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Digital Literacy as Incentive for Knowledge Management in the Digital World

The concept of digital literacy constitutes a distinct but interconnected part of several related literacies that were developed within the past years. This ability or mind-set may equally apply to knowledge, which, as a result of interpretation and interaction of information with individuals, has become a possible source for business added value. Following a technology orientated approach, the question of the possible role attributed to computer technology in the context of «cooperation» will rise in the near future. Due to its actuality and innovative character, it is worth to assess as to whether cloud services may contribute to the organizational goals in a time of globalization of knowledge. This contribution takes the interconnected developments in these fields as opportunity to analyze the concept of digital literacy in the context of cloud computing as form of «new knowledge management» in the digital world.

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Contents

1 Introduction

[Rz 1] The current e-permeated world is comprehensively underpinned by electronic devices and facilities which determine the practice of individuals and organizations. On the basis of the definition introduced by Gilster[1], *digital literacy* in the increasingly e-permeated world refers to the ability to effectively use digital tools in order to support innovation and advantageously manage digital resources; digital literacy may also serve as stimulator for digitalized business and economic growth. Those who are able to use these digital tools are significantly advantaged in respect of the use of digital information and resources.[2]

[Rz 2] On the basis of a digital concept, the impact of emerging technological trends in the context of «cooperation» and knowledge management (KM) gains importance. Hereinafter, these concepts are analyzed in a technological environment and the potential role of cloud computing is examined for these processes.

2 Literacies

2.1 Literacies of the digital

[Rz 3] Digital literacy forms a distinct but interconnected part of different literacies developed in the context of information and communication technologies (ICT). Thus, before approaching the concept itself, the term has to be classified in the context of the related «literacies of the digital»[3] and has to be differentiated from terms avoiding the notion of «literacy».[4]

[Rz 4] The beginning of the literacy development is located in the pre-digital era, in which the need for computer, IT and ICT literacy first occurred.[5] Subsequently, different models such as computer literacy and information literacy, meaning «sets of specific skills and competences nee-

1 Gilster, Paul, Digital literacy, New York: Wiley Computer Publications, 1997, 6.

2 Martin, Allan, DigEULit — a European Framework for Digital Literacy, Journal of eLiteracy, Vol 2 (2005), 131.

3 Martin, Allan/Grudziecki, Jan, DigEULit: Concepts and Tools for Digital Literacy Development, ITALICS, Vol 5 (2006), 250; Cf. Bawden, David , Origins and Concepts of Digital Literacy, 17, in: *Lankshear Colin/Knobel, Michele (eds.)*, Digital Literacies: Concepts, Policies and Practices, New York, 2008, who uses the term «literacies of information».

4 Bawden, 17.

5 Martin/Grudziecki, 250 f.

ded for finding and handling information in computerized form»[6], were developed, but research did not focus on digital areas.[7] While the former term merely addressed a skill set in the sense of effectively using computer devices, the latter had a broader meaning and also encompassed the evaluation of information.[8] Similar concepts refraining to use the term «literacy», but applying the notion of «informacy» or «mediacy», combined general knowledge and attitude with specific skills.[9]

[Rz 5] Albeit the perspective of these different literacies evolved over time from a skill focus through an application focus towards a reflective and critical focus[10], it becomes clear that these approaches considerably overlap and sometimes differ only to a slight extent.[11]

2.2 Digital Literacy

[Rz 6] The concept of digital literacy is directly linked to the emergence of new technologies that fundamentally changed the approach towards information and knowledge and has to be understood as reflection of this development. Hence, it constitutes the current manifestation of the traditional idea of literacy in the e-permeated world.[12] In the meantime, a wide range of conceptual definitions of «digital literacy» have been promulgated, revealing both differences and similarities.

[Rz 7] The origin of the concept can be traced back to Gilster, who defined digital literacy as «the ability to understand and use information in multiple formats from a wide variety of sources when it is presented via computers»[13], particularly by means of the Internet.[14] On the one hand, this involves the ability to effectively use current digital tools and sources as well as electronic infrastructure in order to deal with information.[15] On the other hand, digital literacy does not only denote a technical, but also a cognitive competence in the sense of comprehension of information and critical thinking.[16] This perception as a special kind of mind-set is illustrated by Gilster's statement that «digital literacy is about mastering ideas, not keystrokes».[17]

[Rz 8] According to Gilster, the concept comprises four key competencies: knowledge assembly, evaluating information content, searching the Internet and navigating hypertext.[18] However, this assessment should not obscure the fact that digital literacy does not describe a single ability or

6 Bawden, 21.

7 Martin, 131.

8 Bawden, 21; Cf. Martin/Grudziecki, 250 ff., regarding the three phases of computer literacy.

9 Bawden, 23, with further guidance.

10 Martin/Grudziecki, 253.

11 Martin/Grudziecki, 253.

12 Bawden, 18.

13 Gilster, 6.

14 Lankshear, Colin/Knobel, Michele, Introduction, 13, in: *Lankshear Colin/Knobel, Michele (eds.)*, Digital Literacies: Concepts, Policies and Practices, New York, 2008; Cf. also Martin, 135 f., for another very broad definition of digital literacy.

15 Martin, 131; Bawden, 18.

16 Lankshear, Colin/Knobel, Michele, Digital Literacy and Digital Literacies: Policy, Pedagogy and Research Considerations for Education, Digital Kompetanse, Vol 1 (2006), 12 f.; Martin/Grudziecki, 254.

17 Gilster, 6; Bawden, 18; Lankshear/Knobel, Digital Literacy and Digital Literacies, 13.

18 Lankshear/Knobel, Digital Literacy and Digital Literacies, 13.

set of abilities, but should be rather understood as *digital literacies* in the sense of a heterogeneous and diverse concept, comprising multiple forms of competences.[19] Digitally literate people, who are able to deal with electronic facilities, are significantly advantaged with regard to societal participation as well as the processing of information and knowledge.[20]

[Rz 9] Thus, due to the broad conception of this cognitive framework, digital literacy is to be located among the abovementioned approaches. In terms of content, it is not confined to a particular kind of (digital) technology and may also encompass elements derived from other literacies.[21]

3 Knowledge Management

3.1 Knowledge

[Rz 10] Up to now, no persistent and uniform definition of knowledge has been formed out, albeit most conceptual approaches use similar wordings.[22] Depending on the respective scientific discipline, knowledge is considered *inter alia* as resource or as collective memory of an individual.[23] A rather neutral conception comprehends knowledge as purposive and interconnected information that is hierarchically composed of data and characters.[24]

[Rz 11] Following the dichotomy of «knowledge types», tacit and explicit knowledge can be delimited.[25] The former «people-bound»[26] concept describes experience-based and personal knowledge, which is acquired by executing a project or task and is rather difficult to transfer.[27] The latter «system bound» type comprises structured, formalized and objective knowledge in the form of data, models, rules and procedures, which are expressed through words and numbers and thus easily transferrable.[28] Thereby, both knowledge forms may be internalized and externalized, respectively.[29]

[Rz 12] Knowledge concerns not only individuals, but also organizations[30], which are characteri-

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19 Pietra, Manuela, Digital Literacies. Empirische Vielfalt als Herausforderung für eine einheitliche Bestimmung von Medienkompetenz, 73, in: *Bachmair, Ben (ed.)*, Medienbildung in neuen Kulturräumen, Wiesbaden, 2010; Lankshear/Knobel, Introduction, 7.

20 Martin, 130; Lankshear/Knobel, Digital Literacy and Digital Literacies, 16.

21 Martin, 135; Bawden, 19, 23, 28.

22 Alhashmi, Saadat/Siddiqi, Jawed/Akhgar, Babak, Knowledge Management for Business Performance Improvement, 2, Sheffield Hallam University, SSRN-id670289, http://ssrn.com/abstract=670289 last accessed 19 December 2014.

23 Greese, Christopher, Wissensmanagement im Technologietransfer, Wiesbaden, 2010, 16 f., 19, with an overview table of different knowledge definitions.

24 Greese, 19, 21; Alhashmi/Siddiqi/Akhgar, 2; Cf. North, Klaus/Kumta, Gita, Knowledge Management: Value Creation Through Organizational Learning, Heidelberg/New York/Dordrecht/London, 2014, 32, who provide a «knowledge ladder»; Maier, Ronald, Knowledge Management Systems, 3rd ed., Berlin/Heidelberg/New York, 2007, 39 f.

25 Greese, 25; Cf. Hall, William/Kilpatrick, Bill, Managing Community Knowledge to Build a Better World, 2, University of Melbourne/Monash University, SSRN-id1940198, http://ssrn.com/abstract=1940198 last accessed 19 December 2014.

26 Cf. North/Kumta, xxii.

27 Alhashmi/Siddiqi/Akhgar, 3; Greese, 26; North/Kumta, xxii.

28 Khoshnevis, Sedigheh/Rabeifar, Fatemeh, Towards Knowledge Management as a Service in Cloud-Based Environments, IJMEC, Vol 2 (2012), 98; Greese, 26; Alhashmi/Siddiqi/Akhgar, 3.

29 Greese, 26.

30 Also called «knowledge firms».

zed by the ability to learn and generate knowledge in order to achieve business success.[31] In terms of origin, organizational knowledge can be derived from the internal and external environment of organizations[32]; knowledge may *inter alia* consist of personal skills, abilities and experiences of employees, the comprehension of internal processes and intellectual property as well as technology, but may also encompass external information linked to customers, markets, competitors and suppliers.[33] Thereby, different knowledge domains, such as organization, marketing or technological knowledge can be distinguished.[34] Even though explicit knowledge is considered as more important, implicit knowledge may not simply be excluded with regard to organizations.[35]

[Rz 13] In terms of knowledge, there are typical situations organizations have to deal with: 1) knowledge is not found when required; 2) «lessons learned» are not shared with regard to the prospective prevention of mistakes¸ 3) organizations are unaware of their existing knowledge and 4) internalized knowledge of employees is not externalized for the sake of the organizations' success.[36]

3.2 Knowledge Management

[Rz 14] As already indicated knowledge constitutes a vital resource for individuals as well as for organizations and the use of creative potential is a prerequisite for successful business.[37] However, knowledge allegedly suffered from «under-management» in the past.[38]

[Rz 15] On the basis of these considerations, KM as an interdisciplinary concept at the interface of philosophical and economic science seeks to enable individuals and organizations to systematically create, organize, share and use both tacit and explicit knowledge.[39] Thereby, KM increases the productivity and effectiveness of business processes, contributes to achieve strategic and organizational goals and improves individual and collective competitiveness.[40]

[Rz 16] In times of globalization, the dynamic concept of KM is of increasing importance and has to keep pace with ICT developments that contributed to the emergence of a global information market.[41] The integration of this technical infrastructure into KM processes is referred to as Knowledge Management Systems (KMS).

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31 North/Kumta, 18.

32 Khoshnevis/Rabeifar, 99.

33 Khoshnevis/Rabeifar, 89; North/Kumta, xxii, 1, 31 who uses the term «wisdom of the crowds».

34 Khoshnevis/Rabeifar, 99.

35 Alhashmi/Siddiqi/Akhgar, 3; Khoshnevis/Rabeifar, 98.

36 North/Kumta, 2.

37 Cf. North/Kumta, 7.

38 Cf. Alhashmi/Siddiqi/Akhgar, 2.

39 Khoshnevis/Rabeifar, 88 f; North/Kumta, 1, 6; Alhashmi/Siddiqi/Akhgar, 49; Cf. Maier, 22 f. for the science disciplines involved.

40 North/Kumta, xxiii, 6 f.

41 Khoshnevis/Rabeifar, 88 f; North/Kumta, 1, 8; Alhashmi/Siddiqi/Akhgar, 49.

4 Cloud computing

4.1 General considerations

[Rz 17] In the past years, the influence of ICT significantly increased and new opportunities to deal with information and knowledge appeared.[42] Due to advantages such as scalability, flexibility, appropriateness and cost-efficiency, cloud computing as influential technology for practice and business has to be particularly emphasized.[43]

[Rz 18] Notwithstanding the lack of a uniform definition[44], cloud computing is basically understood in the sense of flexible IT-services and virtual hard- and software which are provided by means of the Internet.[45]From a technical point of view, the service models of IaaS (Infrastructure as a Service), PaaS (Platform as a Service) and SaaS (Software as a Service) can be distinguished.[46] The multi-layered service framework thereby involves either the providing of computing power and storage power on virtual servers[47], refers to application software and infrastructure[48], or concerns the utilization of software installed in the cloud.[49] The deployment of these services may take place by means of private clouds, public clouds, community clouds or hybrid clouds, which differ in terms of the entitlement in the infrastructure.[50]

4.2 Knowledge Management in the cloud

[Rz 19] As mentioned, modern technology attracts attention in the context of KM and may serve as a catalyst for these processes.[51] The involved ICT-systems — denoted as Knowledge Management Systems (KMS)[52] — in the sense of application systems or platforms may thereby support knowledge processes or serve as a base system for KM applications.[53] As the technological part of KM, KMS provide for different functions and services that enable organizations to acquire, store,

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42 Kienhues, Dorothe/Bromme, Rainer, Digital Literacy in a Digital World, 1346 f., in: *Seel, Norbert*, Encyclopedia of Sciences in Learning, Heidelberg, 2012.

43 Marko, Roland, Vertragsrechtliche Aspekte des Cloud Computing, 15, 17, 23 f., in: *Blaha et al.*, Rechtsfragen des Cloud Computings, Wien, 2011; BITKOM-Leitfaden, Cloud Computing, 2009, 15; Delic/Riley, Enterprise Knowledge Clouds, 49; Tsui, Eric/Cheong, Rickey/Sabetzadeh, Farzad, Cloud-Based Personal Knowledge Management as a service (PKMaaS), IEEE Conference Publications 2011, 2152.

44 Cf. National Institute of Standards and Technology, The NIST Definition of Cloud Computing , NIST Special Publication 800-145, 2, according to which «Cloud computing is a model for enabling convenient, on demand network access to a shared pool of configurable computing resources that can rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models and four deployment models.»

45 BITKOM-Leitfaden, 14; Marko, 15; Tsui/Cheong/Sabetzadeh, 2152; Zellhofer, Andreas/Liebel, Helmut, Datenschutzfragen beim Cloud Computing, 65 in: *Blaha et al.*, Rechtsfragen des Cloud Computings, Wien, 2011; Cf. Marko, 17 regarding the five key features of cloud computing.

46 BITKOM-Leitfaden, 22; Zellhofer/Liebel, 65.

47 Marko, 20; BITKOM-Leitfaden, 24.

48 Marko, 20.

49 BITKOM-Leitfaden, 27; Gärtner, Hendrik/Kind, Christian/Langenberg, Dirk, Cloud Computing im betrieblichen Einsatz, ZWF, Vol 11 (2012), 846.

50 BITKOM-Leitfaden, 29 f; Marko, 21 f.

51 Maier, 36.

52 One has to consider in this regard, that there is no coherent definition of «KMS» and the contribution at hand only refers to the technical understanding of this term.

53 Maier, 89; Khoshnevis/Rabeifar, 89.

use, process and transfer explicit and implicit knowledge in order to achieve their organizational goals.[54] However, due to technical complexity and cost-intensive maintenance, the impact of KMS was so far rather limited and merely confined to big organizations that had the respective resources at their disposal to integrate these tools into their IT-environment.[55] Furthermore, KMS were exposed to behavioral restrictions, because employees were either technically overtaxed with the operation of the infrastructure or not willing to externalize and share their knowledge.[56] In this regard, the question arises as to whether cloud computing as new technological paradigm and feasible manifestation of KMS may equally contribute to the goals of KM.

[Rz 20] There is general agreement that cloud computing portals offer the ideal IT infrastructure to support KM efforts.[57] As a result of its advantageous technical conception, cloud computing appears to be a very suitable and beneficial solution to assist KM processes compared with previous KMS, because it offers an affordable, scalable, flexible, dynamic, and interoperable ICT environment.[58] All these features facilitate the intra- and inter-organizational creation, acquisition, storage and use of information as well as knowledge and encourage their transfer and exchange.[59] Owing to its location and sourcing independence as well as to ubiquitous accessibility, cloud computing can interconnect knowledge workers over long distances with a little more than a web-browser in order to support their decision making process and may promote organizational cooperation.[60]

[Rz 21] Whether and to what extent the beneficial features of cloud technologies come into effect with regard to KM depends on the cloud services and the cloud model involved. For instance, IaaS may provide virtual computer and storage infrastructure needed for KM.[61] In contrast, PaaS — which often consumes IaaS — delivers a computing platform for hard- and software and thus allows to create own applications and makes the full potential of cloud computing — in particular scalability — for KM available.[62] Meanwhile, there are also comprehensive SaaS applications which offer Knowledge as a Service (KaaS) or Knowledge Management as a Service (KMaaS).[63] Noteworthy in this context are services such as Microsoft's Sharepoint or Pumacy's KMcloud.[64]

[Rz 22] In addition, the different deployment models are influential with regard to the realization of the cloud advantages in order to overcome previous problems of KMS. Primarily, they become operative in the case of public clouds.[65] Since software and virtual infrastructure are provided by an external cloud provider[66], it is possible to overcome the previous technical and financial cons-

54 Maier, 86 f., 89.

55 Sultan, Nabil, Knowledge management in the age of cloud computing and Web 2.0: Experiencing the power of disruptive innovations, IJIM, Vol 33 (2013), 160, 162.

56 Sultan, 162.

57 Cruz Marta, Fernando/Trindade Neves, Fátima/Ramalho Correia, Ana Maria, Supporting KMS through Cloud Computing: a scoping review, IEEE Conference Publications 2011, 1, 4; Tsui/Cheong/Sabetzadeh, 2152.

58 Cruz Marta/Trindade Neves/Ramalho Correia, 5; Sultan, 162.

59 Cruz Marta/Trindade Neves/Ramalho Correia, 2; Khoshnevis /Rabeifar, 88, 90, 93, 107.

60 Tsui/Cheong/Sabetzadeh, 2153 f.; North/Kumta, xxii; Alhashmi/Siddiqi/Akhgar, 1, 5; Hall/Kilpatrick, 4; Khoshnevis/Rabeifar, 89.

61 Khoshnevis/Rabeifar, 95.

62 Gärtner/Kind/Langenberg, 846; Khoshnevis/Rabeifar, 96.

63 Khoshnevis/Rabeifar, 97.

64 Gärtner/Kind/Langenberg, 846; Sultan, 163.

65 The same can be true for external private clouds, if the infrastructure is maintained by a third party.

66 Gärtner/Kind/Langenberg, 846.

traints regarding KMS and the implementation becomes attractive for all kind of organizations, especially SMEs.[67] On the one hand, the advantages of the deployment model in terms of KM have to be balanced against its potential security, privacy and compliancy risks.[68] On the other hand, the deployment model has to take into account the kind of knowledge which is at stake, because internal and external clouds may encompass intra- or inter-organizational knowledge.[69]

[Rz 23] Cloud computing is also suitable to overcome the behavioral reservations of knowledge workers towards KMS. Cloud computing does not only apply to explicit knowledge, but it is particularly suitable with regard to implicit knowledge, such as «experiences» or «lessons learned», which exist in the minds of employees as contextual knowledge regarding specific processes or prospective unknown situations.[70] These knowledge objects can thereby be provided to the knowledge workers *inter alia* through blogs, wikis, newsfeeds, discussion boards, structured knowledge databases or social networking sites, comparable to Facebook.[71] The combination of cloud services with such Web 2.0 structures may facilitate the externalization and transfer of implicit knowledge, because these tools are simple to operate and already familiar to the knowledge workers, who know their potential value.[72]

5 Concluding Assessment

[Rz 24] Based on the definition by Gilster, digital literacy denotes the effective use of ICT tools by means of the Internet in order to deal with information and knowledge from various sources. Due to its advantageous technical conception, cloud computing performs a supportive function in this respect.

[Rz 25] First of all, it overcomes the technical and financial restraints of previous KMS and provides — in the sense of a technical basis for digital literacy — for the effective operation with digital tools in the context of KM. Furthermore, reference to a cloud portal addresses the behavioral problems towards previous KMS. Virtual cloud infrastructures, especially in conjunction with simple and familiar Web 2.0 applications, enhance the technical abilities of knowledge workers and allow them to effectively use ICT tools for KM. The integration of these digital resources enables knowledge workers to acquire, transfer and use explicit as well as implicit knowledge from various sources. Thus, cloud computing services technically support «mastering ideas» within the framework of KM which — as a result — may give more effective guidance for unknown situations, further facilitate decision making processes and hence increase organizational cooperation. By reference to cloud computing infrastructures, digital literacy with regard to KM processes is given a solid technological basis and the related mind-set is strengthened, i.e. knowledge workers are encouraged to develop a critical approach towards digital resources.

[Rz 26] However, the impact of digital literacy based on cloud computing with regard to KM is

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67 Sultan, 162.

68 Cruz Marta/Trindade Neves/Ramalho Correia, 5; Depending on the organization in question, hybrid cloud structure could represent a middle course.

69 Khoshnevis/Rabeifar, 100.

70 Alhashmi/Siddiqi/Akhgar, 1, 5; Khoshnevis/Rabeifar, 90 f.

71 Sultan, 163; Gärtner/Kind/Langenberg, 845; BITKOM-Leitfaden, 28.

72 Sultan, 162.

not restricted to the individual level. The facilitation of knowledge exchange and cooperation through the interconnection of knowledge workers also has a significant influence on the organizational level, because it may overcome general problems of undertakings in terms of knowledge and may thereby increase organizational efficiency. The foregoing considerations emphasize the value of cloud computing as technical basis for digital literacy in the context of KM and this ICT tool can be considered as a «disruptive innovation» in this regard.[73] The future will reveal as to whether this emerging technological trend will prove its effectiveness in the growing market of KM services.

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[73] Cf. Sultan, 162.