

# Bit-Generations and the Digital Environment

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The information age divides public opinion as new developments usually do. Indeed, ours is an age of knowledge-based societies, in which the process of knowledge-acquisition is being transformed, as is information-processing. The every-day routine of our life is also changing, and this, in the course of time, will directly affect cognitive functions, with learning and comprehension among them, inclusive of our reading habits.

Highly-developed reading competence is a matter of educational and cultural policy, thus also of socio-political significance. It is a tool in the individual's personal and national identity-formation, using culture as its building blocks. The reading child will grow up to be part of a new generation of adults. The medium of reading may itself change, even book-centeredness may vanish, but language and reading will remain, craving continued attention and protection. General reading habits may be constantly shifting, but text interpretation is still one of the basic requirements of effective learning in social, natural, and technical sciences alike. And, so the 2009 PISA Survey found, Hungary ranked last but one at that time, in an average field, as far as reading literacy is concerned.

An especially fascinating aspect of the issue for us is the digital divide between digital natives (bit-generations<sup>1</sup>) and digital immigrants in our days, particularly in view of the fact that it is the digital immigrants, who dominate the educational system (at least for the time being) and teach the new generation of the digital native children. Who is disadvantaged in this situation? Is it the teacher-educator with his or her “classical” approach to information search, reading, teaching, and education, or, is it the child of the digital age? How do the different generations use the tools of information search? Are the e-book and digitalized curricula suitable for information transmission? Can 3D-display lead to a better understanding of, or easier access to, the needed information? Last but not least, what measure of informatics competence are secondary-school-age young people—on the point of entering higher education—furnished with? Is it “self-evident and instinctive,” or can we detect serious deficiencies? I will be looking for possible answers to these questions in my presentation.

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<sup>1</sup> A term introduced by the author in an earlier study. These children of the computer age I jointly call “bit generations” after “bit,” the basic unit of computer information.

## *The bit-generations*

The waves of digital natives start with those that are generally referred to as generations Y and Z.

*Generation Y* (1982-1995) was socialized in consumer society and differs sharply from its parenting generation (X) both in life-style and in the way it relates to technical devices. They are free, agile, purposeful, offspring of internet communication, practical, open and receptive (Tari, 2010:23-24). Don Tapscott called this generation “the children of the digital age,” “the internet generation.” He regards them as the driving force behind society. In their case emphasis shifts from information transmission to reciprocity, i.e., interaction. Their priority concerning digital-media consumption is, in this order: entertainment, learning, communication, and shopping (Tapscott 2001: 10-14). Business strategist and Toronto University professor Tapscott also points out that the knowledge these children command is much more than their parents’ (9-10). This somewhat *ex cathedra* statement can be open to questions; moreover, the truth value of such a view can be problematized, especially if we take into account the psychological and social transformations that are generated by the exceptional speed with which this generation is able to receive and process information. The way I see it, the significant question is whether this generation has really acquired knowledge (whose determinant *sine qua non* is also reading) which is really more substantial than that of the parents? Or, is the idea of knowledge to be reinterpreted and redefined?

The classical experience of reading is disappearing in the case of generation Y, as they are intensive readers of the internet; the preference for short and easy texts starts here (and will continue with generation Z). A survey conducted by the Hungarian Academy of Sciences found, surprisingly, that the age-group of those in their 20s and 30s read most. 76-81 % claim themselves to be readers, which is to say, they had read at least one book in the year previous to the survey (Gyenes 2005: 29). Internet-reading did not count. So we can detect a little contradiction here. University of Leeds researcher Paul Redmond established that 90% of generation Y continue their studies beyond high school, with 70% believing that a college diploma is essential for their career; in other words, they will seek employment where college degree is required (Redmond 2008). The figures available on the website [www.felvi.hu](http://www.felvi.hu) that manages our higher education admittance data indicate that the situation is the same as what Redmond found in England.

Considering this ratio of student interest in further education, it is certainly to the point to take note of the fact that hypertext was gaining ground during the student years of this very generation. In hypertext, constrained text is replaced by non-constrained text and linearity by one with nodes as well as links to other texts. The receiver status has changed, and authorial control gave way to “editorial-readerly-compiler-copying” functions. The passive reader can thereby become active, as s/he actually does (Hesse 1996) in the sense that s/he will edit, reedit, compile, copy, and share texts. Media researcher Zoltán Nagy argues that the findings of a public-opinion research institution—according to which 80% of generation Y does not use printed material—indicate that handwriting has lost ground, or has been backgrounded at least. The course of events leading this far starts in primary school where it is forgotten that deciding against hand-writing acquisition exerts a negative influence on personality development and the development of reading skills. Those who cannot write will be unable to read. Dr. József Hámori, Hungarian academician, regards handwriting as essential. This brain-researcher contends that handwriting is

not only a communicational tool; it is an important means of developing personality, in fact a key to learning. That is to say, the individual who writes in hand learns more easily, makes better progress, his or her creativity and memory are enhanced by it. The part of the brain responsible for memory stores handwriting in multiple ways. This is why it is much easier to evoke handwritten information than a typed one. As things stand now, hitting computer keys has no centre in the human brain (Novák web).

*Generation Z* (children born after 1995), issues of generation X or Y. They are characterized by a sophisticated handling of technologies, and by a higher degree of versatility and cleverness (or proficiency) as far as user applications are concerned. They live in a different world, ready to exploit the possibilities the new world can offer (Tari, 2011:25). For the Z-child everything is available on the internet. They seem to be mentally mature, but their emotional development remains at normal speed. They comprehend what they understand, but are unable to process it emotionally. The daily news, the flood of information, pages that carry brief but, for them, unimportant news items, are all too frequently for a more mature age-group, too early arrivals for the young “receiver,” who is not quite ready to receive those items yet (42-43).

It is this generation that represents the greatest challenge from the point of view of reading. But Plato’s conviction—“Knowledge is that [which] is true belief with an account” (Plato web)—applies here too. Well-founded knowledge has to meet three preconditions, the ancient philosopher maintained: it must be true, verifiable, and believable. Verifiability requires, let us add in our context, the kind of critical relation to things, which the baby boomers still had, but is no longer characteristic of generation Z. The disappearance of the critical view is somehow connected to the emergence of electronization too, I suppose. Balázs Fűzfa suggests, that owing to the transformation that reading and writing undergoes (electronization), our knowledge will be restructured too. Search will take the place of knowledge as effective search will shorten the way to targeted knowledge; we no longer need to get lost in unnecessary (“dead”) material, to learn and know such material. He supports it by quoting Nobel laureate Albert Szent-Györgyi, who famously said: “what we need to know is not the book; what we need to know is which book to take from the shelf” (Fűzfa 2002 web). Szent-Györgyi’s statement is indeed valid, but one thing must be kept in mind: by the time our Nobel-laureate scientist reached the point to know which book to take from the shelf, he had read a whole library. No wonder that he knew which book to take from the shelf after that.

## *Digital environment*

The bit-generations were socialized in the world of the internet in my country too. The digital competence of these Hungarian young generations is apparently on an equal level with that of their western peers. There is no significant “generational belatedness” which was still there when we compared the baby boomers and generation X in the East and in the West.

But how about the technical environment, really? In other words, how about digital presence in Hungary; i.e., the technical environment that provides the tools with the help of which we can access information? The equipment of early 21st-century Hungarian households with info-communicational devices and the use of those devices have shown an ever-increasing trend for years.

**Percentages of equipment of Hungarian households with info-communicational devices and their individual use in relation to total population figures**

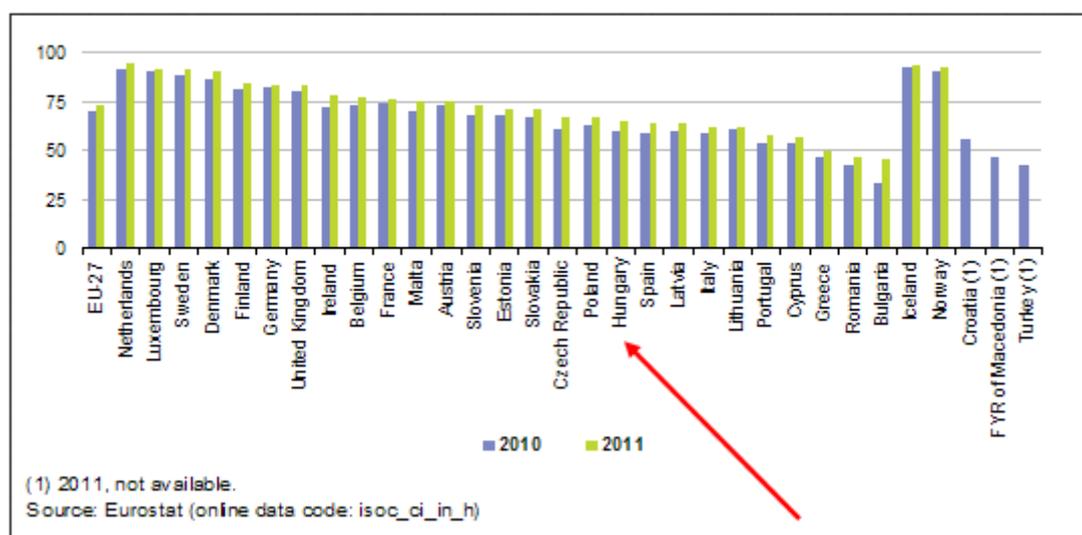
	2005	2006	2007	2008	2009	2010	2011	2012
<b>Equipment of households with info communication devices</b>								
Households with mobilephone	79,9	84,4	86,4	88,0	90,4	93,2	94,7	95,4
Households with PC	40,7	47,1	50,6	54,6	56,8	58,6	59,5	59,1
Households with laptop	6,3	9,3	11,4	15,7	21,0	26	31	35,1
Households with palmtop	1,6	1,8	1,8	2,8	3,6	3,9	4,7	4,5
Households with internet connection	22,1	32,3	38,4	48,4	55,1	60,5	65,2	68,6
Households with broadband internet connection	10,9	22,0	33,0	42,3	50,9	52,2	60,8	68,0
<b>Individual PC and internet usage</b>								
Persons who already used PC	43,3	59,5	62,4	68,5	67,7	70,3	73,9	75,9
Persons who regularly use PC	42,1	54,1	58,3	63,4	62,6	64,1	69,3	71,8
Persons who already used internet	39,9	48,5	54,4	62,7	63,7	67,6	72	74,2
Persons who regularly use internet	37,2	44,9	51,6	58,7	59,3	62,2	68	70,6
Persons who have already made purchase or placed order on internet	8,9	8,2	12,2	15,7	18,9	22,2	26,6	30,3
Persons who regularly make purchase or place order on internet	5,3	5,0	6,9	7,7	8,9	10,3	12,7	14,7

Source: KSH<sup>2</sup>

Available data (Eurostat 2011) indicate that Hungary's digital presence from the point of view of internet access represents an average level.

**Internet access of households, 2010 and 2011**

(% of all households)



Source: Eurostat<sup>3</sup>

The ways we read in a digital environment differ considerably from classical reading. Digital environment, digital reading skills, digital writing skills, and digital

<sup>2</sup> Percentages of equipment of Hungarian households with info-communicational devices and their individual use in relation to total population figures.

[http://www.ksh.hu/docs/hun/xstadat/xstadat\\_eves/i\\_oni006.html](http://www.ksh.hu/docs/hun/xstadat/xstadat_eves/i_oni006.html) [12.10.2013]

<sup>3</sup> [Internet\\_access\\_of\\_households\\_2010\\_and\\_2011\\_\(%\\_of\\_all\\_households\).png](#) [12.10.2013]

education are consecutive levels of digital literacy, each step being a prerequisite to the next.

*Digital reading*, Marc Prensky holds, differs from traditional reading in its methods only, while it admits the indispensability of traditional reading (Prensky 2001: 4). Among other things, digital reading aims at immediate information access; it is mostly nonlinear; and it does not require intense concentration (nor is the latter a precondition). The digital-textual world of interconnected hyperlinks makes it possible to connect items of information (a wonderful potential for speeding up information search) thus facilitating intertextual interpretation. Digital reading is a close kin to traditional reading after all, except that the device used for text transmission is different, as are further possibilities provided by the technical medium. Text comprehension is an essential skill, in the case of both literacies (traditional or digital), especially when reading serves learning.

The consequences of the phenomena outlined above are the problematic that Éva Gyarmathy addresses (2013 web). The bit-generations need to respond to more and more stimuli, so everyday life becomes much more intensive for the young than it used to be for earlier generations. What follows (for one) is that it is not so easy to absorb their attention as it was in the case of their seniors 20-30 years ago. The new situation also explains why these generations do not read in the traditional sense. One reason, among others, is that online content sways towards visuality rather than directing attention to the content of the text.<sup>4</sup> I think I need to complement Gyarmathy's observations by urging us to notice that reading as an activity put to the service of learning is losing ground against scanning-reading, which is motivated by mere information acquisition. What results is that learning is confused with acquiring information. They are not the same. Knowledge is (to put it simply) interpreted and acquired information. As scanning or browsing reading becomes predominant, texts that demand sustained attention, thorough and differentiated thinking, simply do not have the adequate stimulus (because of what we can call their monomediality) to engage the bit-generations.

In February 2013 Ipsos public-opinion research institute conducted a representative public-opinion poll of the reading habits of Hungarian young people.<sup>5</sup> The resulting data revealed that 7% of age-group 18-25 reads with daily, 16% with weekly, and 14% with monthly regularity. Another 35% more rarely than monthly, and 28% never reads. Books have practically no impact on the life of 63% of them. 45% declared that reading does not arrest their attention. E-book readers are not in general use among young people, only 2% are using such devices (Nem olvasnak a fiatalok [Young people do not read] 2013 web). A higher-education survey is also relevant here. It found that barely 60% of the students participating in the survey could cope with the content of a one-minute reading-material in the allotted time; only 1/3rd was able to reproduce the content—this means functional illiteracy. As I have already mentioned, the 2009 PISA Survey found, that Hungary ranked last but one at that time, in an average field, as far as reading literacy is concerned. This survey already incorporated questions related to digital reading.

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<sup>4</sup> Éva Gyarmathy's Eger presentation dates to January 2013.

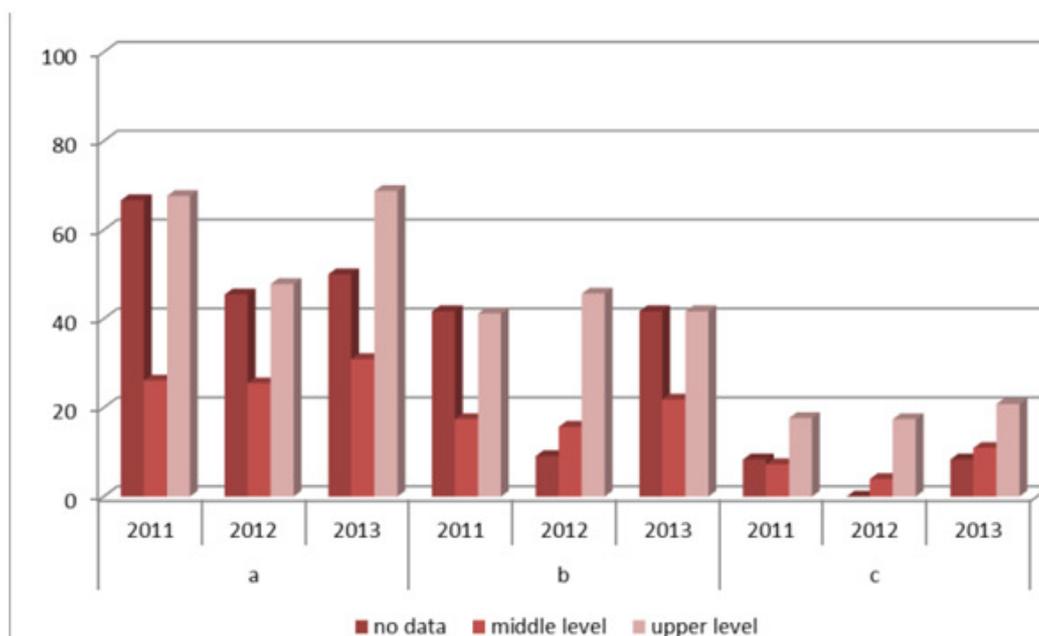
<sup>5</sup> An earlier poll that yielded expressly good data concerning the reading habits of generation Y was taken in 2006.

## Digital writing

Digital writing requires from the user what Henry Jenkins calls “media literacy”: the capability of the user to recognize, make use of, and manipulate (operate) digital media. This is also a social capability in the new millenium, among other things, he says. Jenkins also remarks that the new writing skills cannot do without traditional (Gutenberg-galaxy<sup>6</sup>) writing skills either. But it is much more too: it is complemented with research-, technical, and critical-analytical skills (Jenkins 2009 web: 28-29). As opposed to digital reading (where text-interpretation is an essential competence), digital writing does not necessarily imply an interpretation of the used, restructured, manipulated content. Digital media literacy can do without text interpretation.

Digital writing presupposes adequate digital competences, then. A survey, conducted by M. Chernoch and P. Bíró in University of Debrecen’s Faculty of Informatics, tested the middle and upper level results of the high-school-leaving public examination in informatics, of students who had already made it into higher education. (Hungarian middle and upper levels are O level and A level, alternately, in English terminology.)

**The percentage of correct answers in categories of students by their graduation-exam level**



Source: Bíró-Csernoch 2013

Their findings indicate only slight divergence regarding accurate answers between *Group no data* and *Group upper level* in the years 2011 and 2012, while upper-level examinees scored higher in the year 2013. *Group middle level* performed extremely poorly, in general, in solving programming and algorithmic assignments. Bíró-Chernoch think that several explanations are possible, and feel that the issue should be addressed urgently, but that is beyond what they set out to do in their survey article. What they do infer from their data, however, is that those who had passed the

<sup>6</sup> The author’s remark.

middle-level high-school graduation exam are markedly deficient in algorithmic skills. It is as much as to say that they had acquired the skill of clicking around, thus attaining professional level in surface-structure metacognitive knowledge but not much deep-structure knowledge (Bíró-Csernoch 2013: 4).

Another survey, also conducted in the Debrecen University Faculty of Informatics probed into student knowledge relating to the use of the most popular spreadsheet applications (Microsoft Excel and OpenOfficeCalc). The results concerning the use of array formulae indicate that programming majors are the best in this field (although their knowledge is not up to the mark either), and they had scored much higher in informatics than mathematics in the high-school-leaving maturity examination, middle and upper level alike (Csernoch 2012). If we take how many students were involved in the survey and how many went for the maturity examination in informatics, it becomes evident that the majority of students performed better in informatics than in mathematics. The survey article remarks that spreadsheets is required material of high-school-leaving exams in informatics, so all of the students who were tested by the survey were supposed to be well-versed in spreadsheet functions. The results also clearly show that the group of students majoring in programming were apparently more motivated or interested than those others of the Faculty of Informatics who formed the control group. The surveys examined only part of the digital competence of students of informatics. But when we talk about them, we talk about the bit-generation elite, who are fascinated by informatics as a vocation. But it seems that the skills they exhibit in digital writing “works by fits and starts.” It is not unreasonable to wonder: and where do we stand with the rest of our youths on the issue?

*Digital education* comprises the stages discussed above. A digitally-educated individual is one who has mastered digital reading and writing at the required level in digital presence (commands the right degree of “literacy”), and, furnished with these competences, is capable of evaluating, interpreting, rethinking, and effectively utilizing content. Jenkin’s claim is relevant here: digital literacy cannot do without an analytical-critical approach to information. Digital education for the new millenium does not simply mean the technical (medium-) literacy which enables us to use the computer and other devices of data storage, data transmission, and data-locking. It also includes effective search of information; full comprehension and evaluation of the search results; an analytical-critical approach to them, as well as the competence to choose from among them and communicate them at the required level.

### *Arising questions and possible answers*

1. Who is disadvantaged in today’s world of education? Is it the digital-immigrant teacher or the digital-native student? Prensky asserts that teachers speak an obsolete, predigital-age language while the students they teach communicate in a new, radically different language. What is more, the former have an “accent,” that is, they live with one foot in the obsolete mediality of old times. This intellectual of international renown is convinced that there is no way for teachers other than to master the new language; and master it to the extent that there should be no need for the natives to familiarize themselves with the old methods (Prensky 2001 web). With due respects to the famous thinker, I am not sure that his is the only salutary solution. It is not only that the youths admitted into Hungarian higher education are struggling with grave problems as far as reading and text interpretation are

concerned, but learning itself is a matter that raises serious questions in their case. The problem of attention should not be ignored either. Having studied deep and hyper attention as well as identity questions of new generations of digital natives, also the way reading, comprehension, and learning relate, I have developed a higher-education model in which both the old and the new are present in the right proportion. The model will be submitted to experiment at the Faculty of Informatics, University of Debrecen.<sup>7</sup> A potential solution which requires the ability to compromise on both sides: teachers must learn the new language, and students need to find their way back to the methodology of reading and learning that needs deep attention.

2. How do the different generations use the tools of information search? The digital divide is between generations X and Y in this respect. According to the data of a survey published by BBC in 2010<sup>8</sup>, Z's are the fastest in information search, but they use the least possible sources. Y's are slower in search but use more sources, apply multitasking methodology more, and produce better results. Thus superficiality is gaining ground.

3. Are e-books and digital sound material suitable for information transmission? A printed book is more than simply an information-storage device. It is an organic product that needs no tools, no energy. Its production, printing, binding, and distribution make it considerably more expensive. Its speed of publication and distribution are relatively slow. The printed book is part of our anthropomorphic world, though; i.e., even as an object, an article of use, it is a system that remains within the bounds of the human world, belonging to it. An e-book is text created and distributed in electronic form, tool- and energy-dependent. It is a technical product with built-in obsolescence that tends to break down; moreover, is programmed by industrial and commercial interest to give way to newer and newer generations of such devices. Information placed into virtual space is removed from anthropomorphic immediacy. Since it does not have colour and touch that belong to the human world, the human being senses it to be cooler, more distanced, and impersonal, therefore foreign. Thus it is not so easy to make it part of one's world of privacy. Therefore the desire for information, the urge to read decreases. (Dani 2012: 55) Nevertheless, the e-book can indeed be a means with which to popularize reading. As far as reading for comprehension and interpretation, it makes no difference if a text is printed or electronic after all. But digital subject-matters of instruction can be effective tools of teaching only if they form only part of a blended learning process. In and by themselves they are not adequate means of knowledge acquisition.

4. Would 3D display aid better understanding, or, better information search results? Partial results of our ongoing research indicate that 3D can indeed aid the process of information search.

5. The digital education of the bi-generation is not something that goes without saying. It does not develop by instinct and is plagued with serious competence-

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<sup>7</sup> The model in question is introduced in detail in the author's article: "*E-Existence and Hyper Attention.*" It is awaiting publication in volume 2013, issue 4 of *Könyv és Nevelés* (Book and Education).

<sup>8</sup> The research aimed at examining the information-search habits of generations X, Y, and Z from the point of view of purpose of internet use, multitasking, information-search strategy, and work memory. [http://ciber-research.eu/download/20120601-Google\\_Generation\\_BBC.pdf](http://ciber-research.eu/download/20120601-Google_Generation_BBC.pdf) [10.05.2013.]

deficiencies. They regard digital presence as a given of their life, but conscious, interpreted, purposeful, and self-assured digital reading, writing, and education are goals that can be achieved as a result of serious learning and concentrated attention. So the new generations cannot “save” the effort of serious study in the e-world either.

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