Serendipity and critical thinking: Fighting disinformation in a socio-technical society

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ABSTRACT
In the digital age of today, we are witnessing an advanced phase of a socio-technical society. Engulfed in social media trends and online presence, the digitization of our lives facilitates the creation and manipulation of false information, and impedes the ability of many to interpret right from wrong. Technology giants have started challenging and tampering with true serendipity through the use of synthetic algorithms and hidden processes which are manipulating the content that users see; therefore, individuals are being misled to believe that the online content they find occurs through pure happenstance. As a result, human creativity and free thought have become just as vulnerable as information and serendipity. This paper envisions fighting the spread of disinformation in the digital age, by harnessing greater critical thinking/action, and using the presence of true serendipity as a test case. This will help society fight disinformation to rescue free thought and creativity.

KEYWORDS
Disinformation, misinformation, socio-technical society, serendipity, information encountering, information behavior, critical thinking, critical action.

INTRODUCTION
We find ourselves living in an advanced phase of a socio-technical society where a combination of social structures and technical mechanisms determine human behavior through the rules hidden in algorithms (Erdelez & Jahnke, 2018). With a vast majority of the population relatively new to technology, and not trained in any formal way to decipher the real from unreal, truth from half-truths and lies, people actually end up believing disinformation as truth (Loftus, 1992), especially when there is enough repetition (Fazio, Brashier, Payne, & Marsh, 2015). This further perpetuates a controlled socio-technical environment across countries, organizations, social media and social networks.

While a lot of researchers and practitioners are increasingly concerned (Chen, Sin, Theng, & Lee, 2015; Törnberg, 2018), there is no clarity on how we can fight the manipulation of information. The research questions investigated in this paper are: What can be done to fight disinformation? How can the two concepts of critical thinking/action and serendipity come to the rescue?

Critical thinking is the ability to analyze a piece of information or a particular problem and use logical or scientific reasoning to come to a conclusion and make inferences about that information (Velautham, 2017). The time has come to focus not just on critical thinking but to move from critical thought to *critical situational awareness*, and *critical action* or *critical communicative action*, which imply thinking critically, being aware, and converting that critical thought into action in the way we communicate and make decisions.

Serendipity or information encountering in information behavior is the act of finding some information when one is not actively looking for it, which often leads to a surprise and an 'ahah!' moment (Erdelez, 1997; Agarwal, 2015; McCay-Peet & Toms, 2015; Yadamsuren & Erdelez, 2016; Race & Makri, 2016). Serendipity is essential for creativity and innovation (Fink, Reeves, Palma, & Farr, 2017), and thrives in an environment where people are able to think freely. We may be inclined to trust more information that was encountered through serendipity. Thus, if we could develop a test for serendipity we could potentially help people to think critically as they evaluate the quality of information and the underlying algorithms that present that information to us.

THEORETICAL LENS: SOCIO-TECHNICAL SOCIETY
We are probably the last generation that makes a clear distinction between offline and online worlds (Floridi, 2014). The world is changing towards a socio-technical society (Jahnke, 2015) that is a network of social and technical systems. We are currently living in the fourth phase of a socio-technical society (Table 1), one that is interfused with *CrossActionSpaces*, highly dynamic spaces of communication and information sharing through crossing actions of humans and bots (Jahnke, 2015). Most people cannot tell the difference whether they receive the information from a bot or a person. Crossactionspaces such as Twitter, Facebook, Mobile Microlearning and Augmented Reality/Virtual Reality platforms, show high tensions between openness and constraints; they are volatile, uncertain, complex and ambiguous.

1st phase	2nd phase	3rd phase	4th phase
a) Mainly trust-based virtual communities, very informal rules (architecture of free participation) – living lab of freedom	b) Clear rules (conventions, boundaries, etc.) that are mainly socially enforced – network of policies	c) Additional rules/ mechanism that are technically determined but for most people obscure	d) Society is *interfused* with Cross-ActionSpaces: sociotechnical actions by humans and bots (most people cannot tell the difference)
e.g., Wikipedia's stage in 2005	e.g., Wikipedia in 2010	e.g., Google page ranking, Loan Algorithms	e.g., Spreading misinformation by bots
→ Evolving towards a *Socio-Technical* Society: Society is interfused with dynamics of CrossActionSpaces →			

Table 1. Socio-technical society interfused with crossactionspaces (Jahnke, 2015)

Awareness about the dynamics of crossactionspaces, how and what information gets distributed is relevant to evaluate false from correct information. Before we collectively drift into a socio-technical society to be ruled without us knowing, we propose a critical thinking/action approach embedded into a serendipity context.

NEED FOR CRITICAL THOUGHT AND ACTION

Studies argue that the increased use of social media, along with massive increase in misinformation (Chen, Sin, Theng, & Lee, 2015), require the public to use critical thinking. Focusing more on qualitative rather than quantitative assessment (Nold, 2017), training people in the Socratic Questioning method, where people are asked questions rather than provided with easy answers (Sahamid, 2014), and providing training in research methods can help learners improve their critical thinking skills in five basic avenues of thinking, which include the ability to determine parts of a whole, interpret cause and effect, and differentiate between credible and inaccurate sources (Nold, 2017). To fight disinformation through critical thinking, training includes exposing individuals to the common characteristics of misleading information (Velautham, 2017). For example, the more students are exposed to fake statistics, the more hesitant they become when it comes to accepting them as true. For people to effectively think critically, they must integrate newly discovered information on some subject into their preconceived notions. In doing so, they challenge their previous beliefs, which allows them to improve their understanding of the subject at hand. As a result of training and education methods that improve critical analysis, our society can effectively decrease the spread of misinformation and disinformation all the while increasing individual awareness of fake news. In practicing critical thought and action, testing for serendipity as a heuristic can provide a useful scaffolding in separating the genuine from the fake.

SERENDIPITY TEST FOR GENUINE INFORMATION

Serendipity acts as a hypodermic needle that injects surprising, unexpected evidence into the echo chamber of the filter bubble. This experience is unplanned, not orchestrated by external structures and thus less likely to be flatly rejected. Instead, it inspires interest and curiosity. The challenge here is that serendipity is also prone to manipulation and may not be genuine. Fake serendipity is a product of the very same hidden algorithms that in an advanced socio-technical society create the filter bubbles we are trying to break. Differentiation between genuine and constructed serendipity may serve as a test for identifying the involvement of algorithmic forces unknown to us. This test could be conceptualized at two levels, at an individual level, and at a systems level. At the *individual level*, the test could be designed to assist people in determining if his or her personal experience of serendipity is a genuine one. The test could involve answering several questions about the nature of surprise experienced when serendipitously encountering information and the nature of information encountered. For example, the questions could be: Are there circumstances in previous user-system interactions that may have resulted in finding information that was encountered? Did the user voluntarily request information encountered at some earlier point, but forgot about it? How unusual is the source where information was encountered? Is the information source networked or a physical one? At the *systems level*, the test would evaluate the patterns in the individual's online system interactions and detect the level of connection with encountered information. For example: Are there some established algorithms that capture specific patterns in users online behavior (e.g. online shopping, music downloading, use of search engines, social media activity, etc.)? Do these algorithms communicate with each other and provide an opportunity for an intersection across various online information spheres? Do these algorithms have access to confirmed, identifiable data about individuals? Given all the questions, the test could calculate the likelihood that information encountered is a result of chance or a result of algorithmic interference.

CONCLUSION

We have discussed the controlled nature of today's socio-technical society we live in where disinformation thrives. By teaching and harnessing greater critical thinking and critical action, and using the presence (or not) of genuine serendipity as a test, society can combat the threat of technological power to rescue serendipity, accurate information, and the creativity of the people. Researchers in the information science community possess the research background in a variety of relevant fields and technical skill set to study these phenomena. We encourage them to further explore this line of thinking.

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