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A Maturity Model for Digital Literacies and Sustainable Development

Ravi S. Sharma

Nanyang Technological University, Singapore

Lin G. Malone

Nanyang Technological University, Singapore

Chong Guan

SIM University, Singapore

Ambica Dattakumar

Nanyang Technological University, Singapore

INTRODUCTION

It is a given that the world is now becoming increasingly digitalised. However the speed at which this digitisation has occurred, has led to unequal progression amongst societies. A key aspect of digitisation is the notion of “digital inclusion”; the empowerment of individuals through digital participation. Successful initiatives, supported by digital literacy, have enabled those that are isolated to gain on a social and economic front (Sharma & Mokhtar, 2006). This paper recounts the role of digital literacies in supporting participative, and therefore sustainable, development. Taking a historical development perspective, the paper concludes with a maturity model that links digital policies with socio-economic well-being.

Building on the pioneering work of Gilster (1997), Belshaw (2012) offers a comprehensive definition of modern literacies in digital society:

Literacies involve the mastery of simple cognitive and practical skills. To be ‘literate’ is only meaningful within a social context and involves having access to the cultural, economic and political structures of a society. In addition to providing the means and skills to deal with written texts, literacies bring about a transformation in human

thinking capacities. This intellectual empowerment happens as a result of new cognitive tools (e.g. writing) or technical instruments (e.g. digital technologies). (p.90)

It has been suggested that digital inclusion and participation enables the grassroots to be engaged, bridging some of the prevailing socio-economic disadvantages (SEDs) that exist within societies, as well as across countries (Armenta et al., 2012). This is the fundamental premise of digital literacies – the set of skills and tools that will empower individuals and groups to participate fully in the increasingly digital future and hence bridge the disparities in socio-economic opportunities.

BACKGROUND

The Evolution of Digital Literacy

Lanham (1995) first conceptualised digital literacy as the ability to comprehend information, regardless of the medium. This definition focused on the user’s ability to navigate between the various online and offline mediums. Since this original conceptualisation, the term digital literacy has evolved along with pervasive Information and

Communication Technology (ICT) in society. While Lanham created awareness of the need to comprehend the transformations brought about by the incorporation of ICTs, it was Gilster (1997) who popularised the concept of digital literacy and its emergence as a critical skill. His portrayal of digital literacy as “mastering ideas, not keystrokes” (1997, p.15), positioned the concept to focus more on cognitive ability, as opposed to competencies. This was considered a milestone, as society rapidly digitised and network effects arising from social media led to the development of social capital as a socio-economic advantage.

Building on this, Eshet-Alkalai (2004) presented five survival skills for the digital era: photo-visual literacy, reproduction literacy, information literacy, branching literacy and social-emotional literacy. Of these five digital literacies, four of them are largely based on specific digital skills. As the contrasting element, socio-emotional literacy is of particular interest. The definition of socio-emotionally literate users offered by Eshet-Alkalai (2004) is individuals who are able to work with others, sharing and evaluating information and knowledge, in order to construct new knowledge. This refers to the participation and communication that occurs in the digital world, as well as the opportunities offered via this medium. Where participation leads to collective intelligence, new knowledge may be developed. By situating socio-emotional literacy as a digital literacy skill, the Internet and new media present a new cultural environment, with its own unique values and practices for engagement.

The socio-cultural dimension of digital literacy is further discussed by Bélisle (2006). Although her work focuses on a re-conceptualisation of literacy and not merely digital literacy, Bélisle’s research is important as it explains the changes to society as a result of the digital knowledge revolution. In fact, it could be said that Bélisle (2006) truly grasped the essence of the changes to the concept of literacy within the digital society. Bélisle (2006) examines three dimensions of literacy: Functional, Socio-cultural and Transformational. Functional

literacy refers to the basic skills required to lead a day-to-day life. In the conventional sense, this refers to the skills of reading, writing, speaking and listening. In relation to digital literacies, this includes the ability to perform operational computer skills, such as input, output and searching, but also the ability to understand when and where each skill set is relevant. This dimension of digital literacy could be read in parallel with Lanham’s original concept.

Bélisle’s second dimension of literacies is the socio-cultural. Literacy ultimately serves to address a purpose; it “[gives] access to, and understanding of, the structures of power and authority through mastery of written texts and numbers” (Bélisle, 2006, p.53). Socio-cultural literacy includes knowledge of a society’s values, attitudes, practices and conventions; and an understanding of where each of these apply. This is important in relation to digital literacy, as the digital world provides new channels for participation and communication. Literacy is only meaningful when contextualised to the cultural fabric of society; the socio-cultural dimension of digital literacy enables individuals to immerse themselves within and to participate in social and economic structures of digital society. Hence, when referring specifically to digital literacy, it may be more accurate to consider the socio-cultural dimension of literacy as a “socio-economic” function. This would better capture its *impact on* and *empowerment of* users in online communities.

The final dimension of literacy which Bélisle describes is the transformational dimension of digital literacy. This “brings a profound enrichment and eventually entails a transformation of human thinking capacities” (Bélisle, 2006, p.54). The individuals’ intellectual empowerment through literacy may have the power to transform society, especially where creative cognitive ability leads to the creation of new cognitive tools (Bélisle, 2006). If Bélisle’s transformative digital literacy is viewed alongside Eshet-Alkalai’s socio-emotional literacy, the online world opens up new opportunities for collaboration and creation. This ultimately

brings new knowledge to society, transforming it and those within it.

More recently, Belshaw (2012) has utilised the term digital literacies, rather than digital literacy, both to avoid reducing it to a finite outcome, as well as to address the complexity of the concept. Belshaw (2012) presents eight, non-hierarchic elements of digital literacies: Cultural, Cognitive, Constructive, Communicative, Confident, Creative, Critical and Civic. Within these elements, it can be seen that digital literacies have evolved from a mere set of skills, to encompass cognitive ability, to facilitate cultural engagement, and to enable critical analysis. Continuing the evolutionary path of digital literacies, Belshaw's research (2012) can be seen as particularly prominent, especially where it links the element of "Cultural" to that of "Civic". This emphasizes participation, social justice and civic responsibility; digital literacies are not simply about functional ability but also about the inclusion, participation and empowerment that result from socio-cultural interaction. Belshaw's work draws heavily on Bélisle's; his definition of literacies feeds directly into Bélisle's proposed three

dimensions of digital literacy. Linking Belshaw's work to Bélisle (2006), transformative digital literacy can go beyond the ability to transform an individual through self-enhancement to transforming societies through these "entitlements" gained by individuals.

MAIN FOCUS OF THE ARTICLE

Issues, Controversies, Problems

Levels of Digital Development

The development of a digital society takes place in levels, each of which lays the foundations for the succeeding ones. In the context of the digital divide, Armenta, Serranob, Cabrera and Conte (2012) propose four levels to development; each centred on a key tension point (see Figure 1).

The first level addresses the problem of access, distinguishing between those who have access to the infrastructure and those who do not. The second level focuses on usage, in terms of the social-economic indicators governing usage, while

Figure 1. Levels of digital development

the third level addresses the role of participation within the digital divide and focuses on the need for human development through participation.

Armenta et al. (2012) further suggest that we are currently entering the fourth level of digital development, where digital inclusion must be mediated by human values. At this level, there comes a focus on the need for community involvement and technology adoption. Harding (2016) argues that while the digital world had promised to create a level playing field by creating equal access to information, such information possesses a different cost to different individuals in accordance to their socio-economic status. This highlights the importance of digital inclusion to enable a level playing field. While each level of the developmental model seeks to discourage digital exclusion, it is the fourth level of human values which has the potential to ensure that as society progresses, the socio-economically disadvantaged (SEDs) do not get marginalised and dis-enfranchised. Thus, the links between the civic and cultural elements in Belshaw's model draws parallels to the fourth level of "human values" in work by Armenta et al. (2012) on digital inclusion.

Further analysis of Armenta et al.'s model (2012) has shown each level to reflect different dimensions of digital literacies. This can be seen through adopting a modified lens of Bélisle's (2006) digital literacies and applying it to Armenta et al.'s model (see Figure 2).

A juxtaposition of Bélisle's work (2006) examines three dimensions of functional, socio-cultural and transformational literacies. This provides further clarification of the four developmental levels in Figure 1, by linking digital literacy with digital development. Access (level 1 of development) may be mapped directly to the outcome of functional literacy as without the former, one cannot possibly achieve the latter. Usage and participation (levels 2 and 3) normally lead to socio-cultural (or interchangeably socio-economic) participation. The subtle difference between usage and participation is that while usage is transactional, participation also involves the production of social (emotional) capital. Finally, at the highest level of human values, individuals and society transforms into knowledge societies (again, from the foundations of information societies enabled in levels 1 and 2).

Figure 2. Model of digital development as supposed by digital literacies

As the fundamental argument, bridging digital disparities to access and usage of technologies must be supported by individuals' functional abilities to utilise these tools. Going further into the model, it can be seen that usage still draws upon the socio-economic function of digital literacies. Armenta et al. (2012) discusses how at the second level, applications suited to the needs of the population were incorporated to bridge an existing digital usage divide. There are ample opportunities to develop context relevant applications, opening up new ways of gaining socio-economic status. It may also be said that usage of these applications draw on the socio-economic dimension of digital literacies, as one is able to participate meaningfully within society.

Mansell and Tremblay (2013) have suggested that human development is the process of improving and increasing each individual's choices. The socio-economic dimension of digital literacies can indeed enable this by opening up opportunities for grass-root participation and community leadership through creating meaning around these activities. This increases inclusion in society, and may enable improvement of one's economic status. Morris and Morris (2013), for example, have revealed that Internet access and usage could reduce the socio-economic gap in knowledge and participation. Beyond the socio-economic dimension, level three of participation also supports the transformative capacity of digital literacies. The digital environment holds a myriad of potential for users who are empowered to explore them; digital literacies can open up opportunities for individuals to transform themselves, their abilities and their circumstances.

This final level of human values is demonstrative of transformational digital literacy beyond self-enhancement to enable societal development. As discussed by Belshaw (2012), the digital environment creates new civic responsibilities for users. Relating back to Armenta et al.'s model, the fourth level of human values must comprise an element of civic responsibility to enable society's transformation through community involvement

and technology adoption. By drawing on human values, this level will promote digital inclusion for all.

Digital Maturity and Sustainable Development

"Knowledge societies will not really be worthy of the name unless the greatest possible number of individuals can become knowledge producers rather than mere consumers of already available knowledge." (UNESCO, 2005, p.189). Indeed, UNESCO's further probing (Mansell & Tremblay, 2013) highlights the need for knowledge societies to be based on inclusion to ensure their sustainability. The 2013 report underscores the importance of human values for digital inclusion and participation. The need to respect, welcome and appreciate new ideas is key to building an innovative and sustainable society.

Prior work by Sharma and his associates highlight key characteristics of knowledge societies: 1) they are necessary and sufficient conditions for growth in the knowledge economy, 2) they have high knowledge absorptive capacity and complex chains of creation, production and distribution, and 3) they consist of a sustainable learning community which emphasises innovation (Sharma, Ng, Dharmawirya & Lee, 2008). Four knowledge pillars actively used by the World Bank's Knowledge Assessment Methodology (information infrastructure, economic and institutional governance, education and human capital, and innovation system) have been effective in deriving a set of best practices in developing knowledge policies (cf Sharma et al., 2008; 2009; Chandrasekar & Sharma, 2010). However, these studies did not examine participation gaps arising from the uneven distribution of resources in developing skills and literacies throughout the world, and the lack of transparency in the way digital literacies shape perceptions of the world. At this juncture of the new participatory culture, the key question of "how we can guarantee that the rich opportunities afforded by the expanding

digital landscape are made available to all,” still remains unanswered.

Knowledge societies which are based on an institutional framework that supports collective security system and wider welfare can lead to sustainable development (Spangenberg, 2005a; 2005b). As a knowledge society is based on the need for knowledge distribution, access to information and skills to transform information into knowledge, inclusion within such societies is imperative. This may bridge the existing disparities within society and subsequently, promote sustainable development, where progress benefits all and no one gets left behind.

Synthesising the discussion in the previous section with the gap in prior work identified, the relationship between knowledge societies, digital inclusion and digital literacies may be examined through a proposed *Digital Literacies Maturity*

Model (DLMM) (see Figure 3 below). A maturity model is an assessment tool used to evaluate an entity (e.g., an organization) or a process. The term “maturity” relates to the degree of optimization of practices. Typically, a maturity model formally defines steps and result metrics which are applied to the management of best practices and active optimization of processes (Humphrey, 1988). Our proposed DLMM combines the World Bank’s four knowledge policy pillars with the four levels of digital development and provides a framework on how to promote sustainable development and socio-economic well-being.

Please note that the colouring of the cells in Figure 3 correspond to the different levels of literacy identified in Figure 2 above. Each cell in the matrix has a focus theme that characterises knowledge policy for a given pillar and level of development. For example, at the most basic level of

Figure 3. Digital literacies maturity model

	GOVERNANCE	INFRASTRUCTURE	EDUCATION & HUMAN CAPITAL	INNOVATION
HUMAN VALUES	<i>Sustainable Growth & Development</i>	<i>Community Involvement & Socio-economic Returns</i>	<i>Civic Responsibility</i>	<i>Collective Intelligence</i>
PARTICIPATION	<i>Grassroots Participation</i>	<i>Human Development</i>	<i>Community Participation & Community Leadership</i>	<i>Knowledge Exchange</i>
USAGE	<i>Training</i>	<i>Applications</i>	<i>Skills & Experience</i>	<i>Information Economy</i>
ACCESS	<i>Universal Service Obligation</i>	<i>Devices & Networks</i>	<i>Utility</i>	<i>Efficiency & Effectiveness</i>
DL Maturity Model Key	Functional Digital Literacy	Socio-economic Digital Literacy	Transformational Digital Literacy	

digital development (the access level), governance policies mainly focus on universal service obligations extracted by the regulator from licensed service providers so that no segment of society is excluded from access to basic digital services such as telephony, Internet, cable television and so on. The infrastructure dimension focuses on improving access to devices and networks and the training is geared towards utilitarian functions. Most innovative efforts are engaged in improving access, efficiency and effectiveness. Assuming prevalence of internet access is achieved, the next level focuses on the usage. Government policies promoting skill-based training and applications are essential to the development of an information economy. When both internet usage and access becomes common place, the next question to be asked is how to accelerate digital participation, such as grassroots participation, community leadership and knowledge exchange. Likewise at the highest level of digital development (the human values level), innovation policies must seek to capture the collective intelligence of the masses (sometimes known as the wisdom of the crowds).

However, the field success of the DLMM is dependent on the research methodology chosen. In empirical research conducted on digital literacies (Bonfadelli, 2002; Hargittai & Hinnant, 2008), quantitative data analysis appears to be the preferred research methodology. However, when examining, for example, Hargittai's (2009) web-oriented survey measures to gauge digital literacies, the research may be adequate in capturing functional digital literacy, but its methodology completely overlooks the socio-economic and transformation dimensions of literacies, which is a cause of concern. As ICT becomes increasingly user-centric, functional ability becomes less of an issue as compared to the ability to utilise technology in meaningful ways. In contrast, Canada has provided a vision for 21st century citizens to possess and maintain values that enable them to effectively communicate "to flourish in groups of individuals with multiple-perspectives who care deeply about a topic and are empathetically

responsive to each other's perspectives" (Hoechsmann & DeWaard, 2015, p.19).

The use of DLMM allows an economy to have its digital literacies and sustainable development processes assessed according to a conceptual framework with a clear set of benchmarks. Maturity is indicated by achieving a particular "Maturity Level", which provides a consistent set of measurements for researchers. For policy makers, the DLMM allows a knowledge society to compare its maturity level with other economies, or other parts of their own economy and derive specific recommendations for improvements. As such, a recommended approach to the field usage of the DLMM would be to create narratives, which allows space for quantitative hypotheses as well as data collection (Sharma et al. 2012). The creation of narratives and the application of the DLMM to these narratives could yield more in-depth and interesting results as compared to other methodologies. The details included through the choice of narrative approach thus become more applicable in relation to the levels of maturity (access, usage, participation, values) than the policies. For knowledge societies, it would be argued with choice narratives that government policies have been situated at the fourth level of human values in the digital development model. Whether this has led to sustainable development can be tested by tracking specific policy indicators of governance, infrastructure, education, and innovation.

SOLUTIONS AND RECOMMENDATIONS

Implications of DLMM for Digital Policies

Policies which encourage the continued evolution of knowledge societies must be constructed on the twin principles of inclusion and be supported by digital literacies to best enable the formation of sustainable knowledge societies. As the flowchart below illustrates (see Figure 4), governance can

Figure 4. Flowchart mapping the relationship between knowledge society pillars, digital development levels, and digital literacies

bridge the access divide through their universal service obligations, ensuring that the Internet is made equally accessible to all citizens as a digital entitlement. Infrastructure, built with the intention of bridging the access divide, can create accessible devices and networks for all. Utility may be enabled where access is supported by education and human capital. Innovation systems which enable access can create an efficient and effective society. However, these access policies must still be supported by functional digital literacy for users. Access is redundant when functional ability is absent.

Socio-economic literacy builds on functional literacy, to create meaning behind activity. On the second level, digital inclusion can be enabled through promoting usage. Government policies can enable usage through training, however these activities only have meaning when viewed through the lens of socio-economic literacy. Infrastructure may create applications tailored to the needs of the population, however it is with socio-economic digital literacy that users are motivated to utilise them. Skills obtained through formal education and life-long learning must be similarly motivated by the socio-economic dimension of literacy which creates meaning around the activity; the functional ability to use software and applications is only meaningful when understanding its socio-economic uses, purposes and relevance to the workforce. Human Capital provides the opportunity to gain experience with using technology. It is

important for individuals to use these experiences appropriately in a given context. For example, an individual can progress from being a passive receiver of technology to an active information consumer with effective searching skills. At the highest level, he or she can apply computational thinking skills and use the information intelligently to create value. This, again, results from digital literacies' socio-economic dimension. Finally, when innovation is supported by usage, it will facilitate the creation of the information economy, as the first step toward knowledge societies.

Through empowering people with socio-economic and transformational literacies, this may open up opportunities for digital citizens to improve their socio-economic status. The third level of digital inclusion focuses on the participation divide. Governments seeking to close the digital divide by bridging the participation gap may implement policies to promote grassroots participation supported by socio-economic digital literacy to create meaningful supporting participation. Infrastructure with the goal of achieving participation can incentivise human development, especially if it is supported by socio-economic literacy. Education and human capital, when directed toward bridging the participation divide, can enable community participation and create community leadership, as supported by socio-economic literacy. Finally, the key to the development of knowledge societies is innovation-supported participation. This can cre-

ate exchange of knowledge, which is catalyzed by transformational literacy.

Transformational literacies are especially key to the fourth level of human values. With transformation literacy as a goal, governance supporting human values can enable sustainable growth and development. Infrastructure with human values can allow community involvement and subsequently, social capital returns. Education and human capital supported by human values will create a sense of civic responsibility toward society; and innovation supported by human value will lead to the expression of collective intelligence.

FUTURE RESEARCH DIRECTIONS

When viewing the digital maturity model alongside Bélisle's conceptualisation of literacies (2006), it is apparent that digital literacies are necessary to support participation and subsequently, inclusion. The need to promote digital inclusion, especially through imparting digital literacies, becomes increasingly important for policy makers

in light of the value placed on knowledge within the modern economy and the drive for countries to construct sustainable growth and development.

Frameworks and measures conceptualised by government and policy makers have been developed with the intention of bridging the digital divide. The European Union and Canada, for instance, have developed conceptual frameworks of digital literacies and measures, with a focus on education and creating the 21st century citizen. When developing frameworks through which to build knowledge societies, it is important that governments and policy makers keep in mind that inclusion must serve as the foundation to such societies, not merely an afterthought. The Digital Literacies Maturity Model presented in this article is intended as a map to the creation of sustainable knowledge societies.

In this regard, the Maturity Model may be re-presented as a table of questions for policy makers. This will enable them to determine whether policies under development place adequate emphasis on digital inclusion (see Figure 5).

Figure 5. DLMM for policy making

	GOVERNANCE	INFRASTRUCTURE	EDUCATION & HUMAN CAPITAL	INNOVATION
HUMAN VALUES	<i>How can governance promote human values?</i>	<i>How can infrastructure promote human values?</i>	<i>How can education and human capital promote human values?</i>	<i>How can innovation promote human values?</i>
PARTICIPATION	<i>How can governance promote participation?</i>	<i>How can infrastructure promote participation?</i>	<i>How can education and human capital promote usage?</i>	<i>How can innovation promote participation?</i>
USAGE	<i>How can governance promote usage?</i>	<i>How can infrastructure promote usage?</i>	<i>How can education and human capital promote usage?</i>	<i>How can innovation promote usage?</i>
ACCESS	<i>How can governance promote access?</i>	<i>How can infrastructure promote access?</i>	<i>How can education and human capital promote access?</i>	<i>How can innovation promote access?</i>

By examining policy-making decisions in this manner, digital development may thus be promoted. In addition, at every level, these decisions must be supported by the knowledge of what kinds of digital literacies are necessary to fulfil the requirements of that level. This will enable the formation of knowledge societies on the basis of inclusion.

CONCLUSION

This article has provided a link between digital development and digital literacies. It highlights that in order to reach the level of human values, there needs to be a shift from functional literacy to transformational literacy. This means that the current and future generations need to be supported with other competencies to enable them to be part of sustainable knowledge societies.

Digital literacy can promote inclusion, and reduce socio-economic disparities by promoting participation at an economic level. In order to enable widespread inclusion, knowledge societies need to develop in line with digital inclusion policies. The maturity model presented in this paper brings together these two concepts, offering policy makers the opportunity to identify key areas of development, and ensuring a digitally enabled future.

REFERENCES

- Armenta, A., Serrano, A., Cabrera, M., & Conte, R. (2012). The new digital divide: The confluence of broadband penetration, sustainable development, technology adoption and community participation. *Information Technology for Development*, 18(4), 345–353. doi:10.1080/02681102.2011.625925
- Bélisle, C. (2006). Literacy and the digital knowledge revolution. In *Digital literacies for learning*. Facet Publishing.
- Belshaw, D. (2012). *What is 'digital literacy'? A Pragmatic investigation* (Doctoral dissertation). Durham University.
- Bonfadelli, H. (2002). The Internet and Knowledge Gaps: A Theoretical and Empirical Investigation Survey. *European Journal of Communication*, 17(1), 65–84. doi:10.1177/0267323102017001607
- Chandrasekar, G., & Sharma, R. S. (2010). Analysing knowledge disparity and value creation: Towards a K-Gini coefficient. *International Journal of Knowledge-Based Development*, 1(3), 242–262. doi:10.1504/IJKBD.2010.035661
- Eshet-Alkalai, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia*, 13(1), 93.
- Gilster, P. (1997). *Digital literacy*. New York: Wiley Computer Publications.
- Harding, C. (2016). The New Digital Divide. *Readwrite*. Retrieved from <http://readwrite.com/2016/03/04/new-digital-divide>
- Hargittai, E. (2009). An update on survey measures on web-oriented digital literacy. *Social Science Computer Review*, 27(1), 130–137. doi:10.1177/0894439308318213
- Hargittai, E., & Hinnant, A. (2008). Digital Inequality: Differences in Young Adults Use of the Internet Survey. *Communication Research*, 35(5), 601–621. doi:10.1177/0093650208321782
- Hoechsmann, M., & DeWaard, H. (2015). Mapping digital literacy policy and practice in the Canadian education landscape. *Media Smarts*. Retrieved from <http://mediasmarts.ca/sites/mediasmarts/files/publication-report/full/mapping-digital-literacy.pdf> (Accessed on 16 March 2016)
- Humphrey, W. S. (1988). Characterizing the software process: A maturity framework. *IEEE Software*, 5(2), 73–79. doi:10.1109/52.2014

Lanham, R. A. (1995). Digital literacy. *Scientific American*, 273(3), 198–199.

Mansell, R., & Tremblay, G. (2013). Renewing the Knowledge Societies Vision: Towards Knowledge Societies for Peace and Sustainable Development. Report prepared for the WSIS+10 Review for the Communication and Information Sector, UNESCO and for presentation in the “Knowledge Societies, Stakeholder Accountability for Sustainable Development” Panel at the UNESCO WSIS+10 Conference, Paris, France.

Morris, D. S., & Morris, J. S. (2013). Digital Inequality and Participation in the Political Process: Real or Imagined. *Social Science Computer Review*, 1(5), 589–600. doi:10.1177/0894439313489259

Sharma, R. S., Iqbal, M. I. N. A., & Victoriano, M. M. (2012). On the use of benchmarking and good practices for knowledge management for development. *Knowledge Management Research & Practice*, 11, 1–15.

Sharma, R. S., & Mokhtar, I. A. (2006). Bridging the digital divide in Asia – Challenges and solutions. *International Journal of Technology. Knowledge in Society*, 1(3), 15–30.

Sharma, R. S., Ng, E. W. J., Dharmawirya, M., & Lee, C. K. (2008). Beyond the Digital Divide: A Conceptual Framework for Analyzing Knowledge Societies. *Journal of Knowledge Management*, 12(5), 151–164. doi:10.1108/13673270810903000

Sharma, R. S., Samuael, E. M., & Ng, E. W. J. (2009). Beyond the digital divide: Policy analysis for knowledge societies. *Journal of Knowledge Management*, 13(5), 373–286. doi:10.1108/13673270910988178

Spangenberg, J. H. (2005a). Economic sustainability of the economy: Concepts and indicators. *International Journal of Sustainable Development*, 8(1), 47–64. doi:10.1504/IJSD.2005.007374

Spangenberg, J. H. (2005b). Will the information society be sustainable?: Towards criteria and indicators for a sustainable knowledge society. *International Journal of Innovation and Sustainable Development*, 1(1), 85–102. doi:10.1504/IJSD.2005.008082

UNESCO. (2005). *Toward Knowledge Societies*. UNESCO Publishing. Retrieved from <http://unesdoc.unesco.org/images/0014/001418/141843e.pdf>

ADDITIONAL READING

Coiro, J., Knobel, M., Lankshear, C., & Leu, D. J. (Eds.). (2014). *Handbook of research on new literacies*. Routledge.

European Commission. (2016). The Digital Economy & Society Index (DESI). Retrieved 18th April, 2016, from <https://ec.europa.eu/digital-single-market/en/desi>

Hsieh, J. J. P. A., Rai, A., & Keil, M. (2011). Addressing digital inequality for the socioeconomically disadvantaged through government initiatives: Forms of capital that affect ICT utilization. *Information Systems Research*, 22(2), 233–253. doi:10.1287/isre.1090.0256

Lankshear, C., & Knobel, M. (2008). *Digital literacies: Concepts, policies and practices* (Vol. 30). Peter Lang.

Ramírez, R. (2007). Appreciating the contribution of broadband ICT with rural and remote communities: Stepping stones toward an alternative paradigm. *The Information Society*, 23(2), 85–94. doi:10.1080/01972240701224044

Van Dijk, J. A. (2005). *The deepening divide: Inequality in the information society*. Sage Publications.

KEY TERMS AND DEFINITIONS

Digital Development: The various levels of the digital divide which must be bridged to promote wide spread digital usage within a society.

Digital Literacy Maturity Model: A consistent set of measurements for researchers to study digital literacy in accordance to the level of digital development within knowledge societies.

Digital Literacy: Digital literacy consists of competence in the basic skills to utilize digital technologies, an understanding of how these competences may be utilised to create context to practices and subsequently to participate socially, culturally and economically, and it allows for the intellectual empowerment of individuals to transform society.

Functional Digital Literacy: The basic competences or skills necessary to engage in the digital society.

Knowledge Societies: Societies which possess the necessary and sufficient conditions for growth in the knowledge economy, have high knowledge absorptive capacity and complex chains of creation, production and distribution, and consist of sustainable learning communities which emphasise innovation.

Socio-Economic Digital Literacy: the ability of digital users to engage in the social and economic structures of the digital society.

Sustainable Development: The process of developing while ensuring that the development does not promote existing inequalities, nor does it hinder the resources and abilities for future generations to continue to develop and progress.

Transformational Digital Literacy: The empowerment of digital users, to be transformed intellectually, which ultimately changes society.