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Exploring use and benefit of corporate social software: Measuring success in the Siemens case References+

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Abstract

Purpose – To measure the success of corporate social software (CSS), interviews, surveys, content and usage data analysis have been commonly used in practice. While interviews and surveys are only capable of making perceived use and benefits transparent, usage data analysis reveals many objective facts but does not allow insights into potential user-benefits. Hence, the purpose of this paper is to link both perspectives to advance CSS success measuring.

Design/methodology/approach – The research case is References+, a Corporate Social Software developed at Siemens to facilitate worldwide sharing of knowledge, experiences, and best practices since 2005. References+ currently has around 15,000 registered members located in more than 80 countries. This paper evaluates results from a user survey with nearly 1,500 responding employees and links all survey results to the corresponding participant's data on platform use to generate additional insights.

Findings – The paper generates findings on how CSS is used in practice and how it is perceived by employees of a large-scale enterprise. Furthermore, it explores how a combination of subjective and objective evaluation methods can be applied to advance the state-of-the-art in measuring use and benefits. By linking CSS usage data to corresponding survey data, the paper provides results on what type of use of CSS may create what type of benefit.

Practical implications – This study encourages practitioners to take advantage of a variety of instruments for measuring the benefits of CSS. It generates numerous arguments for practitioners on how to make the benefit of CSS more transparent to financial-oriented decision-makers to successfully defend knowledge management projects against shrinking IT budgets.

Originality/value – This paper is one of the first attempts to explore the relationship between "perceived use" and "perceived benefits" measured by surveys and "factual use" measured by CSS usage statistics for knowledge management research. The findings of this paper may empower the role of user surveys in generating additional insights on use and benefits.

Keywords Knowledge management, Measurement, Knowledge sharing, Social software, Enterprise 2.0, Information system

Paper type Case study

1. Introduction and motivation: the rise of corporate social software

The Word Wide Web has undergone a tremendous paradigm shift: it has transformed from a Web of passive, information-consuming users to Web 2.0, which is, to a very large extent, co-created by its active content publishers. As a matter of fact, the social

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dimension of Web 2.0 (O'Reilly, 2005) has become equally important as its technical dimension, as people have generated vast amounts of information on the Web in a self-organized way, is driven by their joy of use. They create, share and modify Web content, thereby becoming more and more connected to like-minded persons participating in virtual communities and social networks.

The huge success of Web 2.0 platforms in sharing data, information and knowledge has inspired corporate knowledge managers (Panahi *et al.*, 2013, Paroutis and Al Saleh, 2009; Razmerita *et al.*, 2009; Roblek *et al.*, 2013; Schneckenberg, 2009). Soon, organizations started to investigate and use the potential of Web 2.0 within their intranets. They aim to facilitate knowledge sharing and social networking by adopting successful concepts, applications and technologies of Web 2.0. Hence, an ongoing transformation has begun in enterprises, while intranets are becoming ecosystems similar to the Web. Corporate social software (CSS) is a commonly used and accepted umbrella term for Web 2.0-based information systems (ISs) in organizations.

Archetypes of CSS have been heavily investigated in the past to learn more about their corporate adoption, including wikis (Majchrzak *et al.*, 2006; Arazy *et al.*, 2009; Stocker *et al.*, 2012a), blogs (Efimova and Grudin, 2007; Kosonen *et al.*, 2007; Stocker *et al.*, 2008), microblogs (Müller and Stocker, 2011; Stocker *et al.*, 2012b) and social networking services (Richter and Koch, 2008; Richter and Riemer, 2009). Researchers have used a series of instruments to investigate occurring phenomena when social software is implemented in an organization, including observations, interviews, surveys, data analyses and case studies. Amongst those phenomena, *use* and *benefit* (Holtzblatt *et al.*, 2012; Kügler and Smolnik, 2013; Majumdar *et al.*, 2013) are vital subjects of research.

The scientific community has published a series of models and theories to better understand how IS *use* and *benefit* are created and which factors have the highest influence on them. Among them, the technology acceptance model from Davis (1989) and the ISs success model from DeLone and McLean (1992 and 2003) have been studied further in CSS adoption. Both models are often used as a foundation to establish instruments for measuring social software success in terms of *use* and *benefit* (Kügler *et al.*, 2015; Hsu and Lin, 2008; Steinhüser *et al.*, 2012; Richter *et al.*, 2013b).

However, measuring *use* and *benefit* of CSS is still at an early stage. There are many reasons for this: first, there are only few mature long-term cases, where CSS has evolved and been used over time to a sufficient extent to allow a significant benefit to be generated for individuals and their organization. Even fewer case studies provide real evidence on benefits generated by using information shared in CSS. As it is challenging for project managers to argue benefits generated from CSS to senior management in a practical and understandable way, numerous projects have been canceled because of shrinking IT budgets. This makes it difficult for researchers to find mature long-term cases for further in-depth investigation. This is where the wheel comes full circle.

Against this background, we define the research scope of our paper as follows:

- First, it provides a literature review on CSS, citing relevant cases where *use* and/or *benefit* have been the focus of research.
- Second, it introduces the Siemens case References+, where practical instruments for measuring *use* and *benefit* of CSS have been applied since 2005.

- Third, it aims to demonstrate within the Siemens case how two different approaches for measuring *use* and *benefit* can be linked in a meaningful way and discuss the lessons learned.

To advance success measurement, our paper will link research data generated by a large-scale survey of CSS users with research data collected via these users' CSS usage statistics to investigate interesting patterns between perceived and factual phenomena. In other words, we will link data on employees' *perceived use* and *benefit* with data on their *factual u*se. Our results may empower responsible knowledge managers to better understand and to better illustrate the success of CSS in terms of *use* and *benefit* to their senior management. In the long term, our research could enable a higher number of mature case studies when CSS will receive a better chance to win the war for shrinking IT budgets.

In this introduction, we have provided an overview of the initial situation, motivation and research goals. The remainder of our paper is structured as follows: Section 2 provides a literature review on IS success and studies on CSS *use* and *benefit*. Section 3 continues with a presentation of our research approach and outlines our research questions. Section 4 presents our research results, and Section 5 discusses them as well as the limitations of our contribution. Section 6 concludes the paper.

2 Literature review

2.1 Success/benefit of information systems

IS researchers have created a number of models to explain and measure IS success. Various perspectives and system types were taken into account (Gable *et al.*, 2008; Grover *et al.*, 1996; Seddon *et al.*, 1999). In response to a great number of publications, Larsen (2003) developed a taxonomy of antecedents of IS success by surveying, synthesizing and explicating existing work in the domain.

One of the most prominent approaches is the technology acceptance model (TAM) (Davis, 1989), which explains why some ISs are more accepted by users than others. The underlying assumption is that perceived usefulness and perceived ease of use determine an individual's intention to use a system which serves as a mediator of actual system usage. The model's parsimony has contributed to its widespread adoption in IS research (Bagozzi, 2007).

The TAM has been continuously refined and expanded, with one of the most significant adaptations being the unified theory of acceptance and use of technology (UTAUT) (Venkatesh *et al.*, 2003). The UTAUT posits four constructs (performance expectancy, effort expectancy, social influence and facilitating conditions) as direct determinants of usage intention and behavior.

Another dominant model in IS success measurement is the IS success model (DeLone and McLean, 1992). The model provides a taxonomy of IS success originally consisting of six variables: system quality, information quality, use, user satisfaction, individual impact and organizational impact. In a follow-up work, the authors revised the original model and added service quality as a construct (DeLone and McLean, 2003). The update also addressed the criticism that an IS can affect levels other than individual and organizational (Seddon *et al.*, 1999) and replaced individual and organizational impact with net benefits. Despite the model's popularity, there are some points of criticism which led to revisions and extensions (Ballantine *et al.*, 1996; Seddon, 1997). While some

researchers modified the model to evaluate success of specific applications, others extended it, for example, to measure e-commerce systems success (Molla and Licker, 2001).

In conclusion, the aforementioned models have been widely used and adapted by IS researchers to understand and measure the dimensions of IS success. However, the models have been found to be more a useful framework for organizing IS success measurements than an instrument to measure the success of an IS in concrete organizational settings (Petter *et al.*, 2012). Moreover, success in these models is usually measured through self-reported variables (Legris *et al.*, 2003) and typically collected before adoption takes place. However, the usefulness and potential role of a system for one's work practice cannot be determined easily and anticipated *a priori* because of its flexibility and lack of in-built purpose (Richter and Riemer, 2013c). Because these theories do not account for this fact, they are not applicable for explaining user adoption or the success of enterprise social networks (Richter and Riemer, 2013d). Moreover, there is a missing congruence of the organization's and user's benefits. These models focus predominantly on single aspects, do not take into account concrete organizational use cases and therefore lack the applicability in practice. In addition, most of the scientific approaches do not take concrete business value metrics into account.

The authors do not want to omit the fact that there are different practical approaches to IS success measurement, especially in the new field of social media. Forrester Consulting (2010), for example, released a study about the total impact of social software and illustrated its impact using available data and selected financial measures (e.g. costs, benefits). The major findings are that social software leads to "incremental gross revenue from new products and products brought to market faster" and that employees benefit from the "ability to find and share information". A recent study by McKinsey & Co. provided similar results and showed that enterprise internal social software applications can lead to efficiency gains of up to 90 per cent (Mattern *et al.*, 2012). However, these studies and approaches lack of a valid theoretical and scientific basis and can only be seen as indicators (Richter *et al.*, 2013a).

2.2 Use and benefit of corporate social software

A series of terms have been used to explain the paradigm shift occurring in the enterprise, ranging from Enterprise 2.0 as coined by McAfee (2006) to social enterprise/organization (Bradley and McDonald, 2011) or even social business (Holtzblatt *et al.*, 2012). The concepts behind these terms usually build upon the principle of (almost) every employee becoming not only a consumer but also a producer of content. Similar to the Web 2.0 phenomenon, employee-generated content is supposed to spread quickly in corporate intranets, making them more and more social, in analogy to the Social Web, a term often used as a synonym for Web 2.0. Social Media is another term regularly used for Web 2.0-based phenomena and determined by identity, conversations, sharing, presence, relationships, reputation and groups (Kietzmann *et al.*, 2011). Some researchers even classify social media into more specific categories, including collaborative projects, blogs, content communities, social networking sites, virtual game worlds and virtual social worlds (Kaplan and Haenlein, 2010). Supporting the concepts of Web 2.0 and social media requires a set of software tools, i.e. some kind of social software supporting human interaction, communication and collaboration. Hence, CSS

or enterprise social software (ESS) is an ideal umbrella term to include the "technical" part of the socio-technical phenomenon.

Table I provides an overview of knowledge management using CSS with respect to attempts of measuring *use* and *benefit*.

Drawing a conclusion from our literature review, we can state that previous research has mainly applied single methods and theories and triangulation to compare results. However, there has been no direct link between the generated research data, e.g. between the results of an online survey or interview and the usage statistics of a particular survey participant to generate additional findings. A discussion of *perceived use* and *benefit* with *factual use* and *benefit* to facilitate success measuring was not in the scope of any of the papers listed in the table above.

3. Research design

3.1 Research method and questions

Measuring *use* and *benefit* of CSS plays a major role in information and knowledge management, not only because managers increasingly need to justify their investments in information technology and human resources. In practice, either a user survey or a usage data analysis is commonly applied to evaluate the success of CSS. This results in a methodical limitation, which we want to outline further:

- While usage statistics provide insights into the hard facts of CSS *use*, they do not reveal the *benefit* generated for individuals and their organization. Therefore, assessing the *benefit* of platform use through usage statistics is to a large extent a matter of interpretation. However, practitioners argue that a higher *factual use* frequency reported by usage statistics also implies a higher organizational benefit.
- CSS user surveys may reveal *perceived benefits* if users are surveyed accordingly, but these are subjective individual aspects. An organizational benefit of CSS may then only be an accumulation of all reported perceived individual benefits. However, even if survey respondents perceive an individual benefit, they may be biased. There is naturally no rigorous quantification in terms of a return on investment (ROI).

Against this background, we suggest to use not only a single method for exploring *use* and *benefit* of CSS but at least a combination of two, e.g. a survey and a corresponding usage data analysis. Such an approach is also performed in this paper, allowing the exploration of a series of research questions (RQs) on CSS success measuring in terms of *use* and *benefit*:

RQ1. How can surveys and usage data analysis be applied in practice to measure *use* and *benefit* of CSS?

RQ2. How do survey results on *use* and *benefit* of CSS correlate with *factual use* as revealed through usage statistics analysis?

RQ3. What can be learned for CSS success measuring in terms of *use* and *benefit* evaluation when surveys and usage statistics are combined?

Our research questions are especially motivated by the fact that calculating an ROI can be facilitated by surveys, at least in a practical situation, as they make it possible to refer

Authors	Paper scope	Research approach	Key findings
Behrendt *et al.* (2014)	Mixed method analysis of enterprise social networks	Literature review, conceptual framework development	Insights can be derived from different data dimension–combinations can improve validity of analysis
Herzog *et al.* (2013)	Investigate methods and metrics for measuring success	26 interviews with persons responsible for social software	Success measuring mainly focused on analysis of use
Holtzblatt *et al.* (2012)	Evaluate uses and benefits of a social business platform	63 in-depth interviews, log data from 4600+ users, online survey	Level and type of participation affects where users experience a benefit
Kügler *et al.* (2015)	Investigate relationship between use and performance	Testing of hypotheses via survey at media company with 523 respondents	Use influences performance through improved task performance and employee innovation
Kügler and Smolnik (2014)	Identify social software use behaviors	Data from 223 employees using social software in the enterprise	Conceptualization of four distinctive use behaviors: consumptive use, contributive use, hedonic use and social use
Lehner and Fteimi (2013)	Reflection of state of the art on success of social software in a business context	Review of papers investigating the contribution of social media to success.	Findings on how success has been measured and which theories and models are used predominantly
Levy (2009)	Provide understanding of Web 2.0 and its impact on knowledge management	Literature review	Web 2.0 is close to knowledge management in principles and attributes
Majumdar *et al.* (2013)	Explore how managers use social software in the enterprise	Analysis of semi-structured interviews with managers	Information, communication, and organization benefits are major benefits of use
Meske and Stieglitz (2013)	Examine adoption, usage and benefits of social software in small- and medium-sized enterprises (SMEs)	Survey of decision-makers in German SME	SME started to use social software to support collaboration and to improve knowledge management
Nedbal *et al.* (2012)	Models for measuring social software success	Modification of IS success models	Existing models do not represent all relevant dimensions
Richter *et al.* (2013d)	Propose a novel approach to measure enterprise social network success	Framework development and demonstration in a case study	Use case-based approach for success measuring applied in a real case

Table I.
Literature review on use and benefit of CSS

(*continued*)

Authors	Paper scope	Research approach	Key findings
Steinhüser *et al.* (2012)	Models for measuring success of social software	Model development based on theory and multiple-case study	Existing success models are not able to represent all relevant dimensions
Stocker *et al.* (2012a)	Investigate the appropriation of Enterprise wikis	Multiple-case study with interviews and surveys	Help to understand how wikis support working practices
Stocker *et al.* (2012b)	Illustrate findings on implementation, use and benefits of enterprise microblogging	Cross-case analysis of three different case studies on enterprise microblogging	Findings on how and why enterprises implemented microblogging, along with a wide variety of benefits generated
Zhao and Chen (2013)	Study enterprise knowledge sharing using social networks in a quantitative perspective	Social network analysis and interviews	Show potential of social network analysis for quantifying knowledge-sharing practices

Table I.

to specific types of user benefits. But what still remains unexplored is whether and how reported *perceived use* and *benefit* match the *factual use* of a particular CSS at all.

To sum up, we focus on three key concepts in our exploration:

(1) *perceived use* (as measured by a user survey);

(2) *perceived benefit* (as measured by a user survey); and

(3) *factual use* (as measured by corresponding usage statistics).

We are not able to measure *factual benefit* as a potential valuable fourth key concept because we do not know any mechanism to do so (Table II).

3.2 Research case and data: the Siemens community platform References+

3.2.1 Background information on References+. References+ – called References@BT until February 2012 – is a well-known case for CSS used for knowledge management (Müller, 2007; Müller and Stocker, 2011; Müller *et al.*, 2012). The primary goal of References+ is to make core business knowledge and the corresponding experts available within Siemens more quickly. References+ does not attempt to provide a knowledge base that is complete in terms of scope and content. Instead, its scope is more about social networking to connect employees across organizational, hierarchical and geographical boundaries to stimulate direct communication. The use of References+ is entirely voluntary, and currently, there are no business processes that force employees to use it. References+ includes comprehensive functions to search contributions by full-text queries and metadata, to subscribe to new or modified contributions via e-mail notifications and RSS feeds, as well as social networking features such as "following" other community members. References+ content includes four main types of content: Knowledge References, discussion forums, microblog postings and profile pages.

- *Knowledge References* are structured information objects containing multiple text, number and metadata fields. They describe customer projects, product and solution modules, services, best practices cases and lessons learned. All Knowledge References have been examined and released by a Content & Community Administrator to ensure high-quality content. Most project contributions are assigned to geographic coordinates. This allows visualizing the location of a certain project or the distribution of certain search results on an online map. Furthermore, users can post feedback related to a particular knowledge reference that is visible to all other readers. This feedback contains an optional rating on a scale of 0 to 5, indicated by the number of stars, in addition to a textual comment.
- *Discussion forums* allow users to exchange information about technological or functional topics. In the very popular Urgent Requests forum, employees can ask business-related questions about products, technologies, compatibilities, customers, contacts, etc. About 90 per cent of these questions receive one or several replies within the first 24 h.
- *Microblogging* in References+ is similar to Twitter, Yammer, Socialcast, Chatter or comparable tools. It is aimed at facilitating open communication and social networking about topics relevant to the core business. An in-depth evaluation of microblogging was published by Müller and Stocker (2011).
- A *member page* is similar to a profile page on other social networking platforms (such as LinkedIn). It displays the user's name, organization, place of work, current local time, phone numbers, e-mail address, an optional "About Me" text field, an optional photo and up to seven self-assigned fields of expertise. Most user data are synchronized regularly with the Siemens' employee directory, eliminating the need for manual updates. If desired, the "About Me" field can be used to enter personal information relevant for the business, such as title, field of work and expertise. Each registered member can assign him/herself up to seven skill attributes, which describe certain "fields of expertise" of an employee (e.g. Web Application Development). In addition, each user can propose such skill attributes toward other users and can endorse already assigned skill attributes of other colleagues.

3.2.2 Research data. We explored two research data sets on a singular level, as well as a combination of both:

(1) The *first research data set* was generated from an online survey conducted in August/September 2011 to which 1,479 registered References+ users

	Subjective investigation method	Objective investigation method
Explored property of CSS	Perceived use (e.g. by user survey)	Factual use (e.g. by usage data analysis)
	Perceived benefit (e.g. by user survey)	Factual benefit (−)

Table II.
Method mix for CSS use and benefit exploration

responded. As the responsible knowledge manager aimed to explore and quantify the ROI of platform usage in a practical way, the survey included questions on usage, helpfulness, saved working time, saved money, additional turnover generated and additional customers attracted by using the information shared in References+ (as shown in the respective table in the Appendix). Finally, platform users had to rate the overall helpfulness of References+.

(2) The *second research data set* is a compilation of the corresponding platform usage data of all survey respondents. The time span from which the user statistics were extracted ranged from the launch of References+ in 2005 to the survey date in September 2011, where applicable. A respective table in the Appendix presents the attributes used to link survey results to associated usage data. Because the online survey used References+ as the platform, the *user_id* of each survey respondent could be traced, enabling us to link survey answers to the corresponding usage data in the References+ database.

4. Results: findings on perceived and/or factual use and benefit

4.1 Exploring perceived use *and* benefits *through a user survey*

User surveys are periodically conducted to investigate *perceived use* and *benefit* of References+, a CSS tool accessible to all employees within the Siemens' intranet. Our research is based on the user survey conducted between August 26 and October 10, 2011 which resulted in 1,479 completed questionnaires. Table III illustrates selected survey results by displaying the number of respondents for every survey answer option.

Perceived use of References+ ranges from almost daily (140), a minimum of one time weekly (341), a minimum of one time monthly (371) to less than monthly (627). Perceived helpfulness ranges from very helpful (146), predominantly helpful (222) and partially helpful (805) to not helpful at all (306). Overall, References+ is rated very good (281), good (610), average (231) and insufficient (57) by the surveyed employees. A series of concrete user benefits have been surveyed, including perceived saved time, saved money, new turnover and new customers gained by participating in References+ and applying the information found there.

4.2 Exploring factual use *through usage statistics analysis*

The *factual of use* of References+ was revealed by a corresponding usage statistics analysis of all 1,479 survey respondents. Activity figures include usage data from the first login of a survey participant until the survey deadline.

During this period, the usage data of all 1,479 captured survey respondents correspond to a total of 83,303 activity days in References+, 35,810 visited Knowledge References, 7,200 total contributions and 3,169 "following" relationship. The majority of survey respondents are located in Germany (340), Switzerland (301), USA (131), Austria (63), India (48), The Netherlands (44), Canada (39), China (39), UK (39), Italy (31) and Belgium (31).

Table IV presents selected aspects of the investigated *factual use* of survey respondents. This table provides only a snapshot of the usage traces of the 1,479 survey respondents. The factual use of References+ in total is much higher as the user community is not limited to survey participants. Measuring the total factual use of a CSS requires cumulating the electronic traces of all platform users.

Explored property of CSS	*N*	*n* (%)
Usage frequency		
Almost daily	140	9
Minimum weekly	341	23
Minimum monthly	371	25
Less than monthly	627	42
Helpfulness		
Very helpful	146	10
Predominantly helpful	222	15
Partially helpful	805	54
Not helpful	306	21
Overall rating		
Very good	281	19
Good	610	41
Average	231	16
Insufficient	57	4
No rating given	300	20
Saved time		
Several days	123	8
One day	144	10
One/several hours	437	30
None	775	52
Saved money		
More than € 10,000	9	1
€1,000 . . . 10,000	79	5
€0 . . . 1,000	202	14
None	1189	80
New turnover		
More than €1m	3	0
€100,000 . . . 1m	17	1
€10,000 . . . 100,000	51	3
€0 . . . 10,000	109	7
None	629	43
Not relevant for me	670	45
New customers		
3 or more	47	3
2	56	4
1	108	7
0	673	46
Not relevant for me	595	40

Table III.
Perceived use and benefit measured by the user survey with 1,479 respondents

4.3 Comparing perceived use and benefits with factual use

We present three types of comparisons linking *factual use* of References+ to *perceived use* and *benefit*, as shown in the Table V.

4.3.1 Perceived use and factual use. Linking *perceived use* of survey respondents to *factual use* of survey respondents, we explore whether CSS users with a higher *perceived*

use read and/or create more content than those with a lower *perceived use* on the platform. We therefore compare *perceived use* of References+ with different modes of *factual use*, including number of activity days, number of visited Knowledge References, number of contributions and number of initial followers. For that purpose, the usage statistics data are clustered into four user groups: daily, weekly, monthly and sporadic users gained from the survey. Then minimum, maximum, average and total values are calculated for these users to provide a solid basis for analysis. Finally, average values are used to compare *perceived use* to *factual use*.

Table VI generated as described above reveals the following: the 140 employees who indicated in the survey they use References+ almost daily generated an average of 90 days of activity, visited an average of 46.88 Knowledge References, generated an average of 8.09 contributions and had an average of 3.29 followers, i.e. people following them on References+.

The table above shows a general trend: CSS users reporting a higher *perceived use* most likely also have a higher *factual use*. However, daily and weekly users (*perceived use*) do not differ in their overall *factual use*. Interestingly, weekly users (*perceived use*) generate more contributions to References+ (*factual use*) than daily platform users. Perceived daily and weekly users have similar factual platform use in terms of activity days, visited Knowledge References and number of followers.

Table IV. Factual use measured by usage statistics of 1,479 survey respondents (2005-2011)

Property	Factual use of survey respondents # days with access	# visited Knowledge References	# contributions	# followers
Total	83303	35810	7200	3169
Minimum	1	0	0	0
Maximum	1064	1490	597	85
Average	56.32	24.21	4.87	2.14

Table V. Comparison of perceived use and helpfulness to factual use

Perceived *use* and *benefit* compared with	Factual *use*
Perceived use of survey respondents	*Factual use: Average number of…*
Daily	Activity days
Weekly	Visited knowledge references
Monthly	Contributions
Rarely	Followers
Perceived helpfulness (perceived benefit)	*Factual use:* Average number of…
Very helpful	Activity days
Predominantly helpful	Visited knowledge references
Partially helpful	Contributions
Not helpful	Followers
Perceived overall rating (perceived benefit)	*Factual use:* Average number of…
Very good	Activity days
Good	Visited knowledge references
Average	Contributions
Insufficient	Followers

4.3.2 Perceived benefit (helpfulness) and factual use. Linking perceived helpfulness (*perceived benefit*) to *factual* use, we investigate whether CSS users with a higher *perceived benefit* read and/or create more content than those with a lower *perceived benefit*. Hence, we compare the *perceived helpfulness* of References+ users as reported by the survey with different modes of *factual use* including average number of activity days, average number of visited knowledge references, average number of contributions and average number of followers from the usage statistics. To achieve this, the usage statistics data of survey respondents were clustered into the four groups from the survey that rated platform usefulness as very helpful, predominantly helpful, partially helpful or not helpful (Table VII).

According to Table VII, users reporting References+ to be very helpful in the survey (*perceived benefit*) are in fact those with a higher number of average activity days (*factual use*). They visit a comparably higher number of knowledge references, provide more contributions and have more followers (*factual use*). The table reveals a significant difference between employees rating the platform as very helpful and those rating it predominantly helpful (*perceived benefit*) in terms of visited knowledge references and number of contributions (*factual use*).

4.3.3 Perceived benefit (overall rating) and factual use. Linking perceived overall rating (*perceived benefit*) to *factual use*, we finally research whether employees reporting a higher overall rating of CSS (*perceived benefit*) read and/or create more content (*factual use*) than those with a lower rating. Hence, we compare the overall rating of References+ (*perceived benefit*) with the *factual use* of survey respondents, including number of days active on the platform, number of visited knowledge references, number of contributions and number of followers. To achieve this, the usage statistics data were again clustered into four user groups from the survey who indicated an overall rating of very good, good, average or insufficient (Table VIII).

Table VI. Perceived use compared to factual use (2005-2011)

	Perceived and factual use of survey respondents			
Explored property of CSS	Almost daily	Weekly	Monthly	Seldom
Factual use of survey respondents				
# respondents	140	341	371	627
∅ activity days	90.03	89.11	51.70	33.70
∅ visited KRs	46.88	46.87	23.72	7.12
∅ contributions	8.09	11.34	3.37	1.52
∅ followers	3.29	3.32	1.99	1.33

Table VII. Perceived helpfulness (perceived benefit) compared to factual use (2005-2011)

	Perceived helpfulness and factual use of survey respondents			
Explored property of CSS	Very helpful	Predominantly helpful	Partially helpful	Not helpful
Factual use of survey respondents				
# respondents	146	222	805	306
∅ activity days	85.27	76.80	53.95	33.90
∅ visited KRs	72.87	47.28	15.51	7.16
∅ contributions	11.99	7.54	4.25	1.16
∅ followers	3.39	2.42	2.23	1.10

Table VIII reveals a similar finding: employees with a higher perceived overall rating of the platform (*perceived benefit*) have more activity days, visit more knowledge references and have more followers (*factual use*). *Perceived benefits* correlate with the *factual use* of CSS users in a positive way. However, there is a respectable difference between users rating References+ as very good and those rating it as good (*perceived benefit*) in terms of visited knowledge references and number of contributions (*factual use*).

5. Discussion and limitation

The main purpose of our paper is to explore what kind of insights two different approaches for making *use* and *benefit* transparent for success measuring can provide – in particular when they are linked. We had the lucky opportunity to benefit from data generated by both a large-scale user survey and corresponding usage data analysis at Siemens. Our paper is one of the first attempts of studying the relationship between *perceived use* and *perceived benefit* as revealed through a CSS user survey and *factual use* through collecting the respective electronic traces of all survey participants on the CSS and then establishing a link between survey answers and usage data.

After having shown how surveys and usage data analysis can be applied in practice to measure the success of CSS in terms of *use* and *benefit* (answering *RQ1*), we reported in detail how survey results on *use* and *benefit* correlate with factual platform use at Siemens (answering *RQ2*). In a nutshell, our research generated three additional findings of interest, which we will discuss further:

- CSS users with a high *perceived use* according to their survey answers are actually IS users with a high *factual use* according to their usage statistics. CSS users with a low *perceived use* are actually IS users with a lower *factual use*. Hence, surveys are a feasible instrument to investigate the *use* of a CSS and complement usage data analysis because the ratings users provide in a survey are represented in their electronic traces on the IS. The success in terms of *perceived use* of a CSS is actually linked to a higher usage frequency in terms of reading, writing and social behavior.
- CSS users who, according to their survey answers, perceive the IS to have a high degree of helpfulness (*perceived benefit*) are actually IS users with a high *factual use* according to their usage statistics. CSS users perceiving a lower *benefit* are actually users with a lower *factual use*. Hence, IS success in terms of perceived helpfulness of a CSS is linked to a higher usage frequency in terms of reading, writing and social behavior.

Table VIII. Perceived overall rating (perceived benefit) compared to factual use (2005-2011)

Explored property of CSS	Perceived overall rating and factual use of survey respondents: Very good	Good	Average	Insufficient
Factual use of survey respondents				
# respondents	281	610	231	57
∅ activity days	93.26	61.19	36.09	25.07
∅ visited KRs	46.68	28.24	14.94	8.30
∅ contributions	15.57	3.43	2.05	1.12
∅ followers	4.25	1.89	1.80	1.18

- CSS users with a high overall rating (*perceived benefit*) of the IS according to their survey answers are actually IS users with a high *factual use* according to their usage statistics. CSS users with a lower overall rating (*perceived benefit*) are actually IS users with a lower *factual use*. The success in terms of perceived overall rating of a CSS is linked to a higher usage frequency in terms of reading, writing and social behavior, too.

Our research generates a series of lessons learned (answering *RQ3*). User surveys are a common instrument to obtain quantitative feedback on usefulness and helpfulness of a CSS. They might also reveal information on the ROI of a CSS if relevant questions are included, which has been done in this case. However, it should be noted for further analysis and discussion that survey results always reflect the subjective views of the respondents only. Nevertheless, by using a high number of survey replies, a tendency could be derived by calculating average or median values. Based on the results of this paper, linking survey results to usage statistics is highly recommended when aiming to measure the ROI in a more robust way, as perceived use and benefits gained from the survey will then be complemented with results on *factual use* from the usage statistics analysis. The arguments presented by community managers regarding the success of a CSS can be strengthened against the background of financial limitations through more hard facts.

Several limitations of the study results are noteworthy: all findings are generated from a single case, the Siemens' community platform References+, which affects their generalizability. Not all data on platform use of potential research interest could be collected because of technical restrictions. Uncollected but potentially relevant data includes, for instance, the number of views on various References+ content types, e.g. viewed microblog posts and viewed discussion forum posts. The survey design has a practical background and therefore lacks scientific robustness. This affects both the content of the survey questions and the modes of answering them, e.g. no Likert scale was used in the survey. Some survey questions address time savings and monetary aspects, which were of particular interest to management. We know that this approach, while practicable, does not fully conform to the principle of scientific rigor as participants may be unable to quantify *perceived benefit* with regard to monetary aspects, savings or additional customers. However, the main intention of this practitioner-oriented survey at Siemens was to explore user participation and *perceived benefit* as key performance indicators for community management. Therefore, a simplified questionnaire with a few closed but crucial practical questions was chosen to ensure a higher survey return rate.

6. Conclusion and outlook

Our paper wants to provide a contribution to measuring the success of CSS in terms of *use* and *benefit* often associated with the term ROI in practice. We explore whether and how survey results on *perceived use* and *benefit* of a CSS correlate to the factual use of this platform. Starting with a literature review on CSS citing relevant cases where use and/or benefit were within the scope of research, we introduce the prominent Siemens' case References+ where instruments to measure use and benefit have been applied in a practitioner-oriented way since 2005. By accessing data from a large-scale user survey performed in 2011 and a corresponding usage

data analysis, we link data on *perceived use* and benefit to data on factual use to generate additional findings.

Although differences between the user groups are not always very prominent, the findings signal a general trend: it is more likely that employees who report a higher use and/or higher benefit of corporate software are employees who are more active, read and create more content and have more followers. While we compared platform adoption from perceived to factual aspects, future research could be conducted in the other direction, too, exploring whether employees with more platform interaction perceive higher use and benefits as well.

Our research aims to encourage practitioners to use a wider variety of instruments and techniques for measuring the success of CSS and generate numerous arguments for making the benefit of CSS transparent to management and other interested stakeholders.

Future research should investigate approaches for measuring the factual benefit of a platform, e.g. by trying to link factual platform use to factual platform benefit. A feasible approach could be to compare the key performance indicators of projects which are represented on the CSS through more content and social interaction to those which attracted less content and interaction by linking References+ projects to the financial data within the Siemens ERP system.

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Further reading

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Appendix

Online survey questions

(1) How often do you use References+?
- almost daily
- min. one time, weekly
- min. one time, monthly
- less than monthly

(2) How helpful is References+ in your daily work?
- very helpful
- predominantly helpful
- partially helpful
- not helpful

(3) How much working time did you save (in the last 365 days) by using information found in References+?
- several days saved
- one day saved
- one or several hours saved
- no time savings

(4) How much money did you save (in the last 365 days) by using information found in References+?
- more than €10,000 saved
- €1,000 … €10,000 saved
- €0 … €1,000 saved
- o money savings

(5) How much additional business turnover did you generate (in the last 365 days) by using information found in References+?
- more than €1 million in additional turnover
- €100,000 … €1 million in additional turnover
- €10,000 … €100,000 in additional turnover
- €0 … €10,000 in additional turnover
- no additional turnover
- I cannot directly influence turnover

(6) How many additional customers did you attract (in the last 365 days) by using information found in References+?
- 3 or more additional customers
- 2 additional customers
- 1 additional customer
- no additional customers
- I don't have direct contact with customers

(7) What is your overall rating for References+ and the related administration team?
- very good
- good
- average
- insufficient
- I don't want to give a rating.

Table AI. Usage data (from launch of References+ until the date of the user survey)

Present status of user and user account (as of March 2013)	
Office location (city, country)	Organizational unit
Registration date	Date of last visit
Account active/inactive	Photo uploaded (true/false)
# characters in "About me" field	# participating in other major internal social media platforms
Usage data (2005–September 2011)	
# of days with access to References+	# of visited Knowledge References
# of contributions	# of followers and following

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