Opinion

The Currency of the Attentional Economy: The Uses and Abuses of Attention in Our World

Jordan Schoenherr
Department of Psychology, Concordia University, Loyola Campus, Montreal, QC H4B 1R6, Canada
Department of Psychology and Institute of Data Science, Carleton University, Ottawa, ON K1S 5B6, Canada

We live in an attention economy [1]–[3]. People vie for the attention of allies, customers, followers, and mates [4] with advertisements, memes, and websites acting as proxies [5]. This truth defines the digital age. As Jeff Bezos noted in 1997, "capturing mindshare on the Internet is extremely difficult… Attention is the scarce commodity of the late 20th century" [6]. Like any resource, attention can be monetized. For instance, a single product placement can net a social influencer with 100,000 followers $5,000 [8], [9]. Similarly, ads can be promoted on search engines and social media, with Google estimating that companies receive $2 for every dollar spent promoting an ad [7].

Despite the precious nature of attention, few consider the composition of the coin of the realm. While there are many currencies (divided, switching, or vigilance [10]–[12]), I will consider attention capture and its bidirectional relationship with memory.

Attention and memory: silent partners

Attentional capture is automatic. Attention can be captured with "click bait" headlines [13] and smartphones notifications [14]. Misinformation and disinformation often grab our attention due their relative novelty (i.e., a distinctiveness effect) and we can spread it without fully considering the content or source [28].

By capturing attention, we create a memory trace that influences our representation of the world. Like pennies in a jar, these memory traces can accumulate unnoticed over time. They create pathways that reinforce stimulus–response connections with each successive encounter [15], [16]. Crucially, these memory traces guide attention automatically to relevant features of the environment [17]–[19] and free us to perform other tasks [20].

Memory retrieval is also automatic [21]. We never choose to forget our keys, our password, or the answer to a test. Rather, that information is simply not retrieved at the right place and time. We might assume that our most cherished attitudes, beliefs, and values are qualitatively different than everyday memories. To our memory systems, they are not. For instance, attention to appropriate social norms can reduce prosocial behavior [22], with reminders of norms increasing prosocial behavior [23], [24]. And much like any resource, we can deplete our finite supply of attention [25] leading to reductions in prosocial behavior [26].

A partial explanation for these findings is that we tend to be "cognitive misers," hoarding attentional

Digital Object Identifier 10.1109/MTS.2022.3147541
Date of current version: 9 March 2022.

resources until we are motivated to perform a task. Distributing cognitive processing to mediating technologies facilitates this process: offloading seemingly trivial tasks such as reminders of important dates, calculations, and information queries.

Dark patterns of design

Reliance on technology can be potentially costly. The rapid spread of misinformation and disinformation in our time demonstrate this quite clearly. A major source of this problem can be attributed to basic features of memory. When presented with information, we tend to store it and its source as separate representations, that is, a failure of source monitoring [27]. By failing to attend to the source, disinformation can be stored along with information, making it difficult to distinguish the good penny from the bad penny. And bad pennies always turn up. This can lead to "sleeper effects," such that information that is neglected now can influence our later judgments [32]. Even when a computer is the source, studies have demonstrated that we can confuse its productions with our own [29]. Search engine use can also create the same effect: when search engines are available, we tend to recall less information ourselves while still assuming that we possess this knowledge, that is, the "Google Effect" [30], [31].

These insights can be used for good or ill. Designs can intentionally exploit our limited attention resources. "Dark patterns" reflect the ethical *disaffordances* of technology [33], [34], nudging us to perform actions that benefit others, potentially at our own expense. They can include hidden costs, deceptive marketing, questionable testimonials, or using privacy policies and end-user license agreements as "click wrap" giving organization unrestricted use of our information [35], [36]. This is particularly true of social media applications that are designed to promote personal disclosure. Behind the benign interface, users' attention and preferences are being carefully mapped. With little warning, data subjects can also quickly lose control over their identities with sudden changes in policies, such as a recent TikTok decision over the collection of face and voice data from its users illustrates [37].

The Cambridge Analytica scandal revealed the potential scope of such dark patterns. Using psychographic techniques that can accurately predict user attributes [38], Cambridge Analytica *attempted* to target and nudge users to influence their voting behavior [39]. Yet, despite public uproar due to perceived violations of privacy and trust, little changed: one survey suggested that most users did not change their behavior on Facebook (58%). Of those that did change their behavior, only 9.6% deactivated their account, while only 19% reported making fewer posts to Facebook and 24.8% indicated that they were more careful [40]. Of course, nudging is a cheap trick, only working when attention is limited [41]. Users might discount these attempts as exerting little influence on their behavior. For instance, a recent study revealed two networks of over 2,000 bots that produced over 65,000 tweets had little influence [42]. We must nevertheless consider sleeper effects and how they can affect us in the long run, if only subtly.

Rather than focusing only the tail of the coin, we must also consider its head. By understanding the possible failures of attention, designers can help users invest their attention wisely [43]. Outside of virtual environments, collision and proximity warning systems can help direct a driver's attention at critical decision points [44], [45]. Inside digital environments, behavioral nudging can be used to encourage citizens to vote [46], [47] and provide warnings about sharing sensitive content or content without reading the article [48], [49]. Twitter has suggested that these practices increase article reading by 40% [50]. Large-scale efforts are also necessary. Apple's recent App Tracking Transparency policy was directed toward making users more aware of when their information is being shared, a move that proved to be costly for social media platforms [51].

Changes in policies and design nudges are only the first step. Users must be empowered through education and knowledge translation. They must understand the economics of attention to halt the inflationary processes that define big data.

References

[1] M. H. Goldhaber, "The attention economy and the net," *First Monday*, vol. 2, Apr. 1997, doi: 10.5210/fm.v2i4.519.

[2] G. L. Ciampaglia, A. Flammini, and F. Menczer, "The production of information in the attention economy," *Sci. Rep.*, vol. 5, no. 1, pp. 1–6, Aug. 2015.

[3] W. Thorngate, "On paying attention," in *Recent Trends in Theoretical Psychologsy*. New York, NY, USA: Springer-Verlag, 1988, pp. 247–263.

[4] J. R. Schoenherr, "Prestige technology in the evolution and social organization of early psychological science," *Theory Psychol.*, vol. 27, pp. 6–33, Feb. 2017.

[5] L. Weng et al., "Competition among memes in a world with limited attention," *Sci. Rep.*, vol. 2, no. 1, pp. 1–9, Dec. 2012.

[6] J. Bezos, "Interviewee, web and Internet pioneers," Richard Wiggins, Tech. Rep., 1997.

[7] Google, Alphabet Inc. (Dec. 1, 2021). *Google Economuic Impact: Methodology.* Accessed: Dec. 1, 2021. [Online]. Available: https://economicimpact.google.com/methodology/

[8] C. O'Connor, "Earning power: Here's how much top influencers can make on Instagram and YouTube," *Forbes*. Accessed: Apr. 10, 2017. [Online]. Available: https://www.forbes.com/sites/clareoconnor/2017/04/10/earning-power-heres-how-much-top-influencers-can-make-on-instagram-and-youtube/#5ee121c824db

[9] C. Lieber, "How and why do influencers make so much money?" *Vox*. Accessed: Nov. 28, 2018. [Online]. Available: https://www.vox.com/the-goods/2018/11/28/18116875/influencer-marketing-social-media-engagement-instagram-youtube

[10] H. E. Pashler, *The Psychology of Attention*. Cambridge, MA, USA: MIT Press, 1999.

[11] M. I. Posner, C. R. Snyder, and R. Solso, "Attention and cognitive control," in *Cognitive Psychology: Key Readings*. Hove, U.K.: Psychology Press, 2004, pp. 205–223.

[12] J. Fan et al., "Testing the efficiency and independence of attentional networks," *J. Cogn. Neurosci.*, vol. 14, no. 3, pp. 340–347, Apr. 2002.

[13] Y. Chen, N. J. Conroy, and V. L. Rubin, "Misleading online content: Recognizing clickbait as 'False News,'" in *Proc. ACM Workshop Multimodal Deception Detection*, Nov. 2015, pp. 15–19.

[14] Y.-J. Chang and J. C. Tang, "Investigating mobile Users' ringer mode usage and attentiveness and responsiveness to communication," in *Proc. 17th Int. Conf. Hum.-Comput. Interact. With Mobile Devices Services*, Aug. 2015, pp. 6–15.

[15] G. D. Logan, "Toward an instance theory of automatization," *Psychol. Rev.*, vol. 95, no. 4, pp. 492–527, 1988.

[16] R. F. Thompson, "In search of memory traces," *Annu. Rev. Psychol.*, vol. 56, no. 1, pp. 1–23, Feb. 2005.

[17] C. Bundesen, "A theory of visual attention," *Psychol. Rev.*, vol. 97, pp. 523–547, Oct. 1990.

[18] R. Desimone and J. Duncan, "Neural mechanisms of selective visual attention," *Ann. Rev. Neurosci.*, vol. 18, no. 1, pp. 193–222, 1995.

[19] J. Duncan and G. W. Humphreys, "Visual search and stimulus similarity," *Psychol. Rev.*, vol. 96, no. 3, pp. 433–458, 1989.

[20] C. N. Macrae, A. B. Milne, and G. V. Bodenhausen, "Stereotypes as energy-saving devices: A peek inside the cognitive toolbox," *J. Personality Social Psychol.*, vol. 66, no. 1, pp. 37–47, 1994.

[21] M. A. Fernandes and M. Moscovitch, "Divided attention and memory: Evidence of substantial interference effects at retrieval and encoding," *J. Exp. Psychol., Gen.*, vol. 129, no. 2, pp. 155–176, 2000.

[22] J. M. Darley and C. D. Batson, "'From Jerusalem to Jericho': A study of situational and dispositional variables in helping behavior," *J. Personality Social Psychol.*, vol. 27, no. 1, pp. 100–108, 1973.

[23] N. Mazar, O. Amir, and D. Ariely, "The dishonesty of honest people: A theory of self-concept maintenance," *J. Marketing Res.*, vol. 45, no. 6, pp. 633–644, Dec. 2008.

[24] R. B. Cialdini, C. A. Kallgren, and R. R. Reno, "A focus theory of normative conduct: A theoretical refinement and reevaluation of the role of norms in human behavior," in *Advances in Experimental Social Psychology*. New York, NY, USA: Academic, 1991, pp. 201–234.

[25] R. A. Grier et al., "The vigilance decrement reflects limitations in effortful attention, not mindlessness," *Hum. Factors*, vol. 45, no. 3, pp. 349–359, 2003.

[26] C. N. DeWall et al., "Depletion makes the heart grow less helpful: Helping as a function of self-regulatory energy and genetic relatedness," *Personality Social Psychol. Bull.*, vol. 34, no. 12, pp. 1653–1662, Dec. 2008.

[27] M. K. Johnson, S. Hashtroudi, and D. S. Lindsay, "Source monitoring," *Psychol. Bull.*, vol. 114, pp. 3–28, Jul. 1993.

[28] S. Vosoughi, D. Roy, and S. Aral, "The spread of true and false news online," *Science*, vol. 359, pp. 1146–1151, May 2018.

[29] R. L. Marsh and G. H. Bower, "Eliciting cryptomnesia: Unconscious plagiarism in a puzzle task," *J. Exp. Psychol., Learn., Memory, Cogn.*, vol. 19, no. 3, pp. 673–688, 1993.

[30] B. Sparrow, J. Liu, and D. M. Wegner, "Google effects on memory: Cognitive consequences of having information at our fingertips," *Science*, vol. 333, no. 6043, pp. 776–778, Aug. 2011.

[31] M. Näsi and L. Koivusilta, "Internet and everyday life: The perceived implications of Internet use on memory and ability to concentrate," *Cyberpsychol., Behav., Social Netw.*, vol. 16, no. 2, pp. 88–93, Feb. 2013.

[32] G. T. Kumkale and D. Albarracín, "The sleeper effect in persuasion: A meta-analytic review," *Psychol. Bull.*, vol. 130, no. 1, pp. 143–172, Jan. 2004.

[33] C. M. Gray et al., "The dark (patterns) side of UX design," in *Proc. CHI Conf. Hum. Factors Comput. Syst.*, Apr. 2018, pp. 1–14.

[34] C. Bösch et al., "Tales from the dark side: Privacy dark strategies and privacy dark patterns," *Proc. Privacy Enhancing Technol.*, vol. 2016, no. 4, pp. 237–254, Oct. 2016.

[35] A. Mathur et al., "Dark patterns at scale: Findings from a crawl of 11K shopping websites," in *Proc. ACM Hum.-Comput. Interact.*, vol. 3, pp. 1–32, Nov. 2019.

[36] A. M. McDonald and L. F. Cranor, "The cost of reading privacy policies," *ISJLP*, vol. 4, no. 3, pp. 543–568, 2008.

[37] TechCrunch. *TikTok Just Gave Itself Permission to Collect Biometric Data on U.S. Users, Including 'Faceprints and Voiceprints*. Accessed: Jun. 3, 2021. [Online]. Available: https://techcrunch.com/2021/06/03/tiktok-just-gave-itself-permission-to-collect-biometric-data-on-u-s-users-including-faceprints-and-voiceprints/

[38] W. Youyou, M. Kosinski, and D. Stillwell, "Computer-based personality judgments are more accurate than those made by humans," *Proc. Nat. Acad. Sci. USA*, vol. 112, no. 4, pp. 1036–1040, Jan. 2015.

[39] N. Confessore, "Cambridge Analytica and Facebook: The scandal and the fallout so far," *The New York Times,* Apr. 4, 2018. Accessed: Apr. 7, 2021. [Online]. Available: https://www.nytimes.com/2018/04/04/us/politics/cambridge-analytica-scandal-fallout.html

[40] J. Beck, "People are changing the way they use social media," *The Atlantic,* Jun. 7, 2018. Accessed: Jun. 8, 2018. [Online]. Available: https://www.theatlantic.com/technology/archive/2018/06/did-cambridge-analytica-actually-change-facebook-users-behavior/562154/

[41] F. Mols et al., "Why a nudge is not enough: A social identity critique of governance by stealth," *Eur. J. Political Res.*, vol. 54, no. 1, pp. 81–98, Feb. 2015.

[42] R. DiResta et al. (2021). *One Topic, Two Networks: Evaluating Two Chinese Influence Operations on Twitter Related to Xinjiang.* Stanford Digital Repository. [Online]. Available: https://purl.stanford.edu/sn407zm8237

[43] P. M. Todd and G. Gigerenzer, "Environments that make us smart: Ecological rationality," *Current Directions Psychol. Sci.*, vol. 16, pp. 167–171, Jun. 2007.

[44] R. J. Kiefer et al., "Development and validation of functional definitions and evaluation procedures for collision warning/avoidance systems," Dept. Transp., Nat. Highway Traffic Saf. Admin., Washington, DC, USA, Tech. Rep. DOT HS 808 964, 1999.

[45] C. Badue et al., "Self-driving cars: A survey," *Expert Syst. Appl.*, vol. 165, Mar. 2021, Art. no. 113816.

[46] R. M. Bond et al., "A 61-million-person experiment in social influence and political mobilization," *Nature*, vol. 489, pp. 295–298, Sep. 2012.

[47] J. J. Jones et al., "Social influence and political mobilization: Further evidence from a randomized experiment in the 2012 U.S. Presidential election," *PLoS ONE*, vol. 12, no. 4, Apr. 2017, Art. no. e0173851.

[48] A. Hutchinson, "Facebook tests new warning prompts to stop users sharing articles they haven't read," Social Media Today, May 10, 2021. Accessed: Oct. 24, 2021. [Online]. Available: https://www.socialmediatoday.com/news/facebook-tests-new-warning-prompts-to-stop-users-sharing-articles-they-have/599909/

[49] L. Fazio, "Pausing to consider why a headline is true or false can help reduce the sharing of false news," *Harvard Kennedy School Misinformation Rev.*, vol. 1, Feb. 2020, doi: 10.37016/mr-2020-009. [Online]. Available: https://misinforeview.hks.harvard.edu/article/pausing-reduce-false-news/

[50] Twitter Communications (Sep. 24, 2020). "More reading—People open articles 40% more often after seeing the prompt." Twitter. Accessed: Oct. 21, 2021. [Online]. Available: https://twitter.com/TwitterComms/status/1309178716988354561

[51] E. Roth, "Apple's app tracking policy reportedly cost social media platforms nearly $10 billion," *The Verge.* Accessed: Oct. 21, 2021. [Online]. Available: https://www.theverge.com/2021/10/31/22756135/apple-app-tracking-transparency-policy-snapchat-facebook-twitter-youtube-lose-10-billion

Jordan Schoenherr is an Assistant Professor with the Department of Psychology, Concordia University, Montreal, QC, Canada, and an Adjunct Research Professor with the Department of Psychology and a member of the Institute for Data Science at Carleton University, Ottawa, ON, Canada.

■ Direct questions and comments about this article to Jordan Schoenherr, Concordia University, Loyola Campus, Montreal, QC H4B 1R6, Canada and Carleton University, Ottawa, ON K1S 5B6, Canada; jordan.schoenherr@carleton.ca.