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Self-Service Business Intelligence (SSBI): Categorizing into Dimensions of Interest in Scholarly Literature

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Abstract

Self-Service Business Intelligence (SSBI) is discussed in the practitioner community for about ten years. Nowadays, it is regarded as one of the most important trends in Business Intelligence. In this article, it is examined how the concept of SSBI has been considered in scholarly literature until now. With the help of a systematic literature search, it was possible to identify 19 articles in total that are focused on this topic and have been published until the end of 2014. On this base, we investigate which aspects constitute the SSBI approach. For this, the articles were analyzed conducting a frequency analysis. The identified terms of interest can be divided into five dimensions: Technology, data, presentation, social feature, and overall requirements. In addition, we show how to express in simply on which dimensions are mainly discussed in each article.

Keywords: *Self-Service Business Intelligence, Systematic literature search, Frequency analysis*

1. Introduction

Business Intelligence (BI) systems are the most important computer-based information source for many years to get insights and support for strategic decisions. With their help, data are processed that are integrated from different sources (Hamilton, 2009). While these systems in the past are mainly used to deliver standard reports to the strategic management, they are increasingly also used to answer operational inquiries (Böhringer et al., 2010). As an additional factor of change, data sources like social media systems and machine sensors have been added to BI systems that differ from traditional data in their structure and their amount (McAfee and

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Brynjolfsson, 2012). These developments lead to a greater variety of requests of a more heterogeneous user group brought to the report authors. Due to their operational issues, these requests are often time critical and exceed the capacity of the IT department (Henschen, 2013).

The above mentioned changes have resulted in the development of Self-Service BI (SSBI). Users of different business areas and different ranges of expertise are able to access a variety of multi-structured data that can be used to create individual information. The IT department is no longer used as intermediary between data and end user (TDWI, 2007).

The exact rise of the SSBI concept is hard to identify. This is because it cannot be clearly separated from other approaches. Enabling knowledge workers to create reports autonomously was already discussed in the early 1990s (Eckerson, 2005). Nevertheless, this is not the same approach as the self-service concept that is discussed in recent years. In the past, power users with a strategic orientation were in focus of these systems. Nowadays, it is the goal to empower as many employees as potentially necessary to perform analyzes independently, timely and unlimited.

The earliest practitioner article in the SSBI context that could be identified was published in June 2005 by The Data Warehouse Institute (TDWI) (Eckerson, 2005), the leading organization in the area of education and research for practitioners, among other areas with a focus on Business Intelligence (www.tdwi.org). In this paper, changes in the architecture from client/server to web applications are identified as the most important aspect to enable a distribution of BI systems in the whole organization. Also in the subsequent years, TDWI frequently publishes articles in this context that emphasize the continuing relevance of the topic (e,g., Eckerson, 2009; Imhoff and White, 2011; Stodder, 2015).

In recent years, different practitioner studies have been carried out in the SSBI context. In a survey conducted on the TDWI World Conference in 2013, 54 percent of the participants stated that they already use SSBI, 37 percent planned to implement it in the next years (Russom, 2013). A similar question was asked by the Business Application Research Center (BARC) in 2014. As a result, 55 percent of the participants stated that they already use SSBI and 23 percent plan to implement it in the next years. Along with Operational BI, SSBI is identified as the strongest trend in BI (BARC, 2014). Gartner expects that by 2017 the majority of business users have access to self-service applications (Gartner, 2015).

The aim of this paper is to perform a systematic literature search to identify which scholarly articles are published in the SSBI context. By conducting a frequency analysis, we can discover which aspects constitute the topic and categorize them into dimensions. We can also classify the identified articles to point out their field of contribution.

2. Systematic literature search

The literature search was conducted in July 2015. All peer-reviewed scientific articles have been taken into account that were published until the end of 2014. In the first step we searched for the terms "Self-Service Business Intelligence" and "Self-Service BI" in various search engines (Google Scholar, EBSCOhost, JSTOR, Science Direct, and Springer Link). Only articles in English language were taken into account. Articles, in which the search terms were only found in the bibliography and written in other languages, were not considered.

In total, it was possible to identify 61 articles. The oldest one was published in 2008. Figure 1 shows the number of articles found, grouped by the year of publication. It can be seen that the topic has gained a growing attention in the last years. A detailed list of the articles can be found in the appendix.
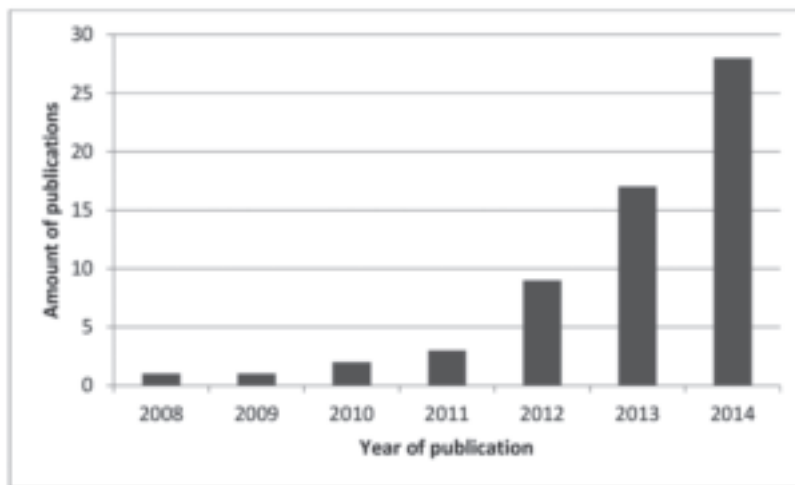

Figure 1. *Amount of scholarly publications using the term "Self-Service Business Intelligence" or "Self-Service BI".*

The articles were reviewed to identify related terms in the context of SSBI. These are shown in Figure 2. With the help of these terms, again a search for scholarly articles was carried out with the same search engines.
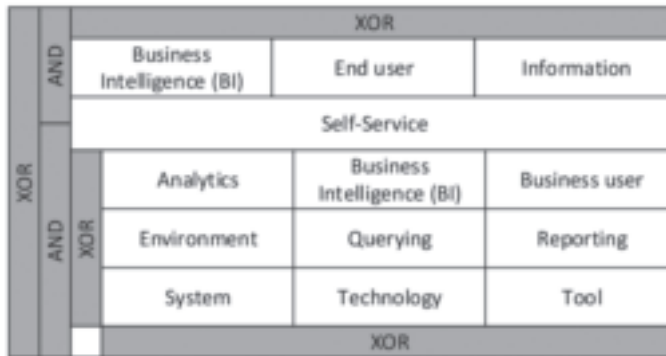
		XOR		
XOR	AND	Business Intelligence (BI)	End user	Information
		Self-Service		
	AND / XOR	Analytics	Business Intelligence (BI)	Business user
		Environment	Querying	Reporting
		System	Technology	Tool
		XOR		

Figure 2. *Search strings used in the literature search.*

Through this extended search dozens of articles could be identified, however mostly of them were not in the context of decision support systems. Some have considered this area only marginally. What most of these articles have been concerned is the basic idea of giving people the opportunity to act independently in a particular area without the assistance of experts. Frequently surveyed areas include end user self-service in digital library systems (e.g., Han and Goulding, 2003), in banking (e.g., Prendergast and Marr, 1994), or in customer service (e.g., Durbin et al., 2002). Within companies, self-service systems have been used in the Human Resources Department. In order to increase productivity in this area, employees are enabled to access and edit information such as their personal data, business trip co or viewing their salary details by themselves (e.g., Hawking et al., 2004).

For articles that focus on decision support systems, additional literature investigation was done. The articles were independently assessed by both authors to identify relevant researches in the SSBI context. The result of the selection process was consistent. Of course, a joined assessment of articles with a related focus was done afterwards to make sure for consensus.

In total, 19 articles with a strong focus on SSBI from the viewpoint of decision support system could be identified, see Figure 3 for an overview. Again, a detailed list of the identified articles can be found in the appendix.
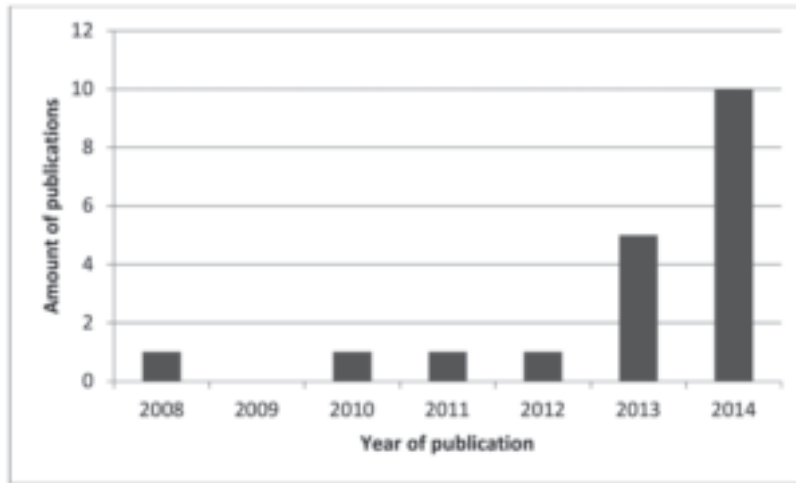
Figure 3. *Amount of publications focusing on SSBI.*

3. Frequency Analysis and categorization of relevant terms

On the basis of the identified articles, a frequency analysis was carried out. This is done by counting different record units and compare their frequency of occurrence. The aim of this research is to assess the importance of identified units in the examined context (Bos and Tarnai, 1999). In this case, an additional purpose was to find dimensions that constitute the SSBI approach.

The process of our frequency analysis based largely on the recommendations of Weber (1990). Figure 4 shows the steps performed in the analysis. As a record unit, we have chosen single word as well as frequently occurring combinations of words. In a first step, we omitted only a coarse categorization, because it lead to find dimensions that can be derived objectively. A category scheme was as follows; terms which were transferred their original form to nominalize in case it is possible and meaningful.

Our coding rules and identified dimensions have been adjusted in several iterations. As the aim was to find the terminology that is suitable to identify topic areas in the context of SSBI, terms were ignored during the coding process (1) that are due to the focus of the literature search included in all articles (e.g., self-service) and (2) that are not suitable to emphasize the particularity of the research focus (e.g., information technology, decision making).

Terms that indicate just users were also removed from the result set because they are observed in all articles, thus it is regarded not useful for a classification of research topics. Nevertheless, the frequency appearance of words that refer to users is noticeable. In total, 33 different terms

could be identified. About one quarter of the entries are general and could not be assigned to a user group. Another quarter could be assigned to the user group *BI specialists* that are users who are either technically specialists that can implement BI systems or data scientists whose job it is to create insights. The remaining half, nineteen articles, can be assigned to the user group *business users* that are users who are normally specialists in certain business areas but not specialists in the use of decision support systems (See Table 1). This highlights the fact that a technically unskilled user is in focus of the SSBI concept.

The texts were coded computer based and were then manually checked. It caused to make clean the result set from mistakes that have been stem from different meanings of a word. In addition, it enabled to distinguish words that are used in a sense that do not match to the meaning of the assigned dimension. Codes, which could not be identified automatically due to the use of abbreviations, have been added manually.
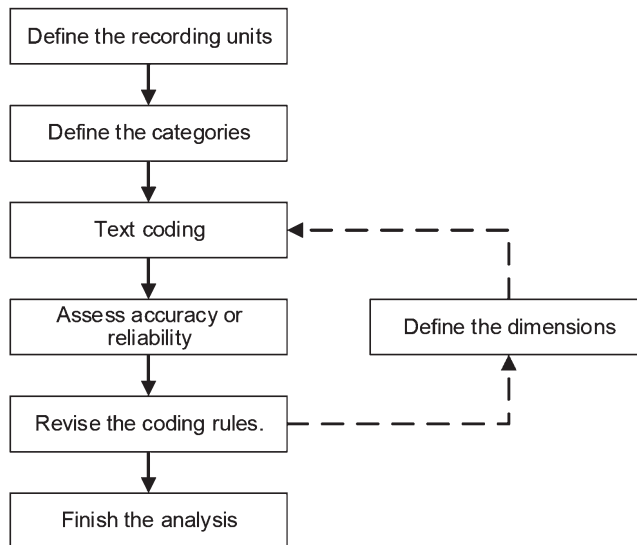

Figure 4. *Procedure for the frequency analysis on the basis of Weber (1990).*

In total, it was possible to identify five dimensions that were in focus in previous scholarly studies from the viewpoint of SSBI context. These are shown in Figure 5, together with those terms that were identified as most frequently used (after a normalization of the articles length).

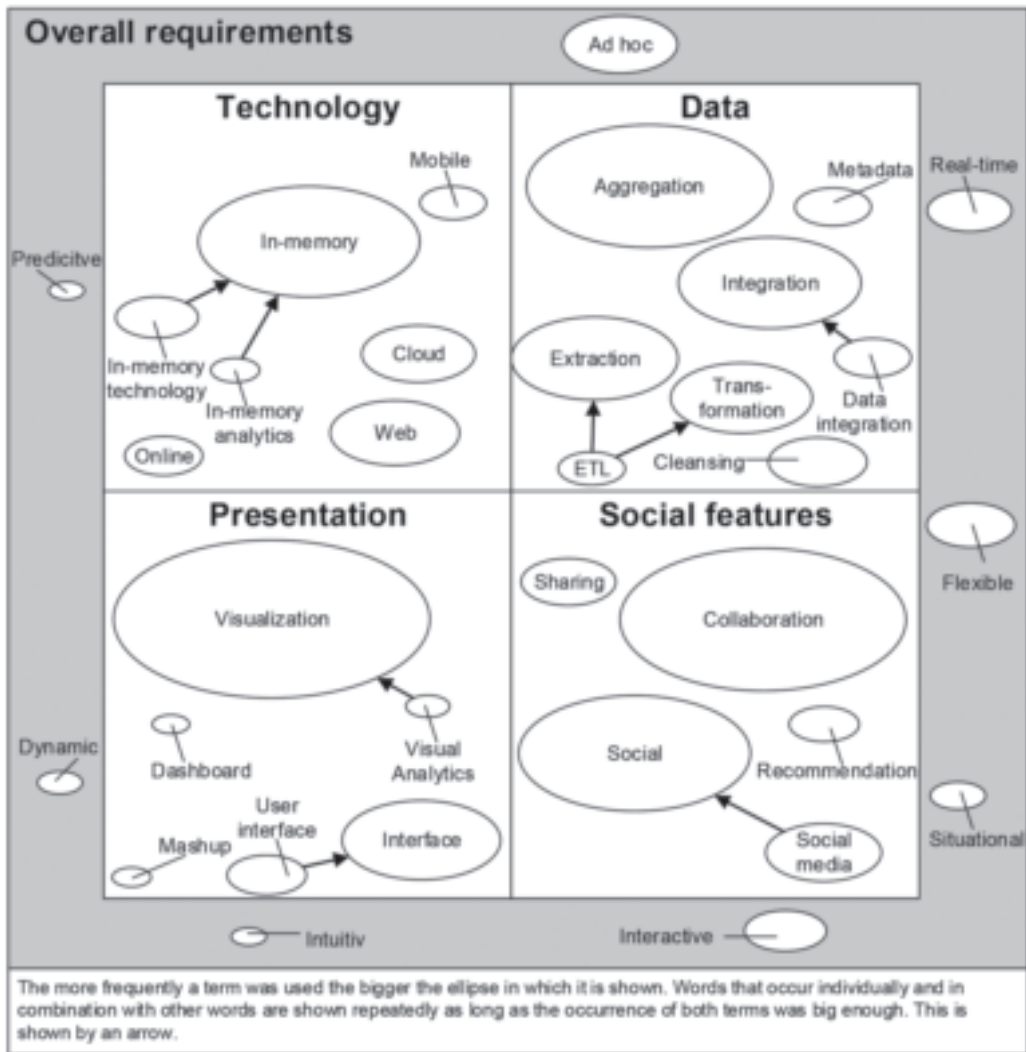**Figure 5.** *Important dimensions and terms identified by the frequency analysis.*

Based on the five identified dimensions and the most frequently used terms in these articles were categorized to identify their main field of contribution. The results can be seen in Table 1. The dimensions and what they focus on are presented as follows. They are expressed in simple way on which dimensions are mainly discussed in each article.

Year	Author(s)	Subject	Used terms containing the word *Self-service* (SS)		Overall requirements	Data	Social features	Technology	Presentation
2008	Spahn et al.	Architecture for information self-service	Information SS		○	·	·	·	●
2010	Berthold et al.	Collaborative decision making	End user SS Information SS SS-query		○	○	●	·	·
2011	Acker et al.	In-memory analytics	Online SS SS-access SSBI		○	·		●	·
2012	Liu et al.	Collaborative decision making systems	SSBI SS-Support		·	·	●	·	·
2013	Abelló et al.	Data integration	SSBI SS-query		○	●	○	·	·
2013	Naish	Cloud-based self-service analytics	SS-analytics SS-interface		·	·	·	●	·
2013	Sulaiman et al.	BI architecture	Information SS SSBI SS-Business User		●	○	○		○
2013	Yu et al.	Requirements modeling	SSBI SS-Tool		●	·	·	·	·
2013	Zaghloul et al.	Self-service data analytics framework	SS-analytics SS-business analytics	SSBI SS-data analytics	·	●	·	·	○
2014	Burnay et al.	Self-service Systems	SSBI SS-system					●	●
2014	Goeken et al.	In-memory technology	Management support systems SS SS analysis SS information systems SS in-memory apps	SS access Manager SS	○		·	●	·
2014	Horvath et al.	Analysis of medical data	SS access SS data access portal SS enterprise data delivery	SS query interface SS query tool SS querying	·	●	·	·	○
2014	Mayer et al.	Design of Management Support Systems	SS Management supp. systems User SS SS information system		●	·	·	○	○
2014	Morton et al.	Visual analytics	SS visual analytics		·	○	·	·	●
2014	Nimmi et al.	Cube design	SSBI		·	●	○		
2014	Poonnawat and Lehmann	Business simulation games	SSBI		●	·	○	○	○
2014	Savinov	Data integration	SS-analytical data integration SS-analytics SS-tool		·	●	·		○
2014	Stone and Woodcock	Interactive marketing	BI SS tool SSBI SS-technology	SS tool SS user	●	·	○	○	·
2014	Zilli	Higher Education Management	SSBI		·	●	●	·	●

The circles show the proportion of identified terms per dimension. The dimension(s) that is (are) strongest emphasized is (are) marked black.

Table 1. *Categorization of scholarly articles focused on SSBI.*

The technology dimension is less driven by the requirements of BI systems but can be seen more as an enabler that helps implementing new ideas. Acker et al. (2011) discuss if an integration of operational and analytical databases become possible by implementing an in-memory architecture. The implementation of a cloud-based self-service analytical system is presented by Naish (2013). Their solution can be used to analyze official statistics. Goeken et al. (2014) have conducted a literature research and a workshop among experts with the goal to define guidelines for the development of management support systems. One of the identified focus lie on the need for self-service information systems.

In the data dimension, mainly traditional topics of data provisioning for BI systems are of relevance which must be adapted to the changed conditions. Abelló et al. (2013) have developed an approach with which data that are needed only by a few people for a short amount of time can be integrated in multidimensional structures. Niemi et al. (2014) have examined how summation in a relational database can be done to integrate data into multidimensional structures. Even though, this article can be clearly assigned to the data dimension, there is only a small amount of used words included in the list of most frequently used terms. This is because a very specific topic is considered in this research. Zaghloul et al. (2013) have developed a framework that makes possible self-service analytics. Horvath et al. (2014) have developed a solution to analyze patient data in a self-service query tool. Savinov (2014) presents a conceptual approach to enable users integrating data without technical experience.

As a consequence of the increased data volume used in BI systems and the additional, partially inexperienced user groups, it became necessary to simplify the usability of frontends to make analyzes possible and to minimize the danger of drawing wrong decisions. Spahn et al. (2008) presents an architecture that enables business users to easily access data and create queries. The challenges of visual analysis conducted by users without education in data science are studied by Morton et al. (2014).

The social features dimension is in comparison to the aforementioned a new area for BI systems. To meet the increased demands of empowered users it is necessary to find solutions that help them by identifying and evaluating relevant information. Berthold et al. (2010) presents a general architecture to identify areas that should be developed to enable ad hoc and collaborative decision making. Liu et al. (2012) have conducted the only quantitative study that could be identified in the context of SSBI. They have examined factors that influence collaborative decision making. One of the defined constructs was *self service support,* which was assumed to influence the *social media intelligence utilization and the social BI utilization*. While the first assumption was confirmed, it was not able to validate the second assumption.

Besides the aforementioned concrete characteristics on the SSBI environment, it was possible to

identify demands that are intangible and that have to be considered in every step of implementation. Yu et al. (2013) focus on requirements modeling techniques in the BI context. They identify SSBI as one important challenge. In the article by Sulaiman et al. (2013) a BI architecture is presented with which business users are given the opportunity to independently exercise their ideal analysis. This can be made possible by extracting knowledge of power users and provide it as suggestion during analyzes by business users. The focus of the article by Mayer et al. (2014) is on self-service management support systems. The authors identify design principles that are proven by a case study. Poonnawat and Lehmann (2014) provide a framework for business simulation games with which the usage of decision support systems can be teached. Stone and Woodcock (2014) have studied how BI can be used in interactive marketing. They emphasize that marketing users have to get the possibility to use self-service functionalities.

For two of the articles it was not possible to assign them clearly to one of the dimensions. For both, only a small amount of identified words was in the list of most frequently used terms derived by the frequency analysis. Burnay et al. (2014) have presented a general discussion on self-service systems with the focus on how they should be designed and which challenges they place to the requirements engineering. They mainly concentrate on SSBI systems. Zilli (2014) discuss a SSBI system and key performance indicators for the employment in higher education management.

4. Conclusion

An examination of practitioner literature can show the great relevance of the SSBI concept. With the help of a systematic literature search in the scholarly field, it was possible to identify 19 articles in total that focusing on this topic.

The earliest scholarly article that could be identified was published in 2008 (Spahn et al., 2008) and thus three years after the earliest practitioner article that was found (Eckerson, 2005). This shows that the concept of SSBI is relatively new. Its increasing relevance can be seen by the fact that the number of scholarly publications in this context has increased significantly in the years 2013 and 2014.

Performing a frequency analysis, it was possible to structure relevant terms in the context of SSBI into five dimensions that were focused in previous scholarly research. By this classification we could identify which aspects are of relevance in the field of SSBI: (1) technology, that enables practitioners and scientists to seek for new BI architectures, (2) data, that differs in its structure and amount from traditional systems, (3) the simplification of data presentation in the frontend, that is needed on the one hand because of the changed data base and on the other

hand because of the heterogeneous and empowered user groups, (4) social features, that are added as a new component of BI systems, to support employees cooperation, and (5) overall requirements, that are mainly caused by the changed analytical goals.   In addition, we show the way to express in simply on which dimensions are mainly discussed in each article.

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Appendix – Results of the literature search

(1) Articles, that are presented in Figure 1; (2) Articles, that are presented in Figure 3

Year	Author(s)	Title	Publication	Used in	
				(1)	(2)
2008	Spahn, M., Dorner, C. and Wulf, V.	End User Development of Information Artefacts: A Design Challenge for Enterprise Systems	Proceedings of the European Conference on Information Systems, Paper 190	X	
2008	Spahn, M., Kleb, J., Grimm, S. and Scheidl, S.	Supporting Business Intelligence by Providing Ontology-Based End-User Information Self-Service	Proceedings of the 1st International Workshop on Ontology-Supported Business Intelligence		X
2009	Panian, Z.	Return on Investment in Business Intelligence in Small and Mid-Sized Businesses	Proceedings of the Applied Computing Conference	X	
2010	Berthold, H., Rösch, P., Zöller, S., Wortmann, F., Carenini, A., Campbell, S., Bisson, P. and Strohmaier, F.	An Architecture for Ad-hoc and Collaborative Business Intelligence	Proceedings of the EDBT/ICDT Workshops, Article No. 13	X	X
2010	Gupta, V. and Saxena, A.	Personalized Data Set for Analysis	International Journal of Database Management Systems 2(4): 37-44	X	
2011	Acker, O., Gröne, F., Blockus, A. and Bange, C.	In-Memory Analytics – Strategies for Real-Time CRM	Journal of Database Marketing & Customer Strategy Management 18: 129-136	X	X
2011	Ghenea, Ş.	From ERP to Data Mining on the Web	UPB Scientific Bulletin Series C 73(4): 89-98	X	

Year	Author(s)	Title	Publication	Used in	
				(1)	(2)
2011	Priebe, T., Reisser, A. and Hoang, D.T.A.	Reinventing the Wheel?! Why Harmonization and Reuse Fail in Complex Data Warehouse Environments and a Proposed Solution to the Problem	Proceedings of the 10th International Conference on Wirtschaftsinformatik	X	
2012	Duma, L. and Orosz, I.	Information Technology Systems in Logistics and Roles of ERPs	IEEE 13th International Symposium on Computational Intelligence and Informatics, 115-121	X	
2012	Jandoš, J.	On Business Intelligence SaaS Solution	Systémová Integrace 2: 32-41	X	
2012	Liu, L., Kim, K. and Sun, W.	An Empirical Research of Factors Affecting Collaborative Decision Making System	International Journal of Hybrid Information Technology 5(4):1-9	X	X
2012	Nedunchezhian, P., Moorty, V.V. and Thirunavukkarasu, P.D.	A Survey on Integrating Business Intelligence with Cloud Computing	International Journal of Applied Information Systems 3(2): 9-13	X	
2012	Němec, R.	The Application of Business Intelligence 3.0 Concept in the Management of Small and Medium Enterprises	Proceedings Information Technology for Practice 2012: 84-89	X	
2012	Roshan, K., Sripada, S., Srinivasulu, C., Upadhayaya, N. and Govardhan, A.	SQL Server Failover Clustering	Computer Science & Information Technology: 119-127	X	
2012	Seguran, M., Senart, A. and Trastour, D.	remix: A Semantic Mashup Application	On the Move to Meaningful Internet Systems, Workshops, 312-315	X	
2012	Stefanova, K. and Kabakchieva, D.	Management Aspects of the Business Intelligent Systems Development	Economic Alternatives 1: 46-61	X	
2012	Stipić, A. and Bronzin, T.	How Cloud Computing is (not) Changing the Way we do BI	Proceedings of the 35th International Convention MIPRO: 1574-1582	X	
2013	Abelló, A., Darmont, J., Etcheverry, L., Golfarelli, M., Mazón, J.-N., Naumann, F., Pedersen, T. B., Rizzi, S., Trujillo, J., Vassiliadis, P. and Vossen, G.	Fusion Cubes: Towards Self-Service Business Intelligence	International Journal of Data Warehousing and Mining 9(2): 66-88	X	X

Year	Author (s)	Title	Publication	Used in (1)	Used in (2)
2013	Baars, H. and Zimmer, M.	A Classification for Business Intelligence Agility Indicators	Proceedings of the 21st European Conference on Information Systems	X	
2013	Franceschini, M.	How to Maximize the Value of Big Data with the Open Source SpagoBI Suite Through a Comprehensive Approach	Proceedings of the VLDB Endowment 6(11):1170-1171	X	
2013	Kabakchieva, D., Stefanova, K. and Yordanova, S.	Latest Trends in Business Intelligence System Development	Proceedings of the 3rd International Conference on Application of Information Communication Technology and Statistics in Economy and Education	X	
2013	Kaur, G.	Business Intelligence as a Competitive Advantage	Shiv Shakti International Journal in Multidisciplinary and Academic Research 2(5): 1-8	X	
2013	Mrdalj, S.	SQL Server Tabular Model: A Step Towards Agile BI	Issues in Information Systems 14(1): 331-338	X	
2013	Muntean, M., Surcel, T.	Agile BI – The Future of BI	Informatica Economică 17(3): 114-124	X	
2013	Muntean, M., Surcel, T.	A Perspective on the Elements that Promote an Agile BI Solution	Proceedings of the IE 2013 International Conference	X	
2013	Naish, A. G.	Cloud-Based Self Service Analytics	Proceedingsof the 59th World Statistics Congress		X
2013	Pondel, M.	Business Intelligence as a Service in a Cloud Environment	Proceedings of the 2013 Federated Conference on Computer Science and Information Systems, 1269-1271	X	
2013	Schwertner, K.	Modern Information Technology (IT): Factor for Business Efficiency and Business Driver	Journal of Modern Accounting and Auditing 9(8): 1131-1139	X	
2013	Shadi, S.A. and Mustafee, N.	Business Intelligence in NHS WALES	Prceedings of the UK Academy for Information Systems Conference, Paper 33	X	
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2013	Yu, E., Lapouchnian, A. and Deng, S.	Adapting to Uncertain and Evolving Enterprise Requirements – The Case of Business-driven Business Intelligence	Proceedings of the 7th International Conference on Research Challenges in Information Science	X	X
2013	Zaghlou, M.M., Ali-Eldin, A. and Salem, M.	Towards a Self-Service Data Analytics Framework	International Journal of Computer Applications 80(9): 41-48	X	X
2013	Zeng, J. and Zhang, J.	Using Dashboards for Lean Revenue Cycle Management	iBusiness 5(3): 100-103	X	
2013	Zeng, J. and Zhang, J.	Visual Data Discovery to Support Patient Care	Proceedings of the International Conference on Smart Health, 66-70	X	
2014	Baars, H., Felden, C., Gluchowski, P., Hilbert, A., Kemper, H.-G. and; Olbrich, S.	Shaping the Next Incarnation of Business Intelligence - Towards a Flexibly Governed Network of Information Integration and Analysis Capabilities	Business & Information Systems Engineering 1: 11-16	X	
2014	Baaziz, A. and Quoniam, L.	How to Use Big Data Technologies to Optimize Operations in Upstream Petroleum Industry	International Journal of Innovation 1(1): 30-42	X	
2014	Burnay, C., Gillain, J., Jureta, I.J. and Faulkner, S.	On the Definition of Self-Service Systems	Proceedings of the 1st International Workshop on Conceptual Modeling in Requirements and Business Analysis	X	X
2014	Chen, C.L.P., Zhang, C.-Y.	Data-intensive Applications, Challenges, Techniques and Technologies: A Survey on Big Data	Information Sciences 275: 314-347	X	
2014	Chen, Z., Narasayya, V., Chaudhuri, S.	Fast Foreign-Key Detection in Microsoft SQL Server PowerPivot for Excel	Proceedings of the VLDB Endowment 7(13): 1417-1428	X	
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2014	Guster, D., Robinson, D., Brown, C.G., Rice, E.P.	Advanced Application of Business Intelligence in Higher Education: Predictive Modeling	Journal of Information Technology Management 25(1): 54-78	X	
2014	Hänel, T., Schulz, M.	Is There Still a Need for Multidimensional Data Models?	Proceedings of the 22nd European Conference on Information Systems	X	
2014	Horvath, M. M., Rusincovitch, S. A., Brinson, S., Shang, H. C., Evans, S., Ferranti, J. M.	Modular Design, Application Architecture, and Usage of a Self-service Model for Enterprise Data Delivery: The Duke Enterprise Data Unified Content Explorer (DEDUCE)	Journal of Biomedical Informatics 52, 231-242		X
2014	Kaufmann, J. and Chamoni, P.	Structuring Collaborative Business Intelligence: A Literature Review	Proceedings of the 47th Hawaii International Conference on System Science	X	
2014	Khumalo, M. and Buckley, S.	Building Sustainable Business Intelligence Systems by Integrating User-centred Methodologies in Re-Engineering	African Journal of Business Management 8(17):741-750	X	
2014	Mayer, J.H., Röder, A., Hartwig, J. and Quick, R.	A Self-Service MSS Design from a New-Generation Manager Perspective	Proceedings of the 9th International Conference on Design Science Research in Information Systems and Technology		X
2014	Morton, K., Balazinska, M., Grossman, D. and Mackinlay, J.	Support the Data Enthusiast: Challenges for Next-Generation Data-Analysis Systems	Proceedings of the VLDB Endowment, 453-456		X
2014	Muntean, M.	Towards Agile BI By Using In-Memory Analytics	Informatica Economică 18(3)	X	
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2014	Niemi, T., Niinimäki, M., Thanisch, P. and Nummenmaa, J.	Detecting Summarizability in OLAP	Data & Knowledge Engineering 89: 1-20	X	X
2014	Obeidat, M., North, S., North, M. and Rattanak, V.	Business Intelligence Domain and Beyond	Universal Journal of Industrial and Business Management 2(6): 127-134	X	
2014	O'Donnell, P., Sipsma, S. and Watt, C.	The Practitioner View of the Top 10 Key Issues in Business Intelligence – 2014	Proceedings of the 25th Australasian Conference on Information Systems	X	
2014	Panja, R. and Paul, S.	A Review Report on the Evolution and Implementation of Business Intelligence Technique in the Banking Sector	International Journal of Computer Science and Mobile Applications 2(11): 109-114	X	
2014	Poonnawat, W. and Lehmann, P.	Using Self-service Business Intelligence for Learning Decision Making with Business Simulation Games	Proceedings of the 6th International Conference on Computer Supported Education	X	X
2014	Roth, A.	Conception of a Holistic and Long-term Performance Management: Five Part Disciplines as Systematizing Framework	Quarterly Review of Business Disciplines 1(2): 127-137	X	
2014	Sapp, C.E., Mazzuchi, T.and Sarkani, S.	Rationalising Business Intelligence Systems and Explicit Knowledge Objects: Improving Evidence-Based Management in Government Programs	Journal of Information & Knowledge Management 13(2)	X	
2014	Savinov, A.	ConceptMix: Self-Service Analytical Data Integration Based on the Concept-Oriented Model	Proceedings of the 3th International Conference on Data Management Technologies and Applications: 78-84		X
2014	Scheffler, A.and Otyepka, S.	Successful In-Memory Database Usage – A Structured Analysis	20th Americas Conference on Information Systems	X	
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2014	Trifu, M.R. and Ivan, M.L.	Big Data: Present and Future	Database Systems Journal 5(1): 32-41	X	
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2014	Zilli, D.	Self-Service Business Intelligence for Higher Education Management	Proceedings of the Management, Knowledge and Learning International Conference	X	X