Assessing the Readability of Policy Documents on the Digital Single Market of the European Union

Jukka Ruohonen
University of Turku, Finland
Email: juanruo@utu.fi

Abstract—Today, literature skills are necessary. Engineering and other technical professions are not an exception from this requirement. Traditionally, technical reading and writing have been framed with a limited scope, containing documentation, specifications, standards, and related text types. Nowadays, however, the scope covers also other text types, including legal, policy, and related documents. Given this motivation, this paper evaluates the readability of 201 legislations and related policy documents in the European Union (EU). The digital single market (DSM) provides the context. Five classical readability indices provide the methods; these are quantitative measures of a text’s readability. The empirical results indicate that (i) generally a Ph.D. level education is required to comprehend the DSM laws and policy documents. Although (ii) the results vary across the five indices used, (iii) readability has slightly improved over time.

Index Terms—readability index, comprehension, literature skills, text mining, legal texts, law, digital single market, EU

I. INTRODUCTION

Comprehension of different texts is a requirement of today’s life. No matter of their background, citizens need to understand many text types to participate in a society and manage their lives. At the same time, surveys around the world have reported declines in literature skills, generally defined not only as the ability to read and write but to also understand, evaluate, and use written texts [1]. There are many reasons behind the declines. Technology is one factor. Although existing results are not definite [2], smart phones and social media are among the technological factors partially explaining the declines. When the declines are coupled with other trends, such as today’s avalanches of misinformation and disinformation, the societal consequences may be ruinous in the long-run.

Technical professions do not exempt from literature skills. Programmers need to write documentation and understand the documentation of other programmers. Engineers need to read and write technical specifications. Thus, language and literature skills, critical thinking, and related “humanistic” skills have long been on the agenda in engineering education programs [3]. There are even online courses specifically for technical writing skills [4]. At the same time, the skill requirements have likely increased and expanded in their scope.

Nowadays, engineers need to comprehend also legal documents, particularly in case legal counseling is not attainable, as is often the case in start-ups and small companies. To this and other ends, educators have long tried to expose students to different text types [5]. To some extent, the attempts have beared fruit. For instance, anecdotal evidence hints that engineering and computer science students are receptive to the grammar and vocabulary of law [6]. Yet questions remain whether and how well they are able to understand and translate law into technical specifications and implementations. In practice, collaboration between lawyers and engineers is often required for such translations [7]. To ease the translations, different formalization methods and tools have long been proposed [8]. Eventually, such technical solutions may eliminate the need to have lawyers in situations requiring the engineering of requirements from law. These requirements have increased particularly in the EU as regulation of the information technology sector has tightened; therefore, the DSM laws and policy documents provide an ideal case study. But engineers and other technical professions are obviously not the only ones required to read, interpret, and understand law and its requirements.

The comprehension of law by ordinary citizens remains the most pressing issue. And existing results are not encouraging. For instance, even many legal counseling websites have been observed to be beyond the comprehension of those with weak literacy skills [9]. The problem can be argued to contain two parts. The first is intentional obfuscation. And, indeed, it is not difficult to find arguments that companies and their legal representatives deliberately obfuscate documents in order to evade transparency requirements [10]. Nor is public sector administration immune to such arguments. The second part derives from the ways lawyers, academics, and other professionals, including legislators, communicate in writing. The topics covered by them are often complex and hence the writing tends to be complex. Sometimes, though, complexity only serves complexity. Lawyers, for instance, have long been accused of writing gobbledygook [11]. Other professionals, including civil servants, are often no better in this regard. Therefore, simple and understandable writing has long been seen as a part of good administration. The same applies to law-making for which language improvements have long been recommended [12]. This point motivates to ask a research question (RQ₁): how readable are the DSM-specific laws and policy documents? The framing to the DSM can be justified with the earlier remarks on technical professions; these are the laws and policy documents engineers specifically should be able to understand. The second research question (RQ₂) is about validity: are there statistical differences between five typical readability indices? The final RQ₃ is longitudinal: has the readability of the laws and documents improved over time?
II. RELATED WORK

The paper shares a long tradition of related work. Readability first became a research topic already in the 1920s. Ever since, different quantitative indices have been proposed to gauge the perceived readability of a text. The ideal has been simplicity. Plain language, plain prose, or plain English have been the terms used to describe this ideal. It has been endorsed by authors of both fact and fiction. Actually, the classical assessments and opinions of both author types have been highly similar, as becomes evident by comparing the 1946 works of Flesch [13] and Orwell [14], respectively. The former author also developed a quantitative index for his ideal.

From the early 1970s onward, the Flesch’s classical readability index was met by multiple competing indices. Yet these competing indices never abandoned the ideal of simplicity. Simple is usually better when a topic is complex. Therefore, a classical application domain has been technical writing by engineers [15], [16]. But the indices have been also applied for many other purposes. Other application domains include the evaluation of financial reports [17], websites [18] and their privacy policies [19], tweets by politicians who speak at the level of 4–5:th graders [20], fake online reviews [21], and consent forms for scientific research [22], to name some examples.

Some previous work exists also for using indices to evaluate the readability laws and related legal documents. The results have not been surprising. The comprehension requirements have been observed to be beyond the educational attainment of most people—and particularly of those who would most need information about their rights [23], [24]. Even the instructions delivered to juries in common law legal systems have been measured to be beyond the literature skills of many adults [25]. The decisions reached by some courts have also become more difficult to read over time, which, as such, reflects the increasing complexity of many legal questions [26]. However, no previous research seems to exists in the EU context according to a reasonable literature search. Regarding the engineering context, it is also worth remarking the work that has focused on the understandability of the general logic of law [27]. But it is difficult to understand a logic when a text describing the logic is difficult to understand. This point provides a justification for evaluating the overall readability of legislations in the EU.

III. DATA

The dataset covers the main documents on the digital single market of the EU. Although there exists no single database that would cover everything about the DSM, the EU has still provided a portal that provides summaries about key topical policy areas. The area reserved for the DSM was used to assemble the dataset by covering all documents except archival material. Based on this portal [28], five domains of the DSM are present: general rules, electronic communication networks, personal data and privacy, copyright and audiovisual material, and data economy and data protection. The data collection resembled the so-called snowball sampling [29]: for each domain, all hyperlinks were visited, and the documents mentioned on the web pages were collected as long as these were directives, regulations, or communications (COM), staff working documents (SWD), recommendations, decisions, or joint declarations (JOIN) of the European Commission or the Council. Hence, references to informal documents, treaties, corrigenda, court cases, decisions of non-legislative EU institutions, and related document types were excluded. Both current and deprecated laws were included in the dataset but only insofar as these were explicitly linked on the web pages.

The individual legislations and policy documents are enumerated in Fig. 1. Of these, about 34% are decisions, 32% directives, 18% regulations, and the remaining communications, recommendations, and other document types. The high amount of decisions is partially explained by the specifications for frequency bands used for electronic and mobile communication. Based on a subjective classification, as much as 35% of the laws and policy documents are about telecommunications. Privacy and data protection (14%), copyright and intellectual property (14%), different contracts and justice in general (6%), Internet governance (4%), and cyber security (3%) follow.

IV. METHODS

Five traditional readability indices are used. The selection of these was practical; these are readily available from an existing Python package [30]. All measure the hypothetical grade level required to comprehend a text. The grades are based on those used in the United States. In theory, there is a upper limit in the grades—a graduate program in a university would be somewhere around the 22:th grade or so, but none of the indices impose limits. Negative values are also possible. Thus, in general, the higher the score, the more difficult a text is to comprehend. To ensure comparability, all scores from the indices are further truncated up towards the nearest integer.

The first is the Flesch–Kincaid index [31]. It is defined as:

\[ g_1 = \left[ 0.39 \left( \frac{\# \text{ words}}{\# \text{ sentences}} \right) + 11.8 \left( \frac{\# \text{ syllables}}{\# \text{ words}} \right) - 15.59 \right], \]

where \( g_1 \) refers to a grade. The second is the SMOG index or the “simple measure of gobbledygook” [32]. It is given by:

\[ g_2 = \left[ 1.0430 \sqrt{\frac{30 (\# \text{ polysyllables})}{\# \text{ sentences}}} + 3.1291 \right]. \]

The third is ARI, the automated readability index [30], [33]:

\[ g_3 = \left[ 4.71 \left( \frac{\# \text{ characters}}{\# \text{ words}} \right) + 0.5 \left( \frac{\# \text{ words}}{\# \text{ sentences}} \right) - 21.43 \right]. \]

The fourth is the Coleman-Liau index [34], as defined by:

\[ g_4 = \left[ 0.0588\alpha - 0.296\beta - 15.8 \right], \]

where \( \alpha \) is the number of letters per a hundred words and \( \beta \) the average number of sentences per 100 words. The fifth and final index is the Linsear Write readability formula. It is defined differently from the other four indices. In essence: for each 100 word sample, easy (with two syllables or less) and hard (three or more syllables) are counted and scored (with one and three points, respectively), after which the per-sample scores are divided by the number of sentences in the sample,
Fig. 1. Legal and Policy Documents Included in the Dataset (n = 201)

Fig. 2. Readability Grades (g₁,...,g₅, n = 201)
and further scaled (for more details see [30]). As with the other indices, a truncated grade, $g_5$, is outputted from the arithmetic. Two additional points are worth briefly making about these classical indices. First, there are many modifications to these, as well as numerous alternatives. Hundreds of individual variables were considered already in the 1970s for constructing readability indices [35]. More recent modifications have focused on natural language processing and machine learning methods [36], [37]. The second point follows: all readability indices have always been heavily criticized. The criticism and thus limitations are later on briefly discussed in the concluding Section VI. For the present purposes, it suffices to justify the use of the five readability indices with an argument that modifications and more elegant methods seem uncalled for in the present application domain. As there is no prior empirical work in the domain, the five indices serve to make a baseline.

V. RESULTS

The grades across the 201 documents are shown in Fig. 2 for each of the five readability indices. There are three points to make from the figure. First, the Linsear Write index does not pass a commonsense validity test: the grades from the index show a fairly large variance, but the median of 72 is not a realistic value (grade) in practice. Second, there is another potential validity concern about the Coleman-Liau index; the small standard deviation of 1.34 seems surprising when compared to the outputs from the other four indices. Third, the previous two points translate into modest correlations with the grades from the remaining three indices. In contrast, the grades from the Flesch-Kincaid, SMOG, and ARI indices are highly correlated (see Table I). By implication, a sum variable constructed from these three indices (based on the rowwise arithmetic means) attains high internal consistency. For instance, Cronbach’s $\alpha$-coefficient [38] is as large as 0.98.

| TABLE I                      |
|-------------------------------|
| CORRELATIONS (PEARSON)        |
| 1.                           |
| 2.                           |
| 3.                           |
| 4.                           |
| 5.                           |
| 1. Flesch-Kincaid            |
| 2. SMOG                      |
| 3. ARI                       |
| 4. Coleman-Liau              |
| 5. Linsear                   |
| 1. 0.940                     |
| 2. 0.995 0.928               |
| 3. 0.018 0.098               |
| 4. 0.512 0.232              |
| 5.                           |

These observations are enough to answer to the first and second research questions. Regarding RQ2: there are notable differences between the five indices. Regarding RQ3: based on the median of the sum variable, the overall readability is somewhere near the 30th grade. What does such a grade mean; how large is this value? Given that even the first quartile is about 27, it seems equitable to conclude that a completion of a graduate program is required to comprehend the DSM laws and policy documents—at least insofar as the quantitative readability indices convey their intended function. Even if their validity is questioned, as can be done on many grounds, there is still a comparative viewpoint supporting the conclusion of overall complexity. For instance, local newspapers in the United States have been observed to attain values around 12 at maximum [39]. Another comparative example would be abstracts in psychology papers for which values around 17 have been reported [40]. Finally, the visualization in Fig. 3 suffices to answer to RQ5. Although the amount of laws and policy documents has steadily grown over the years, the readability of these has slightly improved when compared to the 1980s and 1990s. A potential explanation may relate to incremental law-making; many of the new laws enacted amend or replace old laws, building upon their foundations. Nevertheless, the averages have still remained around 30 or so.

VI. CONCLUSION

This short paper evaluated the readability of laws and policy documents related to the digital single market of the EU. In general, these are difficult to comprehend according to the quantitative readability indices. Even though readability has slightly improved, the hypothetical grade level is still around thirty. What could explain this result? A partial explanation would be that the DSM laws and policies, in particular, simply are complex; many of them address highly technical topics. Another partial explanation stems from the EU’s law-making processes. After a law is finally enacted, it has gone through a heavy process of revisions, often including copy-pasted snippets from politicians pressed by lobbyists [41]. While copy-pasting is not unique to the EU [42], it is likely to increase gobbledygook. Another source relates to Regulation 1/1958 according to which multiple European languages must be accounted for already during the law-making processes.

A further potential explanation stems from the limitations of the quantitative readability indices. In particular, the construct validity of these is often questionable; it is not entirely clear whether they measure what they intend to measure. It is not necessary to elaborate the lengthy criticism in detail. It suffices to note that the indices ignore grammar [15], and do not address the fact that simplicity by itself does not necessarily guarantee comprehension [43]. Thus, developing a readability index specifically for law would be a good topic for further research; the newer machine learning methods may help with the
task. Another topic would be to examine the comprehension of laws and policy documents by human subjects. A particularly interesting question is the comprehension—or, possibly, lack thereof—among engineering and computer science students. The question is relevant because it has been computer science that has been seen to enhance law and its practice, often with questionable consequences [44], and not the other way around.

REFERENCES

[1] OECD, PISA 2018 Results: What Students Know and Can Do, Volume I. Paris: OECD Publishing, 2019.
[2] L. Verheijen, W. Spooren, and A. van Kemenade, “Relationships Between Dutch Youths’ Social Media Use and School Writing,” Computers and Composition, vol. 56, p. 102574, 2020.
[3] M. Abdulwahed, W. Balid, M. O. Hasna, and S. Pokharel, “Skills of Engineers in Knowledge Based Economies: A Comprehensive Literature Review, and Model Development,” in Proceedings of IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE 2013). Balf: IEEE, 2013, pp. 759–765.
[4] Google, Inc., “Technical Writing Courses,” 2021, Available online in January 2021: https://developers.google.com/tech-writing.
[5] M. W. Conley and A. Wise, “Comprehension for What? Preparing Students for Their Meaningful Future,” Theory Into Practice, vol. 50, pp. 93–99, 2011.
[6] M. Hildebrandt, Law for Computer Scientists and Other Folk. Oxford: Oxford University Press, 2020.
[7] K. Hjerppe, J. Ruohonen, and V. Leppänen, “The General Data Protection Regulation: Requirements, Architectures, and Constraints,” in Proceedings of the 27th IEEE International Requirements Engineering Conference (RE 2019). Jeju Island: IEEE, 2019, pp. 265–275.
[8] L. Mommers, W. Voermans, W. Koelewijn, and H. Kielman, “Understanding the Law: Improving Legal Knowledge Dissemination by Translating the Contents of Formal Sources of Law,” Artificial Intelligence and Law, vol. 17, pp. 51–78, 2009.
[9] D. D. Dyson and K. Schellenberg, “Access to Justice: The Readability of Legal Services Corporation Legal Aid Internet Services,” Journal of Poverty, vol. 21, no. 2, pp. 142–165, 2016.
[10] B. A. Rutherford, “Obfuscation, Textuality Complexity and the Role of Regulated Narrative Accounting Disclosure in Corporate Governance,” Journal of Management and Governance, vol. 7, pp. 187–210, 2003.
[11] H. Frooman, “Lawyers and Readability,” The Journal of Business Communication, vol. 18, no. 4, pp. 45–51, 1973.
[12] U. Karpen, “Instructions for Law Drafting,” European Journal of Law Reform, vol. 10, no. 2, pp. 163–182, 2008.
[13] R. Flesch, How to Write, Speak, and Think More Effectively. New York: Harper & Brothers, 1960 [1946].
[14] G. Orwell, Politics and the English Language and Other Essays. Public domain 2018 edition, 1946.
[15] G. M. McClure, “Readability Formulas: Useful or Useless?” IEEE Transactions on Professional Communication, vol. PC-30, no. 1, pp. 12–15, 1987.
[16] S. Zhou, H. Jeong, and P. A. Green, “How Consistent Are the Best-Known Readability Equations in Estimating the Readability of Design Standards?” IEEE Transactions on Professional Communication, vol. 60, no. 1, pp. 97–111, 2017.
[17] Y. Sun, X. Wang, and Y. Yu, “Readability to Financial Report: A Comparative Study of Chinese and Foreign Countries,” in Proceedings of the Seventh International Joint Conference on Computational Sciences and Optimization (CSO 2014). Beijing: IEEE, 2014, pp. 69–73.
[18] E. K. Leong, M. T. Ewing, and L. F. Pitt, “E-Comprehension: Evaluating B2B Websites Using Readability Formulas,” Industrial Marketing Management, vol. 31, pp. 125–131, 2002.
[19] B. Fabian, T. Ermakova, and T. Lenz, “Large-Scale Readability Analysis of Privacy Policies,” in Proceedings of the International Conference on Web Intelligence (WI 2017). Leipzig: ACM, 2017, pp. 18–25.
[20] O. Kayam, “The Readability and Simplicity of Donald Trump’s Language,” Political Studies Review, vol. 16, no. 1, pp. 73–78, 2017.
[21] X. Wang, X. Zhang, C. Jiang, and H. Liu, “Identification of Fake Reviews Using Semantic and Behavioral Features,” in Proceedings of the 4th International Conference on Information Management (ICIM 2018). Oxford: IEEE, 2018, pp. 92–97.
[22] F. Santel, I. Bah, K. Kim, J.-A. Lin, J. McCracken, and A. Teme, “Assessing Readability and Comprehension of Informed Consent Materials for Medical Device Research: A Survey of Informed Consents from FDA’s Center for Devices and Radiological Health,” Contemporary Clinical Trials, p. 105831, 2019.
[23] R. N. Arkell and H. C. van Dyck, “Readability of Human Rights Material,” Canadian Community Law Journal – Revue Canadienne de Droit, vol. 2, pp. 12–14, 1978.
[24] L. M. Tan and G. Tower, “The Readability of Tax Laws: An Empirical Study in New Zealand,” Australian Tax Forum, vol. 9, no. 3, pp. 355–372, 1992.
[25] R. Small, J. Piatania, and B. Cutler, “Assessing the Readability of Capital Pattern Jury Instructions,” Jury Expert, vol. 25, no. 1, pp. 18–22, 2013.
[26] R. Whalen, “Judicial Gobbledygook: The Readability of Supreme Court Writing,” Yale Law Journal Forum, vol. 125, pp. 200–211, 2015.
[27] D. R. Ploch, B. K. Dumas, G. B. Gray, B. J. MacLennan, and J. E. Nolt, “Readability of the Law: Forms of Law for Building Legal Expert Systems,” Jurimetrics, vol. 33, no. 2, pp. 189–222, 1993.
[28] European Union, “Digital Single Market,” 2021, Summaries of EU Legislation. Available online in February 2021: https://eur-lex.europa.eu/summary/chapter/31.html.
[29] P. Biernacki and D. Waldorf, “Snowball Sampling: Problems and Techniques of Chain Referral Sampling,” Sociological Methods & Research, vol. 10, no. 2, pp. 141–163, 1981.
[30] S. Bansal and C. Aggarwal, “Textstat,” 2021, Version 0.7.0. Available online in January: https://pyjni.org/project/textstat/
[31] J. P. Kincaid, R. P. Fishburne, R. L. Rogers, and B. Chissom, “Derivation of New Readability Formulas (Automated Readability Index, Fog Count and Flesch Reading Ease Formula) for Navy Enlisted Personnel,” 1975, Naval Technical Training Command, Research Branch Report 8-75. Available online in February 2021: https://apps.dtic.mil/sti/pdfs/ADA006655.pdf.
[32] G. H. McLaughlin, “SMOG Grading – a New Readability Formula,” Journal of Reading, vol. 12, no. 8, pp. 639–646, 1969.
[33] E. A. Smith and J. P. Kincaid, “Derivation and Validation of the Automated Readability Index for Use with Technical Materials,” Human Factors, vol. 12, no. 5, pp. 457–564, 1970.
[34] M. Coleman and T. L. Liu, “A Computer Readability Formula Designed for Machine Scoring,” Journal of Applied Psychology, vol. 60, pp. 283–284, 1975.
[35] E. B. Entin and G. R. Klare, “Factor Analyses of Three Correlation Matrices of Readability Variables,” Journal of Reading Behavior, vol. 10, no. 3, pp. 279–290, 1979.
[36] T. François et al., “Do NLP and Machine Learning Improve Traditional Readability Formulas?,” in Proceedings of the First Workshop on Predicting and Improving Text Readability for Target Reader Populations (PITR 2012). Montreal: ACM, 2012, pp. 49–57.
[37] L. C. R. Timaná, D. F. S. Lozano, and J. F. C. García, “Software to Determine the Readability of Written Documents by Implementing a Variation of the Gunning Fog Index Using the Google Linguistic Corpus,” in Proceedings of the International Conference on Applied Technologies (ICAT 2019). Quito: Springer, 2020, pp. 409–420.
[38] L. J. Cronbach, “Coefficient Alpha and the Internal Structure of Tests,” Psychological Issues, vol. 16, no. 3, pp. 297–334, 1951.
[39] B. Wasike, “Preaching to the Choir? An Analysis of Newspaper Readability vis-a-vis Public Literacy,” Journalism, vol. 19, no. 11, pp. 1570–1587, 2016.
[40] J. Stricker, A. Chasiotis, M. Kerwer, and A. Günther, “Scientific Abstracts and Plain Language Summaries in Psychology: A Comparison Based on Readability Indices,” PLoS ONE, vol. 15, no. 4, p. e0231160, 2020.
[41] J. Ruohonen, “David and Goliath: Privacy Lobbying in the European Union,” 2019, Archived manuscript, available online: arXiv:1906.01883.
[42] T. Allee and M. Elsig, “Are the Contents of International Treaties Copied and Pasted? Evidence from Preferential Trade Agreements,” International Studies Quarterly, vol. 63, no. 3, pp. 603–613, 2019.
[43] J. Korunovska, B. Kamleitner, and S. Spiekermann, “The Challenges and Impact of Privacy Policy Comprehension,” in Proceedings of the Twenty-Eight European Conference on Information Systems (ECIS 2020). AIS, 2020, pp. 1–17.
[44] N. S. Goltz and G. Dondoli, “A Note on Science, Legal Research and Artificial Intelligence,” Information & Communications Technology Law, vol. 28, no. 3, pp. 239–251, 2019.