



# A STUDY OF DIGITAL LITERACY AND ITS IMPORTANCE FOR THE INDIAN APPAREL INDUSTRY

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*Abstract*— This exploratory study is based on an integrative literature review approach to determine the origin of the term digital literacy, its evolution, and its various theoretical conceptualizations as done by researchers since its inception. It is also aimed to study the significance and utility of digital literacy for the Indian apparel industry.

A review of the extant literature on digital literacy brings out some popular theoretical models and frameworks based on its significance and use. Yet, since each of these models is somewhat different from the other, UNESCO carried out a cross-national mapping of these frameworks from multiple countries across various geographical regions and income levels to come to a common framework and definition of digital literacy. However, some researchers feel that the meaning of digital competence will keep varying due to the rapidly changing technology and society. So, an established definition of digital literacy may not remain relevant with time.

Similarly, to find out the significance of digital literacy in the Indian apparel industry, a review of some popular research papers on apparel industry digitization has been considered. The Indian apparel industry's current level of digitization and potential scope for further digital transformations have also been discussed and examined in this paper. Just as the term digital literacy is still evolving, so is the case with its significance and application, both in India and abroad. Initially, it was seen as a major tool to enhance productivity. However, now its application seems important in multiple areas of the fashion business. Digital literacy is more of a tool now to holistically improve our general living.

*Keywords*— Digital literacy, Digital technologies, Digital competence, Indian apparel industry

## I. INTRODUCTION

Lately, there has been a lot of emphasis on digital innovations in the fashion and apparel industry. Researchers like Behr (2018) who call this digital transformation of the clothing industry as Fashion 4.0, further commented that in the coming years, intelligent apparel will have widespread applications. Be it in biometric body analysis in sports and healthcare, assistance systems for sensory organs and muscular activities, or other similar applications in digital services as part of the Internet of things (IoT) environment. He predicted that digital technology applications will certainly gain worldwide popularity in the fashion and apparel industry. India, being one of the major global suppliers of textiles and apparel is therefore expected to embrace this digital transformation and gain maximum benefit from it.

However, researchers like Khurana (2022) state that despite various technological innovations and advancements in the Indian garment sector, not much has been put into practice. While the banking, education, and health care sectors are quickly adapting to digital change, the textile and apparel industry is lacking behind. Citing other references, the author even admits that most advanced companies in India that have performed digitization of their activities and workflows are still not equipped to face the challenges of digital transformation. Nevertheless, since digitization is the future of all industries today, Indian textile and apparel industry should start to think intensively about it. There should be more awareness of the utility and significance of digital technologies in this industry. Hand in hand, emphasis should also be given in making the apparel industry workforce digitally literate, to face this



challenge. In fact, one should understand and appreciate the holistic importance of digital literacy first and then think of its application which will lead to the much-desired digital transformations.

Digital literacy, of late, has made a phenomenal change in every sector of our daily living. Scholars like Reddy et al. (2020) state that digital literacy has widespread contributions to banking, health, education, transportation, e-governance, and even poverty alleviation. It is currently a crucial determining factor to make oneself employable and getting a decent job. Researchers like Bejakovic and Mrnjavac (2020) even point out that digital literacy facilitates the building of human capital which helps in the uplifting of socio-economic development of the society. Without this, it is not possible to actively participate in a country's economy and digital society. But what is digital literacy, and how will it bring about a digital transformation? Is it the skill set required to manage a digital device? Or the digital competency necessary to successfully utilize a digital device to complete a given task? Or something even more than that?

Though organizations like UNESCO (2019) did try to chalk out a common acceptable definition for digital literacy, researchers like Iilomaki et al. (2016) pointed out that the meaning of digital competence will keep varying due to the rapidly changing technology and society. So, an established definition of digital literacy may not remain relevant with time. It is therefore important to understand and appreciate the evolution of the term digital literacy to realize this concept for contemporary times, particularly concerning the Indian apparel industry. Then only can we plan to adopt it. However, there seems to be a dearth of significant scholarly work in this area. This paper, therefore, attempts to understand the evolution of digital literacy definition, and further utilize it to study its significance from the context of the Indian apparel industry. The following Research Objectives have therefore been framed for this study:

1. To study the meaning, evolution, and standard methods of monitoring digital literacy.
2. To study the significance of digital literacy in the Indian apparel industry

This research work will take an integrative literature review approach by reviewing scholarly research publications on digital literacy and its significance in general for the apparel industry, and specifically for the Indian apparel industry. Since the research topic is an emerging area that is still evolving, researchers like Snyder (2019) supports this methodology to create insights of the conceptual development in the field of digital literacy which can be investigated for advancing the field.

## II. ORIGIN AND EVOLUTION OF THE CONSTRUCT OF DIGITAL LITERACY

The term Digital Literacy was first used by Paul Gilster in his book 'Digital Literacy' (Gilster, 1997). Just as the word literacy is not just having the ability to read with

understanding, but rather an act of cognition, in the same way, digital literacy as pointed out by Gilster is the cognition of what we see on the computer screen when we use the networked medium. Therefore, it is not just a set of skills and competencies using another technology, but instead having the ability to make informed judgments about what we see online. Unlike publications, where the editor filters out authentic information, the internet is open to the contributions of all. One needs to acquire 'critical thinking' competency to master digital literacy. Gilster (1997) further goes on to explain Digital Literacy into four broad competency areas as follows:

1. Knowledge assembly
2. Evaluation of information content
3. Searching the internet
4. Navigating the hypertext

But there were several other researchers like Bawden (2008) who argued that Gilster(1997) failed to state which of these competencies is fundamental, as sometimes Gilster stated content evaluation and critical thinking as 'most essential, whereas at other times hypertext navigation and information searching are pointed out as the basis for digital literacy concept. Because of this reason, Bawden (2008) further points out that the term 'Information literacy' which was synonymously used with digital literacy during this same time became more popular. Since a clear and coherent account of digital literacy itself, or its specific skills were not stated 'Information literacy' was more popular and widely used in tutorials and training programs because of its 'more prescriptive' competencies. Therefore, though some contemporary scholars used digital literacy in a broader sense and associated it with 'critical thinking', mostly still equated digital literacy with 'IT skills' and 'computer literacy'. So, Bawden redefines digital literacy through four generally agreed components, namely (a) 'underpinnings', (b) 'background knowledge', (c) central competencies, and (d) attitudes and perspectives. These competencies link the newer concept of digital literacy with the older idea of literacy and give a 'moral framework' to the whole idea. To sum up, Bawden(2008) explains 'underpinnings' give basic skill sets, 'background knowledge' elucidates how digital and non-digital information is created, 'central competencies' explain digital literacy as proposed by Gilster (1997) whereas 'attitudes and perspectives' give maturity to an individual to learn what one desires and thereafter reflect a sensible and correct behavior in the digital environment.

Along with Bawden (2008), another recognized researcher on digital literacy- Eshet Alkali (2004) published his well-known article 'Digital Literacy: a Conceptual Framework for Survival Skills in the Digital Era' acknowledged that Digital Literacy involves more than the ability to just operate a digital device. It includes 'a large variety of complex cognitive, motor, sociological, and emotional skills' which is essential to function in a digital environment. The article proposed a conceptual



framework for digital literacy which included the following literacy:

1. Photo-visual literacy (the art of reading visual representatives)
2. Reproduction literacy (the art of creative recycling of existing materials)
3. Branching literacy (hypermedia and non-linear thinking)
4. Information literacy (the art of skepticism)
5. Socio-emotional literacy (sociological and emotional aspects of working in cyberspace)

As the concept of 'digital literacy' slowly became popular and widely used and discussed in the first decade of the twenty-first century, the European Commission (2006) also framed its definition for digital competence and started acknowledging its importance. The commission also felt that without adapting to this newer competence, Europe will get marginalized from the rest of the world. Therefore, the European Parliament included 'digital competence' amongst the eight key competences of the European Framework. Subsequently, all future education policies of the European Commission were formulated toward imparting digital competence to its citizens. They also defined digital competence as 'the confident and critical use of Information Society (IST) for work, leisure, and communication.

Subsequently, UNESCO (2011) in their policy brief admitted that digital literacy included 'the use and production of digital media, information processing and retrieval, participation in social networks for creation and sharing of knowledge, and a wide range of professional computing skills'. It is quite similar to traditional literacy and numeracy which comprises of a set of basic skills, and further improves employability. Therefore, it is also called 'gate skill' as many employers also demand this skill when they evaluate a job application.

Like UNESCO, another international body, the G20 in its G20 INSIGHT (2017) communiqué pointed out the 'inconsistent sets of indicators' for measuring digital literacy. The report also stressed the importance of a standardized definition of Digital Literacy across the G20 countries for data collection, analysis, and measurement of information on digital literacy. Based on prior research and independent study, G20 policymakers identified five dimensions of digital literacy, viz Information Literacy, Computer Literacy, Media Literacy, Communication Literacy, and Technology Literacy. These dimensions are further influenced in terms of three perspectives, viz, Cognitive, Technical, and Ethical, which together are called the conceptual components of digital literacy.

Another important organization, the Joint Research Centre (JRC) of the European Commission also established its Digital Competency model DIGCOMP in 2013, which was further revised as DigComp 2.0 (vuorikari et al, 2016) for its member states soon after. The objective was to have a common reference framework and standardize the competencies for being digitally savvy in the field of education, training, and

employment. It will, therefore, play an important role in measuring and further enhancing the digital competence of its citizens. Most of the digital literacy monitoring frameworks used today by contemporary researchers are based on this model. The framework has five competence areas as follows:

1. Information and data literacy
2. Communication and Collaboration
3. Digital content creation
4. Safety
5. Problem-solving

The DIGCOMP proposal also provided a self-assessment grid that illustrates digital competencies and descriptors for three proficiency levels. Based on this assessment grid, the European Union further prepared its Europass CV (2015) with three proficiency levels viz; basic user, independent user, and proficient user. This grid is popularly used by many researchers today for studying the digital literacy of a group of people.

Based on a similar principle, the UNESCO Institutes of Statistics (Law et al, 2018) also defines digital literacy as 'the ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies for employment, decent jobs and entrepreneurship. It includes competencies that are variously referred to as Computer Literacy, ICT Literacy, Information Literacy, and Media Literacy.' To monitor, assess, and further develop digital literacy, UNESCO also proposes a framework viz; 'A Global Framework of Reference on Digital Literacy skills for Indicator 4.4.2' in which they took DigComp 2.0 as the reference framework. After the mapping of cross-national and selected national ICT and digital literacy frameworks of 47 countries across various geographical regions and income levels of the country as per World Bank income level, UNESCO finally proposes the new framework. This new framework adds two more competence areas to the DigComp 2.0 which are as follows:

0. Fundamentals of hardware and software
6. Career-related competencies

The final framework, therefore, has 0-6, i.e. seven competence areas, and twenty-four competences as given below:

**Table 1**  
**Digital literacy and its competencies**

Sl.No.	Competence area	Competences
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
6	Career-related competences	6. Career-related competences refer 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.
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### III. MEASURING OF DIGITAL LITERACY

Along with understanding the origin and evolution of the term digital literacy in general, it is equally important to find out how digital literacy is measured, and the outcome of some relevant work on digital literacy, as carried out by researchers worldwide on various groups of respondents. Though there are several methods to study various levels of internet skills or digital literacy for a group of people, Van Deursen (2014) categorized them into three basic levels:

1. Surveys based on questions for internet applications to complete a given task. Based on the difficulty level of the questions asked, the internet skill level of the respondent is determined.
2. Surveys based on a self-assessment questionnaire on various aspects of internet skills.
3. Real-time performance test on internet skills with a digital device in a controlled environment.

Another paper by UNESCO (2019) on various types of assessment tools, advocates the usage of a self-reporting questionnaire-based survey to collect information on digital literacy for UNESCO framework 4.4.2, which was also used by Eurostat DSI (like the Europass CV with three proficiency levels). Thus, contemporary researchers started using questionnaire-based self-assessment surveys to monitor the proficiency level of various established digital competences of an individual, or a group of people.

Similar study was carried out by Van Deursen(2014) for the Netherland and UK populations for evaluating five types of digital skills, namely operational skill, information and navigation skill, creative skill, mobile skill, and creative skill. The responses were also scored on a 5-point scale with a self-reported truth response against the following items:

1. Not at all true to me
2. Not very true to me
3. Neither true nor untrue to me
4. Mostly true of me
5. Very true of me

Another similar study was carried out by Khateeb (2017) where he utilized the UNESCO competence framework with some modifications. This study was carried out to determine the digital competency of English language teachers in Saudi Arabia. Against each of the three proficiency levels of Europass CV (based on which the UNESCO DLGF was framed), he gave relevant survey statements for the respondents to self-assess themselves. For competence areas like information processing, communication, content creation,



safety, and problem-solving, 42.1% of respondents matched the proficiency level of a basic user, 36.8% matched the proficiency level of an intermediate user, and around 26.3% matched the proficiency level of an advanced user. The author finally concluded that most Saudi Arabia English teachers are not competent enough to be proper digital teachers matching the needs of the twentieth century.

On a similar note researchers like Deursen & Dijk(2008) also carried out digital skill-based performance tests on the Dutch population to determine their competencies in operational, information, formal and strategic skills. The test revealed that 80% of the respondents could complete internet-based tasks on operational skills, 72% could complete internet-based tasks on formal skills, 62% could complete internet-based tasks on information skills, and around 22% completed internet-based tasks on strategic skills. The study also revealed that the digital skills of respondents vary with age and prior education. It however is not dependent on weekly time spent on the internet, or on the gender of the respondents. Another similar study CNECT-F4 (2014) carried out across 14 EU nations based on a self-assessment of the survey of digital skills, it was found that the digital skills of the general population were less than its workforce. Also, the digital skills of the 'disadvantaged population' like unemployed, retired, low educated/low-income group people are less than that of others.

Parvathamma and Pattar (2013) also carried out a similar study in six institutions of higher learning in the Davanagere district of Karnataka, India. It was revealed that most of the students own personal computers, laptops, smartphones, and I-pods with an internet connection. But these new technologies were mostly used for personal purposes as compared to using them for institutional repositories or open access journals for knowledge building. To bridge the gap, a model curriculum was proposed to impart digital literacy skills to MBA students. We, therefore, see that digital literacy has already penetrated amongst general population on a global scale, including India. It may therefore be relevant to study its origin and introduction in India. This will help us in understanding its significance with regard to the apparel industry. In fact, government initiatives on various digitization programs in India started comparatively late as against European countries. It began with the Digital India Program which was introduced by the government of India to transform the country into a digitally empowered society and knowledge economy (Digital India Programme, 2022). The national level e-governance plan was initiated in 2006 with some 31 Mission Mode Projects under the National e-governance plans covering a wide range of areas like agriculture, health, education, passport, and so on. Recently 13 more projects have been added covering many government ministries and departments. The onus of implementation of the Digital India program has been given to each of the Government Departments with the overall coordination responsibility lying with the Department of Electronics and Information Technology (DeitY). Nine program pillars of growth have been earmarked to support Digital Literacy and

further utilize the same to smoothen public services across the country. The pillars are:

- Broadband Highways
- Universal access to mobile connectivity
- Public internet access program
- E-governance
- E- Kranti-Electronic delivery of services
- Information for all
- Electronic manufacturing
- IT for Jobs
- Early harvest program

Though all these pillars support IT competency, some pillars like the 'IT for jobs', 'Electronic manufacturing', 'Information for all' or 'Public internet access Program' directly contribute towards building up a digitally literate environment and thereby support technology adoption and its acceptability. Another important pillar is the 'universal access to mobile connectivity' with which the government plans to reach out to the remotest villages of the country. In fact by 2020, under the National Digital Literacy Mission (NDLM), the Government planned to empower at least one person per household with essential digital literacy skills (National Digital Literacy Mission, 2022). The scheme was expected to benefit 250 million individuals and therefore digitally empower existing adults so that they can comfortably participate and contribute to the overall growth and development of the country. There are industry and corporate partners also to help the government in this mission.

#### IV. SIGNIFICANCE OF DIGITAL LITERACY IN THE INDIAN APPAREL INDUSTRY

Now, that we have studied and discussed about the meaning, evolution, and introduction of digital literacy in India, let us move on to understand the second research objective, i.e., to understand the significance of digital literacy for the Indian apparel industry. To do the same, let us first try and understand how digital literacy can help and support the fashion and apparel industry in general.

Researchers like Bertola and Teunissen (2018) studied the influence of the fourth Industrial Revolution based on cyber-physical systems commonly called Industry 4.0 (I4.0) in the fashion business. Citing various contemporary researchers, they claimed that the textile and apparel industry has been protagonists in various industrial revolutions' cycles in Europe since the late Eighteenth century. Mass production of fashion products has always responded to technological innovation and other globalization changes over time. Based on some common concepts and frameworks, they summarized Industry 4.0 into a comprehensible architectural model. The model is a combination of "smart factories" + "smart networks" + "smart products", diagrammatically expressed as three overlapping spheres based on the current paradigmatic changes brought about by the digitization of the fashion industry. The first



"factory" sphere represents prototyping and collection sampling, production, and logistics. Relevant examples of this sphere include operational technology (OT) and all sorts of digital manufacturing which are commonly used in the textile and apparel industry. The next sphere is the "network sphere" which is populated with digital concepts involving supply chain management, retail, and communication. Pertinent examples of these spheres include digital manufacturing and the use of social media through various devices like mobile devices and app. in the fashion industry. The third "product" sphere is populated with the usage of several digital interfaces in packaging, products, and their surplus management. Relevant examples of this sphere include the use and involvement of QR codes through various mobile devices and apps. Finally lying at the center of these three overlapping spheres and acting as an ideal connection between them is the research, design, and product development activity which is common in all three spheres. Relevant examples of this activity include big data, cloud computing, PLM, and AI which are commonly used nowadays in the fashion industry. The researchers also gave examples of various fashion brands which are currently utilizing digital technology in their fashion business. Some popular names include Nike and Adidas who have incorporated electronic knitting and 3D printed soles in their knitted sneakers, or Fendi, Max Mara, and Michael Kors who have similarly integrated RFID in their products for tracking purposes. Some fashion designers like Van Harpen and Yuima Nakazato are also popular for fusing digital technology with their haute couture. Thus I4.0 has largely influenced and impacted the fashion industry in various areas of its business units, processes, and components.

On a similar note, to find out the actual applications of digital technologies in the contemporary fashion industry, researchers like Kalbaska and Cantoni (2019) carried out an analysis in 29 European countries on LinkedIn, a business and employment-based social networking service, of various digital fashion related jobs positions and its required skills and competences. The purpose was to find out the current level of digital applications, and therefore its related competency and manpower requirement in the fashion industry.

Regarding the search of various skill-related keyword combinations as job titles, it was found that the most frequent keywords among job descriptions in the digital fashion domain are digital marketing, social media, digital designer, and graphic designer. Surprisingly, there was no important mention of digital technologies to be used in the production cycle, or in eCommerce as expected terms like 3D printing, augmented reality, safe payment systems, or logistics for e-Commerce were missing from the list. Perhaps these areas need some more time to be widely accepted and utilized in the industry. However, digital applications do seem to be rampant in fashion design, and its marketing involves non-conventional channels like social media to impress and attract customers.

This trend seems to be prevalent in India as well since researchers like Sudha and Sheena (2017) confirm that social

media is firmly anchored in consumers changing habits in keeping themselves updated with the latest fashion trends in India. The researchers also go on to state that Indian consumers are fond of reading comments on blogs before making a purchasing decision. So, many companies find blogging an efficient way of reaching out to their customers. And as far as the shortfall of digital applications in various areas of the apparel manufacturing supply chain is concerned, it also resonates with a similar finding by Khurana (2022) as discussed earlier in this paper. However, we need to strengthen it to remain competitive in the global apparel manufacturing sector. A digitally literate workforce is therefore required to accept this challenge. But to better understand this workforce, we need to know the background of the Indian apparel industry along with its working human resources.

In a recent interview with Rahul Mehta, the past President of the Clothing Manufacturers Association of India (CMAI), Dominic and Bhaskar (2022) point out that Indian apparel export is around \$15 to \$16 billion, whereas the domestic apparel market is around \$80 billion to \$85 billion with an overall strength of around 45 million people working for this sector. However, the industry is largely fragmented with only 5% of CMAI members belonging to leading industrial houses like Arvind, Aditya Birla Group, Raymond's, and Reliance. The rest 95% belong to production houses with an annual turnover of around Rs 1 crore to Rs 15 crore. So, the actual technological level of development of the Indian domestic small-scale industry has been slower than its neighboring competitors.

Also, most of these MSME production houses are dominated by first-generation entrepreneurs who are not properly educated and were once working as a productive workforce in the industry. Therefore, there is a general inability of these entrepreneurs to understand the importance of technology, particularly digital technology, for generating digital transformations. What ultimately results are poor productivity due to the lack of necessary foresight and vision.

Another important factor that influences the manufacturing sector is the tendency of educated manpower to shift towards white-collar jobs in the retail sector, as compared to blue-collar jobs in manufacturing. However, since a major portion of India's domestic consumers are young people with a growing tendency of being influenced by international brands, the growth potential of the industry is still around 10-12%. Thus, along with the marketing, sales, and retail sector, the manufacturing sector also needs to adopt more digital technologies to enhance its skill and productivity. Here the workforce needs to be competent not only in handling the latest digital innovations but also in their interpersonal soft skills and basic literacy skills, including digital literacy skills to holistically influence workplace efficiency and productivity.

Thus, researchers like Shukla (2020) who worked on basic skill requirement of the apparel industry, points out that apparel industry manpower requires three types of skills, namely technical skills, soft skills, and basic literacy skills. The



researcher also goes on to categorize three levels of necessary skill intervention commonly required in the apparel industry. These skill interventions are 'early reactive interventions' in response to the current needs of the industry, 'ongoing proactive intervention' which are important for the upcoming needs of the industry, and 'future-oriented interventions' which are in response to the anticipated needs of the future workforce of the industry. Digital literacy and ICT competency may therefore be considered important competencies for the second and third types of skill requirements for the apparel industry.

Another similar study by KPMG (2013) on necessary human resources and skill needs of the textile and clothing sector categorizes three types of job roles for the garment and home textile industry. These job roles are (a) entry-level jobs for machine operators, patternmakers, and tailors, (b) middle-level jobs for quality controllers and supervisors, and (c) higher or managerial-level jobs for designers and merchandisers. Since a lot has already been said and understood about entry-level jobs of primarily managing technologically advanced machinery, this area doesn't need any additional emphasis. However, the report explains the job roles in detail with regard to middle and higher-level jobs for designers, merchandisers, and production managers. Emphasis is given to middle and higher-level job roles to effectively plan, manage, and understand the global market trends and needs of the industry. ICT competency and digital literacy which plays an important role in the general management of fashion business may therefore be considered a necessary skill for various managerial roles in the Indian fashion and apparel industry.

We can therefore conclude that digital literacy is an essential competence for productivity enhancement at every level of the Indian apparel industry workforce. An integrated plan, therefore, needs to be chalked out, and adopted, to fulfill this requirement.

## V. CONCLUSION

From our integrative literature review method, we have aimed to establish the construction of digital literacy. An effort has been made to study the significance of digital literacy, particularly with regard to its relevance and extent of application in the apparel industry in general, and Indian apparel industry in specific. Since this concept of digital literacy emerged after the emergence of the fourth Industrial Revolution (I4.0) and is comparatively new, its meaning is still evolving and theoretical models on the same are still being framed. So is the case with its significance and application, both in India and abroad. Initially, it was seen as a major tool to enhance productivity, primarily on the manufacturing side. However, since digital literacy improves our general living, including workplace productivity, it has directly, or indirectly, influenced other areas of the fashion business.

Researchers like Kalbaska and Cantoni (2019) call this influence 'digital fashion competence' and explain it as an interplay between digital technologies and couture. He further

goes on to state that it has deeply integrated both into the fashion industry, as well as within the experience of clients and prospects by enhancing (a) the production cycle to design and produce fashion products with the involvement of digital technologies, (b) the marketing, distribution, and sales of fashion products, and (c) the communication activities with all its stakeholders and even contribute to the co-creation of the fashion online environment. Thus, instead of a restricted application of productivity enhancement, digital literacy and its technological applications have the potential of influencing the whole fashion and apparel business in totality.

Recent researchers like Jin and Shin(2021) even argue that the 4th industrial revolution (also referred to as I4.0 in this paper), which necessitates the need for digital literacy, can not only provide technological solutions in the area of intelligent manufacturing, augmented and virtual reality, artificial intelligence and many other related areas of the fashion business if utilized properly can go further in addressing other apparel industry challenges as well. Problems of unmatched demand and oversupply of fashion products may also be addressed by these technological advancements. Hyper-personalization of fashion products/services can assist consumers in finding the right product at a reduced cost. This will not only enhance customer satisfaction but also help in reducing material waste and thereby promote environmental sustainability. It, therefore, helps us in enhancing the quality of human life and brings about a paradigm shift in the way the apparel business works. Therefore, the Indian apparel industry which also employs a large percentage of its population needs to align with this paradigm shift and embrace this I4.0 in totality. It also needs to train its workforce in digital literacy to effectively manage this technological challenge to remain globally competitive.

## VI. SCOPE FOR FUTURE STUDIES

Now, that the constructs of digital literacy along with some popular methods of measuring the same has been established, future scholarly studies may be carried out in verifying these constructs for workforce of apparel industry. Influence of various organizational and human factors on existing digital literacy of apparel industry workforce may also give an additional insight in this area. Further studies may be even carried out in determining the pedagogy of imparting these digital literacy competencies to fashion institute students.

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