

# Digital Literacy: How It Has Been Evolving? Its Significance in the Indian Context

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## Abstract

Digital literacy indicates having the skills that one needs to live, learn, and work in an e-permeated society and economy, where communication and access to information is through digital technologies like internet/digital platforms/apps, social media, mobile devices, etc. Given this trend, the present paper tries to understand how the digital literacy has been evolving in the last two decades. Central theme of this review has been: what is digital literacy and how it has been evolving over time and across multiple perspectives. It is argued that digital literacies should be seen as “evolving”, as digital practices shape, and are shaped by the imitations and innovations along with the development of the public digital ecosystem combined with its accessibility and affordability of both the data and the devices. As we will see, defining this term has been proven to be complex, because the digital environment is constantly fast changing. Due to its inherent nature of fluidity and flexibility, the term covers from a narrow to a comprehensive coverage. On the parallel, the endeavours of the multilateral agencies to capture and define digital competency are examined. In this backdrop, its significance in the Indian context is looked at. The concluding section highlights the concerns that need attention from several standpoints.

## Keywords

Digital Literacy

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## 1. Introduction

With the increasingly digitalised world in the fourth revolution, to live a full life in this modern e-world, one must be digitally literate. Pervasiveness of digital plat-

forms, the knowledge economies and societies, literacy and technology inevitably play a vital role in every sphere of life. Given its ubiquity, complexity, utility, and heterogeneity of digitalness, the meaning and definition of the term “digital literacy” remains intractably nebulous. Simply put, digital literacy connotes the skill of individuals to comprehend and apply digital technologies and the ability to access its related and complementary tools. Anyone who can operate a computer, laptop, tablet, or smartphone and can use other IT related tools and their applications is considered digitally literate. Digital literacy or digital competency help citizens achieve improved or positive life outcomes in digital settings.

Digital literacy indicates having the skills that one needs to live, learn, and work in a society where communication and access to information is increasingly through digital technologies like internet/digital platforms, social media, and mobile devices. The Information and Knowledge Society demands the development of these skills for the critical and responsible consumption and use of technology for leisure, personal, professional, academic development, and citizen participation. Digital technologies are pervasive for its usefulness and ubiquity and its penetration is becoming intensive and inevitable. This is juxtaposed in a world with broader socioeconomic and political changes into an increasingly mediated, complex, fluid, multimodal, multi-layered, and fast-changing place.

Digital dividends are the broader development benefits accruing from using these technologies including better growth (World Bank, 2016). Invariably digital technologies have boosted growth, expanded opportunities, and improved service delivery. However, adapting workers’ skills to the demands of the new economy is a challenge for the adult unskilled workers. On the other hand, responding to the fast-changing information and communication technology (ICT) and their adoption requires multiplicity of skills viz., higher-order cognitive, socio-emotional, and technical skills. The digital transformation is in its fifth generation and moving beyond. In this fast-growing sector, it is important to equip most of the young and adult population digitally literate for making the day-to-day life easier for improved life outcomes.

Moreover, the twin principles of affordability and accessibility of the devices and data play a crucial role in the progress and inclusiveness of digitally literate population across countries. Besides the interaction of the demand for the devices and internet data access alongside the supply of the digital public infrastructure by the government and the role of the private players in the spectrum allocation, distribution and supply of devices by various firms play a vital role as a game changer. The success of digital or ICT applications will depend on the levels of digital literacy and the ability of citizens to benefit from the availability of internet-based services. As the New Zealand Ministry of Education notes Digital literacy being embedded in life situations. Digital literacy is now seen as a “life skill” in the same way as literacy and numeracy (Ministry of Education, 2003; European Commission, 2003).

The importance of digital competence is now the power engine to enhance the rest of competences. This key competence goes beyond the operational use of technological tools and applications and has been studied from different approaches and multiple perspectives. It contributes to the understanding of an integrated approach to digital literacy, where six dimensions are identified: critical, cognitive, operational, social, emotional, and projective (Martínez-Bravo et al., 2022). However, the definitions of digital literacy are contested, leading to the development of different and inconsistent sets of indicators for measuring digital literacy. It is an on-going discussion.

In this backdrop, the rest of the paper tries to understand how the digital literacy has been evolving in the last two decades. It is being argued that digital literacies should be seen as “evolving”, as digital practices shape, and are shaped by the imitations and innovations along with the development of the public digital ecosystem combined with its accessibility and affordability of both the data and the devices. This, however, differ based on income, location whether rural or urban, age, level of education, culture, language (primarily English) skills, etc.<sup>1</sup>. As we will see, defining this term has proven to be complex, because the digital environment is constantly fast changing.

## 2. Methodology

This review analysis is broadly to examine the evolution of the term digital literacy from past studies and reports related to digital literacy. As we progress, it can be seen that it has been continually morphing. In a constantly changing landscape of digital literacies, this paper tries to explore how digital literacy is evolving over time? In this endeavour, our first search is using the keyword, “digital literacy” in google scholar and ideas Economics. Subsequently, the abstracts were examined and if promising those articles and reports were selected for the present review. Another set of related studies were identified by examining the cross-references of those selected papers. In this process, we did not limit any publication to a specific country or area or period. However, we excluded studies related to student digital literacy or students’ digital education.

### 2.1. Data Sources and Search Strategy

The review of studies included in the paper are peer-reviewed journal articles, government reports, policy documents, and other relevant publications. The search for relevant literature was conducted across multiple academic databases and search engines, such as Ideas/RePec: Economics and Finance Research and Google Scholar.

The search strategy used are a combination of keywords and Boolean operators, such as “digital literacy”, “evolution of digital literacy”, “digital literacy in India”, and “information and communication literacy”.

<sup>1</sup>The present paper does not investigate the determinants and variations which many of the social science researchers pursue.

## 2.2. Inclusion and Exclusion Criteria

The inclusion criteria include Studies published in English, Studies conducted in India, Publications from 1990s onwards with a focus on the new millennium, Peer-reviewed journal articles, government reports, policy documents of EU, UNESCO, and other relevant publications.

Exclusion criteria cover viz., Studies published in languages other than English, Publications before 1995, and Non-peer-reviewed articles, opinion pieces, and editorial comments.

## 2.3. Data Extraction and Management

Data extraction was undertaken using a standardized data extraction form to ensure consistency and accuracy. The following information will be extracted from each included study: Author(s); Year of publication; Title of the study; Objectives; Study design; Methodology; Key findings and Conclusions.

## 2.4. Data Synthesis

The data synthesis involved a sequential and critical synthesis of the findings from the included studies. Thereby the synthesis brings out the evolution of digital literacy as concept to start with and subsequently becoming digital competencies recognised by the international agencies and national governments.

### **Procedure adopted include the following**

**Literature Search:** Conduct a comprehensive search of academic databases and search engines using predefined keywords and Boolean operators.

**Study Selection:** Screen the titles and abstracts of the retrieved studies to identify potentially relevant studies. Obtain the full texts of these studies and apply the inclusion and exclusion criteria to select the final set of studies for review.

**Data Compilation:** Extract relevant content from each included study using a standardized table as reported in appendix **Table A1**.

**Data Synthesis:** Sequential and critical synthesize the definitions, discussions, findings from the included studies using narrative synthesis.

Based on these criteria, select earliest studies were found to be suitable and are summarised and reported in appendix **Table A1**<sup>2</sup>.

At this juncture, it is important to differentiate between digital literacy and digital education or education technology. More often, they are used interchangeably. Digital education is an umbrella term to denote any “education that is conducted at least partly in, with or through digital technologies. This definition encompasses the use of technology in traditional classrooms, blended learning and education that takes place entirely online.” (Allan, 2019). In the 21st century, digital technologies are often an unseen part of daily life, from online banking, social media and streaming services, to education or work-specific activities such as email, PowerPoint presentations, and PDF handouts. However, when it comes to

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<sup>2</sup>The relevant studies were selected within the author’s ability. However, there may inevitably exist other related studies which might have been precluded.

more overtly digital technologies such as the Virtual Learning Environment (VLE), or creation or use of digital media resources, or adoption of pedagogical approaches specifically related to digital education things can feel a bit more daunting (Mcilwhan, 2020). The present paper excludes such type of studies.

Yet another often interchangeably used terms are *digital literacy vs. digital skills*, to some extent, they overlap. Despite some continuing inconsistency in the use of the term, several authors, following Paul Gilster, are using “digital literacy” to denote a broad concept, linking together other relevant literacies. Digital literacy can be viewed as a framework for integrating various other literacies and skill-sets, though it does not need to encompass them all. When referring to the differences, however, they compare each with digital skills, which focus on technological issues, and regard both digital literacy and competence as broader terms that incorporate skills, understandings, and critical reflections. Digital literacies can include network literacy, internet literacy, web-literacy, and multimedia literacy. It is important to know whether digital literacy is a “skill” for using digital technologies or a “disposition” toward those technologies? In one perspective, literacy can be used as a synonym for knowledge, competence and learning. Changes in what constitutes digital literacy involves a move from tool based functional literacies to literacies of representation, as well as from reproduction and reception to creating and sharing in digital environments (Pangrazio et al., 2020). Yet another perspective is that digital literacy is not related to a specific technology but rather the competences and skills needed to take advantage of different technologies to learn, framed within certain social and institutional settings (Erstad, 2010). Despite such differences, some tensions associated with the conceptual, practical, and political dimensions of digital literacies and digital competencies as they emerge (Pangrazio et al., 2020).

Noting these tensions between the use of these terms and in response, section II of the paper examines the evolution of the term in two groups, the first one relating to the research studies and another one on capturing the digital skills framework by multilateral agencies such as UNESCO, OECD, EU, etc. Central theme of this review has been: what is digital literacy and how it has been evolving over time and across multiple perspectives. Given this backdrop, the rest of the paper is organised as follows: The third section attempts to explore how digital literacy as a concept has been evolving since 1990s. Fourth section investigates the digital competency framework from an educational policy perspective. The subsequent section investigates the digital literacy in the Indian context. Section VI brings out the concluding remarks along with the concerns.

There have been different understandings of digital literacy in the last two and half decades. Among these various definitions of digital literacy, one way of grouping the studies can be into three categories: i) papers which defined digital literacy focusing on technical skills only; ii) Studies proposed the definition of this term, paying attention to the other related capabilities like literacy, information literacy, financial literacy, etc and iii) Yet another group of studies could be the

digital literacy and its socio-emotional and cultural impact across different contexts. Alternatively, the present review on earlier studies is classified in two parts: first part of the review attempts to understand what is digital literacy considering the research papers of either individuals and or collective works. Subsequently, from the policy outlooks, the views, approaches and frameworks developed by the international organisations in an effort to standardise for the measurement of digital skills or competencies across different settings is examined.

### 3. Evolution of Digital Literacy

Digital literacy is a relatively new concept that emerged in the 1990s during the era of the Internet revolution. Prior to that, it was referred to as “computer literacy”. In 1997, Gilster’s landmark work first defined the skills needed to critically navigate information in an increasingly digital world. Paul Gilster, a historian, and educator first coined the term “digital literacy”, arguing that digital literacy went beyond just skills in using technology. He said it is about “mastering ideas, not computer keystrokes” (Gilster, 1997). For him, digital literacy involves the ability to critically evaluate information (presented in different formats) and make decisions about how to use this information in different real-life context. Gilster (1997) makes a persuasive and authoritative, account of digital literacy, and suggests that there are four core competencies of digital literacy, invariant to technology changes such as *knowledge assembly; internet searching; hypertextual navigation and content evaluation*. Gilster, like many authors but much in advance suggests this new literacy must be seen as an essential life skill, rather a survival skill.

However, Bawden (2001) argues that prior to Gilster’s idea of digital literacy, substantial literature, and practical experience around the ideas of information literacy and computer literacy prevailed. The terms IT and Computer literacy originated largely to describe sets of specific skills and competences needed for finding and handling information in computerized form. “Computer literacy” was the term mainly in vogue through the 1980s, with “information literacy” gaining popularity in the 1990s. Computer literacy stressed the skill sets while Information literacy has been regarded as a multifaceted concept. Bawden (2001) notes the connections and parallels with other fields of literacy, such as information literacy and computer literacy. From an information scientists’ perspective, his emphasis is on information management and skill-based literacies. Like Gilster (1997), Bawden argues that digital literacy should not be reduced to a set of functional skills and competences, and focuses on the importance of context to the meaning making process, including the sociocultural perspective. Further he argues that the traditional idea of literacy per se, i.e., the ability to read, write and deal with information using the technologies, is an essential life skill.

This is somewhat like the *competence lists* as envisaged in the European or UNESCO frameworks, where digital literacy is a generic expression of the idea. However, it is being criticised that using such generic expression is allowing it without much concern for the sometimes-restrictive competence lists. How these

IT and computer literacy definitions have evolved into DigEuLit project or the European framework of defining digital literacy is discussed in the subsequent section. The review articles by [Bawden \(2001, 2008\)](#) and [Martin and Grudzieck \(2006\)](#) attempted to bring in analytical order of the concept of digital literacy and its relation to overlapping concepts such as information literacy, library literacy, media literacy and computer literacy. **Table A2** in appendix illustrates the summary of these key concepts.

Extending it, [Alkalai \(2004\)](#) argues that the use of the term “digital literacy” has been “inconsistent”, arguing that some scholars “restrict the concept to the technical aspects of operating in digital environments, while others apply it in the context of cognitive and socio-emotional aspects of work in a computer environment”. Instead, he identifies five subcategories to digital literacy: photo-visual literacy; reproduction literacy; branching literacy; information literacy; and socio-emotional literacy. Alkalai repeatedly refers to digital literacy as a “survival skill” for “scholars and information consumers” ([Alkalai, 2004](#)).

In a widely quoted work of [Martin and Grudziecki \(2006\)](#), it is argued that the sheer variety indicates that digital literacy can be seen as “a framework for integrating various other literacies and skill-sets” without “the need to encompass them all” or to serve as “one literacy to rule them all” ([Martin and Grudziecki, 2006](#)). Equally, however, it reminds us that any attempt to constitute an umbrella definition or overarching frame of digital literacy would involve reconciling the claims of multiple concepts of digital literacy. In doing so, [Martin and Grudziecki \(2006\)](#) give an account of the DigEuLit project in defining digital literacy, and developing a digital literacy framework for use in European educational settings. Digital literacy is seen as based on a convergence of literacies—IT literacy, information literacy, technological literacy, media literacy, and visual literacy—as their relationship to the digital has become clearer. From the socio-cultural perspective, [Martin and Grudziecki \(2006\)](#) indicated that people possessed the ability, attitude, and awareness to use digital devices in a proper way to handle the digital resources first and then create new knowledge and expressions to make communications with others and make meaningful social actions. In other words, he situates digital literacy in relation to a web of “literacies of the digital” including ICT/computer literacy, information literacy, technological literacy, media literacy, communication literacy, visual literacy, network literacy, e-literacy, digital competence, digital Bildung<sup>3</sup>, and the like.

Given its expansive uses, [Martin and Grudziecki \(2006\)](#) define it as the ability of individuals to understand and use digital technology and its available tools. It becomes a key factor in enabling participation in education, employment, and other aspects of social life, and a means of gaining better understanding of the world in the e-permeated society, a society increasingly unpredictable and uncertain. In a broader sense, [O'Brien and Scharber \(2008\)](#) define digital literacies as

<sup>3</sup>Refers to the German tradition of self-cultivation (as related to the German for: creation, image, shape), wherein philosophy and education are linked in a manner that refers to a process of both personal and cultural maturation.

“socially situated practices. These are supported by skills, strategies, and stances that enable the representation and understanding of ideas using a range of modalities enabled by digital tools”. Digitally literate people not only represent an idea by selecting modes and tools but also plan how to juxtapose multimodal texts spatially and temporally to best represent ideas. It enables the bridging and complementing of traditional print literacies with other media. They regard digital and traditional literacies as like different points on the continuum.

Like [Martin and Grudziecki \(2006\)](#) and [O’Brien and Scharber \(2008\)](#) view digital literacy as plural i.e. digital literacies. They rationalise it with three reasons such as the utter diversity of digital practices; the strength and utility of adopting a sociocultural perspective on literacy practices; and the benefit of an expansive view when considering digital learning. They argue digital literacies should be seen as a sociocultural practice and that there are different ways of reading and writing with digital texts.

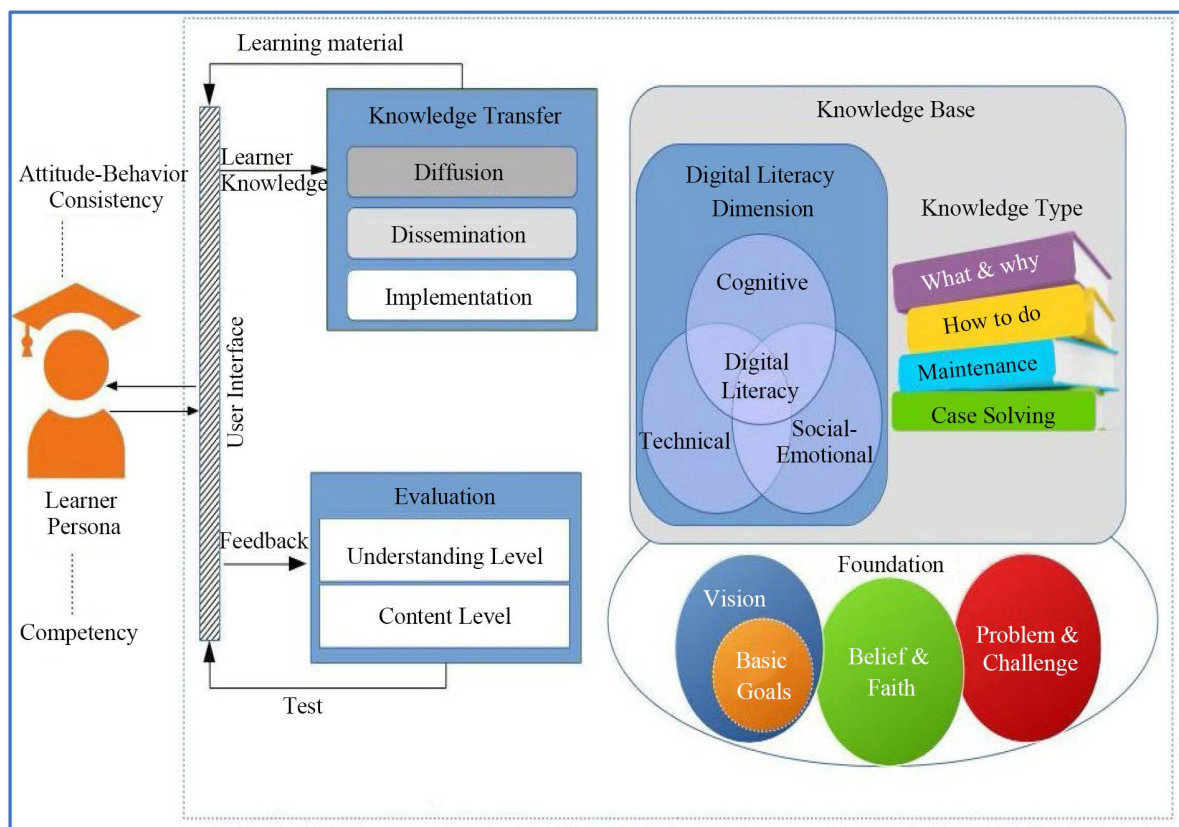
[Bawden \(2008\)](#) puts forward four components for digital literacy education based on his reading of [Gilster \(1997\)](#). They are: Underpinnings (i.e. traditional literacy and computer/ICT literacy); Background knowledge (i.e. nature of information resources); Central competences (i.e. knowledge assembly); Attitudes and perspectives (i.e. independent learning, moral/social literacy). Bawden argues that a “central theme” of digital literacy should be “an ability to synthesize and integrate information from varied sources” ([Bawden, 2008](#)). At the same time, he explains that there is a need for flexibility in how we think about digital literacy education, explaining that it is not “sensible to suggest that one specific model of digital literacy will be appropriate for all people or, indeed, for one person over all their lifetime”.

In a broader perspective of this conundrum, [Jones and Hafner \(2012\)](#) set digital literacy as “the ability to creatively engage in social practices, to assume appropriate social identities, and to form and maintain various social relationships”. They further contemplate that the best way to become more competent users of technologies is to become more critical and reflective about how we use them in our everyday lives, the kinds of things that they allow us to do, and at the same time the kinds of things they don’t allow us to do. A decade later in their 2<sup>nd</sup> edition with the same title, [Jones and Hafner’s \(2022\)](#) examine it with an intersection of technology, language, and literacy. Their illustration of critical digital literacies explores the process of being more aware of how mediational tools such as language, software, and digital media function to shape one’s behaviors and relationships with others and the rest of the world. This is almost like the concern they raised in 2012 and very much relevant today and will hold in the future as well that “mediation is always a matter of power—the tools we use can either empower or disempower us in different ways”.

Digital Literacy is evolving as we progress in this E-world, as [Rahmah \(2015\)](#) expands it to three dimensions involving technical, cognitive, and socio-emotional. Technical is related to the actual use of the technologies, the cognitive di-

mension is meant as a filter to handle useful information when using technology and socio-emotional is referring to the purpose of using technologies, like learning and creating social connection. On expanding, digital literacy is extended to individuals' information in digital environments, access, management, evaluation (quality and validity), creation and analysis of new information, and the choice and use of the right platforms that can meet the needs of daily life (communication, social media, education, business, etc.) (Gilster, 1997; Livingstone, Van Cou-  
 vering, & Thumim, 2008; Ng, 2012).

Among the several definitions reviewed and reported in appendix Table A1, one of the comprehensive digital literacy interfaces (see Chart 1) has been illustrated by Rahmah (2015), which is self-explanatory. He developed it for the Indonesian context, however applicable to global citizens. It has four distinct parts, each one is interdependent, however stems from the foundation values (coming from stable homes), and knowledge base (based on the socio-economic and school characteristics along with family support). These two are the building blocks for an individual to use and apply the digital literacy skills in both knowledge transfer and evaluation. The fourth part is of the bidirectional connections of the individual users in terms of the attitude-behavior consistency and digital and knowledge competency (see Chart 1).



Source: Rahmah (2015).

Chart 1. Digital literacy learning system.

This illustration in **Chart 1** provides a comprehensive ecosystem. In a similar vein but in a lighter way yet on the other side of the coin, the illustration at the appendix in **Figure A1** posits on reflecting on one's digital identity from an individual or users' perspective. Yet another comprehensive view is offered by JISC (2015), which defines digital literacy as "the capabilities which fit someone for living, learning and working in a digital society". The capabilities outlined by JISC include: information, media, data literacy (critical use); digital creation, scholarship, and innovation (creative production); digital communication, collaboration, and participation (participating); digital learning and personal/professional development (learning); and digital identity and wellbeing (self-actualising) (JISC, 2015).

So far, the discussions encompassed the idea of digital literacy captured, and examined by various researchers from largely a theoretical exposition or point of view. Extending this discussion flows from the endeavours of the multilateral, bilateral and national governments' efforts towards standardisation for the purposes of measurement in the policy arena. Parallel to these researchers' individual and collective works on the efforts to understand, define and explore digital literacies, the international agencies such as UNESCO, OECD, etc. make the initiatives to develop an encompassing framework to measure digital competencies across nations. At the international level "digital literacy" is approached in a more generic and instrumental way and avoids drawing on the specific operational context of the learner. In a somewhat similar way, national governments as well have made attempts to develop such frameworks<sup>4</sup>.

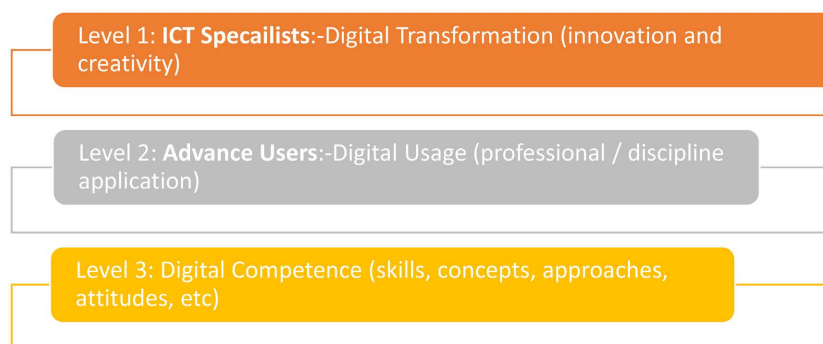
Digital competence is increasingly becoming the power engine to enhance the rest of competences. This key competence goes beyond the operational use of technological tools and applications and has been studied from different perspectives adopting several approaches. In this light, we try to understand some of the select definitions and approaches to comprehend the term digital literacy (skills). Their conceptual multiplicity is inevitable—given the wide spectrum of its applications, viz., social media literacy, data literacy, app-based literacy, games literacy, AR and VR based games, platform-based literacy, portal-based literacy, etc. Such multiplicity could also be due to the interaction and involvement of multiple stakeholders including the state, think tanks, industry groups, academics, the media, etc. Interestingly, they are neither ideologically neutral nor coherently and consistently communicated. Each represents an interest in the field of literacy education relating to their own spheres.

Digital competence, for example, refers to the specific set of skills required to be digitally literate, whereas digital literacy refers to skills as well as dispositions, including the tacit and social practices associated with digital media use. Recently, with the push to standardise digital literacy as a set of "skills" the trend has been against social approaches to literacy. However, several scholars have critiqued broader definitions of digital literacy as "vague", arguing that digital literacy be-

<sup>4</sup>As a point of reference, an effort is made here to examine it in the Indian context.

comes a “catch-all” phrase for knowledge, competence and learning. This might explain why the term “digital competence” rather than “digital literacy” has become an agenda setter for education policy. It has been noted that competences cannot be reduced to a list of abilities or capabilities. Competence is a constellation of abilities and/or capacities embodied in successful activities (tasks) and outcomes. From the competency perspective, digital literacy is a middle point of purely behaviourist and activist views of human beings. Noting these restraints, the following paragraphs examine the digital competency framework.

UNESCO (2003) in its Prague Declaration states that information literacy is prerequisite for participating effectively in the Information Society, and is part of the basic human right of lifelong learning (UNESCO, 2003). Enhancing it to digital literacy after 15 years, it is the ability to access, manage, understand, integrate, communicate, evaluate, and create information safely and appropriately through digital devices and networked technologies for participation in economic and social life. It includes competences that are variously referred to as computer literacy, ICT literacy, information or data literacy, and media literacy (UNESCO, 2018). Evidently, it echoes Gilster’s and many others’ definition that it is the ability to use digital technology, communication tools or networks to locate, evaluate, use and create information. It also refers to the ability to understand and use information in multiple formats from a wide range of sources when presented via computers, or to a person’s ability to perform tasks effectively in a digital environment.












Source: Based on OECD (2005).

**Chart 2.** Levels of digital literacy.

At the start of the new millennium, there were no commonly adopted definition of ICT skills, but efforts were ongoing to characterize the various types of ICT skills, for example through the [European Skills Forum \(2004\)](#). Three categories of ICT competencies are distinguished, viz., (1) ICT specialists: who have the ability to develop, operate and maintain ICT systems. In this case, ICTs constitute the main part of their job; they develop and put in place the ICT tools for others. (2) Advanced users: competent users of advanced, and often sector-specific, software tools. Here, ICTs are not the main job but a tool; and (3) Basic users: competent

users of generic tools (e.g. MS office tools) needed for the information society, e-government and working life. Here too ICTs are a tool, not the main job (OECD, 2005). These are illustrated in **Chart 2**.

Even though MDGs did not consider the digital competencies, it was part of the SDGs under SDG 4, quality of education. SDG target 4 has ten different targets encompassing different aspects of education and literacy. Under this sub-component, target 4.4 states that by 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs, and entrepreneurship, in which 4.4.1. refers to digital competency or digital literacy. United Nations incorporated “digital literacy skills” as a thematic indicator under its Sustainable Development Goals, implying that digital literacy is no longer a conspicuous privilege but an essential right. Accordingly, the sub-component 4.4.1 of SDG 4, defines the proportion of youth/adults with information and communications technology (ICT) skills, by type of skill. These ICT skills are illustrated in **Box 1**.

Skills to be measured to assess ICT skills	
 Copying or moving a file or folder	 Finding, downloading, installing and configuring software
 Using copy and paste tools to duplicate or move information within a document	 Creating electronic presentations with presentation software (including text, images, sound, video or charts)
 Sending e-mails with attached files (e.g document, picture, video)	 Transferring files between a computer and other devices
 Using basic arithmetic formulae in a spreadsheet	 Writing a computer program using a specialised programming language
 Connecting and installing new devices (e.g. modem, camera, printer)	

Source: <https://uis.unesco.org/en/blog/meet-sdg-4-data-indicator-4-4-1-skills-digital-world>.

**Box 1.** Skills to be measured to assess ICT skills.

However, to offer a more comprehensive view of the digital skills of youth and adults, the UIS, through the Global Alliance to Monitor Learning (GAML) with partners viz., Global Education Monitoring (GEM) Report and Hong Kong University’s Centre for Information Technology in Education (CITE) developed the thematic Indicator 4.4.2. It is measured as the percentage of youth/adults who have achieved at least a minimum level of proficiency in digital skills. In addition to SDG 4 monitoring, this framework lays the foundations to develop new sources of information which can be used to better track the use of ICT not just in education but also the wider use of digital skills by households, businesses, and e-government.

Subsequently, Indicator 4.4.2 is measured as percentage of youth/adults who have achieved at least a minimum level of proficiency in digital literacy skills. This is also known as the Digital Literacy Skills indicator. To develop a methodology that can serve as the foundation for SDG 4.4.2., the UNESCO commissioned worldwide review in 2018 which suggests that the European Digital Competence framework is the most suitable for the development of a global digital literacy framework<sup>5</sup>. It involved a technical review of more than 40 digital literacy frameworks which represents world regions and income groups. These different frameworks were mapped against the European Commission's Digital Competence Framework for Citizens (DigComp 2.1).

**Table 1.** Proposed digital literacy competence areas and competences.

Competency area	Competencies
0. Fundamentals of hardware and software	0.1 Basic knowledge of hardware such as turning on/off and charging, locking devices 0.2 Basic knowledge of software such as user account and password management, login, and how to do privacy settings, etc.
1. Information and data literacy	1.1 Browsing, searching and filtering data, information and digital content 1.2 Evaluating data, information and digital content 1.3 Managing data, information and digital content
2. Communication and collaboration	2.1 Interacting through digital technologies 2.2 Sharing through digital technologies 2.3 Engaging in citizenship through digital technologies 2.4 Collaborating through digital technologies 2.5 Netiquette 2.6 Managing digital identity
3. Digital content creation	3.1 Developing digital content 3.2 Integrating and re-elaborating digital content 3.3 Copyright and licenses 3.4 Programming
4. Safety	4.1 Protecting devices 4.2 Protecting personal data and privacy 4.3 Protecting health and well-being 4.4 Protecting the environment
5. Problem solving	5.1 Solving technical problems 5.2 Identifying needs and technological responses 5.3 Creatively using digital technologies 5.4 Identifying digital competence gaps 5.5 Computational thinking
6. Career-related competences	6. Career-related competences refers to the knowledge and skills required to operate specialized hardware/software for a particular field, such as engineering design software and hardware tools, or the use of learning management systems to deliver fully online or blended courses.

Note. Underlined competence areas and competences are proposed additions to the existing DigComp 2.1 competences.

Source: UNESCO (2018).

<sup>5</sup><https://sdgs.un.org/partnerships/contribution-development-global-digital-literacy-skills-indicator>.

Even though DigComp 2.1 was designed to reflect the situation in European countries, the UNESCO commissioned review focussed on the measurement frameworks used in developing countries and examined the application of digital literacy skills across economic sectors, viz., agriculture, energy, finance, transportation, etc. Even though DigComp 2.1 is comprehensive, yet it lacked two critical areas: (i) fundamentals of familiarity with hardware and software, which is an offshoot of the literate population of advanced nations; and (ii) career-related competences, which would help make the generic competences more relevant to country contexts through practical examples of their use. The proposed global framework covers a total of seven areas of competence presented in **Table 1**.

Interestingly, this framework supports the efforts to develop indicators for SDG targets beyond education. Wider development priorities of their respective countries shaped the skills and competences adults sought to improve. This has important implications for the new framework. The first order is to provide a tool that countries can use to monitor progress towards SDG 4. But at the same time, the framework can also serve as a guide to help countries with very different contexts and needs target their policies, interventions, and assessment of digital literacy (UNESCO, 2018). This is an important educational policy initiative on the digital competency front. Getting back with SDG 4.4, **Table 2** below summarises the digital literacy in a comprehensive manner.

**Table 2.** SDG Target 4.4 and its sub-components.

Target 4.4	By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship <sup>6</sup>
4.4.1	Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill
4.4.2	Percentage of youth/adults who have achieved at least a minimum level of proficiency in digital literacy skills
4.4.3	Youth/adult educational attainment rates by age group, economic activity status, levels of education and programme orientation

Source: UNESCO (2018), quick guide to education indicators for SDG 4, UNESCO Institute for statistics, and sustainable development goals.

Further, the Information and Knowledge Society demands the development of skills for the critical and responsible consumption and use of technology for leisure, personal, professional, academic development, and citizen participation. In an integral perspective based on the content analysis of eight different international frameworks (EnGauge, National Assessment of Education Process, European Union, National Education Technology Standards, UNESCO, OECD, and P21 (Martínez-Bravo et al., 2022)) contribute to the understanding of an integrated approach to digital literacy, where six dimensions are identified: critical,

<sup>6</sup>Definitions from multinational organisations such as these tend to standardise the concept of digital literacy in an “instrumental” way, promoting skills that are labour-oriented (Pangrazio et al., 2020).

cognitive, operational, social, emotional, and projective. In these definitions, there is an emphasis on mastery of skills and tools, and referred to as digital competence. For instance, the European Union refers to digital literacy as digital competence and includes this in its standard of eight key competencies for lifelong learning.

Digital Competence can be broadly defined as the confident, critical, and creative use of ICT to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society. Digital competence is a transversal key competence that enables to acquire other key competences (e.g., language, mathematics, learning to learn, cultural awareness). It is related to many of the 21st Century skills which should be acquired by all citizens, to ensure their active participation in society and the economy.

These digital competence expositions standardised instrumental approach to developing digital literacies. It is important to emphasise that digital literacy refers to something broader than digital competence, digital skills, or digital proficiency. Digital competence, for example, refers to the specific set of skills required to be digitally literate, whereas digital literacy refers to skills as well as dispositions, including the tacit and social practices associated with digital media use. In more recent years, with the push to standardise digital literacy as a set of “skills” the trend has been against social approaches to literacy. Broader definitions of digital literacy are critiqued as “vague”, arguing that digital literacy becomes a “catch-all” phrase for knowledge, competence and learning. This might explain why the term “digital competence” rather than “digital literacy” has become an agenda setter for education policy in the international context. To a larger extent, this trend is being adopted in national contexts like the case of India.

The term competence has also raised controversy—responds to educational reforms developed by international organizations and is framed by neoliberal demands such as structural adjustments. Despite these tensions, it is a multidimensional concept. It is of vital significance to increase both the basic digital skills and those skills by which people understand and use the online content. It can be deciphered from the foregoing analysis that digital literacies should be seen as “evolving”, as digital practices shape, and are being continuously shaped by the providers inside and users outside of ecosystem. Hence, updating the digital literacy and competencies is mandatory, as individual circumstances change, and as changes in the digital information environment bring the need for fresh understanding and new competences. Rather the digital literacy becomes a necessary condition and a threshold level of digital literacy becomes a pre-requisite for countries to move out of the middle-income trap, which India is aspiring for.

#### 4. Digital Literacy in India

In this virtual world, India is one of the forerunners and an emerging third pole in the world’s digital landscape, besides USA and China. To make India digitally competitive, the *Digital India* campaign was launched by the Govt of India in

2015 to ensure that all government services are available to citizens electronically via improved online infrastructure and increased internet connectivity. Digital India programme, which aims to transform India into a digitally empowered society and knowledge economy, envisions digital infrastructure as a core utility to every citizen. The focus areas include the availability of high-speed internet as a core utility for delivery of services to citizens, unique digital identity, enabling citizen participation in digital and financial space, shareable private space on a public cloud<sup>7</sup> and a safe and secure cyber-space, by the Govt of India in 2023.

As discussed earlier, digital literacy is the ability of individuals or organizations to understand, use, evaluate, and create information using digital technology. It includes skills in accessing the internet, using digital devices, communicating online, and understanding cybersecurity and digital ethics. Mastering digital literacy requires digital competence. Digital literacy is developing or evolving to the demands of community needs development. Digital literacy skills can answer various problems currently being faced by society, especially in the business world. Multiple concepts experts view digital literacy with each approach to obtain information to make it easier for organizations or individuals to achieve their goals. For this reason, the Indian government is helping society towards digitalization by providing infrastructure for internet connectivity<sup>8</sup>.

In the Indian context, GoI (Meity)<sup>9</sup> defines digitally literate persons are those who can operate computers/digital access devices (like tablets, smartphones, etc.), send and receive emails, browse the internet, access Government Services, search for information, undertake cashless transactions, etc. and hence use IT to actively participate in the process of nation-building. Based on the above discussions, it can be noted that the Meity definition of digital literacy caters to the generic skills and is almost similar to UNESCO's digital skill framework as reported in **Box 1** titled as Skills to be measures to assess ICT skills. It is from an utilitarian perspective and at the beginners' level. While NSO (2019) in its 75<sup>th</sup> round defines it as the ability to operate computer involve the following tasks viz., If a person of age 5 years and above was able to carry out any of the tasks given below using a computer, he/she was considered as able to operate computer; Copying or moving a file or folder; Using copy and paste tools to duplicate or move information within a document; Sending e-mails with attached files (e.g. document, picture, and video); Using basic arithmetic formulae in a spreadsheet; Connecting and installing new devices (e.g. modem, camera, printer); Finding, downloading, installing, and configuring software; Creating electronic presentations with presentation software (including text, images, sound, video or charts); Transferring files between a computer and other devices, and Writing a computer program using a specialized programming. This NSO (2019) has adopted the SDG sub-component

<sup>7</sup>Citizens can digitally store their documents, certificates, etc. and share them with public agencies or others without the need to physically submit them.

<sup>8</sup>This paper however does not focus on the benefits of digital literacy for society and the business world as its focus is on evolution of digital literacy.

<sup>9</sup>Ministry of Electronics and Information Technology (Meity), GoI.

of 4.4.1 as illustrated in **Box 1**.

In the 78<sup>th</sup> NSO Multiple indicator survey for the period 2020-21, ICT skills are defined as the ability of performing different ICT skills of each of the surveyed persons of age 15 years and above were collected in terms of the nine questions, viz. (i) whether able to copy or move a file or folder, (ii) whether able to use the copy and paste tools to duplicate or move information within a document, (iii) whether able to send e-mails with attached files (e.g. document, pictures and video), (iv) whether able to use basic arithmetic formulae in a spreadsheet, (v) whether able to connect and install new devices (e.g. modem, camera, printer), (vi) whether able to find, download, install and configure software, (vii) whether able to create electronic presentations with presentation software (including text, images, sound, video or charts), (viii) whether able to transfer files between a computer and other devices and (ix) whether able to write a computer program using a specialized programming language. The percentages of persons of age (15 - 24) years and (15 - 29) years, with ability of performing these ICT skills (NSO, 2023). Even though this NSO (2019) definition is little broader, yet it is evident that the situation is similar to the definition of Indian adult literacy levels.

Given that the digital world will continue to evolve, digital literacy also needs to progress, albeit in ways that might initially be uncomfortable for some. This emergence and evolution of digital literacy in the global context brings out several similarities in the Indian context through various government and non-government initiatives in enhancing the digital literacy of the adult population of India. Some of the key initiatives by the Govt. of India in this direction are the Skill India, Digital India, and the vast and vibrant digital public infrastructure that has been created since the beginning of the twelve-digit unique identity numbers starting in 2009, is almost universal. Even though the ecosystem of the public digital infrastructure is in place in India, yet improving the digital skills are equally important, besides enhancing the access to devices and cheap or free data to the hardest to reach groups of the deprived population of India.

The Govt. of India initiatives in these directions are (i) National Digital Literacy Mission (NDLM) and (ii) Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) and the emphasis on the digital or e-learning in the New Education Policy, 2020. Besides, several private (Facebook, Google, etc.), public-private initiatives and multilateral organisations like UNICEF, World Economic Forum, etc are intervening in the promotion of digital literacy across the nooks and corners of Bharat. Improving digital literacy especially in pockets where the adult literacy levels are low. There are several GoI initiatives in this regard to cover especially women in rural India. This is indeed a great task ahead as it is essential that majority of the population must know how to utilize the digital services. Despite all those endeavors, it is important to note that India is just at the preliminary level of defining digital competencies.

## 5. Summing Up

Originating in the US (Gilster, 1997) and spreading quickly to the UK, Canada

and Australia, the term digital literacy captures the set of skills and dispositions required for effective use of digital media. It refers not only to the skills and capacities required to use digital texts, but also a disposition toward the digital that is both critical and creative. In these early conceptualisations, digital literacy had a normative function, with little focus on the everyday literacies' individuals bring to their use of digital media. Later, as [Bawden \(2008\)](#) notes, there is some noticeable continuum from the early references to computer literacy and the subsequent emergence of new forms of literacies from information literacy to the Internet, web literacy and digital literacy.

To sum up on the Digital Literacy as a concept, with the evolution of the Internet, technology, internet of things (IoT) and given the massive scope of what can be done with digitization, the conception of digital literacy has been expanding, with elements of cultural, economic, political, and social participation. It can be noted that digital literacy an encompassing term evolved from the ICT literacy two to three decades ago. On the contrary, digital literacy in India is viewed 'the capacity of individuals and communities to interact with, access and utilize new and existing digital technologies relevant to their existing as well as emerging needs and requirements. This is a means-based or an utilitarian approach. Digital literacy is much broader than other terms like ICT literacy, and comprises different types of literacies, viz., numerical literacy, financial literacy, information literacy, communication literacy that involve an interaction with technology ([Martin and Grudziecki, 2006](#)). It is quite evident that the meaning and scope of digital literacy and competence is not static but dynamic across time and space as both social practices and technology develop.

Yet another interesting and welcoming development in this process is the fact that digital literacy or competencies binds scholars across a range of disciplines, including computer scientists, IT specialist, education, economics, information science, psychology, sociology, etc. This gives an impetus to a multi and inter disciplinary approaches and studies. Many of the practical initiatives and attempts to improve digital literacy have had abilities-oriented rather than socio-cultural underpinnings, popularity of theoretically simpler conceptualisations is their measurability and skill-oriented conceptualisations. Digital competencies and skills, though equally worthwhile to capture the status quo of the country or global contexts, though is an effort to standardisation. Even though it has been evolving as with digital literacy, it misses out some of the important socio-cultural, psychological and other concerns. The interaction of the digital world with reality brings in very deep challenges and concerns in many spheres. Few select issues of them are flagged here. They can be categorised into educational, social, economic, and political issues.

### **5.1. Education**

One major concern is whether digital literacy should be thought of as a list of skills or whether it referred to something broader, such as social practices and values, remains an ongoing discourse. The extent to which context should be emphasised

is another point of difference. It has implications for digital literacy education and research. For example, educators and researchers working in the ‘skills’ tradition would focus on what needs to be taught and understood, whereas those working in the social tradition might be more interested in finding out what people do with digital media and texts in their everyday lives. To researchers from the social practice perspective, digital literacies cannot be separated from the social, technological, and economic changes taking place, so any kind of empirical work must take account of these broader shifts (Sefton-Green et al., 2016).

Since digital literacy has emerged from an existent field (i.e. literacy) many of the tensions and issues evident in literacy research were carried over into this new and emerging field. Some of the *generic skills* are simply expressed as reading, writing, counting; whilst others are harder to specify viz., analytical thinking, or the awareness of bias. The rapidity with which digital literacy evolves has raised the importance of generic skills issues; and in the e-permeated world, the claim of digital literacy to be recognised as an essential generic skill. This generic skill is intricately linked with the progress and attainment of digital literacy skills. Further, proliferation of competing definitions and inconsistency of the references to different types of digital literacies is problematic. In this process, plurality of digital literacies has become too broad and confused. Moreover, it appears doubtful whether it is possible to reach a full consensus of views. Gilster’s idea of literacy may be seen as a relatively straightforward extension of the traditional idea of literacy as a capability to read and write—to cope with information using the conventional array of contemporary technologies. This understanding is contrasted by a socio-cultural understanding of literacy as a constellation of social practices.

## 5.2. Social

Today’s *digital exclusion* is instead reinforcing existing patterns of privilege and discrimination. It is quite clear that many of the offline inequalities are replicated online. Recent research from the ITU and gSmA shows that the *digital gender gap* is growing wider. Digital traces that are being created by the users are not aware of the purposes for which this data is used for. Global and local digital companies rely on this data to personalize services and target ads that will be most relevant to users, but this collection of data can also lead to unintended consequences when we are profiled in ways that are detrimental to our interests, or when governments around the world take advantage of our digital trails to extend the state surveillance apparatus to unprecedented levels.

Using the National Survey Organization data, Geetha Rani (2023) constructed a youth digital literacy index across states in India using NSO data corresponding to the period 71<sup>st</sup> and 75<sup>th</sup> rounds of data. Digital literacy in the 71<sup>st</sup> round is calculated with following weights:  $0.25 * (\text{youth who are able to operate computers}) + 0.25 * (\text{youth who are able to use the Internet}) + 0.5 * (\text{youth who have used the Internet for emailing})$ . Digital literacy in the 75<sup>th</sup> round is calculated with the following weights:  $0.25 * (\text{youth who are able to operate computers}) + 0.25 * (\text{youth$

who are able to use the Internet) + 0.5 \* (youth who have used the Internet during the last 30 days). The study found an alarming gap across States and gender in the acquisition of digital literacy skills among youth in India, for details (Geetha Rani, 2023). Such **digital exclusion** is indeed reinforcing existing patterns of privilege and discrimination. It can be observed that many of the offline inequalities are replicated online.

### 5.3. Economic

Digital public infrastructure and the ecosystem play a key role. Its access and affordability rely on both supply and demand side of the digital goods and services. Access and affordability of the devices and data, an interplay of these crucially depend on the digital ability and literacy. India being a forerunner in the cyber space has an edge on the supply front on the connectivity where she has largely attained the SDG goals of **universal, affordable Internet access** for all. But the reality is that we still have a long way to go to achieve this goal Even though the supply of 4G internet connectivity is universal, yet the constraints on the demand side, viz., access to smart phones, less share of digitally literate population which is very closely related to the adult and youth literacy rates, and lower internet penetration pose challenges.

### 5.4. Political

Given the asymmetry of information and awareness between digital providers and consumers, **regulation** must focus on the data aggregator who has a disproportionately larger control in the ways data can be sliced, aggregated, used and abused. Digital literacy encompasses issues of privacy, safety, and ethical use of technology.

Everyone has a right to know what is collected about us and what it will be used for. And we have a right to transparent explanations of how **our personal data** is processed, sold, and used to make decisions for and about us. All of us—government and public sector policymakers, tech companies and service providers, activists, and civil society—must come together to develop policy and regulatory frameworks that protect us online, and which put a fair level of control back into the hands of the people.

Above all, the concept **digital agency**, which is defined in terms of three component parts—digital competence, digital confidence, and digital accountability. Passey et al. (2018) contend that from an equity perspective all learners need to be able to develop agency in all three parts to live, work and learn in current society. They further argue that “Fundamentally, unless people have agency, they cannot act in their own interests, and are effectively powerless. Thus, equipping citizens with the skills and attributes required to exercise digital agency is a big societal challenge involving all stakeholders, including policy makers, technology leaders, practitioners, and the research community” (Passey et al., 2018). All these concerns are equally important and needs full attention in the Indian context.

## Declaration

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## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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## Appendix

**Table A1.** Understanding the evolution of digital literacy: select explanations/definitions of digital literacy.

Author(s)	Definition/Explanation
Gilster (1997)	The ability to make informed judgements about what is found on-line, which he equates to “the art of critical thinking”, the key to which is “forming a balanced assessment by distinguishing between content and its presentation”, skills of reading and understanding in a dynamic and non-sequential hypertext environment knowledge assembly skills; building a “reliable information horde” from diverse sources, with “the ability to collect and evaluate both fact and opinion, ideally without bias” searching skills, essentially based in Internet search engines managing the “multimedia flow”, using information filters and agents creating a “personal information strategy”, with selection of sources and delivery mechanisms an awareness of other people and our expanded ability [through networks] to contact them to discuss issues and get help being able to understand a problem and develop a set of questions that will solve that information need understanding of backing up traditional forms of content with networked tools wariness in judging validity and completeness of material referenced by hypertext links (as quoted in <a href="#">Bawden, 2001</a> )
(Livingstone, Van Couvering, & Thumim, 2008).	Digital literacy refers to individuals’ information in digital environments, access, management, evaluation (quality and validity), creation and analysis of new information, and the choice and use of the right platforms that can meet the needs of daily life (Communication (social media, etc.), education, business, etc.)
Alkalai (2004)	<p>“The ability to survive in the digital age.” Digital literacy involves more than the mere ability to use software or operate a digital device; it includes a large variety of complex cognitive, motor, sociological, and emotional skills, which users need to function effectively in digital environments. The tasks required in this context include, for example, “reading” instructions from graphical displays in user interfaces; using digital reproduction to create new, meaningful materials from existing ones; constructing knowledge from a nonlinear, hypertextual navigation; evaluating the quality and validity of information; and have a mature and realistic understanding of the “rules” that prevail in the cyberspace.</p> <p>describes a new conceptual model for digital literacy, as a “survival skill in the digital era,” though largely derived from, and mainly applicable to, the context of formal education. It is based on an integration of five other “literacies”: photo-visual literacy (the understanding of visual representations); reproduction literacy (creative re-use of existing materials); information literacy (understood as largely concerned; with the evaluation of information); branching literacy (essentially the ability to read and understand hypermedia); and social-emotional literacy (behaving correctly and sensibly in cyberspace). Photo-visual; Reproduction; Information; Branching, and Socio-emotional literacy.</p>
Van Joolingen (2004)	ICT literacy is the interest, attitude, and ability of individuals to appropriately use digital technology and communication tools to access, manage, integrate, and evaluate information, construct new knowledge, and communicate with others to participate effectively in society. It was part of the OECD-ILO led Program for International Student Assessment (PISA) project.
Martin and Grudziecki (2006)	Digital literacy is seen as based on a convergence of literacies—IT literacy, information literacy, technological literacy, media literacy, and visual literacy—as their relationship to the digital has become clearer.
O’Brien and Scharber (2008)	Digital literacies as socially situated practices supported by skills, strategies, and stances that enable the representation and understanding of ideas using a range of modalities enabled by digital tools. Digitally literate people not only represent an idea by selecting modes and tools but also plan how to juxtapose multimodal texts spatially and temporally to best represent ideas. Digital literacies enable the bridging and complementing of traditional print literacies with other media.

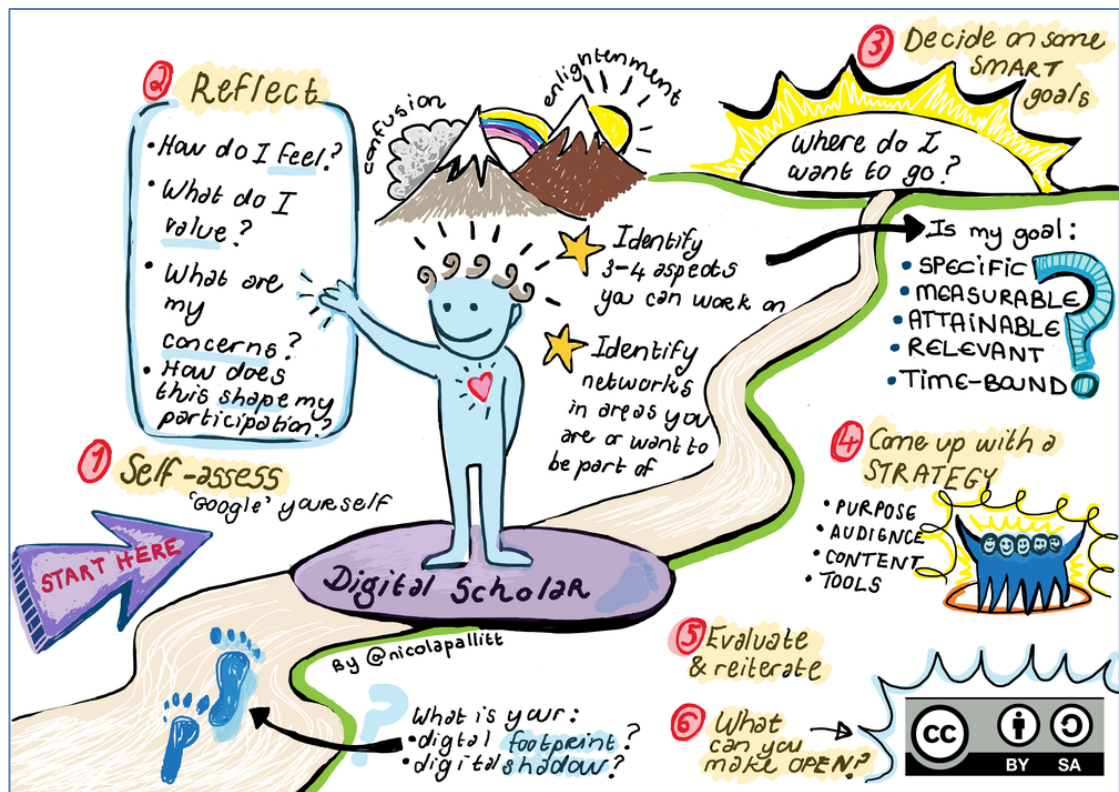
**Continued**

Ng (2012)	Adapting to existing and new technologies is an indicator of digital literacy
Rahmah (2015)	Three dimensions, technical, cognitive, and socio-emotional; technical is related to the actual use of the technologies, cognitive dimension is meant as a filter to handle useful information when using technology and socio-emotional is referring to the purpose of using technologies, like learning and creating social connection
<b>International Digital Frameworks</b>	
Ministry of Education, 2003	Digital literacy is the ability to appreciate the potential of ICT to support innovation in industrial, business, and creative processes. Learners need to gain the confidence, skills, and discrimination to adopt ICT in appropriate ways. Digital literacy is seen as a “life skill” in the same way as literacy and numeracy.
European Commission (2003)	The ability to use ICT and the Internet becomes a new form of literacy—“digital literacy”. Digital literacy is fast becoming a prerequisite for creativity, innovation, and entrepreneurship and without it, citizens can neither participate fully in society nor acquire the skills and knowledge necessary to live in the 21st century (European Commission, 2003)
Prague Declaration (UNESCO, 2003)	Information Literacy encompasses knowledge of one’s information concerns and needs, and the ability to identify, locate, evaluate, organize, and effectively create, use, and communicate information to address issues or problems at hand; it is a prerequisite for participating effectively in the Information Society, and is part of the basic human right of lifelong learning
UNESCO (2011)	As a set of basic skills required for working with digital media, information processing and retrieval. Digital literacy also enables one’s participation in social networks for the creation and sharing of knowledge, and the ability supports a wide range of professional computing skills. Digital literacy, as with general literacy, provides an individual with the capability to achieve other valued outputs in life, especially in the modern digital economy.
DigEuLit project, (2006) as in Martin and Grudziecki (2006)	Digital Literacy is the awareness, attitude, and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse, and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, to enable constructive social action; and to reflect upon this process.
OECD (2016)	identified the types of valued ICT skills as ICT generic, ICT specialist and ICT complementarity (OECD, 2016). Generic skills allow an individual to use skills for technology for professional purposes and specialist skills allowed the worker to programme, develop applications and manage the use of the new modern technologies. Complementary skills allow the worker to use technical skills in multiple work settings.
World Economic Forum (WEF, 2016)	White paper in 2016 discussing the needs of digital enterprises and focused on digital business models, digital operating models, digital talent and skills, and digital traction metrics (WEF, 2016). The recommendations pertaining to digital skills, are targeted to businesses and offer strategies for developing digital competence amongst their staff. To do so, the WEF identifies the need to monitor digital competence amongst the workforce across sectors.
UNESCO (2018)	Links the need to measure digital literacy to Sustainable Development Goal Four. They identify a common need to measure the proficiency levels in reading and mathematics as there is to digital literacy. In measuring ICT skills, UNESCO referred to the International Telecommunication Union’s (ITU) narrow view of ICT skills and refers to computer related activities such as copying files, managing a spreadsheet and writing a computer programme. Whilst recognising the broader nature of digital literacy, UNESCO found it important to have a concrete measurement.
<b>India</b>	
Indian National Statistical Office	a digitally literate person is at least five years old and can navigate the Internet via a web browser, use e-mail, and find, evaluate, and communicate information using social media tools.

**Table A2.** Summary of key concepts (adapted from Brown, 2023, CC-BY-SA).

	Information Literacy	Media Literacy	Computer Literacy	Digital Literacy	Financial Literacy
Definition	the ability to locate, identify, retrieve, process, and use digital information optimally (UNESCO, 2011)	the ability to access the media, to understand and to critically evaluate different aspects of the media and media content, and to create communications in a variety of contexts (European Commission, 2007)	a set of user skills that enable active participation in a society where services and cultural offerings are computer supported and distributed on the Internet (UNESCO, 2011)	those capabilities which fit an individual for living, learning, and working in a digital society (JISC, 2015)	combination of awareness, knowledge, skills, attitude, and behaviours necessary to make sound financial decisions and ultimately achieve individual financial wellbeing, (OECD, 2022)
Primary Focus	information retrieval and assessment of quality	evaluation and production of media texts	skills in the use of computer-related technology	innovation, collaboration, lifelong learning	skills & concepts required to handle the money wisely

Source: adapted from Brown (2023).



Source: <https://pressbooks.library.torontomu.ca/digcit/chapter/chapter-1/>.

**Figure A1.** Reflecting on one's digital identity.