

More than Meets the Eye with Hypertext and Paper-Based Reading: An In-Depth Comparison

Omar Taky-Eddine

Ibn Zohr University, Morocco

Redouane Madaoui

Ibn Zohr University, Morocco

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Introduction

Students today spend more time using their computers, laptops, tablets, and other diverse technological devices than before. Moreover, there is mounting evidence that students nowadays read articles, short stories, poems, books, and other reading materials on digital screens more than before (Baron, 2013; Taky-eddine & Madaoui, 2022). Hypertexts, also called electronic texts or online written materials, can incorporate hyperlinks, audios, videos, and/or animations (Yankelovich et al., 1988). The World Wide Web is the widely used hypertext to obtain information in varied subject fields in the twenty-first century (Spire & Estes, 2002).

Additionally, hypertext reading has been promoted as an alternative to paper-based reading by the ongoing integration of ICT in learning and teaching. The mounting efforts by educational systems worldwide to integrate Information and



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Communication Technology (ICT) in schools and universities have made technology a priority in empowering education. In fact, the integration of ICT in education redefines the role of teachers, whose roles become facilitators and guiders to diverse digital content. Hypertexts, which characterize reading digital content, have transformed how knowledge is accessed, shared, and retained. Moreover, since the Coronavirus pandemic, ministries of education worldwide have made considerable efforts to equip schools and universities with ICT equipment and provide students with free access to online learning platforms and courses.

Considering the points discussed above, the increasing dependence on technology in education and the advancement in using digital inventions for learning and accessing information have made students experience more hypertext reading than before. Although hypertext reading is likely to dominate the future of reading in the coming decades and thus transform how readers approach information, little is known about its traits and how readers interact with it. In fact, this phenomenal shift from paper-based texts to hypertexts begs the following questions: do readers read hypertexts the same way they read paper-based texts? Is navigating hypertexts equivalent or different from flickering printed pages? How exactly do hypertexts change the way readers read? These questions are exceptionally critical inquiries that need examination to understand the changes readers undergo nowadays. To offer insights into these questions, this review examines the main traits that distinguish hypertext reading and, at the same time, provides an in-depth comparison between it and paper-based reading.

Hypertexts are Nonlinear

The first prominent trait that characterizes hypertexts is that they are nonlinear. Hypertexts can be read in multiple sequences; therefore, they are described as nonlinear and non-sequential (Nielsen, 1990). This, however, does not mean that hypertexts are random or unplanned. Instead, the term nonlinear suggests hypertexts can be read in more than one single sequence. As previously defined, hypertexts are blocks of electronically connected texts via links (Delany & Landow, 1994). Thus, readers can read the text non-linearly by choosing and ordering information according to their purposes and motives. Put differently, unlike paper-based textual content in

which information is linearly structured into sentences, paragraphs, and chapters that readers follow from beginning to end, the hypertext environment provides readers with multiple pathways that they can follow differently and freely (Nielsen, 1995; Stalin, 1990).

However, Protopsaltis (2006) asserted that ascribing nonlinearity only to hypertexts can somehow be both misguided and misleading. In fact, reading paper-based texts can also be nonlinear, for they contain some nonlinear traits such as tables of content and indexes that entitle readers to locate and read the requested information without going through the entire textual content linearly. Furthermore, not all paper-based texts necessitate readers to follow a predefined order to make sense of the reading material. For instance, reading magazines, newspapers, and dictionaries allows readers to skip or read in their chosen order. In this regard, Platteaux (2008) pointed out:

Text structuring tools play a central role in the concept of nonlinearity. On the one hand, they break the linearity of a text by proposing links to other text passages. On the other hand, they support the nonlinear reading activity of the reader who can activate or not the proposed link, according to his navigation aims. (p. 204)

In this quotation, Platteaux (2008) indicated that nonlinearity is restricted to how readers interact with the hypertext vis-à-vis paper-based texts and not how information is stored. In this way, a reader can linearly read hypertexts if he/she chooses to follow one node after the other in a linear, sequential order and can read paper-based texts in a nonlinear manner if s/he chooses to jump from one title to another. Accordingly, the fact that hypertexts contain multiple links (paths) that readers can interact with freely and differently can also make them linear. In other words, despite being described as naturally nonlinear, some readers can still interact with hypertexts linearly and sequentially (Luzón et al., 2010).

Notwithstanding, what makes hypertexts nonlinear, par excellence, is that they are structured to enable readers to access multiple electronic links and other multimedia

information (Hua, 2012). The embedded traits of hypertexts enable readers to establish their pathways through various nodes in a non-sequential manner (Coiro & Dobler, 2007). That is, while paper-based texts are written to be read in sequential order, hypertexts are designed to be read in a multi-directional order (Bolter, 1991). In this regard, Landow (1992) addressed hypertext readers as follows: "You have chosen your reading path - and since you, like all readers, will choose individualized paths, the hypertext version of this book might take a very different form in your reading, perhaps suggesting the values of alternative routes." (p. 7).

Briefly, nonlinearity is the main trait that features hypertexts. Contrary to static texts that are fixed in a sequenced order, hypertexts offer multiple options (embedded links) that readers interact with to construct their own meaning (Coiro & Dobler, 2007). That hypertexts offer more optional content leads us to the next trait, which revolves around readers' accessibility to hyperlinks.

Hypertexts have Access to Electronic Links

As stated before, hypertexts permit readers to click on links, pop-up windows, or bold words to access different information, including texts, pictures, tables, diagrams, or multimedia content (audio or video). To illustrate, the famous free online encyclopedia Wikipedia (see the figure below) is a typical example of a hypertext that students widely employ to look for school-related information. According to Selwyn and Gorard (2016), 87.5% of students report using Wikipedia for their academic work. Furthermore, online connectivity enables readers to access further links within the same hypertext and simultaneously navigate through other hypertext web pages for supplementary information.

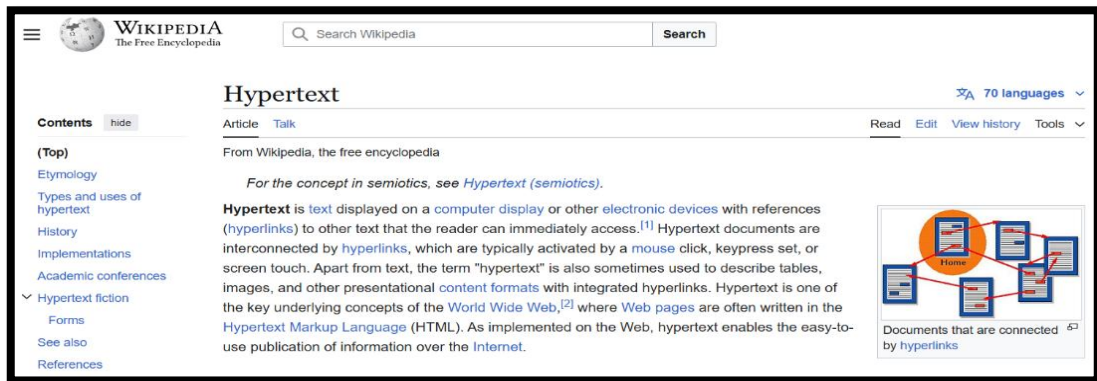


Figure 1. Screenshot source: Wikipedia. (2024), Wikipedia, the free encyclopedia

Retrieved October 30, 2024, from: <https://en.wikipedia.org/wiki/Morocco/wiki/Hypertext>

Contrary to classical reading, which (Mangen, 2008) described as "a static and fixed perceptual phenomenon does not provide us with options for attentional switching" (p: 410), hypertext readers enjoy the freedom to click on diverse links and switch to other web contents. However, critics warned that access to endless electronic links makes readers more vulnerable to various stimulations that distract and scatter their attention (Mangen, 2008). In this regard, Foss (1989) talked about the "Art Museum Problem" through which he analogized between gazing at too many paintings in a museum and navigating through a hypertext containing multiple stimulating links. That is, Foss believes that cognitive processing requirements imposed by navigating hypertexts are akin to being unable to remember or examine a particular painting when too many paintings are presented at once. Psychologists assert that we are naturally inclined to lose focus quickly as our interest and excitement fade. In this regard, Tversky and Kahneman (1974) pointed out that our attention naturally prefers new, engaging, or unanticipated information, thus making it hard to focus on monotonous or ordinary tasks.

The natural tendency of attention when left to itself is to wander to ever new things; and so soon as the interest of its object is over, so soon as nothing new is to be noticed there, it passes, in spite of our will, to something else. If we wish to keep it upon one and the same object, we

must seek constantly to find something new about the latter, especially if powerful impressions are attracting us away (Carroll, 2003, p. 29).

The numerous and diverse hyperlinks embedded in hypertexts encourage readers to leap from one link to another to revive their attention, maintain interest, and suppress boredom. Hence, with such temptations, it might take considerable effort for hypertext readers to remain focused on what they read. This distraction or the phenomenological experience of "being neither here nor there" - as Ben-Shauld (2004) called it - results from readers' realization of their accessibility to countless links to other nodes, new websites, multimedia content, and/or other stimuli at hand. In other words, readers' attention is split between constructing meaning from the written text and their knowledge of options offered by the hypertext. As a result, hypertext readers are more likely to find themselves subject to clicking on links and switching to other hypertexts or multimedia content. In this respect, Ben-Shauld (2004) asserted that:

The split attention of the viewer/user between what he/she cognitively constructs from what's going on in front of him/her, and his/her constant awareness to what may potentially lie at stake in options made available by behaviorally changing the course of events... In all of these experiences the behavioral option is restlessly often activated, resulting in the user/viewer being neither here nor there. (p: 157)

In this respect, Mangen (2008) analogized reading screen-based texts to watching TV. The common reflex of TV viewers as they start losing interest and getting bored with a channel's content is deviating attention to another TV channel to substitute the old, fading stimulus with a new, interesting one. By the same token, readers of hypertexts are predisposed to quickly lose interest, especially since they are aware that numerous new stimuli are at hand. Accordingly, using the remote control to switch from one channel to another becomes akin to using the mouse, the touchpad, or the screen to jump from one link to another.

Likewise, Carr (2011) blamed hypertexts for stimulating readers to bounce from one hyperlink to another without being capable of processing information deeply. He also made a similar analogy to Mangen's when he analogized reading hypertexts to zipping

along the surface with a Jet Sky. Carr stated in this regard that once he was a scuba diver in the sea of words, but now he zips along the surface like a guy on a Jet Ski. Carr used this analogy to show the transformation in his reading experience, which was deep and focused on paper and now is becoming shallow and rapid on digital devices.

Similarly, Coiro et al., (2008) asserted that superficial, unfocused reading is the greatest challenge that typifies hypertext reading. The fact that most digital reading devices are connected to the Internet makes readers more vulnerable to distracting stimulations, which increases the dangers of multitasking and poor reading performance (Burak, 2012). In short, the availability of the Internet and web links that readers may encounter in hypertexts make readers easily distracted and their attention more likely to be scattered.

Notwithstanding, describing hypertext reading as shallow and unfocused and analogizing it to jet skiing or TV viewing is a sweeping generalization. Hypertexts indeed contain multiple hyperlinks that make browsing one of their main traits, yet still, it is also true that readers can browse while reading paper-based texts. Ascribing some reading ills such as shallow, unfocused, or distracted reading exclusively to hypertexts might put the whole blame on the reading device, overlook readers' active role, and picture them as helpless victims of the reading device. Contrariwise, the availability of embedded hyperlinks can encourage readers to investigate their own reading path, become actively engaged with the text, and boost their cognitive flexibility (Spiro et al., 1991). As for the problem of multitasking, Prensky (2001) stated that, through practice and interaction, digital natives have developed cognitive skills to successfully play new roles in reading hypertexts. In light of this, the following section examines new roles that distinguish readers in the hypertext environment to deepen our understanding of this issue.

Hypertexts Entail New Roles for Readers

As stated earlier, hypertexts are characterized as being nonlinear, allowing readers to take multiple paths to navigate the text. Accordingly, readers' interaction with the

hypertext differs from one reader to another depending on their interests, needs, and purposes. Thus, hypertext readers navigate, explore, build, and make sense of what they read not necessarily according to writers' plans but rather to their own plans (Murray, 1997). Murray further declared that by selecting, exploring, and organizing their own paths through the hypertext, readers participate in recreating new texts and exercising agency. Therefore, hypertexts changed not only the way texts exist but also how readers read these texts (Landow, 1992).

Stalin (1990) distinguished three roles readers can play while reading hypertexts: the browser, the user, and the co-author. To begin with, the browser is the most common description associated with readers of hypertexts due to the reading process of shifting attention from one node to another (navigation). Stalin affirmed that the browser reads hypertexts with no pre-determined objective in mind. Readers, hence, purposelessly jump from one hyperlink to another without essentially reading the whole text in the node. In fact, this reminds us of Carr (2011) and Mangen (2008) who criticized hypertexts for inducing readers to bounce from one hyperlink to another without being capable of deeply processing information. Besides, according to many researchers (e.g., Lawless & Kulikowich, 1996, 1998), the fact that hypertexts are characterized by browsing to explore and find the required information has made hypertext reading more time-consuming than paper-based reading. The role of browser-readers was also called apathetic hypertext readers (Lawless & Kulikowich, 1996, 1998); these readers arbitrarily browse hypertexts without necessarily applying logical strategies or following a meaningful sequence.

Additionally, the second role readers can play while reading hypertexts, according to Stalin (1990), is that of a user, also referred to as a "knowledge seeker" (Lawless & Kulikowich, 1998). This role demands readers to scan hypertexts purposefully to find the information they want. Thus, readers know their reading objectives, plan to achieve them, and finish reading when they achieve them (Slatin, 1990). In other words, while playing the role of a user, readers of hypertexts employ reading strategies to navigate and locate the required information in a planned and organized way (Lawless & Kulikowich, 1996).

Furthermore, the third new role that features hypertext readers is that of being a co-author. According to Landow (2006), this role permits and encourages readers to comment, contribute and react to the information in the hypertext by communicating their information, opinions, and ideas with both the author and its readers. In other words, in addition to the freedom that permits readers to choose their reading path through hypertexts actively, Web 2.0 technologies such as blogs, social networks, and wikis allow users to share, react and contribute to the websites' content (Guntram, 2007).

In fact, Web 2.0 tools have been widely used in educational settings to create an extra flexible learning environment that enables students to actively and responsibly publish, share, develop, edit, evaluate, reuse and comment (Guntram, 2007). In this regard, Landow (1992) pointed out that "although you cannot change my text, you can write a response and then link it to my document" (p. 7). However, it is essential to note that not all hypertext systems were developed to provide such options. In other words, unlike the Web 2.0 environment that allows readers to read and write, early hypertext systems (Web 1.0) do not allow their readers to react to the text (Greenhow et al., 2009).

Hypertexts are Screen-based

The most obvious trait that characterizes hypertexts is that they are screen-based. Contrary to paper-based reading, which necessitates readers to sequentially flicker through printed pages from top to bottom and front to back, hypertext readers are involved in clicking, scrolling, and interacting with screen-based textual content (Chen, 2009). In fact, the physical dissimilarity and the intangibility of textual materials in the two reading formats have triggered both criticism and support from researchers in the field.

To start with, critics consider the intangibility of hypertexts to result in readers' detachment from the text, which negatively influences their immersion and engagement with the text (Coiro et al., 2008). In this regard, Mangen (2008) affirmed that screens, such as computers, smartphones, or e-readers, create a gap that disunites

a direct connection between the reader and the text. Mangen further proclaimed that - Unlike the sense of detachment that can arise from the clicking and scrolling involved in reading on digital platforms –printed texts are "physically and functionally unitary object where content cannot be distinguished from material part" (p: 408). Similarly, Baron (2013) declared that the loss of the physical feeling of textual materials has a significant impact on readers:

It's not a book. It doesn't have a smell, you don't touch it..., you're plugged into the Internet, you can't concentrate, it hurts your eyes, and you lose the beauty of the words behind this screen. Life itself is in hard copy. ... Not this treacherous digitalism, which has permeated our lives and our reality. (p. 01)

Additionally, different researchers warned against the negative effects of the screen on readers' well-being. Baron (2013), for instance, considered eyestrain, headaches, sensitivity to light, and eye discomfort as some of the symptoms that readers often suffer from while reading onscreen. Other researchers (e.g., Spencer, 2006; Baron, 2013; Liu, 2006) indicated similar onscreen reading drawbacks such as (1) adverse health effects such as neck pain, headache, and eyestrain, (2) absence of physical holding of the reading material, (3) loss of focus and increased likelihood to multitasking, (4) difficulties in highlighting, underlining, and jotting down notes. Likewise, Taky-eddine and Madaoui (2022) cautioned about several drawbacks students face while reading onscreen. These include cognitive and health drawbacks, such as multitasking, slow reading, unfocused reading, neck pain, headache, and eyestrain.

Notwithstanding conservatives' criticism, the actual situation shows that the shift towards hypertext reading is rapidly growing, especially with the proliferation of digital devices and new information access, such as AI. Contrary to the critics, advocates of hypertext reading conceive the shift from paper to screen as having numerous benefits. Coiro (2003), for instance, described screen-based texts as having three main traits missing in the paper-based ones: nonlinearity, interactivity, and multiplicity of text structures. These traits allow and encourage readers to investigate

their own reading path, become actively engaged with the text in personally relevant ways, and boost their cognitive flexibility (Spiro et al., 1991).

Other advocates of screens, such as Prensky (2001), stated that young readers, who are digital natives, have a natural inclination and cognitive abilities that enable them to engage successfully with hypertexts more than static, conventional ones. More interestingly, Baron (2013) advocated screen-based texts for being environmentally friendly and practically portable. One digital device lowers paper consumption by holding countless eBooks, PDFs, and Word documents that can be carried effortlessly anywhere and anytime.

To summarize, the fact that hypertexts are screen-based prompted a heated debate on the pros and cons of screens on readers. Nevertheless, despite its limitations, hypertext reading is obviously not a phenomenon that today's readers can do without. In fact, the shift from paper to screen is evolutionary and inevitable (Rose, 2011). Therefore, a more productive approach to dealing with the "paper-vs.-screen" debate is to refrain from viewing one as better or favouring one while opposing the other. Alternatively, a more constructive standpoint is to perceive this debate in a complementary approach. An approach that embraces technological changes, provides more learning opportunities for readers, and trains them to use effective reading strategies to obtain optimal advantages of the screens. [Put differently](#), the goal should not be to make readers afraid of or avoid digital screens; rather, it should be to inform and empower them to maximize the benefits of hypertext reading in an age characterized by the constant spread of digital screens.

Conclusions and Recommendations

The World Wide Web is the widely used hypertext to obtain information in varied subject fields in the twenty-first century (Spires & Estes, 2002). Thus, students find themselves required to comprehend information presented in different hypertext structures and probably utilize more or new reading strategies to compensate for the inherent difficulties of the hypertextual environment. This review discussed four key traits that distinguish hypertext reading from paper-based reading. Hypertexts are

nonlinear, screen-based texts embedded with multiple electronic links, and entail new reading roles. From this perspective, 21st-century teachers should be aware of the changes and challenges their students experience when reading in the hypertext environment. Also, research in hypertext reading should continue providing knowledge and recommendations for enhancing students' comprehension of hypertexts.

To begin with, the multiplicity of links in the hypertext environment stresses the need to develop students' critical thinking skills to evaluate information on the World Wide Web. In fact, it became crucial for students to be able to navigate, integrate, and evaluate the required information from multiple hypertext structures. Thus, students are required not only to comprehend information presented in different hypertext structures but, more crucially, to develop critical thinking skills to determine the quality, accuracy, and credibility of the information on the WWW. This can be attained by training students to identify credible and trustworthy sources of information and examine the authorship, publication date, and references on the WWW.

On the other hand, hypertexts provide the perfect reading and learning educational environment. In contrast to the straightforward manner in which paper-based texts are read, Cognitive Flexibility Theory (CFT) recommends complex learning environments, such as the hypertext reading environment, for such environment encourages active construction of knowledge rather than passive consumption of knowledge products (Spiro et al., 1991). To illustrate, unlike paper-based texts that participants had to read linearly, hypertext readers can/must choose their reading path freely and maintain coherence between links, contributing to cognitive flexibility. Nevertheless, as already stated in this review, additional cognitive demands and access to endless electronic links can make readers more vulnerable to various stimulations that distract and scatter their focus. Therefore, comparing and understanding the strengths and weaknesses of hypertext reading is crucial for not only keeping abreast of recent developments in the field of reading but also for preparing students for future challenges of innovative reading and learning environments.

Furthermore, the fact that hypertexts entail new roles (browser, user, and co-author) requires fostering students' self-directed learning. In fact, teaching students to become autonomous, independent readers and develop responsibility for their own learning are the foundation for students' progress and success through high school, University, and occupational fields. Therefore, educational systems should embrace the opportunities of the World Wide Web to foster independent learning and reading. To this end, schools need to adopt and promote a learner-centred approach to teaching that can instill and nurture an independent reading and learning culture among students. Also, educational systems should work towards suggesting programs and/or courses that intend to ameliorate students' control of their own reading to become independent readers and learners.

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About the Authors

Omar Taky-Eddine is a Professor of English at the Faculty of Letters and Humanities, Ibn Zohr University, Agadir, Morocco. He earned his Ph.D. in Applied Linguistics from Ibn Zohr University, where he also completed a Master of Education (M.A. Ed) in TEFL and ICT. Additionally, Taky-eddine holds a Bachelor's degree in Applied Linguistics and TEFL from the Faculty of Education at Mohammed V University as well as a state-recognized TEFL diploma from the Teacher Training Center (CRMEF) in Rabat. His research interests lie at the intersection of Human-Computer Interaction (HCI), Reading Comprehension, and Psycholinguistics, reflecting a strong commitment to advancing knowledge in these areas.

E-mail: omar.takyeddine@gmail.com

ORCID: 0009-0001-9894-1970

Redouane Madaoui is an associate professor at the Higher School of Education and Training, (ESEF) Agadir – Morocco. He obtained his Ph.D. from the Faculty of Education, Rabat. He is the coordinator of the Language Learning & Teaching (LLT) Research Group affiliated with the Laboratory of Values, Society and Development (LVSD) at Ibn Zohr University, Agadir - Morocco. He is also a certified Cambridge ESOL speaking examiner. His current areas of research include EFL reading and listening pedagogy, academic writing, and teacher education.

E-mail: r.madaoui@uiz.ac.ma

ORCID: 0009-0006-1052-3608