technological side is demanded to an external company, leaving internally a social media team that is not strong enough to constitute a stand-alone department. On the contrary, there is a team inside another department in charge to supervise social media activities.

This variety of accounting practices support a more general discussion about how calculative social media practices are reshaped by social media and their entanglement with the social and technological dimensions. Three main lines of discussions can be identified.

The first issue concerns the marginal role of accountants in dealing with calculative social media practices. New expertise are emerging in terms of data analysis and data management, strictly depended on the technology of the social media platform, but these expertise are under the supervision of organizational functions other than accounting. This finding raised a question about the role of accountants in these social media revolution: are accountants missing an opportunity, leaving the field to other organizational roles?

The second issue concerns the role of technology, which emerged being strictly connected to calculative social media practices. The computation of social media indicators cannot occur without the technological support. Hence, KPIs do not exist without technology for data download and data analysis, further corroborating the sociomateriality nature of calculative social media practices. In this context, new competences about data management and IT-technologies are required, posing a problem about where to position these competences inside the organization (organizational role intertwined with the technical one). The solution adopted seems to be to externalize this activity leaving to someone outside the organization the technological work to data download

The third issue is related to the nature and timing of calculative social media practices. With respect to the nature of calculative practices, results revealed that KPIs related to social media data are mainly non-financial rather than financial with the unique exception of social media ROI. This prevalence of non-financial indicators can occur because such practices are not managed by accountants, but by social media professionals that do not have the need to quantify with money. Moreover, the technological dimension of social media allows to derive information about users and the network, or sentiment, which are difficult to be transformed into money, leading to a prevalence of non financial data. With respect to the timing of social media practices, social media KPIs are moving towards real time monitoring, posing several challenges at the level of data management, storage and interpretation. When data are collected in real time, this requires a big effort in terms of availability of personnel 24/7, but also storage capacity to manage huge volume of data, again associated with the technological issues about data mining.

2.3.6 Conclusions

This study explores calculative social media practices in Telcos by addressing two research questions: what are the (new) calculative practices, in terms of KPIs (Key Performance Indicators) and reports associated with social media? and 2) how organizational and technical aspects related to social media are intertwined with these calculative practices. These questions are driven by the need to unravel the intricate relationships that is emerging from literature between the social and technological dimensions associated with social media (Kietzmann et al., 2012), which does not find an adequate support in the accounting literature yet.

The empirical analysis, relying on the socimateriality lens and, in particular, on the conceptualization of the social and the technological dimension as intertwined (Scott and Orlikowski, 2012), allowed to identify four main configuration for social media calculative practices: real time, internally driven; alert-based, internally supervised; periodically based, externally driven; on-demand, externally driven. Differences among these four configurations are related to KPIs and reports, technological and social aspects. KPIs and reports move from a real time-base to a computation on demand. Technological aspects strongly affect the computation of KPIs, leaving company to choose either to develop these technological capability inside or to externalize the computation of social media data. Strictly connected to this technological issue, the social dimension concerns the organizational role in charge to manage these calculative social media practices, which move from a standalone department that acts as a digital hub to a team inside the communication group mainly based on people working part-time on social media.

Albeit these different configurations, we highlighted also three patterns common to all the four investigated companies. The first pattern concerns the marginal role of accountants who are becoming substituted by social media managers in dealing with social media calculative practices. The second pattern is related to the increasingly role played by technology, which being strictly intertwined with the computation of social media indicators, requires the development of ad hoc expertise that, when not available inside the companies, are demanded to ad hoc external professionals. The third pattern refers to the nature and timing of the accounting practices themselves that are becoming non-financial and real time based.

This study adds to extant literature about sociomateriality, the role played by accounting practices in the social media era, where the technology and the social cannot be separately analyzed (Wagner et al., 2011; Pollock and D'Adderio, 2012). It also contributes to the accounting literature providing an in-depth understanding on how the technological, organizational and accounting components are strictly interviewed with social media.

This paper has also some practical implications. It provides a detailed map of social media adoption with Telecommunication practices enabling specific sociomaterial characteristics: technological (data analysis), organizational (configurations) and calculative practices (key performance indicators, and reports). The paper focuses on Italian Telecommunication companies and does not explore how social media are reconfiguring accounting practices in other industrial sectors or in other countries. An explorative or comparative study could provide more in-depth understanding on how social media changes the technological accounting components. All these aspects demands for further investigation into how accounting can support this activities or if new roles should be introduced to perform these emerging needs.

2.3.7 References

Agostino, D. (2012), "The effectiveness of social software for public engagement", *International Journal of Engineering Business Management*, Vol. 4, pp. 1-10.

Berners-Lee, T., Cailliau, R., Luotonen, A., Nielsen, H.F. and Secret, A. (1994), *The World Wide Web. Communication of the ACM*, Vol. 37 No. 8, pp. 76–82.

Bonson E., Ratkai M. (2013), "A set of metrics to assess stakeholder engagement and social legitimacy on a corporate Facebook page", *Online Information Review,* Vol.37 Iss.5, pp.787–803.

Blanchard, O. (2011), "Social media ROI: Managing and measuring social media efforts in your organization", USA: Pearson Education Inc.

Blankespoor, E., Miller, G. and White, H. (2014), "The Role of Dissemination in Market Liquidity: Evidence from Firms' Use of Twitter.TM", *The Accounting Review,* Vol. 89, pp. 79–112.

Bruhn M., Schoenmueller V., Schafer D.B. (2012), "Are social media replacing traditional media in terms of brand equity creation?", *Management Research Review*, Vol.35, Iss.9, pp.770-790.

Burnap, P., Rana, O.F., Avis, N., Williams, M., Housley, W., Edwards, A., Morgan, J. and Sloan, L. (2013), "Detecting tension in online communities with computational Twitter analysis", *Technological Forecasting and Social Change*, doi: 10.1016/j.techfore.2013.04.013

Cosenza V. (2012), "Social Media ROI", Apogeo, Milano.

Costa, E., Ferreira, R., Brito, P., Bittencourt, I.I., Holanda, O., Machado, A. and Marinho, T. (2012), "A framework for building web mining applications in the world of blogs: A case study in product sentiment analysis", *Expert Systems with Applications*, Vol. 39 No. 5, pp. 4813-4834.

Denzin, N. K. (1978), "The Research Act" (2nd ed.), New York: McGraw-Hill.

Dutta, S. (2010), "What's Your Personal Social Media Strategy?", *Harvard business review*, November 2010, pp.1-5.

Einwiller, S.A. and Steilen, S. (2014), "Handling complaints on social network sites – An analysis of complaints and complaint responses on Facebook and Twitter pages of large US companies", *Public Relations Review*, Doi: 10.1016/j.pubrev.2014.11.012

Eisenhardt, K. M. and Graebner, M. E. (2007), "Theory building from cases: Opportunities and challenges", *Academy of Management Journal*, 50, pp. 25–32.

Floreddu, P.B., Cabiddu, F. and Evaristo, R. (2015), "Inside your social media ring: How to optimize online corporate reputation", *Business Horizon,* Vol. 57, pp. 737-745.

Gandomi, A. and Haider, M. (2015), "Beyond the hype: big data concepts, methods and analytics", *International Journal of Information Management*, Vol. 35, pp.137-144.

Gao, Y., Wang, F., Luan, H. and Chua, T.-S. (2014), "Brand Data gathering from live social media streams", *Proceedings of international conference on multimedia retrieval* – ICMR '14, pp. 169–176, doi: 10.1145/2578726.2578748

George, G., Haas, M. and Pentland, A.S. (2014), "Big data and management", *Academy of Management Journal*, Vol. 57 No. 2, pp. 321-326.

Ghiassi, M., Skinner, J. and Zimbra, D. (2013), "Twitter brand sentiment analysis", *Expert Systems with Applications*, Vol. 40 No.16, pp.6266-6282.

Go, A., Bhayani, R., and Huang, L. (2009), "Twitter sentiment classification using distant supervision", *Technical report, Stanford Digital Library Technologies Project*, pp. 1–6.

Golbeck J. and Hendler J., "Accuracy of Metrics for Inferring Trust and Reputation in Semantic Web-Based Social Networks", 2004 in EKAW.

Gruber, D.A., Smerek, R.E., Thomas-Hunt, M.C. and James, E.H. (2015), "The real-time power of Twitter: Crisis management and leadership in an age of social media", *Business Horizons*, in press, doi: 10.1016/j.bushor.2014.10.006

Haefliger, S., Monteiro, E., Foray D., von Krogh, G. (2011) "Social Software and Strategy", *Long Range Planning*, Vol.44, pp.297-316.

Heath, A.W. (1997), "The proposal in qualitative research", The Qualitative Report, Vol. 3 No.1, Retrieved December 27, 2011, from http://www.nova.edu/ssss/QR/index.html

Heydebrand, W. (2008), "Accounting for great expectations: Lessons from the new media surge for critical management theory", *Critical Perspectives on Accounting,* Vol. 20, Iss. 3, pp. 418-444.

Hoffman, D. L. and Fodor, M. (2010), "Can You Measure the ROI of Your Social Media Marketing?", *MIT Sloan Management Review*, 52:1 pp. 40–49.

Jackson, S.E. (2011) "The value of weak connections", *Journal of Business Strategy*, Vol.32 Iss.5, pp.51-53.

Jansen, B., Zhang, M., Sobel, K., and Chowdury, A. (2009), "Twitter power: Tweets as electronic word of mouth", *Journal of the American Society for Information Science and Technology*, Vol. 60 No. 11, pp. 2169–2188.

Jeacle, I. and Carter, C. (2011), "In TripAdvisor we trust: Rankings, calculative regimes and abstract systems", *Accounting Organizations and Society*, Vol. 36 No.4-5, pp. 293.309.

Kaplan, A. and Haenlein, M. (2010), "Users of the world, unite! The challenges and opportunities of social media", *Business Horizons*, Vol. 53 No. 1, pp. 59—68.

Kietzmann, J. H., Hermkens, K., McCarthy, P., and Silvestre, B. S. (2011), "Social media? Get serious! Understanding the functional building blocks of social media", *Business Horizons*, Vol. 54, pp. 241–251.

Kietzmann, J. H., Silvestre, B. S., McCarthy, I. P., & Pitt, L. (2012). Unpacking the social media phenomenon: Towards a research agenda. *Journal of Public Affairs*, Vol. 12, pp. 109–119.

Khobzi, H. and Teimourpour, B. (2014), "How significant are users' opinions in social media?", *International Journal of Accounting and Information Management*, Vol. 22 No.4, pp. 254-272.

Lee, C.H. (2012), "Unsupervised and supervised learning to evaluate event relatedness based on content mining from social-media streams", *Expert Systems with Applications*, Vol. 39 No. 18, pp. 13338-13356.

McAfee, A. and Brynjolfsson, E. (2012), "Big data: the management revolution", *Harvard Business Review*, October, pp. 1-9.

Meyer, C. B. (2001), "A case in case study methodology", *Field Methods*, 13(4), pp. 329- 352.

Michaelidou, N., Siamagka, N.T. and Christoduulides, G. (2011), "Usage, barriers and measurement of social media marketing: An exploratory investigation of small and medium B2B brands", *Industrial Marketing Management*, Vol. 40, pp. 1153-1159.

Miller, P. and O'Learly, T. (1987), "Accounting and the construction of the governable person", *Accounting Organizations and Society*, Vol. 12 No. 3, pp. 235-265

Miller, P. (2001), "Governing by numbers: why calculative practices matter", *Social Research*, Vol. 68, pp. 379-396.

Mislove A., Viswanath B., Gummadi K.P., Druschel P. (2010), "You Are Who You Know: Inferring User Profiles in Online Social Networks", *in Proceedings to WSDM'10, ACM*, New York City, New York, USA.

Montoyo, A., Martínez-Barco, P. and Balahu, A. (2012), "Subjectivity and sentiment analysis: An overview of the current state of the area and envisaged developments", *Decision Support Systems*, Vol. 53, No. 4, pp. 675-679.

Naaman, M., Zhang, A. X., Brody, S. and Lotan, G. (2012), "On the study of diurnal urban routines on twitter", proceedings of the 6th International AAAI Conference on Weblogs and Social Media (ICWSM'12).

Neuman, W.L. (2000), "Social Research Methods: Qualitative and Quantitative Approaches", 4th ed. Boston: Allyn & Bacon.

Ngai, E.W.T., Tao, S.S.C. and Moon, K.K.L. (2015), "Social media research: Theories, constructs, and conceptual frameworks", *International Journal of Information Management*, Vol. 35 No. 2, pp. 33-44.

O'Reilly, T. (2005), "What is Web 2.0", retrieved from http://www.oreilly.com/pub/a//web2/archive/what-is-web-20.html

Orlikowski, W.J. (2007), "Sociomaterial Practices: Exploring Technology at Work", *Organization Studies*, 28(9), pp.1435-1448.

Orlikowski, W.J. and Scott, S.V. (2014), "Exploring material-discursive practices", *Journal of Management Studies*, doi: 10.1111/joms.12114.

Pardo C., Ivens B.S., Wilson K. (2013), "Assessing and strengthening internal alignment of new marketing units: An interpretative tool", *Industrial Marketing Management, 42,* pp.1074-1082.

Peters, K., Chen, Y., Kaplan, A. M., Ognibeni, B. and Pauwels, K. (2013), "Social Media Metrics — A Framework and Guidelines for Managing Social Media", *Journal of Interactive Marketing*, Vol. 27, pp. 281-298.

Pollock, N. and D'Adderio, L. (2012), "Give me a two-by-two matrix and I will create the market: Rankings, graphic visualisations and sociomateriality", *Accounting, Organizations and Society*, 37, pp. 565-586.

Reinartz, W., Krafft, M. and Hoyer, W.D. (2004), "The customer relationship management process: its measurement and impact on performance", *Journal of Marketing Research*, Vol. XLI: 293-305.

Romero, N.L. (2011), "ROI. Measuring the social media return on investment in a library", *The Bottom Line*, Vol. 24 No. 2 pp. 145 – 151.

Rust, R.T. and Huang, M.H. (2014), "The service revolution and the transformation of marketing science", *Marketing Science*, Vol. 33: 206-221.

Sabate, F., Berbegal-Mirabent, J. Cañabate, A. and Lebherz, P.R., (2014), "Factors influencing popularity of branded content in Facebook fan pages", *European Management Journal*, Vol.32 No.6, pp. 1001-1011.

Scott, S.V. and Orlikowski, W.J. (2012), "Reconfiguring relations of accountability: Materialization of social media in the travel sector", *Accounting Organizations and Society*, Vol. 37 No. 1, pp. 26-40.

Smailović, J., Grčar, M., Lavrač, N. and Žnidaršič, M. (2013), Predictive Sentiment Analysis of Tweets: A Stock Market Application*", In Human-Computer Interaction and Knowledge Discovery in Complex, Unstructured, Big Data*, Springer, pp. 77–88.

Stake, R. (1995), "The art of case study research", Thousand Oaks, CA: Sage.

Stamati, T., Papadopoulos, T. and Anagnostopoulos, D. (2015), "Social media for openness and accountability in the public sector: Cases in the Greek context", *Government Information Quarterly*, Vol. 54 No. 3, pp. 241-251.

Suddaby, R., Saxton, G.D., and Gunz, S. (2015), "Twittering change: The institutional work of domain change in accounting expertise", *Accounting Organizations and Society*, Vol. 45, pp. 52-68

Swani, K., Milne, G. and Brown, B.P. (2013), "Spreading the word through likes on Facebook: Evaluating the message strategy effectiveness of Fortune 500 companies", *Journal of Research in Interactive Marketing*, Vol. 7 No. 4, pp.269 – 294.

Swani, K., Brown, B.P. and Milne, G. (2014), "Should tweets differ for B2B and B2C? An analysis of Fortune 500 companies' Twitter communications", *Industrial Marketing Management*, Vol. 43 No. 5, pp. 873-881.

Wagner, E.L., Moll, J., and Newell, S. (2011), "Accounting logics, reconfiguration of ERP systems and the emergence of new accounting practices: A sociomaterial perspective", *Management Accounting Research*, Vol. 22, pp. 181-197.

Waters, R.D. and Jamal, J.Y. (2011), "Tweet, tweet, tweet: A content analysis of non-profit organizations' Twitter updates", *Public Relations Review*, Vol. 37 No. 3, pp. 321-324.

Weinberg, B.D., de Ruyter, K., Dellarocas, Ch., Buck, M., Keeling, D.I. (2013), "Destination Social Business: Exploring an Organization's Journey with Social Media, Collaborative Community and Expressive Individuality", *Journal of Interactive Marketing,* Vol. 27, Issue 4, pp. 299-310.

Weinberg, B.D. and Pehlivan, E. (2011), "Social Spending: Managing the Social Media Mix," *Business Horizons*, Vol 54, 3, pp. 275–282.

Yu, Y., Duan, W. and Cao, Q. (2013), "The impact of social and conventional media on firm equity value: A sentiment analysis approach", *Decision Support Systems*, Vol 55 No. 4, pp. 919-926.

Yin R.K. (2014), "Case study research: Design and methods" (5th ed.), Thousand Oaks, Calif.: Sage.

2.4 Study 4 - Creating value from Social Media Data

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Author

Yulia Sidorova
Ph.D. candidate, Department of Management, Economics and Industrial Engineering,
Politecnico di Milano, Milan, Italy

Abstract

Social media diffusion captured both individuals and business world. Numerous organizations adopted social media to communicate and listen to their customers and analyse own performance. However, only few have succeed in creating value and knowledge from this massive unstructured data flow. The management accounting practices challenge for understanding social media data reliability, representativeness and dissemination inside organizations. This study addresses these questions in a holistic way through theoretical lens of Bhimani and Willcocks (2014) to analyse the process of data collection, analysis, dissemination and application for specific accounting activities. The empirical evidence is based on in-depth single case study with the one of the most proactive users of social media – Telecommunication company. This study contributes to the management accounting theory proposing a revised framework for social media data process within organisation, highlighting its particular configuration for knowledge, value creation and alignment with the employees' perceptions.

Keywords: Social media data, accounting, value, knowledge

Paper type: Case study

2.4.1 Introduction

Web 2.0 and specifically social media platforms are widely adopted among diverse companies in different "account forms" (Risius and Beck, 2015): employment of new staff members, sales planning, development of new products, official disclosure of accounting documentation and handling customers relationships. The current studies in marketing and information technology are leading this research with interests of scholars laying beyond the analysis of social media management, and addressing also social media as a source of "big data". This information is said to be "likely to generate exciting changes in the scenario planning and decision-support field in the coming decade" (Raford, 2015).

Several scholars underlining that social media data is unique source of immediate news, understanding reaction of public towards new legislation, an alternative to the exit poll for elections and quality assessment of products, services, in particular meal in a restaurant or a hotel (Tumasjan et al., 2010; Jeacle and Carter, 2011; Kavanaugh et al., 2012; Freberg et al., 2013; Kim et al., 2015). Researchers investigate benefits of these data for business, organizations and government (Korschun and Du, 2013; Bianchi and Andrews, 2015). Yet, many of them acknowledge value of social media information for operational activities and innovation, still a lot of questions remain answered. Researchers underline the difficulties connected with understanding these "big data", reliability, representativeness and dissemination inside organization (Boyd and Crawford; 2012; Ferrara et al., 2014; Bianchi and Andrews, 2015). In order to create value is not enough to collect, analyse and choose innovative ideas from social media platforms, but also present to managers and receive approval for their implementation (Dong and Wu, 2015). The privacy and ethics questions are other important issues that researchers and companies are struggling with (Clark et al., 2011; Curtis, 2014). The value of social media data (SMD) remain controversial. This is mainly due to the fragmentation of previous researchers, which do not address the problem of "value" for companies in a holistic way. In this paper, we aim at addressing this gap, by analysing the value of SMD in a complete way considering that the value for user is determined by several elements: the process through which data are collected and processed; the way through which data are communicated and the agent preparation to read and use the data. Drawing on the framework developed by Willcocks & Whitley (2009), following refined to the sphere of Big Data (Bhimani and Willcocks, 2014), we investigated a case of advanced use of SMD: TELCO company. TELCO (anonymous name) is a large telecommunication company operating in Italy and was chosen after a preliminary phase in which several companies were screened through both secondary source and interviews. TELCO was selected as exemplary of its advanced processing and use of SMD and its enterprise wide diffusion among different agents.

The findings show that the construction of value of SMD for managers entail two main revisions compared to more traditional area of management accounting. The first is the pervasive interactivity between specialists and managers underpinning the entire flow from data collection to data use. To carry out this interaction some devices are employed where the flexibility of human interaction and physical spaces play a central role. A second result is related to time. Social media are associated to immediacy, velocity; yet our study revealed impacts on time management, but in broader way; the timing of reporting is variable and related to the type of social media, and how it is employed by companies. This difference in reporting corresponds to the adoption of diverse visual tools to favour the creation of knowledge.

To recount our argument the rest of the article is organized as follows: the next section illustrate previous studies on SMD and its value; section three introduce the framework of analysis followed by the methodology; section five presents the results; finally concluding remarks are presented.

2.4.2 Literature review

Interest on social media as source of data is now central in scholarly debate, crossing several disciplines from information systems to accounting. With reference to the goal of this paper, which is analysing the generation of value for manager from SMD, there are two relevant streams of research: the process of data collection and processing; the knowledge creation process within the company.

Regarding the process of data collection and processing, there are fewer managerial contributions, as management researchers tend to see the data collection process and analysis as a black box (Wang and Lin, 2011; Ceron et al., 2013). Only a few scholars have addressed the problem of processing. For example, Bell (2012) has proposed a method for analysing unstructured SMD targeting specific company objectives, starting from strategy of company, willingness to invest in social media and proposing set of measures (online panel or even ROI) based on social media analytics. Focusing again on unstructured information, the work of Martini et al (2014) instead help understanding how processes change according to the goal (here co-creation). They describe the information processing is made by several stages: identification of area of interest; collection of ideas for specific topic; election of the best ideas, according to company's criteria, presentation of final proposition of new products. Chan et al (2015) proposed a variation of data processing report, he studied how social media data can help managers in defining business strategy for operation and product management based on data collected from Facebook. They explained in detail process of data collection, analysis, clustering important issues and creating hierarchy tree. Finally, a recent study has proposed a reference framework for social media data processing within performance measurement system,

including the following steps: setting stage, data gathering, analysis, indicators measurements and dissemination (Sidorova et al., 2015).

Further to these business studies, significant research has been carried out by information technologies scholars, who analysed SMD and its particular requirements in terms of collection and analysis (Vercellis, 2009; Nikolopoulos et al., 2013; Shelton and Skalski, 2014; Balahur, 2014). In this field contribution are very specific, analysing and experimenting the data collection and processing for different type of social media and information form (words, pictures, videos or symbols). Entering the detail of these methods is beyond the scope of this paper, but what is important is that different contributions (e.g. Ngai, Xiu, and Chau, 2009; Kwak et al., 2010; Choi et al., 2012; Marres and Weltevrede, 2013; Snead, 2013; Sebate et al., 2014; Swani et al., 2014; Li et al., 2014; Brambilla et al., 2014; Ngai et al., 2015; Atkinson et al., 2015; Bernabé-Moreno et al., 2015) highlight that, so far, all methods employed have degrees of subjectivity, due to several decisions: which social media do you chose? (Ferrara et al., 2014; Dzvapatsva et al., 2014; Bravo-Marquez et al., 2014) How do you clean data, neglecting some messages? (Doerflinger and Dearden, 2013; van Dam and van de Velden, 2015) How do you automatically cluster messages to create relevant categories? (Dzvapatsva et al., 2014; van Dam and van de Velden, 2015) How do you trace negative and positive sentiment? (Paltoglou and Thelwall, 2012; Hu et al., 2013; Xianghua et al., 2013; Nguyen et al., 2014).

This first stream of researches evidences the importance to investigate how the process of collection of SMI is designed and implemented in order to fully understand if and how information are accepted and then used by managers. However, previous studies in accounting (Speier, 2006; Matilal and Hopfl, 2009; Justesen and Mouritsen, 2009; Yigitbasioglu and Velcu, 2012) have evidenced that the acceptance and use of information is also related to the way through which data are communicated and visualised, considering the type of agent reading the data (Cho et al., 2009; Davison 2009; Yigitbasioglu and Velcu, 2012). A first seminal contribution for visualization dates back to the introduction of the Balanced Scorecard (Kaplan and Norton, 1992) a process and visual tool, which translates strategic information in operational indicators represented in a dashboard (Kaplan and Norton, 1992, 1996, 2010). More recently studies in accounting have emphasised that visual aspects of reporting have "powerful" role in data communication (Justesen and Mouritsen, 2009). The "visualizations can have the capacity to strengthen" messages of data signals and translate them for managers in accounting, marketing design and planning (Justesen and Mouritsen, 2009: 973). Speier (2006) examines how to leverage formats of information presentation to support more effective decision-making. Laboratory experiment results uncover that mix formats, as graphs, charts or tables, are more suitable for managers. In the light of complexity of information and process of decision-making additional variables, such as time and cognitive capacity of managers are suggested to be

taken into consideration (Speier, 2006). Yigitbasioglu and Velcu (2012: 50) address in their study the role of agent, detecting that specific presentation format is required "according to the level of accounting knowledge of the user". Russel et al (2009) brought up another important aspect for managers understanding of unstructured data. "Compact representation" of unstructured information provides pressures "insights to management personnel help explain performance, or assist with communication" (Russel et al., 2009: 1045). The work of Masud et al. (2010) illuminate the "transformation" role of visualisation in the passage from data to knowledge creation. Scholars suggested that "visualizations… imply: what, in which way and to whom communicate" (Masud et al., 2010: 446). Further studies propose measurements to assess the visualisation of information, such as "readership impact" accounting for comprehension of financial reporting by managers and ease of communication (Davison, 2009).

These problems highlighted by accounting scholar for traditional data, become even more visible and problematic when entering the world of social media. SMI in fact potentially contain a wide range of elements: they can provide early signals of phenomena and risks (Ranaweera and Jayawardhena, 2014), they can predict the valence or volume of traditional metrics (Lau et al., 2014; McAfee and Brynjolfsson, 2012; Gandomi and Haider, 2015), they can grasp previously unrevealed issues, such as service improvement (Risius and Beck, 2015). Balduini et al. (2015) affirm that the social media information visualized in time and on the geographical surface able to make "hidden relations visible and information more accessible" for final users. Notwithstanding SMI are fluid, dynamic and unstructured (Lavalle et al., 2011; Panagiotopoulos et al., 2015) and communicating its value across the company becomes a challenge, where two issues overlap: data visualisation and reporting; the expectation and preparation of user in reading those data. The preparation of user and its propensity towards "new" information have been extensively studied (Stancich and Curry, 2000; Stoddart, 2001; Kietzmann et al., 2006; Berthon et al., 2007; Hargittai, 2010). The researchers underline numerous factors affecting managers in use of social media information, such as computer knowledge (Stancich and Curry, 2000; Stoddart, 2001), internet skills (Kietzmann et al., 2006; Hargittai, 2010) or simply level of social activity (Berthon et al., 2007).

Social media information, and more generally big data, is raising increasing interest in knowledge creation and enabling knowledge sharing (Burnett et al., 2012; Vuori and Okkonen, 2012; Levy, 2013; Chua and Banarjee, 2013).

For the purpose of this study we focus on knowledge creation from social media information and its potential to create value for an organization (Tomas and Hult, 2003). Prior studies investigate whether social media information is good source of knowledge. Caputo (2009: 33) stated that social media represent "high-quality, timely information, but … require simple, scalable tools that direct critical

trusted knowledge appropriate to each of the user groups in organization". Other scholars empirically examined what is required for knowledge acquiring from social media, resulting in following attributes: accumulating experiences, obtaining knowledge through talent, guiding learning, and transferring knowledge from academic practices (Gupta et al., 2010). Controversially, James (2011) affirmed that the knowledge creation within companies and university based on social media information could be a trap. The social media expanded content naming it "informational waste". Instead, Stoddart (2011) named social media to be "knowledge democratization" that proper management of social media information involves ensure relevancy and manage risk. Further to this Dale (2014) claimed that effective social media information requires real-time technology and tools used by knowledge experts who can interpret and add insight to this data.

Prior literature on knowledge management and organizational learning theories propose numerous classifications of knowledge, the scholars usually define two types of knowledge: explicit and tacit knowledge. The explicit knowledge refers to numbers, structured information, while tacit or implicit knowledge refers to non-codified or personal experience (Nonaka, 1994, Botha et al., 2008). Alberghini et al. (2014: 271) affirm that social media information generate knowledge for the employees in both tacit and explicit forms, in particular "the number of new ideas and suggestions and by evaluating votes and comments provided by users". Furthermore, for the explicit knowledge Choi & Jong (2010) propose specific measures: financial, non-financial and hybrid. Instead, other researchers propose different classification of measures for social media explicit knowledge: network metrics (centrality, weak ties, key nodes, etc.), metrics based on content and sentiment (positive and negative opinion towards company, service or product) (Bakshy et al., 2011; Clark et al., 2011; Chikandiwa et al., 2013; Ghose et al., 2012). Nguyen et al. (2014) proposed a tailored model for knowledge acquisition from social media for innovation process in China's technology industry both in explicit (number of new ideas) and tacit (reciprocal relationships, new opportunities) forms useful for managerial activities. However, researches omit some of the important parts suggested for future investigation: knowledge acquisition process relates to value creation and how knowledge acquisition differs across cultures, people's perceptions and information adoption that we use as a starting point for our study.

To summarise previous studies we evidenced some key elements. First, regardless the method adopted in collecting and processing data, there are always arbitrary choices which potentially affect results, particularly when analysis of data move from simply counting occurrences (messages or words) to more refined analysis of content. Second, the creation of value, intended as the use of SMD by managers in their activity depends on one hand by the way SMD are visualised, shared and communicated, but on the other hand by the expectation and preparation of managers.

2.4.3 Framework

To develop our arguments, we draw on the framework of Willcocks & Whitley (2009) further enriched in 2014 (Bhimani and Willcocks, 2014) with the emergence of Big Data. The framework was developed to analyze the complex process and relationships between human beings (agents), data (structured and unstructured), information and communication technologies, and finally knowledge acquisition.

Referring to the most recent proposal (Bhimani and Willcocks, 2014: 471), the model (figure 1) comprises "components from an information system in receiving input, processing data into knowledge and producing output" and "relationships between data, information and knowledge in a system used by agents". The components of information processing within the company includes data collection, data transformation supported by information and communication technologies, and delivery to agent mediated by their tacit and explicit knowledge. The relationships of the system couple perceptions of agents with knowledge acquisition through supporting elements: filters, accounting models and communication. "Agent operates perceptual filters to orient the senses to certain types of activities… conceptual filters extract information-bearing data" (Bhimani and Willcocks, 2014: 471). These filters are shaped by prior knowledge of agents and they are evidenced to help considering cognitive and affective expectations.

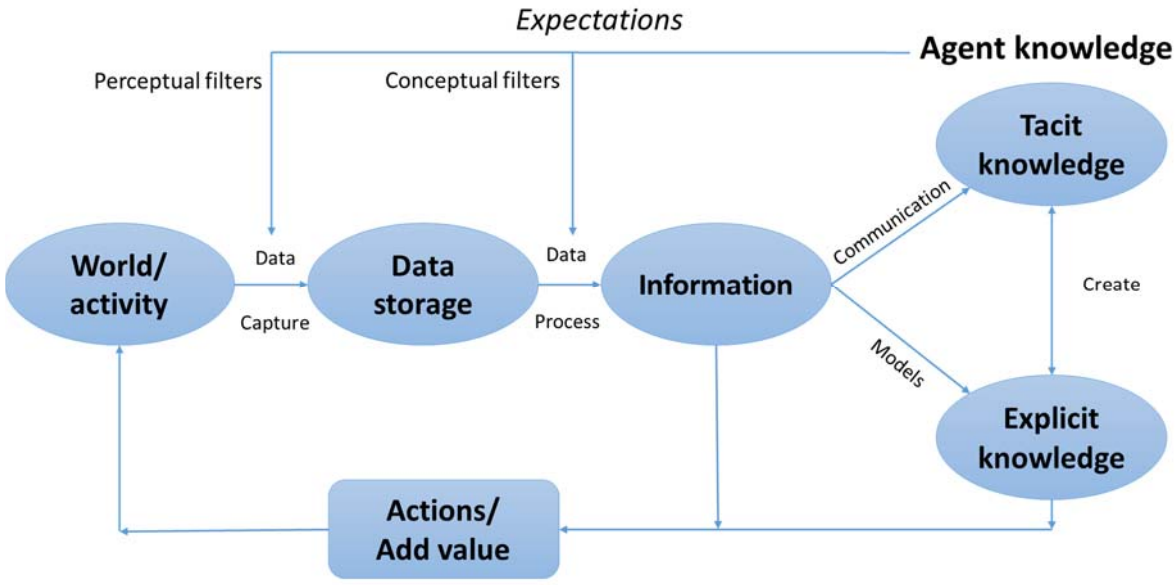

Figure 6: Data, information systems and knowledge framework; reproduced from Bhimani and Willcocks (2014)

This theoretical lens helps us to provide a comprehensive picture of SMD processing and use within an organization, considering information systems components related to data and activities, but also relationships among agents, their expectations and knowledge about social media. Although the entire

process of value creation has not yet been studied in the context of SMD, previous researches in social media settings provide important insights for investigating elements of the framework.

The first component is activity, which is defined by Bhimani and Willcocks (2014), as any management accounting activity related to individual, organizational or world function. SMD also applied to wide spectrum of accounting activities, such as decision-making, planning (Boyd & Gessner, 2013; Phang et al., 2013). The second component is information and information systems. Regarding information Willcocks and Whitley (2009) refers to two types: structured and unstructured, connecting them to knowledge typology. Structured information are represented by numbers, such as financial data, but also non-financial information. Unstructured data instead are instead information not embedded in models, consequently not visualized in the form of a number, thresholds, ranges. SMD represents mix of structured, such as the number of followers or messages, and unstructured data, linked to the content such as single expressions of the users, claims of poor product performance (Speier, 2006; Russel et al., 2009; Yigitbasioglu and Velcu, 2012). Bhimani and Willcocks (2014: 472) suggested that technologies for data collection and analysis plays important role in this process "codify knowledge into a managerially usable form and subsequently informing business activities". In the case of SMD previous studies in information technologies is rich of specific studies entering the details of how capturing and then processing data. Notwithstanding the number of studies, there are no so far consolidated methodologies, especially when moving to text mining that is the process to automatically process large amount of text for a specific purpose (Lee, 2012; Gao et al., 2014; Songchang et al., 2015).

The relationships of the system form expectations (perceptual and conceptual filters), models, communication modes to foster tacit and explicit knowledge in extracting value from processed data. These elements are discussed together embracing agents' and organizational perspective in value creation. Bhimani and Willcocks (2014) underline that agents' perceptual and conceptual filters are bridges between collected data and knowledge development. The perceptual filters help identify the object of interest, while conceptual filters influence data analysis and presentation. The agents requires proper models and communication modes for information presentation (Speier, 2006; Matilal and Hopfl, 2009; Justesen and Mouritsen, 2009; Yigitbasioglu and Velcu, 2012) to be able to absorb these data both in unstructured form, creating tacit knowledge, or through, structured accounting models, like dashboards or metrics, leading to explicit knowledge. Prior literature highlighted that the visualization plays important role in relating information and knowledge creation (Alberghini et al., 2014; Balduini et al., 2015). The Bhimani and Willcocks (2014: 472) framework aims to reach "the effective formatting of information for action by knowledge-vested managers". In terms of added value from SMI researchers underline effectiveness (Dutta, 2010) and timeliness (Gummerus et al.,

2012). Additionally, researches highlight that tacit and explicit knowledge from social media sources helps company to make better decisions resulted in higher revenues and higher customers satisfaction based text-mined information from Twitter (Hea et al., 2013) or video games (Marchand and Hennig-Thurau, 2013).

We use the identified components and relationships of the framework together with patterns emerged from prior literature, as a backbone for further empirical investigation and defining different critical issues for knowledge and value creation.

2.4.4 Method

The empirical evidence for this study was collected using a qualitative method based on an in-depth single case. This methodology has been chosen since retained appropriate to describe and interpret complex phenomenon and supporting in-depth exploration of practices in use (Heath, 1997; Yin, 2014). The case study organization is an Italian telecommunication company – TELCO (fictitious name). This organization was chosen after a preliminary screening and engagement with ten companies using SMD. The preliminary screening was carried out through a web analysis and interviews with the SM owner to understand the state of use of SM. TELCO emerged as the most interesting case as they had advanced procedure and an enterprise-wide use of SM.

TELCO is a significant player in the Italian market with staff over 50 thousands employees. The company is considered a proactive user of social media platforms and information deriving from them. The adoption of social media started in 2008 with a Facebook page of the company. However, the exploitation of social media platforms for company's activities started after 2010. Now, company has over seven millions followers on diverse platforms, in particular two million followers on Facebook and four hundred thousand followers on principal Twitter account. TELCO intensively uses different social media channels, but mostly focus the traditional ones like Facebook, Twitter, YouTube, LinkedIn and Google+. Facebook and Google+ are used for communication and marketing purposes, while Twitter have a dedicated role of "help" account for the client relationship activities.

In our specific case, the aim is to explore how managers inside organizations use social media data and to analyse their expectation and perception of social media data reporting and its value. The addressed phenomena implied to use multiple source of observation which unfolded over a 18 month period, between June 2014 and September 2015. A first phase was devoted to the analysis of TELCO owned social media, we monitored two social media channels owned by TELCO during two weeks, observing level of their activity, identify velocity of responses, type of content published, tone of the conversation, comparing it with traditional media (La Republica, Corriere della Sera). A major source of information was face to face interviews, 21 interviews were held with 15 informants, employees

of Digital Intelligence department (DID), Communication, Marketing, Sales, Customer experience, Customer Relationship Management (CRM), Innovation and Development department. The interviews were administered through a small set of semi-structured and open-ended questions to encourage the interviewees to take active roles and unrestrained dialogue (Denzin and Lincoln, 2005; Patton, 2004). On average each interview lasted from 40 minutes to one hour and half.

We adopted twofold approach: within DID and across departments using SMD – agents. Firstly, we made interviews within DID, including Head of the department, Manager of social media strategy, Manager of social media analytics group, Data scientist and Social media officer, providing profound understanding of social media data process: collection, analysis, reporting preparation and dissemination of SMD across other departments. Other eleven interviews aimed to discover how these reports and SMD are used in daily activities of different departments. This twofold approach aimed to provide thorough picture of SMD use and value perceived by final users.

# of interviews	Department	Roles interviewed	SMD
2	DID	Head of Digital Intelligence Department	Owner/user
1	DID	Manager of social media strategy	Owner/user
3	DID	Manager of social media analytics group	Owner
1	DID	Data scientist	Owner
1	DID/CRM	Social media officer	User/owner
1	Sales	Manager of "yourth" products	User
1	Communication	Head of communication	User
1	Marketing	Communication manager	User
1	Customer experience	Customer experience manager	User
1	Development	Application developer	User
2	Innovation center	Director	User
2	Innovation center	Project manager	User
2	Marketing	Program manager	User
1	Marketing	Marketing manager	User
1	Marketing	Presales specialist	User

Table 19: Interviewees summary

12 out of 21 interviews were digitally recorded and subsequently transcribed. For the remaining interviews, we were not allowed to record, but detailed notes were taken in the form of report and added to the body of data. The data were analysed by an iterative process using QRS NVivo 10 coding to identify patterns relating to process of SMD (Whillcocks and Whitley, 2009). The framework of the Willcocks and Whitley (2009) was used as a guiding lens though which to observe the data. Moreover every effort was taken to ensure that the reading of the data allowed for other aspects to emerge beyond those prescribed in the process. The interviews were complemented by direct

observation and personal participation at the work of DID, we participated in the daily monitoring of social media in real time, which included the following steps: task assessment, review of first results, application of different methodologies and choice of graphical representation of social media data. Insights from interviews and observations were integrated with additional data sources: reports from DID, presentations and analysis of TELCO social media channels. Reports and presentation include information on SMD: key performance indicators, content, sentiment, trend analysis and direct citations for customers. We revised their social media accounts and asses the approach in comparison with the interviews statements (i.e. the tone of communication, correctness of responses, timeliness). Additionally, we presented our preliminary research results to the DID in August, 2015. The two strategy managers and all group of data analyst were presented and provided useful comments.

To identify different patterns for process of SMD and its value together with the organizational and knowledge creation issues we have used the multiple source of evidence (Anderson-Gough et al., 2005; Jorgensen and Messer, 2010). The triangulation of large body of data gathered during 18 months, consisting of interviews, observation, reports, presentation and social media platform analysis (Denzin, 1978; Yin, 2014) analysed through the lens of theoretical framework have been used to prepare the results and discussion section of the article.

2.4.5 Results

The findings are articulated in four sections. The first one presents the SM organizational configuration of TELCO; the second what are SMD and how they are generated in the attempt to face expectations and needs of diverse business divisions. The third section focuses on the use of this information by agents (managers), highlighting how they differently react and endorse SMD in their activity. The fourth section sheds light on the knowledge from SMD and challenges for management.

2.4.5.1 SM organizational configuration

The center for SMD management is a corporate organizational unit, positioned under Communication business unit and it is labelled Data Intelligence department (DID). At the time of data collection the department consist of 25 people and the aim declared is to "engage with our clients, listen to them and analyse their interactions to understand their needs - identify signals from the noise of social media information surface" (words of Head of DID). DID is organized in three main teams: 6 data analysts, including people dealing with collection and analysis of information, data designer; 11 employees in social caring group, responsible for social client relationship management; 6 managers or strategy planners, who are directly working with business units to retrieve best data, organize

reporting, follow marketing, mobile, sales, sponsorship, business events, corporate, media, advertisement campaigns and other social media activities. The 6 strategy managers working with departments and responsible for strategy have in-depth knowledge about their field (brand, mobile, advertisement, fix lines, etc.) and company overall. Most of these employees primary were working in the departments with whom they currently collaborate. Furthermore, DID closely collaborates with start-ups sponsored by TELCO for improving data collection and analysis in parallel with data analysts' team.

Although informants at DID consider themselves as a unique TELCO team, not all of them are employed by TELCO and some informants belong to an external agency. Specifically, the 6 strategy planners and heads of social caring group and data analyst team are directly employed by TELCO, while the data scientist and 10 people working with social media caring (Twitter-Facebook officers) are employed by two external agencies. One agency provides staff for caring activities and another is specialized in big data analysis that support TELCO's data analyst team. This configuration helps to provide a necessary flexibility in term of volume and range of competences required. When the company needs a specific analysis (network, identification of influential social media accounts, data representation in time, etc.), it can ask for the "big data" agency to send temporary (one-two months) a data scientist or a graphic designer acquiring this particular knowledge and capable to perform this task. Regardless their contractual arrangements all members of DID work physically together in the same building, at the same floor to favour collaboration. During our research we visited company 4 times and observed that doors of the offices were open, managers and data analyst were meeting and discussing their work also during their coffee breaks or springing up in the doors of "monitoring room", fostering collaboration and exchange of knowledge.

Another peculiar asset of DID is "monitoring room", where data analysts are working at their round table. The "monitoring room" presents large room with big round table and 6 big screens on the wall that transmit in real time several types of data, one screen is assigned for real time data from traditional media (news stream), another represents social media, mainly Twitter and Facebook. Other projects data from competitors and benchmark analysis. During observation the pictures changed, it could be simple tweets or graphs representing sentiment or volumes of conversation.

DID manages only social media information distributing the results of its work across company, being kind of satellite or hub for different social media activities. Moreover, TELCO has several looking forward projects. The department closely works with client relationship department on clients' penetration issues, trying to provide coherent picture of clients sentiment and exigence among traditional (telephonic) and social media channels, coupling different data bases, and develop homogeneous service across them. DID also collaborates with legal department for privacy and

information disclosure issues. These collaborations aim to provide the best information for internal users and support them in their daily activities.

2.4.5.2 SMD process

The social media data collection and processing is complex and diversified; further to the human network described above, DID uses more than 10 different applications and platforms. The reporting processes do not have unique structure and vary significantly based on expectations of the final user, but also in relation to the moment in time, due to the evolving situation and new projects.

> *"We use feedbacks from social media, from Playstore charts or surveys to evolve our services. Otherwise, we ask to make a research or focus group whether application satisfy needs of final users. Customer caring department provides us direct comments from users by email on daily basis… the inflow of comments and feedback is more intense if new smartphone comes on the market, like Samsung6, or Apple introduce IOS 8.0". (Application developer)*

Although the variation within DID is high and changeable, there are three main approaches of data processing and report creation. The first one is the *informative and acknowledgement* process. Here DID collects on the web and main social media, information relevant to the company reputation, its brands, activities (both profit and non-profit), products, CEO, CFO and other key figures. The collection of such information is based on specific keywords, for each relevant issue DID identifies number of keywords, in particular for their service (name of the product, price, name of similar product from their competitors, main characteristics of product, price). These keywords represents catalogue of reputation, products, corporate and other issues important for TELCO. From a technical perspective, some of the platforms are proprietary of the social media sources, like Facebook insights, Google trends or Tweetdeck. Another external sources are identified by DID strategists and include service platforms for multiple source data analysis, like Radian6[4]and Voices from the blogs[5]. The aim of DID is to collect all relevant information and to present it to internal users in periodic report, including structured and unstructured data (numbers of followers, mentioning, polarity of sentiment, but also citations of final consumers, trend). The aim of these reporting is to acknowledge managers working in different departments with available information and performance on social media channel. Based on the *informative* process DID prepares monthly, bi-weekly or weekly communication sent to marketing, communication, sales and CRM departments. For management

[4] Radian 6 is an application to listen, publish, engage, and scale social care, gain deeper insight with powerful new multi-lingual sentiment engine and manage social properties (https://www.salesforce.com/form/marketingcloud/social-studio-migration.jsp).

[5] Voices from the blogs is platform of data analytics, business intelligence, web-reputation e web-sentiment. (http://voicesfromtheblogs.com/)

board and head of marketing department DID also provides a dynamic dashboard which provides real time information for most their critic activities. Another type of *informative* report is complete annual report for the management, i.e. head of communication department and management board. DID also prepares quarterly reports on trend analysis and benchmarking. The monthly reports are sent to all departments of the company, as a part of communication report.

The second process is the *department-specific reporting*. The *informative reporting* does not cover in detail issues of marketing (mobile and fix line), communication, application development, sponsorship, corporate, CRM and sales departments. Therefore, DID introduced a procedure to create and deliver ad-hoc reports for these departments. This process is laborious and requires constant dialogue between DID and other department. The conceptual filters and strategic goals of research, the content of reports (mix of structured and unstructured data), visualization and the periodicity are decided during meetings with heads of departments and employees directly working with these data. While the *informative* process is more stable and the update is related to new keywords, this second type of reporting is constantly changing over time following launch of new marketing campaigns, new products or focus on certain profile of customers – expectations of managers (agents). The interaction between DID and departments is high also during data collection, as in the case of the request from customer experience manager to trace offer and customer related process on Twitter:

> "*We need to know a little bit more about last offer or about customer experience, so we ask to focus on Twitter and to study and to analyse this specific topic related to the direct request of customers" (Customer experience manager)*

DID receives feedback on the information provided, but also may provide suggestions based on data exploration. In particular, during analysis data scientist can recognize influential actors on social media or emerging trend on the market, results are presented in the report, transforming conceptual filters of the agents. Further request may come from agents to deepen this argument, leading to another round of data collection and analysis. These reports maybe based on different perceptual filters, single social media platform or on the mix suggested by managers. The inclusion and exclusion of the certain type of sources and data are playing crucial role in creating reliable datasets. This is why data scientists first of all check the quality of data and exploring it before making analysis. The first results are shared with department which requested report and next steps of data analysis and types of analysis are negotiated. This step is required to assure that report based on structured and unstructured data leads to creation of explicit and tacit knowledge with agents (managers). The data scientists proposes hypothesis based on the collected data, but always check their relevance with DID and departments' managers. The monthly, bi-weekly, weekly or even daily reports are prepared by DID for *department-specific* process in connection with their exigence.

The third type of process is the *thorough reporting*, which originates on specific unique request coming from managers, contrary to the *department-specific* regular reports. For instance, the sales manager may ask to compare particular products on the market, sentiment and statistic for certain geographic area or age target. DID collects ad-hoc information based on perceptual and conceptual filters and prepares vertical reports according to the requirements (time-period, mix of measures, graphical presentation, etc.). Although this process is activated upon managers requests, DID attempt to structure also this reporting line to be more "efficient and effective" (Head of DID). These unique reports based on exigence of different departments are prepared with different timeframes. "Time required to prepare report is usually no more than one week – 5 working days" (Data scientist words). Another type of *thorough* reports prepared by DID are "crisis reports". These reports could be hourly or even each 15 minutes depending on the gravity of issue, delivered by email or even by phone.
Data analysts of DID prepared an internal presentation where the present their approach; the following figure provide a graphical representation of it (adapted from the presentation for anonymity reason):

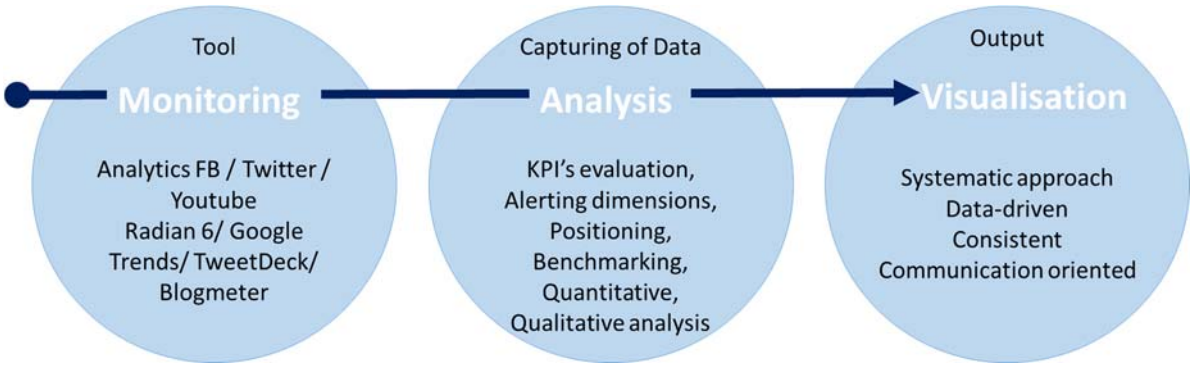

Figure 7: Process of SMD elaboration (image from TELCO official documents – adapted for anonymity reason)

All three processes rely not only on information collected directly by DID, but often on data collected at the departmental level, in particular three departments have a strict collaboration in data provision: application developers, communication and CRM. The application developers have access to all comments on Play store regarding company's application and also to private message of applications support that are not visible to others. Communication department and CRM also have additional data bases, providing information from Facebook messenger and CRM data base from enquires coming from website or feedback to activities performed via crowdsourcing platforms.

2.4.5.3 Agents and use of SMD

The previous section highlighted that DID has several activities targeted to three main reporting processes with six types of outputs. Although we evidenced that even in the *informative* reporting

preparation agents are involved, further details are needed to understand how actually SMD are used. The following table illustrates how the three types of reporting are used by different organizational units.

Department	**Development**	**Sales**	**Marketing**	**Communication**	**Customer experience**	**CRM**
Agent	Application Developper	Manager of "Youth" products	Communication manager	Head of communication	Customer experience manager	SM officer
Use	Improvement and new application	New product / service	Marketing plan	Brand	Penetration / customer experience	Response management
Informative reports			Use of monthly reports for an overview		Weekly reports on mood of customers	
Departmental reports	Weekly and daily feedback, monitoring new developments and features	Market overview, performance of new product, feedback from customers	Mood of SM audience Mood of TELCO customers, Content creation and profiling of different customers (geolocation, age, leisure or business)	Monthly Sentiment towards TELCO Sentiment towards key figures Performance of sponsorship	Monthly Sentiment towards additional activities like free music, overview of soccer	Daily, weekly or even real time through Monitoring room reports identifying common users' problems, Mood of customers
Thorough reports			Crisis management	Overview of particular events	Crisis events	

Table 20: Use of SMD reports by agents

The informative report is send to all organizational units, but its use is different. Departments which receive more personalized reporting, tend to overlook this first type of report, as highlighted by the customer experience manager (Customer experience department):

"I receive even weekly (informative) reports, but from my side I take a look on the monthly (departmental) reports… We have periods where we have a lot of things to monitor and so we send request for reports (thorough) weekly. There are some more stable periods when I read standard (departmental) reports and I do not need any further details… It is important to have a feeling about real relation between customer and TELCO" (Customer experience manager)

Marketing and communication department is an exception, although they receive and ask for several specific reports, they consider interesting to look at the informative reporting, which is a continuous glance on users:

"Weekly reports [informative reports] helps understand our clients and their engagement, the diffusion of information on social networks… Other reports [department-specific] are base for studying strategy of content" (Head of communication department and part of management board)

The manager of social media CRM team uses *informative* report focusing its attention on performance of social caring, however general sentiment towards TELCO and activeness of people are important signals for the social media CRM team, being major intermedium between customers and company. Communication and marketing departments uses *department-specific* repot for brand management and marketing plan development, bi-weekly and monthly reports that helps "*studying the strategy of content" (Head of communication department and part of management board).* Furthermore, DID refocus their report to provide information on the current mood of social media and provides recommendations on sentiment of communication: "*when community cry, we should cry with them*" (Head of DID). Manager of data analyst add that reports sent to communication department provides an overview of possible content based on data driven approach pointing out strong and weak parts of company's communication respect to their competitors. DID monitors the communication of its top managers and reaction of audience, they also provide recommendations to meet expectations of audience.

> "*We analyse all conversations about top management and what top management says to the press and on social networks, in the tweets. We can reconstruct the most spread topic. For example, president (of the company) talks a lot about development, but not about new job positions. We try to construct different clusters and we can tell him "look, you are talking to much about development, to less about job positions, so next month focus your communication on job positions" and it is very important for decision-making" (Manager of data analyst)*

The *department-specific* reports are read and used by managers in the marketing, communication, research and development and CRM. These reports provide information on the issue of department interests considering time frame and level of details, i.e. all their perceptual and conceptual filters. The agents' expectations are communicated to DID during their bi-weekly or monthly meetings. The sales department uses only *department-specific* reporting filtered by the age of customers and their interests in order to identify unique features for new products and services that customers are interested in, but not generic attitude of all customers' base.

> "*I use the reports done for us from Facebook feedback, a lot of interesting and important issues that after I use during the new tariff creation. We introduced the offer including music services allowing young people to listen it for free though special application. But not all of issues (free minutes, more "favourite" numbers, more GB of internet) are possible to satisfy, we cannot work for free, we are profit company. We have to reach our budget."* (*Manager of "Youth" stream of products)*

Manager of "Youth" products confirmed that they use principally the reporting focused on young audience (from 8 to 30 years old) that usually prepared before, during and after launching of new

offer on the market. During interview manager showed us reports with graphs, clusters of issues and some direct feedbacks from clients. The mix of visualization tools, structured and unstructured information helps to individualize possible features for new offers and trace performance of current offer.

In the development department agents receive daily updates on the feedbacks coming from social media, as a part of their *department-specific* report. Expectations and frequency for this department is high, as many users on social media platforms are professionals in this field and can provide suggestions for improvement.

> "*Social media feedbacks are important for us, people that we address are front users of technology and when we launch something new or update app. They first to find mistakes. It helps a lot…we have to control budget and check time and availability of our suppliers if the improvements could be implemented*" (Manager of application development)

The value perceived by manager is high even if not all improvements could be introduced. Among other departments this manager use SMD more frequently than others, but after the registration was over, she noted that reading all reports are time-taking and new and interesting suggestion are not easy to find from large body of this information.

The social media CRM team uses *department-specific* report focused on service of social caring, velocity of response and mainly quality of response being part of DID they have access to "monitoring room", which help to trace their activities in real time.

The *thorough* reports are used by communication, marketing and CRM departments during specific events, "black out of the system" where company try to analyse exigence of their customers and develop plan to effectively respond to all arising questions or for analysis of important events, speech of CEO or participation of company at high level meetings to asses performance and sentiment towards these events.

The three types of reports are unevenly used across company. The informative reports represents a starting, entry point for managers, while department-specific reports are real sources of information and tools for managerial activities based on specific exigence, presented through visualisation tools and mix of structured and unstructured information. The *thorough* reports respond to specific call from agents at certain time period (hour, day or week). TELCO managers have concerns and evaluate SMD differently. For some managers the timing is very important (from immediate to monthly), for some only *department-specific* reports are interesting (specific issues and in-depth analysis). However, all of them confirm the unique value of this information for their activities (from creating content, product or update of application), but still SMD are not core source for decision-making.

"Clients are interested in the price. They are driven by price of offer… after they will love you, but before you should give them best offer" (Manager of "Youth" stream of products)

2.4.5.4 From information to Knowledge

""We got 1.8 million of impressions, is it good?" – is common question for us" (Head of DID)

DID staff working a lot on the transformation process and collaboration with other departments to make SMD understandable and usable. Their work consists of several aspects: collecting expectations, better understanding of agents' perceptions, but also better presentation of information.

"We are also doing sort of education inside company, through the data visualisation… data-driven approach is REVOLUTION for such company… Company is very traditional, very structured and complex, but we are trying day after day to change the mind of people and their approach" (Manager of data analysts)

The transformation of reporting is going in several directions: methodological, data-driven approach, network analysis; communication new forms of delivery (dashboards or "monitor room"), introduction of storytelling; and data visualisation, video and info-graphics. The aim of DID to add intelligence to the report, but also to "keep it simple and stupid". The reports based on SMD should be easy to read, understand and use. Lot of people inside company are "scared" of numbers and complex models. This transformation tackles not only employees working on new product, improvement of application or communication plan, but also top management of the company.

"Social media is growing channel of communication and we invest a lot… individual education is important… 2 years ago I was not able to use Twitter, now posting each day and reading others… it is a long process for us and our company…"(Head of Communication and member of Management Board)

This long process has been started and working well for communication and marketing areas, where social media information is leading immediate knowledge creation and help with daily activities. The attempt of company to provide knowledge both explicit, though numbers, network and trend analysis, and tacit, communication, meetings. The quality of data is playing important role in these communications and use of SMD in managerial activities across company.

"Social media gives another perspective and we are doing a lot to analyse and provide best information possible… we have specific meetings once in month to define possible indicators and type of report specifically for each department. So we meet with them to understand what they need and what we can provide them for their work." (Head of DID)

However, significant effort and investment in creation of DID and new process of SMD dissemination across company, some of employees stay reluctant and do not use this data in their decision making processes.

> *"The majority of top management do not use social media… It is one of our challenges to spread this knowledge among our colleagues and management." (Head of communication department and part of management board)*

2.4.6 Discussion & Conclusion

The results section has evidenced a complex process for attempting to generate value from SMD across the company. More specifically the second section highlighted variations in understanding and use of SMD by managers, while the third one evidenced the challenges of transforming information into knowledge. Starting from these results and the initial theoretical framework we here propose a revised model for SMD process, where two main revisions are embodied: the pervasive *interaction* and *time* impact.

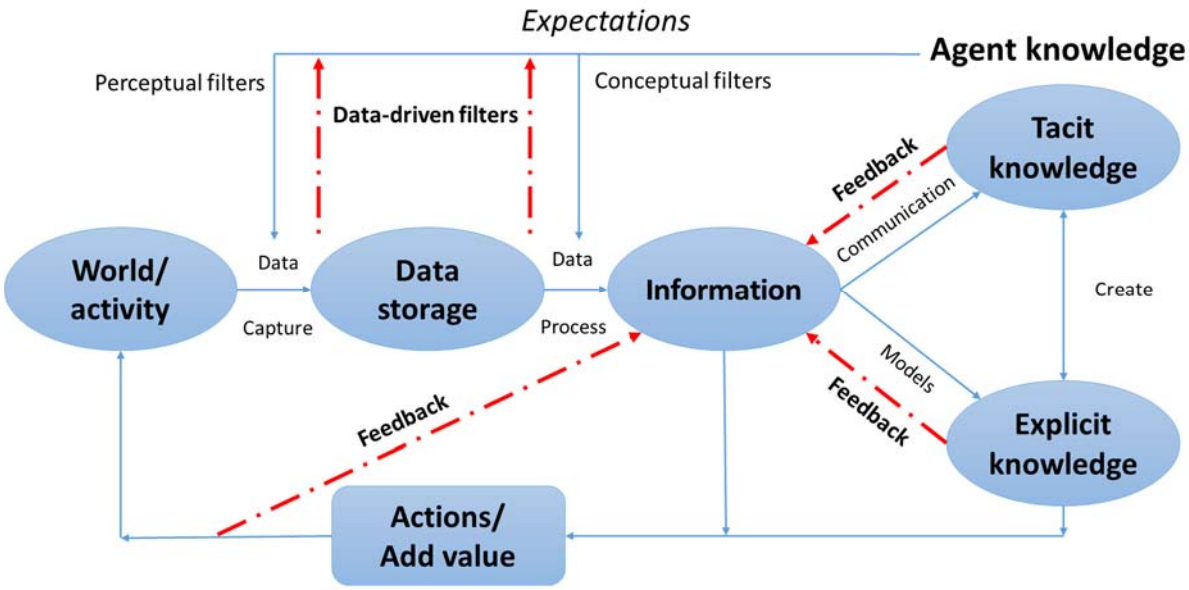

Figure 8: revised framework for SMD

The revised framework highlights that *interaction* plays key role for SMD, represented, though schematically in Figure 3, with the bidirectional links between components of the system, agent and final output, emphasising routes of the information flows: from agent to process, from process to agent, and introducing new supporting elements of relationships (data-driven filters, models and communication modes).

The reasons for the need of higher *interaction* is firstly related to the nature of SMD. Traditional data are in fact based on repetitive financial transaction or operations, from which accountant obtain

financial indicators (e.g. revenues, costs) or non-financial indicators (e.g. delivery time, productivity) based on consolidated models. SMD are instead based on a fuzzy flows of information derived from a variable set of users. Understanding the real need of departments and managers is the only way to get the most useful information, narrowing down the scope and refining the methodology to search and clean data. Another element which leads to an increased interaction is the evolutionary and unstable nature of the processing capability of SMD specialists. The evolution is due on the one hand to the increased knowledge that specialist acquire during the interaction with different business units, for example which topics are relevant for R&D and which frequency of reports delivery is most appropriate. On the other hand, the evolution of processing capability is due to the fast improvement of methodology in collecting data from external sources and text mining, which are still open field also at the academic level (Lee, 2012; Gao et al., 2014; Songchang et al., 2015).

The empirical evidence from the case study highlighted also how the *interaction* is enacted in the attempt to create value. A first level of interaction is searched asking feedback by email or in larger meetings on communication issues, such as visualisation through graphs, charts, understanding of trends and sentiment polarity. This is done for the more general reporting (informative) which is received by a larger audience in the company. The focused interaction is aimed at favouring managers' understanding of the information provided, capturing obstacle filters and then improving communication for their specific needs. Yet this interaction usually does not touch the core of analysis and models.

A deeper interaction is enacted through *focused meetings*, addressing one business area (e.g. marketing, research and development). In the case analysed this mode of interaction was visible in relation to the department reporting. Here the core of data collection, processing and analysis is put under question and discussed since the beginning. Advanced communication tools are used to ensure delivery of analysis based on structured and unstructured information, in particular increase of comments towards objective, polarity of its sentiment, citations of most active users or propositions for improvement. This type of communication fosters creation of the explicit and tacit knowledge. The dialogue between DID and department agents stimulate to refine communication, but at the same time changed perceptions and expectation of agents, shaping the value of SMD both for specialists and users. Further interaction modes emerge in the case of some thorough report in particular crisis management. In this, interaction could be constant and require involvement of larger set of agents, like legal department or public relationships, usually not involved in the process. Here the interaction takes the form of *temporary space,* between physical facility (the open space of DID to cooperate and the monitoring room), employees (data analyst and designers), direct users and advisers (public relationship and legal departments) to trace and interact in real time with SMD.

Regardless the degree of interaction, all modes area favoured by using always facts and fact-building (Latour, 1986) as central in meetings, not to convince actor, but to reshape together data processing and filers of the system relationships. DID leads interaction with department agents and shapes new ideas from extensive analysis of SMD. These new ideas represent data-driven filters based on network analysis, advanced content clustering or mix of approaches. The value of data-driven filters and inclusion into routine report should be approved by department agents, as their value and utility are also not clear to DID and have to be shaped together with user. In parallel, the value of SM is not so obvious for agents, this is why interaction is crucial for creating tacit and explicit knowledge for managers, being unique mode for added value creation.

The second variation emerged from results is relation to *time*. The velocity of SMD is considered one of its major characteristics (Rust and Huang, 2014; Gandomi and Haider, 2015). The case demonstrated a more complex situation, where time and its management needs a broader conceptualisation. There are some uses and users, which needs a constant monitoring, while other ones provide information, considered significant, only when monitored over a month or a year. This situation is originated again by the nature of SMD and two interrelated effects: volume of information, which is in some cases too large, in other cases too small for making analysis; the duration of the decision making cycle, which is sometime prolonged in the social media, due to the need to engage with a community. TELCO showed that the volume of SMD accounts for terabytes of information created by over 7 million of followers only on the proprietary pages of Facebook and Twitter. Furthermore the SMD body of information used by DID department includes not only proprietary pages, but also forums, blogs and other social media platforms. Processing these data, according to specific uses, requires large resource capability that impose choices in the frequency of reporting. On the other hand on some issues or channels the volume of data is not so high to justify a continuous reporting. Hence understanding the *time* dimension for SMD needs careful analysis and intimacy with the social communities. In the case of TELCO, after different experimentation, the resulting situation is that real time monitoring is activated on consolidated issues or for crisis management procedures, medium-term for the marketing campaigns with weekly and monthly duration and large trend and benchmarking analysis for long term periods. This flexibility helps to capture different issues from SMD body of data: immediate reaction on advertisement, trend of attitude towards service, perception by "youth" clients or comparison between results of current and past year.

The *time* variable significantly affects also communication and visualization for agents. In particular the real time monitoring introduce in accounting the "monitoring room", a physical control rooms with screens where operator can constantly watch at signals, which becomes a centre for crisis management.

To conclude, taking as point of reference work of Bhimani and Willcocks (2014) emphasising the role of Big Data and business analytics activities in finance reporting and management accounting consequences, we contribute to the management accounting theory proposing a revised framework for SMD process within organisation, highlighting its particular configuration for knowledge and value creation. We respond to the call of Nguyen et al. (2014) in knowledge acquisition process from SMD and value creation according to different employees' perception, providing a model to connect agent's requirements and information technologies to retrieve tacit and explicit knowledge for further managerial activities. This model helps to overcome the problems of the agent attitude (Vuori and Okkonen, 2012) and increase motivation of agents though delivery of tailored, timely information.

From practitioners perspective this research provide a thorough model for SMD processing, ensuring substantial results and propositions for value creation for different management accounting activities across the company. This overall perspective allows the adoption, application and modification of the model according to diverse requirements of managers and companies. The detailed overview of the reporting procedures and crucial issues of timing and communication, represents a roadmap for the analytics departments or people working with outsourcing agencies.

Further research can extend this study in several ways. In particular, future research can look into the individual agent's characteristics and skills to identify portfolio of SMD open employees. The empirical evidence is provided from proactive user of SMD, different results could be obtained from companies in transition process or from other industry. Another important issues stays uncovered is effectiveness of this innovative information compared to traditional information types.

2.4.7 Reference

Alberghini, E. Cricelli, L., Grimaldi, M. (2014), "A methodology to manage and monitor social media inside a company: a case study", in Journal of Knowledge Management, Vol. 18 Iss 2, pp. 255 – 277.

Andersen, O, Buvik, A. (2012), "Firms' internationalization and alternative approaches to the international customer/market selection", in International Business Review, 11, pp 347–363.

Anderson-Gough, F., Grey, C., & Robson, K. (2005). "Helping them to forget…" the organisational embedding of gender relations in public audit firms", in Accounting, Organizations and Society, 30(5), pp 469–490.

Atkinson, J., Salas, G., Figuerao, A. (2015), "Improving opinion retrieval in social media by combining features-based coreferencing and memory-based learning", in Informatics Science, Vol. 299, pp 20-31.

Bakshy E., Hoffman J.M., Mason W.A., Watts D.J. (2011), "Everyone's an Influencer: Quantifying Influence on Twitter", in proceedings of WSDM'11, Hong Kong, China, available at: http://misc.si.umich.edu/media/papers/wsdm333w-bakshy.pdf (accessed December 2013).

Balahur A. (2014), "Computational approaches to subjectivity and sentiment analysis: Present and envisaged methods and applications", in Computer Speech & Language, Vol.28 (1), pp 1–6.

Balduini, M., Della Valle, E.; Ciuccarelli, P.; Azzi, M., Larcher, R., Antonelli, F., (2015), "CitySensing: Fusing City Data for Visual Storytelling", MultiMedia, IEEE, Volume:22, Issue: 3, pp 44-53, DOI: 10.1109/MMUL.2015.54

Bell G. (2012), "Interview with Marshall Sponder, author of Social Media Analytics", in Strategic Direction, Vol.28(6), pp 32–35.

Bernabé-Moreno, J., Tejeda-Lorente, A., Porcel, C., Fujita, H., Herrera-Viedma, E. (2015), "CARESOME: A system to enrich marketing customers acquisition and retention campaigns using social media information", in Knowledge-Based Systems, Vol. 80, pp 163–179.

Berthon P.R., Pitt L.F., Plangger K., Shapiro D. (2012), "Marketing meets Web 2.0, social media, and creative consumers: Implications for international marketing strategy", in Business Horizons, Vol. 55, pp 261-277.

Bhimani, A. and Willcocks, L. (2014), "Digitisation, 'Big Data' and the transformation of accounting information", in Accounting and Business Research, 44:4, pp 469-490.

Bianchi, C., Andrews, L., (2015), "Investigating marketing managers' perspectives on social media in Chile", in Journal of Business Research 68, pp 2552–2559.

Botha, A., Kourie, D., & Snyman, R. (2008), "Coping with continuous change in the business environment, knowledge management and knowledge management technology" Chandice Publishing Ltd.

Boyd, D. and Crawford, K. (2012) "Critical questions for Big Data", in Information, Communication & Society, 15:5, pp 662-679.

Brambilla, M., Dell'Aglio, D., Della Valle, E., Mauri, A. and Volonterio, R. (2014), "Enriching Live Event Participation with Social Network Content Analysis and Visualization", in The Semantic Web: ESWC 2014 Satellite Events, Lecture Notes in Computer Science 2014, pp 159-170.

Bravo-Marquez, F., Mendoza, M., Poblete, B. (2014), "Meta-level sentiment models for big social data analysis", in Knowledge-Based Systems, Vol. 69 pp 86-99.

Burnett, S., Pedersen, S., Smith, R., and O'Neill, A. (2012), "Venting, joining and educating: Motivations for knowledge sharing in the UK police blogosphere", in Business Information Review, 29, pp 57-63, DOI: 10.1177/0266382112438689

Caputo, A. (2009), "Making the complex simple for better business decisions", in Business Information Review, Vol 26(1), pp 28–34.

Ceron A., Curini L., Iacus S.M., Porro G. (2013), "Every tweet counts? How sentiment analysis of social media can improve our knowledge of citizens' political preferences with an application to Italy and France", in New Media & Society, 1461444813480466.

Chan, H.K., Lacka, E., Yee, R.W.Y., and Lim, M.K. (2015), "The role of social media data in operations and production management", in International Journal of Production Research, DOI: 10.1080/00207543.2015.1053998
Chikandiwa T.S., Contogiannis E., Jembere E. (2013), "The adoption of social media marketing in South African banks", in European Business Review, Vol.25 (4), pp. 365-381.
Cho, Ch.H., Phillips, J.R., Hageman, A.M., Patten, D.M. (2009),"Media richness, user trust, and perceptions of corporate social responsibility", in Accounting, Auditing & Accountability Journal, Vol. 22 Iss 6 pp 933 – 952.
Choi, B. and Jong, A.M. (2010), "Assessing the impact of knowledge management strategies announcements on the market value of firms", in Information & Management 47, pp 42–52.
Choi, S., Park, J. and Park, H.W. (2012), "Using social media data to explore communication processes within South Korean online innovation communities", in Scientometrics, Vol. 90, pp. 43-56.
Chua, A.Y.K and Banerjee, S. (2013), "Customer knowledge management via social media: the case of Starbucks", in Journal of Knowledge Management, Vol. 17 Iss 2 pp. 237 – 249.
Curry, A., and Stancich, L. (2000), "The intranet: An intrinsic component of strategic information management?", in International Journal of Information Management, 20, pp 249-268.
Dale, St. (2014), "Content curation: The future of relevance", in Business Information Review 2014, Vol. 31(4), pp 199–205.
Davison, J. (2009), "Icon, iconography, iconology", in Accounting, Auditing & Accountability Journal, Vol. 22 Iss 6, pp 883 – 906.
Denzin, N. K. (1978), "The Research Act" (2nd ed.), New York: McGraw-Hill.
Denzin, N. K., & Lincoln, Y. S. (2005), "The SAGE handbook of qualitative research", Thousand Oaks: Sage Publications.
Doerflinger, J., Dearden, A., (2013), "Evolving a software development methodology for commercial ICTD projects", in Information Technology and International Development, Vol.9, No.3, pp 43-60.
Dong, J.Q., Wu, W. (2015), "Business value of social media technologies: Evidence from online user innovation communities", in Journal of Strategic Information Systems 24, pp 113–127.
Dutta, S. (2010), "What's Your Personal Social Media Strategy?", in Harvard business review, November 2010, pp.1-5.
Dzvapatsva, G.P., Mitrovic, Z., Dietrich, A.D. (2014), "Use of social media platforms for improving academic performance at Further Education and Training colleges", in Journal of Information Management, Vol.16, No 1, pp 1-7.
Ellison, N.B. and Boyd, D. (2013), "Sociality through Social Network Sites", in W.H. Dutton (Ed.), in The Oxford Handbook of Internet Studies, Oxford: Oxford University Press, pp. 151-172.
Ferrara, E., De Meo, P., Fiumara, G. and Baumgartner, R. (2014), "Web data extraction, applications and techniques: a survey", Knowledge Based Systems, Vol. 70, pp. 301-323.
Freberga, K., Saling, K., Vidoloff, K.G., Eosco, G. (2013), "Using value modeling to evaluate social media messages: The case of Hurricane Irene", in Public Relations Review 39, pp 185– 192.
Gandomi, A. and Haider, M. (2015), "Beyond the hype: big data concepts, methods and analytics", in International Journal of Information Management, Vol. 35, pp.137-144.
Gao, Y., Wang, F., Luan, H. and Chua, T.-S. (2014), "Brand Data gathering from live social media streams", in Proceedings of international conference on multimedia retrieval – ICMR '14, pp. 169–176, DOI: 10.1145/2578726.2578748
Ghose, A., Ipeirotis, P.G., Li, B. (2012), "Designing Ranking Systems for Hotels on Travel Search Engines by Mining User-Generated and Crowdsourced Content", in Marketing Science 31(3), pp 493-520.
Gummerus, J., Liljander, V., Weman, E., Pihlström, M., (2012) "Customer engagement in a Facebook brand community", in Management Research Review, Vol.35 Iss.9, pp.857 – 877.
Gupta A.K., Smith K.G., Shalley C.E. (2006), "The Interplay Between Exploration and Exploitation", in Academy of Management Journal, 49, pp 693–706.

Hargittai, E. (2010), “Digital Na(t)ives? Variation in Internet Skills and Uses among Members of the “Net Generation””, in Sociological Inquiry, 80, pp 92–113.
Hea, W., Zha, Sh., Li, L. (2013) “Social media competitive analysis and text mining: A case study in the pizza industry”, in International Journal of Information Management, 33, pp. 464– 472.
Heath, A.W. (1997), “The proposal in qualitative research”, The Qualitative Report, Vol. 3 No.1, Retrieved December 27, 2011, from http://www.nova.edu/ssss/QR/index.html
Hu, X., Tang, J., Gao, H. and Liu, H. (2013), “Unsupervised Sentiment Analysis with Emotional Signals”, in Proceedings of the 22nd international conference on World Wide Web, pp. 607-618.
James, R. (2011), “Out of the box – A life with rubbish information”, in Business Information Review 28(3), pp 179–183.
Jeacle, I. and Carter, C. (2011), “In TripAdvisor we trust: Rankings, calculative regimes and abstract systems”, in Accounting Organizations and Society, Vol. 36 No.4-5, pp. 293-309.
Jørgensen, B., & Messner, M. (2010), “Accounting and strategising: a case study from new product development”, in Accounting, Organizations and Society, 35(2), pp 184–204.
Justesen, L. and Mouritsen, J. (2009), "The triple visual", in Accounting, Auditing & Accountability Journal, Vol.22 Iss 6, pp 973 – 990.
Kaplan R.S., Norton D.P. (1992), “The balanced scorecards – measures that drive performance”, in Harvard business review, pp 71-79.
Kaplan R.S., Norton D.P. (1996), “Using the Balanced Scorecards as Strategic Management Systems”, in Harvard business review, pp 150-161.
Kaplan R.S., Norton D.P., Rugelsjoen, Bj. (2010), “Managing Alliances with the balanced scorecards – measures that drive performance”, in Harvard business review, pp 114-120.
Kavanaugh, A.L., Fox, E.A, Sheetz, S.D., Yang, S., Li, L.T., Shoemaker, D.J., Natsev, A., Xie, L. (2012), “Social media use by government: From the routine to the critical”, in Government Information Quarterly 29, pp 480–491.
Kietzmann, J. H., Hermkens, K., McCarthy, P., and Silvestre, B. S. (2011), “Social media? Get serious! Understanding the functional building blocks of social media”, in Business Horizons, Vol. 54, pp. 241–251.
Kima, S., Kohb, Y., Chaa, J., Lee, S. (2015), “Effects of social media on firm value for U.S. restaurant companies”, in International Journal of Hospitality Management 49, pp 40–46.
Korschun, D., Du, Sh. (2013), “How virtual corporate social responsibility dialogs generate value: A framework and propositions”, in Journal of Business Research 66, pp 1494.
Kwak, H. Lee, C., Park, H. and Moon, S. (2010), “What is Twitter, a social network or a news media?”, in Proceedings 19th International Conference on World Wide Web, ACM, Raleigh, North Carolina, USA, 2010, pp. 591–600.
Latour, B. (1987), “Science in Action: How to follow scientists and engineers through society”. London. Sage.
Lau, R.Y.K., Li, Liao, St.S.Y. (2014), “Social analytics: Learning fuzzy product ontologies for aspect-oriented sentiment analysis”, in Decision Support Systems 65, pp 80–94.
LaValle, Lesser, Shockley, Hopkins and Kruschwitz, (2011), “Big data, analytics and the path from insights to value”, in MIT Sloan Management Review, Vol. 52(2).
Lee, C.H. (2012), “Unsupervised and supervised learning to evaluate event relatedness based on content mining from social-media streams”, Expert Systems with Applications, Vol. 39 No. 18, pp. 13338-13356.
Levy, M., (2013), "Stairways to heaven: implementing social media in organizations", in Journal of Knowledge Management, Vol. 17 Iss 5 pp 741 – 754.
Li, J., Peng, W., Li, T., Sun, T., Li, Q., Xu, J. (2014), “Social network user influence sense-making and dynamics prediction”, in Expert Systems with Applications, Vol. 41, pp 5115-5124.
Marchand, A., Hennig-Thurau, Th. (2013), “Value Creation in the Video Game Industry: Industry Economics, Consumer Benefits, and Research Opportunities”, in Journal of Interactive Marketing, Vol. 27, Iss. 3, pp. 141-236.

Marres, N. and Weltevrede, E. (2013), “Scraping the social? Issues in live social research”, in Journal of Cultural Economy, Vol. 6 No.3, pp 313-335.
Martini, A., Massa, S., Testa, St. (2014), “Customer co-creation projects and social media: The case of Barilla of Italy”, in Business Horizons 57, pp 425—434.
Masud, L., Valsecchi, F., Ciuccarelli, P., Ricci, D. and Caviglia, G. (2010), "From Data to Knowledge - Visualizations as Transformation Processes within the Data-Information-Knowledge Continuum," in Information Visualisation (IV), 14th International Conference, 2010, pp 445-449.
Matilal, S. and Höpfl, H. (2009), "Accounting for the Bhopal disaster: footnotes and photographs", in Accounting, Auditing & Accountability Journal, Vol. 22 Iss 6 pp 953 – 972.
McAfee, A. and Brynjolfsson, E. (2012), “Big data: the management revolution”, in Harvard Business Review, October, pp. 1-9.
Ngai E. W. T., Li X., and Chau D. C. K., (2009), “Application of data mining techniques in customer relationship management: A literature review and classification”, in Expert Systems with Applications 36, pp 2592–2602.
Ngai, E.W.T., Taoa, S.S.C., Karen K.L. Moon, K.K.L. (2015), “Social media research: Theories, constructs, and conceptual frameworks”, in International Journal of Information Management, Vol. 35, pp 33-44.
Nguyen, T.T., Quan, T.T., Phan, T.T. (2014), "Sentiment search: an emerging trend on social media monitoring systems", in Aslib Journal of Information Management, Vol. 66 Iss 5 pp. 553 – 580.
Nikolopoulos S., Zafeiriouc S., Patras I., Kompatsiaris I. (2013), “High order pLSA for indexing tagged images”, in Signal Processing, Vol.93, Iss.8, pp 2212-2228.
Nonaka, I. (1994), “A dynamic theory of organization knowledge creation", in Organization Science, Vol. 5 No. 1, pp. 14-37.
Paltoglou, G. and Thelwall, M. (2012), “Twitter, MySpace, Digg: Unsupervised Sentiment Analysis in Social Media”, in ACM Transactions on Intelligent Systems and Technology, Vol. 3 No. 4, pp 1-19.
Panagiotopoulosa, P., Shanb, L.Ch., Barnettc, J., Regand, A., McConnon, A., (2015), “A framework of social media engagement: Case studies with food and consumer organisations in the UK and Ireland”, in International Journal of Information Management 35, pp 394–402-
Patton, M. Q. (2004), “Qualitative research & evaluation methods”, Thousand Oaks: Sage.
Phang, C.W., Zhanga, Ch., Sutanto, J., (2013), “The influence of user interaction and participation in social media on the consumption intention of niche products”, in Information & Management, Vol.50, Iss.8, pp. 661-672.
Raford, N. (2015), “Online foresight platforms: Evidence for their impact on scenario planning & strategic foresight”, inTechnological Forecasting & Social Change 97, pp 65–76.
Ranaweera, Ch., Jayawardhena, Ch. (2014), “Talk up or criticize? Customer responses to WOM about competitors during social interactions”, in Journal of Business Research 67, pp 2645–2656.
Risius, M., Beck, R. (2015), “Effectiveness of corporate social media activities in increasing relational outcomes”, in Information & Management 52, pp 824–839.
Russell, A.D., Chiu, Ch.-Y., Korde, T. (2009), “Visual representation of construction management data”, in Automation in Construction 18, pp 1045–1062.
Sebate, F., Berbegal-Mirabent, J. Cañabate, A. and Lebherz, P.R. (2014), “Factors influencing popularity of branded content in Facebook fan pages”, in European Management Journal, Vol.32 No.6, pp 1001-1011.
Shelton A.K., Skalski P. (2014), “Blinded by the light: Illuminating the dark side of social network use through content analysis”, in Computers in Human Behaviour, Vol.33, pp 339-348.
Sidorova, Y., Arnaboldi, M., Radaelli, J. (2015), “Social Media and Performance Measurement Systems: towards a new model?”,In International Journal of Productivity and Performance Management, forthcoming.
Snead, J.T. (2013), “Social media use in the U.S. Executive branch”, in Government Information Quarterly, Vol. 30 No.1, pp 56-63.

Songchang, J., Wangqun, L., Hong, Y., Shuqiang, Y., Aiping, L.,·Bo D. (2015), "Community structure mining in big data social media networks with MapReduce", in Cluster Comput 18, pp 999–1010.
Speier, Ch. (2006), "The influence of information presentation formats on complex task decision-making performance", in International Journal Human-Computer Studies 64, pp 1115–1131.
Stoddart, L. (2012), "Emerging leadership opportunities and new roles for knowledge professionals", in Business Information Review, 29(4), pp 215–220.
Suddaby, R., Saxton, G.D., and Gunz, S. (2015), "Twittering change: The institutional work of domain change in accounting expertise", in Accounting Organizations and Society, Vol. 45, pp 52-68.
Swani, K., Brown, B.P. and Milne, G.R. (2014), "Should tweets differ for B2B and B2C? An analysis of Fortune 500 companies' Twitter communications", in Industrial Marketing Management, Vol. 43 No. 5, pp 873-881.
Tomas, G. and Hult, M. (2003), "An integration of thoughts on knowledge management", in Decision Sciences 34(2), pp 189–195.
Tumasjan A., Sprenger T. O., Sandner P. G. and Welpe I. M. (2010), "Predicting Elections with Twitter: Whan 140 Characters Reveal about Political Sentiment", in 4th International AAAI Conference on Weblogs and Social Media (ICWSM).
van Dam, J.W. and van de Velden, M. (2015), "Online profiling and clustering of Facebook users", in Decision Support Systems, Vol. 70, pp 60-72.
Vercellis, C. (2009), "Business Intelligence, in Business Intelligence: Data Mining and Optimization for Decision Making", John Wiley & Sons, Ltd, Chichester, UK.
Vuori, V. and Okkonen, J., (2012) ,"Knowledge sharing motivational factors of using an intra-organizational social media platform", in Journal of Knowledge Management, Vol. 16 Iss 4 pp 592 – 603.
Wang Sh. and Lin J.Ch. (2011), "The effect of social influence on bloggers' usage intention", Online Information Review, Vol.35, No.1, pp 50-65.
Willcocks, L. and Whitley, E.A. (2009), "Developing the Information and Knowledge Agenda in Information Systems: Insights From Philosophy", in The Information Society, 25:3, pp 190-197.
Xianghua, F., Guo, L., Yanyan, G. and Zhiqiang, W. (2013), "Multi-aspect sentiment analysis for Chinese online social reviews based on topic modeling and HowNet lexicon", in Knowledge Based Systems, Vol. 37, pp. 186-195.
Yigitbasioglu, O.M and Velcu, O. (2012), "A review of dashboards in performance management: Implications for design and research", in International Journal of Accounting Information Systems 13, pp 41–59.
Yin R.K. (2014), "Case study research: Design and methods" (5th ed.), Thousand Oaks, Calif.: Sage.