Chapter

Introductory Chapter: Why Usability Matters

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1. Introduction

1.1 Usability and software development

Despite what it may seem at times in the context of software development nowadays, *usability* is a rather old term. It was first defined in 1998 by the International Standards Organization as part of ISO 9241-11: 1998. At the time, *usability* was defined as "*the degree to which a software can be used by specified consumers to achieve quantified objectives with effectiveness, efficiency, and satisfaction in a quantified context of use*" [1].

It took two decades to review this document, two decades in which software and people interact with software, have changed enormously, and continues to change [2]. The ISO 9241-11:1998 is now superseded by ISO 9241-11:2018 [3], but the definition of *usability* has changed very little: "*extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.*" So, it would seem that, even if we have moved from orange/green monochrome monitors attached to very limited hardware in large companies' offices to ubiquitous high-resolution pocket-fitting devices, the main concerns should still be three: effectiveness, efficiency, and satisfaction.

The paradox about software is that applications and systems have become tools for other disciplines, and thus are being used to determine how they approach usability. In other words, as architects, engineers, and even fashion designers, use 3D models, AR, and VR, to test their creations, software is allowing them to improve user experience in fields from architecture [4] to food packaging [5]. The number of publications in these fields that have to do with usability shows a similar trend, same as the general interest in usability, according to people's online searches (see **Figure 1** and **Table 1**).

Thus, we could argue that the usability of software products is somewhat a key to usability in many (and increasing) aspects of our daily lives.

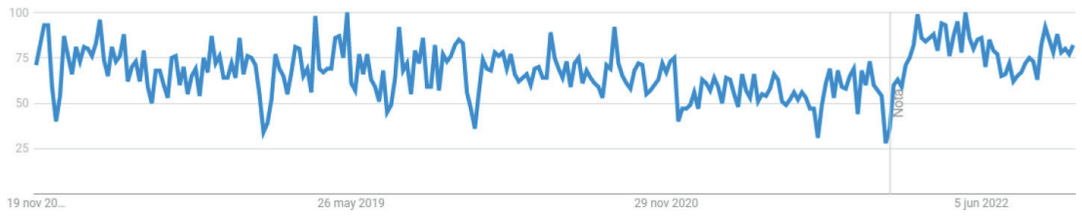

Figure 1.
Global searches related to "usability" (source: Google Trends).

	Computer Science	Architecture[1]	Engineering	Food[2]
2022[3]	825	25	452	25
2021	1203	45	605	17
2020	1268	24	575	14
2019	1398	29	725	13
2018	1124	25	509	14
2017	1096	36	474	15

[1]*Taken as part of the "Arts and Humanities" category in SCOPUS.*
[2]*Taken as part of the "Agricultural and Biological Sciences" category in SCOPUS.*
[3]*We include 2022, even if it is still ongoing at the time of writing this chapter.*

Table 1.
Number of scientific papers related to usability (data source: SCOPUS).

Last but not least, although almost all the time *usability* is about the user, software developers are heavy users of software themselves, specifically software development tools and applications. However, even if "programmers are users too" [6], there is comparatively far less research in their direction.

2. The side-effects of usability

The ill effects of bad usability depend highly on the context and purpose for which software is used. Of course, there is no comparison between angry users that turns to other social networks or music streaming platforms, and the health-threatening consequences of usability failures [7, 8]. However, bad software usability might affect, as stated in the previous section, any field that uses software as a tool, even archaeology [9].

While rating the severity of usability failures [10] is a sensible *afterward* approach to what was not detected before, same as in software testing, the efforts that pay off the most are those aimed to prevent usability failures from happening in the first place [11].

Something that cannot possibly be quantified is the harm done to the whole software development industry as a whole, and to the regard in which society holds technology and technology makers, when usability issues slip through to the final users, the regular citizens [12].

3. Conclusions and challenges ahead

Quoting Melvin Kranzberg, "Technology is not positive, nor negative, nor neutral" [13]. A biased development team, organization, and societal context... will most likely produce biased software. No team produces unusable software on purpose, but rather fails to understand what *usability* means to their users, in terms of its three key components: effectiveness, efficiency, and satisfaction.

Unsuited (biased and unusable) technology is not only a cause for unhappy people, but it may also lead to failed projects and economic losses. From a higher-level perspective, it may even perpetuate stereotypes and hinder the empowerment of minorities and underrepresented groups. Ultimately, the unsuitability of technology delays innovation and progress.

So far, the most effective ways of fighting biases in technology that we know are: (a) being aware of said biases, in all their shapes and forms, and (b) strive to have as much diverse development teams and organizations. From the perspective of usability, we can work toward the construction of more inclusive, thoughtful ways of interacting with software by carefully analyzing the individuals and societal non-functional requirements, and being aware of the influence of cultural and geographical differences in the three key pillars: effectiveness, efficiency, and satisfaction.

The future ahead comes with unprecedented challenges: the myth of the digital natives was debunked [14, 15], but will the digital divide with senior citizens [16] really fade away as generations of developers age themselves? Or will new technologies appear once again, and will the software development industry stumble on the same ineffective, inefficient, and dissatisfactory stone?

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References

[1] ISO 9241-11:1998 Ergonomic requirements for office work with visual display terminals (VDTs)—Part 11: Guidance on usability [Internet]. 1998. Available from: https://www.iso.org/standard/16883.html

[2] Eischen K. The Social Impact of Informational Production: Software Development as an Informational Practice. UC Santa Cruz: Center for Global, International and Regional Studies. 2002. Available from: https://escholarship.org/uc/item/9rp0c3w4

[3] ISO 9241-11:2018 Ergonomics of human-system interaction — Part 11: Usability: Definitions and concepts [Internet]. 2018. Available from: https://www.iso.org/standard/63500.html

[4] Bittencourt MC, do Valle Pereira D, Lúcia V, Júnior WP. The usability of architectural spaces: Objective and subjective qualities of built environment as multidisciplinary construction. Procedia Manufacturing. 2015;**3**:6429-6436. DOI: 10.1016/j.promfg.2015.07.919

[5] Goswami B. The Role of Food Packaging. Chapter of the Book: Global Challenges and Innovation in Science and Management. Delhi: KAAV Publications; 2019

[6] Myers BA, Ko AJ, LaToza TD, Yoon YS. Programmers are users too: Human-centered methods for improving programming tools. In Computer. 2016;**49**(7):44-52. DOI: 10.1109/MC.2016.200

[7] Alnosayan N, Chatterjee S, Alluhaidan A, Lee E, Feenstra LH. Design and usability of a heart failure mHealth system: A pilot study. JMIR Human Factors. 2017;**4**(1). DOI: 10.2196/humanfactors.6481

[8] Johnson ME, Willey N. Usability failures and healthcare data Hemorrhages. IEEE Security & Privacy. 2011;**9**(2):35-42. DOI: 10.1109/MSP.2010.196

[9] Traviglia A. Archaeological usability of hyperspectral images: Successes and failures of image processing techniques. BAR International Series. 2006;**1568**:123-130

[10] Sauro J. Rating the Severity of Usability Problems [Internet]. 2013. Available from: https://measuringu.com/rating-severity

[11] Horgan JR, Mathur AP. Software testing and reliability. In: Lyu MR, editor. The Handbook of Software Reliability Engineering. New York: McGraw-Hill; 1996. pp. 531-565

[12] Lauesen S. IT project failures, causes and cures. IEEE Access. 2020;**8**:72059-72067. DOI: 10.1109/ACCESS.2020.2986545

[13] Kranzberg M. Technology and History: "Kranzberg's Laws". Technology and Culture. 1986;**27**(3):544-560. DOI: 10.2307/3105385

[14] Bennett S, Maton KA, Kervin L. The 'digital Natives' Debate: A Critical Review of the Evidence. 2008. Available from: https://ro.uow.edu.au/edupapers/1149

[15] The digital native is a myth. Nature. 2017;**547**(380). DOI: 10.1038/547380a

[16] van Dijk JAGM. Digital divide research, achievements and shortcomings. Poetics. 2006;**34**(4-5):221-235. DOI: 10.1016/j.poetic.2006.05.004