User Interface Constraints to Influence User Behaviour when Reading and Writing

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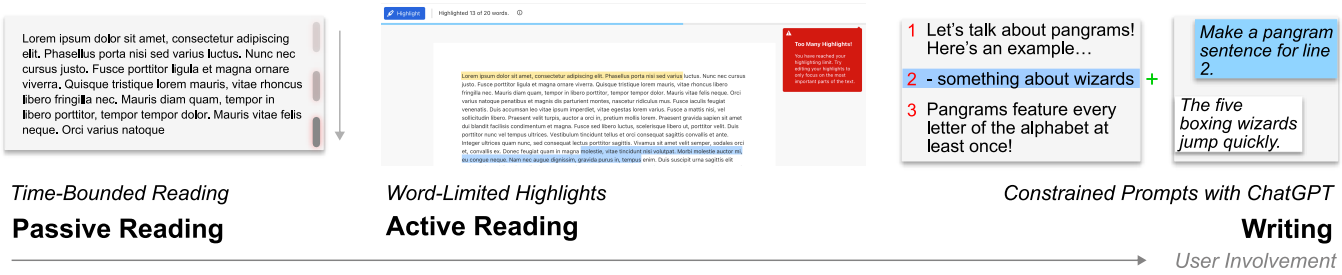

Figure 1: Applying constraint-based interaction techniques to influence user behaviour while passively reading, actively reading, and writing.

ABSTRACT

Constraints are fundamental to human-centered design. Although by definition, constraints "limit" or "restrict" the capability of software, when designed correctly, they can have enabling characteristics as well. In my dissertation, I seek to understand how user interface constraints can influence user behaviour when reading and writing text. First, I discuss a document reader with auto-scrolling to facilitate time-bounded reading for increased focus. Second, I contribute the idea of limiting how much text can be highlighted in a document to encourage readers to think more about what is truly important in the document. Lastly, I discuss how constraining an AI writing assistant through prompts with varying levels of detail may improve a writer's feelings of ownership. Through these three projects, my dissertation will contribute novel constraints-based interaction techniques that can be integrated into new or existing systems, which is of interest to the UIST community and the HCI community more broadly.

CCS CONCEPTS

• **Human-centered computing** → **Interaction tech**.

KEYWORDS

interaction techniques, interface design, constraints

ACM Reference Format:
Nikhita Joshi. 2023. User Interface Constraints to Influence User Behaviour when Reading and Writing. In *The 36th Annual ACM Symposium on User Interface Software and Technology (UIST '23 Adjunct), October 29-November 1, 2023, San Francisco, CA, USA.* ACM, New York, NY, USA, 5 pages. https://doi.org/10.1145/3586182.3616710

1 INTRODUCTION

Constraints are a fundamental part of human-centered design, with Norman having noted that designers should use *"constraints to guide the actions"* of users [37, p. 67]. Although constraints have the connotation of *"limiting"* or *"restricting,"* prior work argues that constraints have many enabling characteristics as well. For example, constraints can improve creative expression through constrained creativity experiences (e.g., [17, 35, 48]), boost productivity (e.g., [7, 14]) and drive innovation within organizations (e.g., [18, 46]).

In user interface design, constraints have largely been used to reduce errors, like restricting user commands in certain modes. However, there are other ways constraints can be applied to guide user actions. Intentionally imposing constraints in software that are not required by resource limitations can act as a nudge to alter user behaviours. For example, using character limits to encourage more user participation on social media [26], displaying only a few search results to improve user confidence and satisfaction when retrieving information in a search engine [41], and imposing time limits to encourage focused knowledge-sharing through videos [27, 34].

We interact with text documents and articles daily, either by reading them passively or actively, or writing our own. Although constraints have been successfully applied to creative writing to encourage creativity (e.g., [7, 24, 35]), there are other ways our interactions with text documents can be purposely limited to encourage desirable user behaviours. For example, constraints can be imposed to encourage users to pay closer attention to text they are reading, focus their highlights or notes on the most important concepts within an article, and help writers feel more satisfied with their writing when working with an AI assistant.

In my dissertation, I seek to answer the research question: **how can user interface constraints enable users and positively**

alter user behaviour when reading and writing? By combining theories from psychology with interaction design, my work aims to innovate novel constraint-based interaction techniques that can be integrated into software user interfaces, which would be of interest to the broader UIST community.

2 BACKGROUND AND RELATED WORK

Constraints are a fundamental aspect of life; ecological psychology suggests that humans interact with the world by perceiving what can and cannot be done it in as they try to achieve their goals [22, 23]. Constraints appear in many domains, though they may take on other names, such as requirements, conditions, or rules. They can be thought of as measures needed to turn large or ill-defined problems into smaller or well-defined problems [42, 44]. Despite the negative connotation associated with unintentional constraints like bottlenecks in production, intentional constraints can be quite positive, enabling desirable characteristics and behaviours. As Boden notes: *"constraints on thinking do not merely constrain, but also make certain thoughts – certain mental structures – possible"* [9, p. 58]. Here, I outline the dual nature of constraints as both an enabler and an inhibitor before discussing prior ways in which constraints have been applied to reading and writing text.

2.1 Duality of Constraints

Many believe that constraints are fundamental to the creative process. Elster [20, p. 176] describes the creative process as two-stages: the choice of constraints and choosing within constraints. Similarly, Stokes [47] argues that creative breakthrough can be achieved through self-imposed constraints that are manipulated throughout the creative process. Self-imposed time limits can spark creative thinking and solutions [18, 25, 43] and reduce perfectionism [14]. Prior work in HCI has created constrained creativity systems for the visual arts [4, 48] and music [5, 15].

Constraints can be useful beyond creativity applications as well. When applied to search engines, limiting the number of results improves a user's confidence and satisfaction in their search [41], and constrained task descriptions can result in more in-depth and on-task explorations [6]. Social media applications with character or time limits can lower the user's perceived requirement of time for generating each post, encouraging more participation [26]. Knowledge-sharing over time-bounded video sharing social media forces content creators to focus on one or two key points in each video, which can be more comprehensive and enjoyable for viewers [34]. I created MicroMentor [27], a help-seeking system that constrains help sessions to three minutes. Results showed that constrained help sessions can encourage more help-seeking, as there is less of a perceived burden associated with asking for and giving help. Self-imposed time restrictions can be effective for discouraging excessive smartphone usage [30, 31].

However, there is a balance that needs to be struck as over constraining can have adverse effects. Over-constrained creativity experiences can result in too much uniformity and decrease enjoyment [17, 28, 29]. Severe time constraints may cause stress [25, 33]. Many researchers have proposed that there is an inverted U-shaped relationship between the level of constraint and the extent to which constraints are enabling [2, 20]. This has been described as *"the sweet spot"* [40, 43]. Optimal results can be achieved by balancing the level and type of constraint [1].

2.2 Constrained Reading and Writing

Some prior work has explored the impacts of constraints on reading and writing. Walczyk et al. [49] examined the effects time limits have on reading comprehension scores and found that reading under mild time pressure encouraged readers to stay focused and motivated while reading, which resulted in better scores. Similarly, Chang [12] found that when learning a second language, imposing time limits on reading can improve reading comprehension as readers are forced to read faster and focus on broader concepts rather than reading word by word. Though not strictly enforced, some websites like Medium show estimated read times for each article and some marketing research suggests they can improve user engagement [45]. This is likely caused by the Ellsberg paradox [19], which states that people avoid ambiguity when making decisions.

MakeWrite [35] is a constrained creativity system for writing erasure poetry, poetry that is created by removing content from an existing piece. Haught and Johnson-Laird explored how constrained writing prompts affect creative writing [24]. They tested using nouns and drawings, which are more limiting as they impose more specifications on what needs to be written, and found that the drawings resulted in longer and more creative sentences. Biskjaer et al. [7] explored how time constraints in a writing tool can encourage more creative writing. They found writing under time constraints generated more new writing, but the quality was lower. However, such writing would be suitable as a warm-up exercise, or to help writers overcome perfectionism.

Overall, imposing constraints can have positive effects while reading and writing. However, with the exception of MakeWrite, applying such concepts to user interfaces and interaction design has not been explored in depth. Rather, much of prior work has focused on evaluating constraint-based theories, without creating novel user interfaces or interaction techniques. My dissertation aims to bridge this gap by creating constraint-based interaction techniques for reading and writing.

3 RESEARCH AGENDA

My work is focused on how a single user's interactions with text documents can be enhanced through constraints. There are three primary ways people can interact with text documents: passively reading, actively reading, and writing new content. My research aims to innovate on novel interaction techniques for all three of these through time-bounded passive reading, highlights and comments that are limited by word count, and prompts that vary in their level of detail to place limits on an AI writing assistant.

3.1 Passive Reading

Time limits can encourage more focused reading, but this concept has yet to be integrated into existing document readers. Although marketing research on estimated read times provides some indication of what possible benefits there may be, such as increased engagement with the text, I am interested in understanding **how enforced read times impact the reading experience of a text article**. Inspired by Breznitz and Share's work [10], which showed

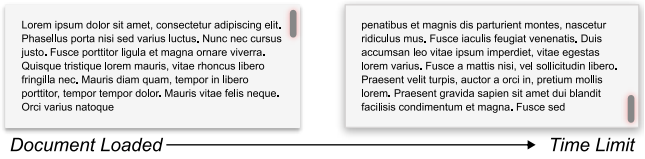

Figure 2: As the reading time limit approaches, the document reader automatically scrolls down to encourage the reader to read at a specific rate.

that students can recall more information from a text where words disappear after they are read, I will create a new document reader, ReaderPrompter (Figure 2), that removes the reader's ability to scroll through a document at their own pace to encourage more focused, time-bounded reading, and evaluate usability.

3.1.1 Methodology. At the core of the system design, is an auto-scrolling feature to match a target reading rate, like a teleprompter. Auto-scrolling is not new; systems like Microsoft Word allow users to automatically scroll through documents by pressing the mouse wheel and using cursor placement to control speed. However, applying auto-scrolling to impose a time constraint on reading has not been explored before. There are many interesting design challenges that arise as the optimal scroll speed may be different depending on the reader's reading ability, the type of document being read, and the reader's objectives. To guide the design of ReaderPrompter, I will first conduct a within-subjects experiment to evaluate usability and reading comprehension. Participants will be asked to read different types of text documents, like short stories, news articles, and academic papers, with different scroll speeds and will be asked a series of questions about the content shortly thereafter. Eye tracking will be used to measure workload and to estimate whether the reader is deep reading or skimming [13].

Using these results, I will create the full ReaderPrompter system that can automatically set optimal scroll speeds for different documents. Scroll speed will adapt as the document reveals new sections (e.g., slower speeds for a results section of an academic paper), or as the reader's goals change (e.g., longer time limits for first-time reading but shorter time limits for reviewing text). As reading is not always done linearly, I will also design interactions to support non-linear reading. For example, it may be beneficial to create "focus zones" on demand, where the scroll speed is significantly slower, or to indicate regions that can be skipped over.

3.2 Active Reading

Marking up text through highlights and underlines is an active reading strategy that can help readers remember more content in-text [21]. This is caused by two main effects: marking up text visually isolates it from other text, making it more memorable (i.e., the von Restorff effect) [36]; and deciding whether text is important, and worth marking up, or not, forces the reader to think more about it, which can improve memorability [16, 50]. However, many readers tend to over-mark [3], which is not as effective as being more selective with text marks [21, 36] and can even instill a false sense of comprehension [8, 50].

I propose imposing constraints on how much text can be marked up while reading a document to encourage readers to be more selective with their text marks. I hypothesize that readers will naturally try to self-regulate their own text marking behaviours so that they fall within the specified limit, which has been shown to improve recollection [32].

3.2.1 Methodology. I designed and implemented a custom web interface for reading and highlighting text passages (Figure 3). The interface displays the passage and users can add new highlights by selecting text. Once a new highlight has been added, a progress bar at the top of the page increases in width. If the limit has been reached, the system prevents additional highlights; the user must delete existing highlights to regain the ability to highlight.

The ideal word limit on highlights is unclear: if the limit is too high, the user's behaviour does not need to change; but if it too low, the user may become frustrated. I am currently running a series of between-subjects experiments using this interface to understand how word limits can be applied to text highlighting and what the ideal word limits are. Both experiments use the same procedure. Participants will first highlight a passage for an upcoming reading comprehension test. The next day, participants will complete a timed open-book reading comprehension test where they can view, but not edit, their highlights from the previous day. For the first experiment, participants will not have any constraints to work within. Using these results, I will be able to characterize current highlighting behaviours and identify word limits for the second experiment (i.e., limits that fall 1, 2, or 3 standard deviations below the mean word count). During the second experiment, participants will either be constrained by one of three different word limits, or not be allowed to highlight anything.

I will compare highlighted content and test scores between groups. I will then conduct a follow-up experiment that also considers how such constraints can also be applied to comments in the margins, and develop a document reader system that supports both types of constrained annotations. Combining constrained highlights and comments into one system has interesting design challenges. For example, should each type of annotation have its own word limit, or should they be counted together?

3.3 Writing

Caspi and Blau [11] noted that when writing with others, a writer's perceived quality of the text can increase. However, this comes at the cost of psychological ownership, and losing too much ownership can deter writers from collaborating with others. With the recent advancement of large language models (LLMs) and AI chatbots like ChatGPT, the process of writing will be forever changed, and writers will increasingly collaborate with AI assistants.

One major difference between collaborating with a person versus an AI assistant is that the writer has full control over how the AI assistant is to be used; the writer can indicate the level of involvement by imposing more or less constraints in the prompt. For example, a prompt like *"write a five paragraph essay about WWII"* is much less constrained than *"write a sentence to summarize Hitler's rise to power at the beginning of paragraph 2."* Imposing different levels of constraints on prompts has been shown to be beneficial for search tasks [6] and creative writing [24], but **how is psychological ownership and perceived quality impacted when writers impose more or less constraints on an AI writing assistant?**

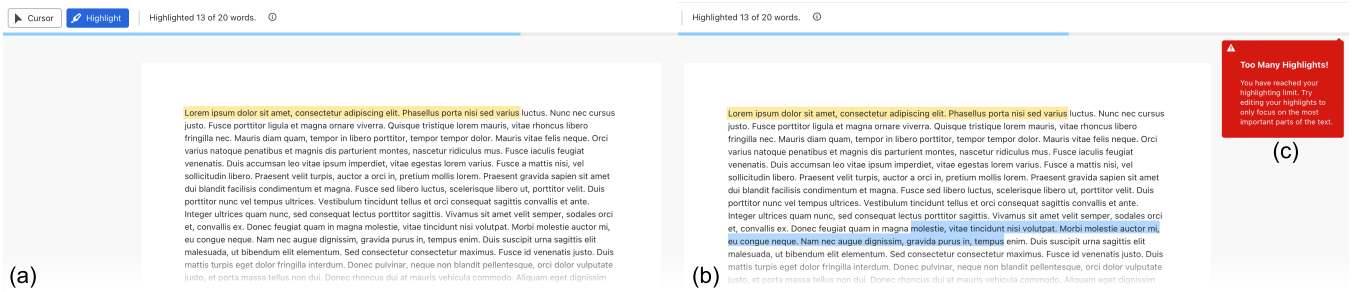

Figure 3: (a) Constrained highlighting interface. A count and progress bar showing how many words have been highlighted appear in the top toolbar; (b) if too many words are selected, (c) an error message appears, and the new highlight is not created.

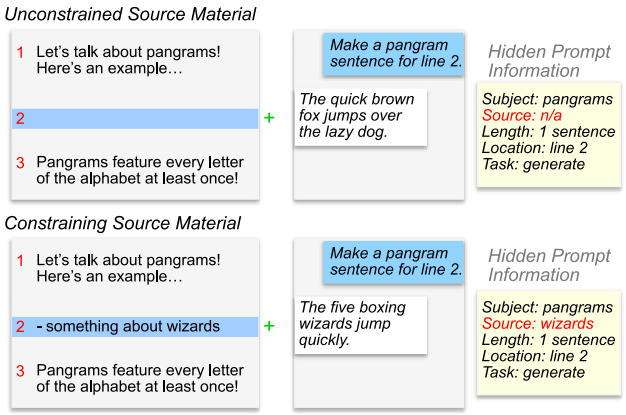

Figure 4: ChatGPT writing example when the source material is unspecified or constrained to include "wizards."

3.3.1 Methodology. I will first create a text editor that features a side-by-side view of a writing area and chatbot (Figure 4). The chatbot will be powered by ChatGPT and the system will control the structure of the prompts by imposing more or less constraints on ChatGPT. Using this editor, I will conduct a within-subjects experiment. Participants will be given a writing prompt and will be asked to write a paragraph for the prompt. While writing, they will either be asked to write the paragraph entirely by themselves or to use ChatGPT. When using ChatGPT, the system or the participant will modify different parameters to control the level of constraint: the subject, length (sentence or paragraph), the placement (specific line numbers or no indication), source material (nothing or using specified bullet points), and the type of task (generating new content, or editing existing content). For each paragraph, participants will answer questions about the perceived quality of the text and psychological ownership. With these results, I will formalize design guidelines for future document editors that integrate AI assistants in-product to optimize for ease of writing and ownership.

4 CONCLUSION

Overall, my work aims to leverage user interface constraints to improve a reader's ability to read with focus, highlight a document, and improve a writer's ability to work with an AI assistant while maintaining feelings of ownership. Text documents, whether they are short news articles or book chapters from a university textbook, are fundamental pieces of information that are consumed by users daily. As such, innovating on ways to make users better at reading or writing them is an important research direction.

Although the aforementioned projects focus on a single user, constraints can be used to improve multi-user experiences with text documents as well. For example, I explored the idea of limiting how frequently updates are shared with collaborators in synchronous shared editors (e.g., Google Docs) to improve how comfortable a writer feels when writing with others. The results showed that delaying updates after full sentences have been written can improve comfort. This project is currently under review.

Outside of text documents, there are also other ways constraints can be leveraged to enable users. For example, with the rise of digital photography, people receive immediate gratification by being able to capture and view photos whenever it is desired. However, systems like Photobox [38, 39] showed that delayed gratification can build anticipation and encourage people to revisit their photos more frequently. Constraints could be combined with digital photography by purposely slowing the user experience through time restrictions on when new photos can be captured and viewed.

Even beyond software, focusing on constraints in HCI can lead to innovative designs. For example, this year at UIST, I will be presenting work that explores how microgestures performed by the middle, ring, and pinky fingers can enable input when the hands or fingers are constrained by location or posture. By considering different types of hand constraints, I was able to innovate on new types of gestural input and their applications that had not been explored extensively in the literature previously.

Phrases like *"think outside the box"* imply that in order to achieve beneficial outcomes, like creative breakthrough, we need to think beyond the constraints placed upon us. But have we ever stopped to really think about the box itself? If it is too big, we would get lost trying to find a way out, and if it is too small, we would not have enough room to explore. What makes the box special and how can we use the box to our advantage? My dissertation, and career more broadly, is focused on putting the spotlight directly on the box itself in exciting and innovating ways.

ACKNOWLEDGMENTS

I thank my advisor, Daniel Vogel, for his continued support and for giving me unconstrained freedom to explore while simultaneously guiding me by helping me impose constraints on my own research.

REFERENCES

[1] Oguz A Acar, Murat Tarakci, and Daan Van Knippenberg. 2019. Creativity and innovation under constraints: A cross-disciplinary integrative review. *Journal of Management* 45, 1 (2019), 96–121.

[2] Markus Baer and Greg R Oldham. 2006. The curvilinear relation between experienced creative time pressure and creativity: moderating effects of openness to experience and support for creativity. *Journal of Applied psychology* 91, 4 (2006), 963.

[3] Kenneth E Bell and John E Limber. 2009. Reading skill, textbook marking, and course performance. *Literacy research and instruction* 49, 1 (2009), 56–67.

[4] Luca Benedetti, Holger Winnemöller, Massimiliano Corsini, and Roberto Scopigno. 2014. Painting with bob: Assisted creativity for novices. In *Proceedings of the 27th annual ACM symposium on User interface software and technology*. 419–428.

[5] Ben Bengler and Nick Bryan-Kinns. 2013. Designing collaborative musical experiences for broad audiences. In *Proceedings of the 9th ACM Conference on Creativity & Cognition*. 234–242.

[6] Michael Mose Biskjaer, Bo T Christensen, Morten Friis-Olivarius, Sille JJ Abildgaard, Caroline Lundqvist, and Kim Halskov. 2020. How task constraints affect inspiration search strategies. *International Journal of Technology and Design Education* 30, 1 (2020), 101–125.

[7] Michael Mose Biskjaer, Jonas Frich, Lindsay MacDonald Vermeulen, Christian Remy, and Peter Dalsgaard. 2019. How Time Constraints in a Creativity Support Tool Affect the Creative Writing Experience. In *Proceedings of the 31st European Conference on Cognitive Ergonomics*. 100–107.

[8] Robert A Bjork. 1999. Assessing our own competence: Heuristics and illusions.

[9] Margaret A Boden. 2004. *The creative mind: Myths and mechanisms*. Routledge.

[10] Zvia Breznitz and David L Share. 1992. Effects of accelerated reading rate on memory for text. *Journal of Educational Psychology* 84, 2 (1992), 193.

[11] Avner Caspi and Ina Blau. 2011. Collaboration and psychological ownership: How does the tension between the two influence perceived learning? *Social Psychology of Education* 14 (2011), 283–298.

[12] Anna Chang. 2010. The Effect of a Timed Reading Activity on EFL Learners: Speed, Comprehension, and Perceptions. *Reading in a Foreign Language* 22, 2 (2010), 284–303.

[13] Xiuge Chen, Namrata Srivastava, Rajiv Jain, Jennifer Healey, and Tilman Dingler. 2023. Characteristics of Deep and Skim Reading on Smartphones vs. Desktop: A Comparative Study. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. 1–14.

[14] Francesco Cirillo. 2006. The pomodoro technique (the pomodoro). *Agile Processes in Software Engineering and* 54, 2 (2006), 35.

[15] Tim Coughlan and Peter Johnson. 2007. Constrain yourselves: Exploring end user development in support for musical creativity. In *Proceedings of the 6th ACM SIGCHI Conference on Creativity & Cognition*. 247–248.

[16] Fergus IM Craik and Robert S Lockhart. 1972. Levels of processing: A framework for memory research. *Journal of verbal learning and verbal behavior* 11, 6 (1972), 671–684.

[17] Darren W Dahl and C Page Moreau. 2007. Thinking inside the box: Why consumers enjoy constrained creative experiences. *Journal of Marketing Research* 44, 3 (2007), 357–369.

[18] Steven P Dow, Kate Heddleston, and Scott R Klemmer. 2009. The efficacy of prototyping under time constraints. In *Proceedings of the seventh ACM conference on Creativity and cognition*. 165–174.

[19] Daniel Ellsberg. 1961. Risk, ambiguity, and the Savage axioms. *The quarterly journal of economics* 75, 4 (1961), 643–669.

[20] Jon Elster. 2001. Ulysses unbound. *Philosophical Quarterly* 51, 205 (2001).

[21] Robert L Fowler and Anne S Barker. 1974. Effectiveness of highlighting for retention of text material. *Journal of Applied Psychology* 59, 3 (1974), 358.

[22] James Jerome Gibson. 1977. The theory of affordances. *Perceiving, Acting, and Knowing: Toward an Ecological Psychology* (1977), 67–82.

[23] James Jerome Gibson. 1979. *The ecological approach to visual perception*. Houghton, Mifflin and Company.

[24] Catrinel Haught and Philip N Johnson-Laird. 2003. Creativity and constraints: The production of novel sentences. In *Proceedings of the Annual Meeting of the Cognitive Science Society*, Vol. 25.

[25] Shih-Wen Hsiao, Ming-Feng Wang, and Chien-Wie Chen. 2017. Time pressure and creativity in industrial design. *International Journal of Technology and Design Education* 27, 2 (2017), 271–289.

[26] Akshay Java, Xiaodan Song, Tim Finin, and Belle Tseng. 2007. Why we twitter: understanding microblogging usage and communities. In *Proceedings of the 9th WebKDD and 1st SNA-KDD 2007 workshop on Web mining and social network analysis*. 56–65.

[27] Nikhita Joshi, Justin Matejka, Fraser Anderson, Tovi Grossman, and George Fitzmaurice. 2020. MicroMentor: Peer-to-Peer Software Help Sessions in Three Minutes or Less. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. 1–13.

[28] Sebastian Kernbach and Sabrina Bresciani. 2013. 10 years after Tufte's" cognitive style of PowerPoint": synthesizing its constraining qualities. In *2013 17th international conference on information visualisation*. IEEE, 345–350.

[29] Sebastian Kernbach, Sabrina Bresciani, and Martin J Eppler. 2015. Slip-sliding-away: A review of the literature on the constraining qualities of PowerPoint. *Business and Professional Communication Quarterly* 78, 3 (2015), 292–313.

[30] Jaejeung Kim, Hayoung Jung, Minsam Ko, and Uichin Lee. 2019. Goalkeeper: Exploring interaction lockout mechanisms for regulating smartphone use. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 3, 1 (2019), 1–29.

[31] Jaejeung Kim, Joonyoung Park, Hyunsoo Lee, Minsam Ko, and Uichin Lee. 2019. LocknType: Lockout task intervention for discouraging smartphone app use. In *Proceedings of the 2019 CHI conference on human factors in computing systems*. 1–12.

[32] Detlev Leutner, Claudia Leopold, and Viola den Elzen-Rump. 2007. Self-regulated learning with a text-highlighting strategy. *Zeitschrift für Psychologie/Journal of Psychology* 215, 3 (2007), 174–182.

[33] Lassi A Liikkanen, Tua A Björklund, Matti M Hämäläinen, Mikko P Koskinen, et al. 2009. Time constraints in design idea generation. In *DS 58-9: Proceedings of ICED 09, the 17th International Conference on Engineering Design, Vol. 9, Human Behavior in Design, Palo Alto, CA, USA, 24.-27.08. 2009*. 81–90.

[34] Xing Lu and Zhicong Lu. 2019. Fifteen seconds of fame: A qualitative study of Douyin, a short video sharing mobile application in China. In *International Conference on human-computer interaction*. Springer, 233–244.

[35] Timothy Neate, Abi Roper, Stephanie Wilson, and Jane Marshall. 2019. Empowering expression for users with aphasia through constrained creativity. In *Proceedings of the 2019 CHI conference on human factors in computing systems*. 1–12.

[36] Sherrie L Nist and Mark C Hogrebe. 1987. The role of underlining and annotating in remembering textual information. *Literacy Research and Instruction* 27, 1 (1987), 12–25.

[37] Don Norman. 2013. *The design of everyday things: Revised and expanded edition*. Basic books.

[38] William Odom, Mark Selby, Abigail Sellen, David Kirk, Richard Banks, and Tim Regan. 2012. Photobox: on the design of a slow technology. In *Proceedings of the designing interactive systems conference*. 665–668.

[39] William T Odom, Abigail J Sellen, Richard Banks, David S Kirk, Tim Regan, Mark Selby, Jodi L Forlizzi, and John Zimmerman. 2014. Designing for slowness, anticipation and re-visitation: a long term field study of the photobox. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. 1961–1970.

[40] Balder Onarheim and Michael Mose Biskjaer. 2015. Balancing constraints and the sweet spot as coming topics for creativity research. *Creativity in design: Understanding, capturing, supporting* 1 (2015), 1–18.

[41] Antti Oulasvirta, Janne P Hukkinen, and Barry Schwartz. 2009. When more is less: the paradox of choice in search engine use. In *Proceedings of the 32nd international ACM SIGIR conference on Research and development in information retrieval*. 516–523.

[42] Walter R Reitman. 1964. Heuristic decision procedures, open constraints, and the structure of ill-defined problems. *Human judgments and optimality* (1964), 282–315.

[43] Brent D Rosso. 2014. Creativity and constraints: Exploring the role of constraints in the creative processes of research and development teams. *Organization Studies* 35, 4 (2014), 551–585.

[44] Herbert A Simon. 1973. The structure of ill structured problems. *Artificial intelligence* 4, 3-4 (1973), 181–201.

[45] Simpleview. 2023. https://www.simpleviewinc.com/blog/stories/post/adding-read-time-on-blogs-boosts-engagement-by-up-to-40/

[46] Ana Cristina O Siqueira and Benson Honig. 2019. Entrepreneurs' ingenuity and self-imposed ethical constraints: creating sustainability-oriented new ventures and knowledge. *Journal of Knowledge Management* (2019).

[47] Patricia D Stokes. 2005. *Creativity from constraints: The psychology of breakthrough*. Springer Publishing Company.

[48] Carla Tamburro, Timothy Neate, Abi Roper, and Stephanie Wilson. 2020. Accessible Creativity with a Comic Spin. In *The 22nd International ACM SIGACCESS Conference on Computers and Accessibility*. 1–11.

[49] Jeffrey J Walczyk, Kathryn E Kelly, Scott D Meche, and Hillary Braud. 1999. Time limitations enhance reading comprehension. *Contemporary educational psychology* 24, 2 (1999), 156–165.

[50] Carole L Yue, Benjamin C Storm, Nate Kornell, and Elizabeth Ligon Bjork. 2015. Highlighting and its relation to distributed study and students' metacognitive beliefs. *Educational Psychology Review* 27, 1 (2015), 69–78.