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Ideas Worth Spreading? Adverse Effects of Information Load in Online Communications

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Abstract

What makes public addresses such as online talks successful vs. not? Across seven field and lab studies, I find that *information overload* hurts consumer adoption. The cause? Processing disfluency. Information overload makes a message more difficult to process, which in turn reduces liking and interest. The effect disappears among audience members with greater need for cognition, a personality trait marking a penchant for deep and broad information-processing. My empirical investigation concludes by documenting the counter-intuitiveness of the findings (i.e., how consumers mispredict which talks they actually (dis)like). From these results, I derive insights for (i) the psychology of adoption, and (ii) communicators of all creeds wishing to broaden their reach and appeal (e.g., professors, politicians, journalists, scientists, bloggers, podcasters).

Keywords

Processing fluency, Online talks, Virality

Summary for lay audience

The recent emergence of online mediums, consumer blogs, and mobile apps has overwhelmed consumers with an enormous amount of information to process every day. The amount of presented information to individuals is usually more than they can process. The same issue can happen within a single message: The more topics covered in a message, the more difficult processing it will be. This difficulty in processing will make the recipients of said message like it less and be less likely to share and propagate it. In this research, I examine the problem of information overload in the context of online recorded video messages (i.e., TED talks). I find that talks covering numerous topics are liked less and viewed less.

Moreover, I show that people learn less from talks covering numerous topics. This happens because the audience of such addresses finds it more difficult and more complicated to process. However, I show that said effect does not occur among individuals who inherently enjoy thinking. Therefore, the negative impact of information overload also depends on specific individual differences. The limits on our information processing resources will cause a cognitive selection process that will determine the evolution of information similar to the process of biological selection. If a message exceeds its audience's processing limits, it is not likely to be shared and re-shared. Therefore, I hope that my findings help public speakers and researchers who wish to communicate their message, do so more effectively.

Co-authorship statement

I hereby declare that I am the primary contributor to and author of this dissertation. I have led all aspects of the current dissertation project, including theorizing, data collection and analysis of both field and laboratory data, and writing the first draft of the manuscript originating from this thesis. Said manuscript is undergoing final edits to be submitted to *Journal of Consumer Research* and is co-authored with Dr. Rod Duclos (Western University) and SeyedNasir HaghighiBardineh (Washington State University).

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(T. S. Eliot)

Introduction

In 2011, people in the United States took in five times more information every day than 1986 (Levitin 2014). The recent eruption of online mediums, consumer blogs, and mobile apps has overwhelmed consumers with an enormous amount of information to process every day. However, is this ever-increasing amount of information and choice beneficial to consumers? Research on information overload (e.g., Jacoby 1984; Malhotra 1982) and choice overload (Iyengar and Lepper 2000) suggests otherwise: More attributes, more alternatives, and more choices can lead to paralysis and negative consumer evaluations. As suggested by Broniarczyk and Griffin (2014), both of these components, choice freedom and information expansion, while being empowering can also be overwhelming.

Thomas Hills has nicely summarized this problem and its associated consequences (2019, P.323):

> *"There are well-understood psychological limits on our capacity to process information. As information proliferation— the consumption and sharing of information—increases through social media and other communications technology, these limits create an attentional bottleneck, favoring information that is more likely to be searched for, attended to, comprehended, encoded, and later reproduced."*

It is, therefore, absolutely critical for communicators to be wary of the adverse effects of information overload on their messages' appeal and virality. In this section, I review the existing literature on information (over)load across three different and yet inter-related fields: a) Marketing, b) Psychology, and c) Information Systems**.**

Information (over)load in Marketing

Information load indicates the type and number of stimuli an audience has to attend to (Jacoby 1977). Humans have a capacity to process information. As Jacoby (1977) puts it, information overload occurs when this capacity is exceeded, and as a result, human decision-making renders less accurate and less effective. Many researchers have investigated various aspects of information (over)load. However, most of them have been focused on explicit information load imposed by the number of attributes and alternatives (Jacoby, Speller, and Kohn 2016; Malhotra 1982; Payne 1976). This stream of research was later augmented by investigations on the nuances of information overload. For example, Lurie (2004) examines the role of information structure on information overload and the associated processing outcomes. Past research has documented the downstream consequences of information load as confusion (Lee and Lee 2004; Malhotra 1982), inaction and postponement (Bawden 2001; Schick, Gordon, and Haka 1990), and eventually reduced satisfaction (Jacoby 1984; Lee and Lee 2004).

Similarly, choice overload refers to instances where too many choices lead to suboptimal decisions or forfeiture of choice (Iyengar and Lepper 2000). Later on and with the advent of online reviews, the same concepts have led researchers to examine eWOM overload (Gottschalk and Mafael 2017; Park and Lee 2008). Research on consumer learning also suggests that

learning from multi-attribute information is difficult, and the obtained knowledge can be flawed (Hutchinson and Alba 1991; Tellis and Gaeth 1990).

The effectiveness of many marketing activities (e.g., sales and advertising) relies on how a message is processed and received by its target audience. Therefore, marketers must consider the potential adverse effects of information overload on their endeavours.

Information (over)load in Psychology

Humans have limited cognitive resources for attending to and processing information. For example, several psychology papers have examined the limitations of selective attention in a listening task paradigm (aka., the *cocktail party* problem; Moray 1959; Wood and Cowan 1995). There are similar limits at the processing phase, too. For example, Miller (1956) has shown that there is a *magical number seven* when it comes to working memory and processing capacities. He observed that humans could process only seven units of information, plus or minus two (Miller, 1956). Other researchers have found that the number "seven" suggested by Miller (1956) is relatively optimistic, and the limits on our processing capacities are more stringent (for a review, see Cowan 2001). Similar limits have been established with visual processing memory (Luck and Vogel 1997; Pashler 1988). Once the amount of presented information goes beyond these, the recall task would become susceptible to errors. These limits will determine the evolution of information. Hills (2019) proposes that cognitive selection in information-rich environments will shape the evolution of information in a process similar to that of biological selection. Given the information-rich world we live in today, it is more important than ever to be vary of the adverse effect of information load on a given message's reach and appeal.

Other researchers have examined the moderating role of information load on other domains, such as information dissemination in group discussions (Stasser and Titus 1987), information processing goal pursuit (Laran 2010), implicit learning of visual covariation (Chun and Jiang 1999), visual working memory (Awh, Barton, and Vogel 2007), psychological distance (Fukukura, Ferguson, and Fujita 2013), and spoken language comprehension (Engelhardt, Ferreira, and Patsenko 2010).

An interesting nuance that is one of the primary goals of this thesis has also been examined in psych literature: Is information overload all about the "number" of units of information or does the inherent complexity of the stimuli play a role? Psychological researchers examining visual change detection have presented mixed evidence. On the one hand, researchers have shown that information overload is determined by the number of units that need to be processed and is not a function of the number of attributes within each stimulus (Luck and Vogel 1997; Vogel, Woodman, and Luck 2001). Conversely, other researchers have documented significant processing capacity reductions as inherent stimulus complexity increased (Alvarez and Cavanagh 2004; Eng, Chen, and Jiang 2005). I address this nuance in the next section of this thesis.

Information (over)load in Information Systems

The issue of "dark side of information" has received its fair share of attention in Information Systems (IS) literature as well. Bawden and Robinson (2009) examine the main issues around the communication of recorded information. They discuss two main categories of issues: a) problems originating from the quantity and variety of the information available (i.e., information overload), and b) issues related to the emergence of Web 2.0 (e.g., loss of identity).

Moreover, the authors explain and discuss pathologies of information such as “information anxiety”, “infobesity”, “information avoidance”, and “satisficing”.

Similarly, Eppler (2015) contributes to discussing opportunities and threats in “information age”. Specifically, he discusses two key concepts: a) information quality and b) information overload. In his review of information overload definitions across various fields, he identifies the key components/dimensions of these definitions. Some of the aforementioned components include information utilization, the volume of information supply, information processing capacity, information processing requirements, available vs. invested time, and subjective effects of information overload.

On the empirical side, too, the concept of information (over)load has been investigated by IS researchers. The role of information load has been studied in the contexts of tabular vs. graphical data presentation (Benbasat and Dexter 1986), dynamics of online forums (Jones, Ravid, and Rafaeli 2004) as well as face-to-face electronic meetings (Grisé and Gallupe 1999), and personalized recommendation systems (Liang, Lai, and Ku 2006). In these articles, researchers have either manipulated information overload via the number of units of information to be processed (e.g., Grisé and Gallupe 1999) or measured it via simplistic proxies (e.g., word count; (Jones, Ravid, and Rafaeli 2004).

Conclusion

The dark side of information and the concept of information overload has been examined across the three different and yet inter-related fields of marketing, psychology, and information systems. Researchers in these fields have documented the negative consequences of information overload. However, most of these articles have been focused on the explicit number of units of

information on the comprehension side, and the explicit number of choices and alternatives on the decision side. In this thesis, I posit that information load has an *implicit* (or "qualitative") dimension, thus far understudied. Consider two 1-page messages (i.e., with roughly the same number of words). The first covers ideas drawn from biology and environmental science, whereas the second covers insights from biology, environmental science, economics, ethics, society, and politics. Although the information load imposed on viewers may seem identical since both messages are of a length of one page, I argue their *implicit* load varies substantially. This implicit dimension is the focus of my investigation in the current thesis.

In the next section, I report my complete investigation of implicit information overload in the context of online recorded videos (i.e., TED talks).

Ideas Worth Spreading? Adverse Effects of Information Load in Online Communications

Abstract

What makes public addresses such as online talks successful vs. not? Across 7 field and lab studies, we find that *information overload* hurts consumer adoption. The cause? Processing disfluency. Information overload makes a message more difficult to process, which in turn reduces liking and interest. The effect disappears among audience members with greater need for cognition, a personality trait marking a penchant for deep and broad information-processing. Our empirical investigation concludes by documenting the counter-intuitiveness of our findings (i.e., how consumers mispredict which talks they actually (dis)like). From these results, we derive insights for (i) the psychology of adoption, and (ii) communicators of all creeds wishing to broaden their reach and appeal (e.g., professors, politicians, journalists, scientists, bloggers, podcasters).

Keywords

Processing fluency, Online talks, Virality

Intended Contribution

What makes public addresses such as online talks successful vs. not? We answer this question through the lens of information processing. In 7 field and laboratory studies, we examine how the *information load* carried within a talk contributes to (or impedes) consumer interest and liking. Importantly, though our investigation focuses on TED talks, our findings extend to other public addresses (e.g., speeches, research presentations, op eds, corporate communications).

Historically, the literature has operationalized information load as the number of alternatives (e.g., a choice set composed of 3 vs. 8 options) and/or as the number of product attributes to be considered for each option. This form of operationalization considers primarily the *explicit* (or "quantitative") aspect of information-load. When it comes to consuming messages (e.g., TED talks), however, we argue that information load has an *implicit* (or "qualitative") dimension which has been thus far ignored. Consider two 10-minute talks. The first covers ideas drawn from biology and environmental science whereas the second covers insights from biology, environmental science, economics, ethics, society, and politics. Although the information load imposed on viewers may seem identical since both talks last 10 minutes, we argue their *implicit* load varies substantially. This implicit dimension is the locus of our investigation. Controlling for talk duration, we find a negative relationship between (i) the number of distinct topics/ideas broached in a talk and (ii) consumer adoption (i.e., liking and interest). In addition to documenting this novel effect, we (i) articulate its underlying process, (ii) identify a boundary condition, and (iii) showcase how misguided consumers are when it comes to predicting which talks they would actually prefer.

Our findings speak to the psychology of adoption and yield prescriptive insights to communicators of all creeds (e.g., professors, politicians, journalists, scientists, bloggers, podcasters, corporations). Indeed, assuming their goal is to broaden reach and appeal when they communicate, our results yield useful insights on what they should do (vs. avoid) when crafting their messages.

Wise men speak because they have something to say;
fools because they have to say something.

~Plato

Beginning with Socrates, Plato, and Aristotle, the art of communication has been discussed, researched, and taught. To this day, the topic remains of keen interest for scholars and consumers alike. Testifying to this appetite, countless self-help books, press articles, workshops, and blogs heil recipes and top-10 to-do lists promising to turn anyone into a master presenter/communicator (illustrations in appendix A). Classic tips include establishing eye contact, not reading from notes, avoiding too many words on slides, the calm gesturing of hands, using humorous and/or inspiring quotes.

Though claiming to be rooted in science, little evidence (if any) is ever presented. Rather, much of the advice offered comes from anecdotal experience and/or best-practice emulation (e.g., imitating charismatic speakers such as Franklin D. Roosevelt, Martin Luther King, Steve Jobs, or Barack Obama). Given the societal interest for the topic, the present manuscript endeavors to contribute novel insights by adopting a rigorous approach. To ground our investigation, we ask a specific question: what makes public addresses such as online talks successful vs. not? By anchoring our efforts, this question helps us examine methodically which elements of communication find traction with the public.

Our inquiry begins online where we tested our theorizing on >2000 TED talks. We then head to the lab to articulate cause and effect (i.e., process). Lo and behold, we find that broaching a variety of topics/ideas in a talk is deceptively appealing. In reality, information overload lessens consumer interest and liking, two proxies of consumer adoption. Overall, we report seven

field and laboratory studies documenting the key effect aforementioned and its underlying mechanism by way of mediation and moderation.

Conceptual Development

A public address[1] consists of delivering a speech to an audience. Historically a face-to-face endeavor (i.e., an orator facing a live audience), public speaking has evolved with the advent of technology. Today, a public address may be recorded and broadcasted at a later time. Alternatively, it may be broadcasted in real-time but without a proximal, immediate audience (e.g., over TV/radio/internet airwaves). Regardless of its delivery form, the purpose of public speaking has remained the same since its beginnings in ancient Greece. Politicians, managers, professors, scientists, podcasters; all aspire to inform, motivate, persuade, and/or entertain. But how may they reach their goals?

Consider the example of a prolific researcher invited to give a TED talk. Said researcher does not know what topics or which research projects the audience will like. For instance, a group of attendees may like her work on charitable giving, another may find interesting her projects in promoting green behaviors, and a third segment may favor her research on group dynamics.

Pondering over the unknowns, she wonders how many and which research projects she should discuss. Given the uncertainties (i.e., the unobservable heterogeneity in the audience's idiosyncratic preferences), she decides to feature a variety of projects. As wisdom goes, this would increase the likelihood that there be "a bit of something for everyone."

[1] We use the terms "public address" and "talk" interchangeably.

Like the researcher in the above example, any speaker faces indeed a series of unobservables (e.g., How many people will attend his talk? What are their granular (dis)likes? What topics interest them the most?). Given these unknowns, what topics should the speaker feature to appeal (at least somewhat) to as many audience members as possible? A reasonable strategy to hedge risk and maximize the chance of appeal would be to discuss a variety of topics/ideas. Despite its alluring promises, however, we posit that a talk covering numerous topics is in fact *less* likely to be popular. We ground this proposition in the information-processing and fluency literatures.

In the next section, we discuss how information load maps onto processing (dis)fluency. Thereafter, we review the known effects of processing (dis)fluency on (dis)liking.

Information load and Processing Disfluency

A speech consists of sentences stitched together into a coherent, meaningful whole. As progresses the speech, information[2] flows from the author to the audience which must in turn process it. The nature and amount of information to be unpacked, made sense of, and encoded by listeners is commonly referred to as "information load" (Jacoby 1977).

Prior literature shows that human capacity to process information is limited. In fact, it does not take much for saturation (i.e., for a state of information *over*load) to emerge. Illustrations of this limitation are numerous and come from various disciplines. In psychology, for instance, reviews of the working-memory literature noted (as early as in the 1950s) that cognitive processing is a scarce resource. In a seminal article, Harvard's cognitive scientist and co-founder of psycholinguistics, George Armitage Miller, observed that humans can

[2] "Information" should be thought of broadly; for instance, as thoughts, ideas, opinions, facts, findings, etc.

handle/remember only seven chunks of information, plus or minus two (e.g., lists of digits, letters, words; Miller, 1956). Beyond this threshold, processing capacity saturates and errors accumulate.

In marketing, too, have scholars documented similar phenomena. Godfather of the "overload" literature, Jacob Jacoby demonstrated in a series of papers that consumers can get overwhelmed fairly quickly with product information (Jacoby, Kohn, and Speller 1973; Jacoby, Speller, and Berning 1974; Jacoby, Speller, and Kohn 1974). Often operationalized as the number of options available and the number of product attributes to be considered, information overload causes a variety of dysfunctions (e.g., decision inaccuracy, uncertainty, dissatisfaction; Jacoby, 1984; Lee & Lee, 2004; Malhotra, 1982). These dynamics are best summarized by Jacoby (1977) himself: "Information overload refers to the fact that there are finite limits to the ability of human beings to assimilate and process information during any given unit of time. Once these limits are surpassed, the system is said to be 'overloaded' and human performance (including decision-making) becomes confused, less accurate, and less effective."

We argue that two messages of the same duration/length (i.e., with the same *explicit* information load) may still vary in the *implicit* load they carry. Consider two different 10-minute talks. The first covers ideas drawn from biology and environmental science whereas the second builds on insights from biology, environmental science, economics, ethics, society, anthropology, and politics. Although the information load is seemingly the same (i.e., both talks last 10 minutes), the implicit load imposed on viewers varies. This difference is what the present manuscript focuses on. Whereas previous research considered the explicit expression of information overload (e.g., increasing the number of product alternatives and/or the number of

product attributes to be processed), we examine instead the implicit manifestation of information load.

Drawing from the above, we predict greater information load should be experienced as *disfluent* (i.e., as hard to process). This "information load → processing disfluency" link constitutes the first tenet of our argumentation; the next link concerns the effect of processing disfluency on consumer adoption.

Processing Disfluency and Consumer Adoption

Processing (dis)fluency is commonly defined as the subjective ease (or difficulty) experienced by people as they process information (Schwarz et al. 1991). A wide variety of approaches have been used to manipulate (dis)fluency but, regardless of the approach, remarkably-convergent consequences emerge for attitudes and behavior. Take "liking" as one such consequence.

In psychology, Reber, Winkielman, and Schwarz (1998) find that stimuli against less-contrastive backgrounds (i.e., visual unease) are liked less than counterparts against highly-contrastive backgrounds. Similarly, harder-to-imagine travel destinations (i.e., visualization unease) are liked less than counterparts easy to imagine (Mandel, Petrova, and Cialdini 2006; Petrova and Cialdini 2005). In the same vein, difficult-to-choose items (i.e., decision unease) are liked less than easy-to-choose counterparts (Iyengar and Lepper 2000).

In marketing, Lee and Labroo (2004) find that fluency (induced by advertising exposure) inflates consumers attitudes toward brands; conversely, disfluency impedes the liking of brands. In the same vein, Shen, Jiang, and Adaval (2010) find that processing disfluency (associated with a given product) hurts consumers' evaluations of said product. Lastly, examining when message framing (loss vs. gain) proves more or less successful at driving recycling intentions, White,

MacDonnell and Dahl (2011) find that loss (gain) frames are more effective when consumers hold a low-level, concrete (high-level, abstract) mindset. Conversely, loss (gain) frames are *less* effective when consumers hold a high-level, abstract (low-level, concrete) mindset. The reason? Processing (dis)fluency. Processing a loss-frame message while holding an abstract mindset (or a gain-frame message while holding a concrete mindset) proves disfluent, which in turn hurts attitudes toward recycling.

Complementing the above streams of research and founding ours is the notion that an increase in the amount of information can decrease fluency (Reber, Schwarz, and Winkielman 2004). Documenting this effect in judgments of beauty, Garner (1974) found that figural goodness is rated superiorly when viewers need to extract *less* information to comprehend stimuli. Relatedly, Checkosky and Whitlock (1973) found that stimuli with less information are not only less challenging to process (as operationalized by identification speed) but also more pleasant.

In sum, the fluency literature points to one consistent finding: processing difficulty (whether its modality be visual, linguistic, spatial, perceptual, etc.) fuels people's subjective experience of disfluency. And in turn, disfluency hurts attitudes toward and liking of a target stimulus[3]. Bringing these findings to bear in our context, we propose that public addresses broaching more topics/ideas increase processing disfluency, which in turn hurts consumer adoption. Broken down as main-effect and process predictions, our hypotheses read as follows:

H1 (main effect): More information load in public addresses hurts consumer adoption.

H2 (process): The deleterious impact of information load on consumer adoption (H1) is mediated by processing disfluency.

[3] This chain of events is particularly true when the difficulty itself is salient (e.g., when processing a given stimulus feels hard relative to expectations).

The Mitigating Role of Need For Cognition

If our theorizing above is correct, then it stands to reason that certain consumers may find information load less off-putting. Specifically, if processing disfluency is indeed the force causing consumers to like talks covering numerous topics less, then we should see this effect weaken among individuals who exhibit a natural penchant for deep and broad information-processing. One personality trait encapsulates this penchant: need for cognition (NFC).

Need for cognition refers to one's propensity to engage in and enjoy thinking (Cacioppo and Petty 1982). High-NFC individuals put more effort into processing information (Cacioppo, Petty, and Morris 1983) and process information with more depth and breadth (Levin, Huneke, and Jasper 2000; White and Willness 2009). Perhaps the best metaphor to understand NFC is that of "magnets" (Cacioppo et al., 1996, p. 199): "If individuals could be thought of as magnets, information in daily life as fields of iron filings, and the acquisition, scrutiny, and retention of this information as the movement of the filings toward the magnets, then interindividual variations in need for cognition would be the strength of the magnetic fields."

Drawing from this literature, we posit the deleterious impact of information load on consumer adoption (H1) should be mitigated for consumers exhibiting a stronger need for cognition. Stated formally:

H3 (moderation): Need for cognition moderates (i.e., lessens) the deleterious impact of information load on consumer adoption.

Overview of Studies and Results

We test our theorizing in six primary studies using mixed methods and a wide variety of stimuli. Kicking off our inquiry by examining >2000 TED talks, study 1 finds that talks

broaching more topics/ideas prove less popular (i.e. receive fewer views; H1). Study 2 replicates this effect in the lab, this time manipulating information load experimentally and measuring adoption as consumers' interest in and liking of talks. Studies 3a and 3b shed light on the process underlying H1. Supporting H2, we find that processing disfluency mediates the deleterious impact of information load on consumer adoption. Study 4 explores process, too, but by way of moderation (H3). We find the adverse effect of information load on interest and liking (H1) is lessened by need for cognition (i.e., among consumers showing a penchant for deep and broad information-processing). Study 5 probes the robustness of our main-effect and mediation hypotheses (H1 and H2) by comparing addresses made face-to-face (i.e., in a video format) to counterparts made in writing (i.e., through text only). We find our process explanation holds across both mediums of delivery. A sixth study expands our realm of outcome variables. Curious to explore the effect of information load beyond consumer-adoption measures, we examined *learning* (i.e., how much consumers understand and retain from the talks they watch). In line with our theorizing, we find that information load causes not only disfluency (i.e., feelings of difficulty while processing information) but also subpar learning.

Study 7 concludes the main part of our empirical efforts by examining the counter-intuitiveness of our core effect (H1). We find that consumers lack foresight into their own preferences (i.e., a majority *thinks* they would prefer watching a talk covering numerous topics).

Regardless of the approach on the front end (i.e., whether the IV is measured or manipulated) or on the back end (i.e., whether the DV is operationalized as number of views, liking, or interest), we find converging evidence for the deleterious impact of information load on consumer adoption. The psychological process underpinning the phenomenon and its non-obvious nature are also addressed.

Study1. Ideas Worth Spreading? Testing H1 in the Real World

Study 1 tests H1 in a naturalistic environment, the TED platform. Initially a brick-and-mortar conference held annually, TED morphed into an online repository of talks covering a gamut of topics (e.g., technology, entertainment, design, science, culture, politics, sports). The format is simple; speakers are given a few minutes to present their ideas as interestingly as possible through the art of storytelling. Notable speakers include Chimamanda Adichie, Jeff Bezos, David Cameron, Bill Clinton, Richard Dawkins, Sylvia Earle, Pope Francis, Bill Gates, Al Gore, Stephen Hawking, Elon Musk, Malala Yousafzai, and numerous Nobel laureates. With thousands of videos and over 3 billion views annually[4], TED constitutes a fertile context to examine the effect of information load on consumer adoption.

Data

Our scope of inquiry consists of all talks uploaded to the TED platform until September 21, 2017 (N = 2460).

Independent Variable

For robustness, we used not one but two approaches to operationalize information load. The first consists of simply using as IV the number of "tags" (a.k.a. "categories") describing each talk. For instance, Malala Yousafzai's talk titled "Activism, changemakers, and hope for the future" is described by the following tags: gender equality, activism, education, social change, coronavirus. The second consists of the number of distinct topics discernible in each talk; this measure was computed through topic modeling. Regardless of the approach, we find converging results.

Dependent Variable

[4] https://www.ted.com/about/programs-initiatives/ted-talks

Consumer adoption was operationalized straightforwardly: by the number of views received by each talk. For context, the mean across talks is 1.74M.

Results of Approach #1 (number of tags as IV)

Using the number of tags as a proxy for information load, we find that talks described by more tags are viewed less (B = -30,793.71, SE = 11,831.1, p = .009). The effect holds if controlled for talk duration (appendix B).

We pause here to underscore the counter-intuitiveness of these findings. Indeed, as the number of descriptive tags attached to a talk increases, so should the frequency at which said talk appears in search results. Stated differently, the more descriptive-tags are ascribed to talk, the more often it will match someone's locus of interest. Hence, the negative effect (of information load) identified here is large enough to outweigh the otherwise positive-effect one would expect from keyword-search matches.

Ancillary analysis. Out of curiosity, we investigated the moderating impact of "analytical language" on the aforementioned main-effect. Analytical language corresponds to words indicative of formal, logical, connective, and/or hierarchical thinking (Pennebaker et al. 2014).

To examine this boundary condition, talk transcripts[5] were submitted to LIWC, one of the most recognized text-mining softwares to date (Humphreys and Wang 2018; Pennebaker et al. 2015; Tausczik and Pennebaker 2010). For each talk, LIWC computed an analytical-language score which we used, in turn, in regression analyses.

For intuition purposes, a higher "analytical language" score would reflect greater usage of articles and prepositions relative to negations, adverbs, or pronouns (Chung and Pennebaker 2007). Articles describe nouns; prepositions establish relationships between concepts. While

[5] Transcriptions are done by TED itself and posted on the platform.

these do not influence content per se, we posit they promote processing fluency. Accordingly, we conjectured analytical language may attenuate the negative main-effect of information load on consumer adoption.

In line with our expectation, we find that the negative main-effect of tags on views (B = -108,727.20, SE = 41,037.31, p = .008) is moderated (i.e., lessened) as analytical language itself increases (positive interaction-term: B = 1,460.03, SE = 701.90, p = .04; details in appendix C). Specifically, once the analytical-language score passes the threshold of 58.65 (i.e., 42% of talks), tags no longer exert a negative effect on views. A floodlight analysis depicts this interaction in figure 1. Once again, the pattern of results and significance level hold when controlling for talk duration.

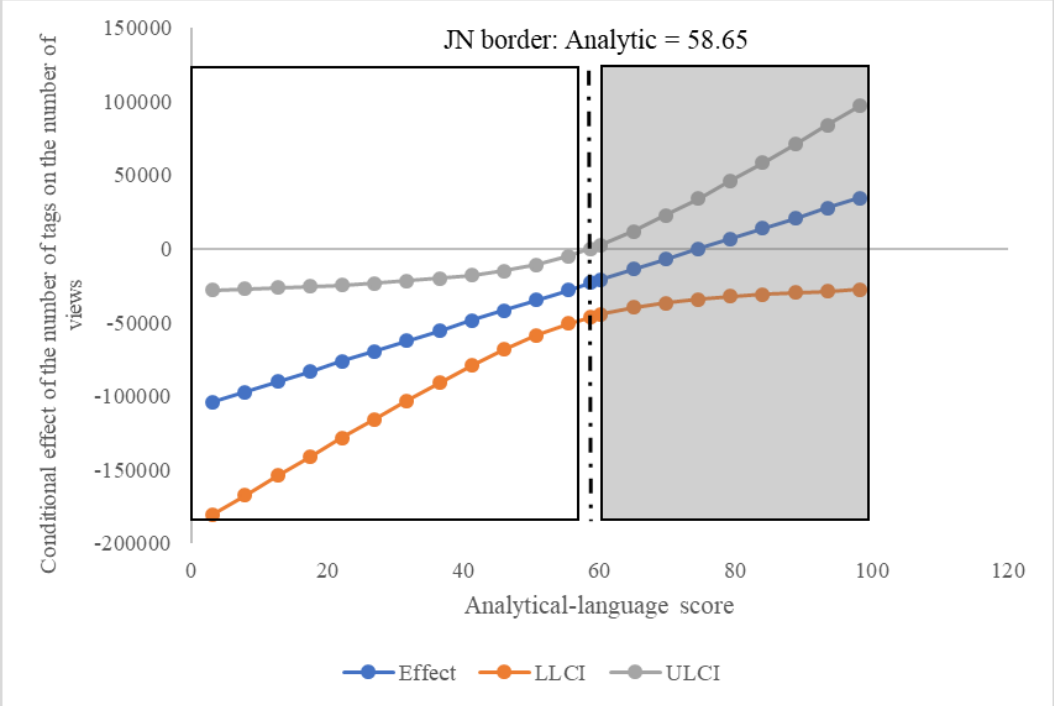

Figure 1. Conditional effect of the number of tags on consumer adoption (i.e., views) at varying levels of analytical language (study 1)

Results of Approach #2 (topic modeling)

Though operationalizing information load via the sheer number of tags describing each talk provided supportive evidence for H1, we endeavored to retest our hypothesis through the lens of topic modeling. To this effect, we applied latent Dirichlet allocation (LDA; Blei, 2012) to the transcripts of all TED talks in our dataset.

LDA mines text to measure the co-occurrences of words both within and across transcripts. Doing so, the algorithm identifies (i) the topics discussed in each talk and their respective prevalence, and (ii) the words composing each topic (see table 1 for examples; Berger & Packard, 2018; for a full review, see Berger et al., 2020).

Table 1. Sample topics emerged from text analysis and their constituting words

Topic	**Examples of words constituting each topic**
Health	health, care, medical, patient, treatment
Family	children, child, parent, baby, born
IT	data, internet, information, online, web
War	war, military, Afghanistan, Iraq, peace
Energy	energy, water, oil, carbon, power
Animals and environment	fish, ocean, sea, animals, species

To identify the number of topics discussed within each talk, we employed an iterative approach. We began modeling topics assuming a conservatively-low number (i.e., 10 topics) and progressively increased to 100 topics (this was done in steps of 3). Using harmonic means of log-likelihood values from each topic number (Chen, Chen, and Xing 2015; Griffiths and Steyvers 2004), we identified the optimal number of topics to be 34. Next, we modeled topics across all transcripts extracting 34 topics. This analysis provided the proportion (a.k.a. “share”) of each of the 34 topics in each of the talks. Of note, if a talk were uniformly distributed across all 34

topics, each topic would have a share of 2.9412%. We thus used 3% as a natural cut-off point to determine the number of topics covered in each talk. Results are robust if 2.9% or 2.9412% (i.e., 100/34) is used as the cut-off point instead of 3%.

Echoing the results of our previous approach, an ordinary-least-squares (OLS) regression revealed a negative main-effect of the number of topics on the number of views received by each talk (B = -124,445.81, SE = 33,347,49, $p < .001$). The effect holds if controlling for the duration of talks (appendix B).

For completeness, we considered an additional measure: the standard deviation across topic proportions. Our rationale is as follows. Less standard deviation in topic proportions should reflect that a talk covers more topics. Conversely, more standard deviation across topic proportions should reflect that specific topics are emphasized at the expense of other (i.e., that a talk covers a lower number of topics).

Putting this idea to the test, we find that more standard deviation in topic proportions within a talk (i.e., lower number of topics) is associated with more views (B = 14,387,253.270, SE = 4,027,509.409, $p < .001$). The results hold if controlled for talk duration (appendix B).

Ancillary analysis. Out of curiosity, we again examined the moderating impact of analytical language on H1. Results mirror those of approach #1. Talks broaching more topics receive fewer views (B = -261,406.42, SE = 107,640.22, $p = .01$). However, this negative main-effect of information load on consumer adoption is reduced as talks contain more analytical language (positive interaction-term: B = 3,459.79, SE = 1795.40, $p = .05$; details in appendix C). Specifically, once the analytical-language score passes the threshold of 56.28 (i.e., 47% of talks), the multiplicity of topics no longer exerts a negative effect on views (see floodlight illustration in

figure 2). Once again, the pattern of results and significance level hold when controlling for talk duration.

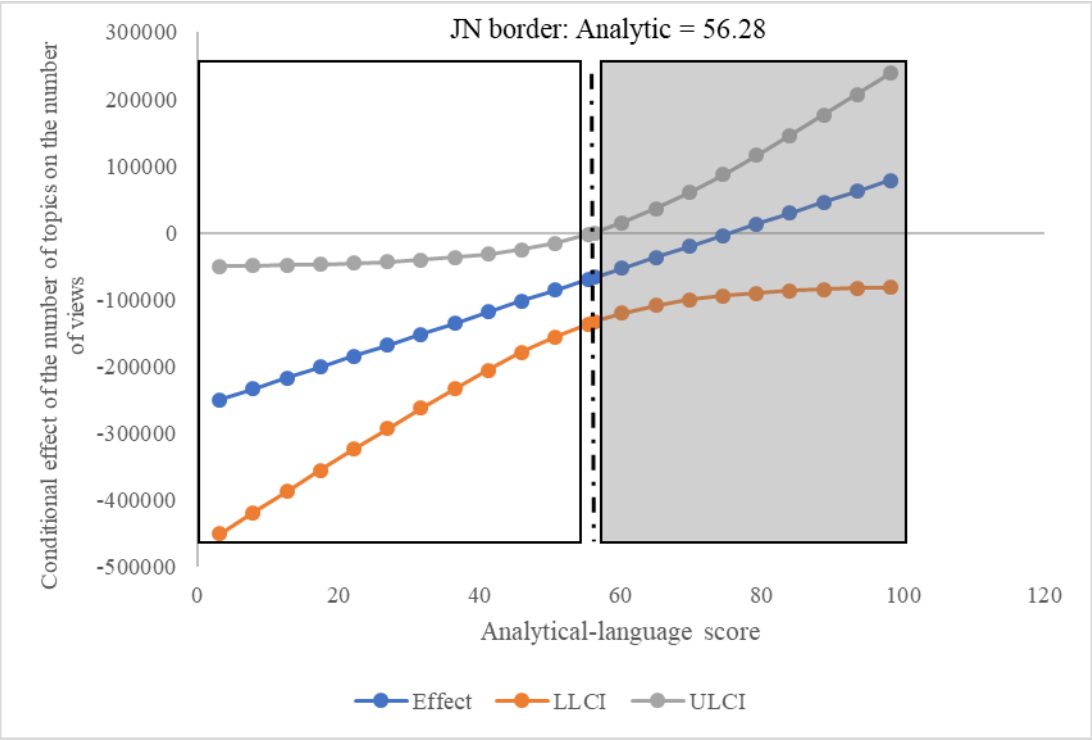

Figure 2. Conditional effect of the number of topics on consumer adoption (i.e., views) at varying levels of analytical language (study 1)

Additional Considerations

Duration

One may argue that talks covering more topics would naturally be longer and it may be the duration that is driving the negative effect. While this is a reasonable argument, we always obtain the same pattern of results controlling for duration of the talks. Stated differently, the negative effect of number of topics on views holds even after covarying out the effect of duration on views. The results of all analyses controlling for duration can be found in appendix B.

Primary topic

Another consideration may be the primary topic of a talk (i.e., its general genre/theme). If some topics are inherently more complex, the talks discussing said topics may indeed be liked less automatically. To account for this possibility, we reran our "number of topics → number views" analysis while controlling for primary topics as a fixed effect. Our results go unchanged; the more topics broached in a talk, the fewer the views. The same pattern holds if we control for both duration and primary topics (see appendix D).

Is the number of views a good proxy for liking?

We contend it is; our reasoning lies in the psychology of contagion. Indeed, though a user may view a talk but not like it, we argue that most views garnered are the result of shares and referrals on social platforms made by satisfied viewers. If viewers did not like a talk, they would unlikely share it on their social media or refer it to friends. All else equal, then, we argue that talks exhibiting more views are those that were generally liked by viewers.

Is the number of topics the same thing as the number of tags?

Further analyses revealed that the negative effect that the number of topics has on views is *separate* from the adverse effect exerted by the number of tags[6]. Indeed, while both main effects remain negative and significant in presence of each other ($B_{Num\text{-}Topic}$=-222,992.24, SE= 68,726.29, p=.001; $B_{Num\text{-}Tag}$=-114,693.30, SE= 52,073.90, p=.03), the effect of the number of tags moderates the negative effect by the number of latent topics, albeit marginally (B=13,858.49, SE=8,259.79, p=.09). Specifically, when a large number of tags describe talks, the adverse effect exerted by the number of topics discussed in a talk becomes non-significant (see floodlight illustration of this interaction in figure 3). Stated

[6] Despite the large number of observations, the correlation between the number of tags describing each talk and the number of topics developed within each talk is insignificant (r=.03, p=.17).

differently, the deleterious effect caused by the number of tags overtakes the negative effect caused by the number of topics, giving the latter no room to operate.

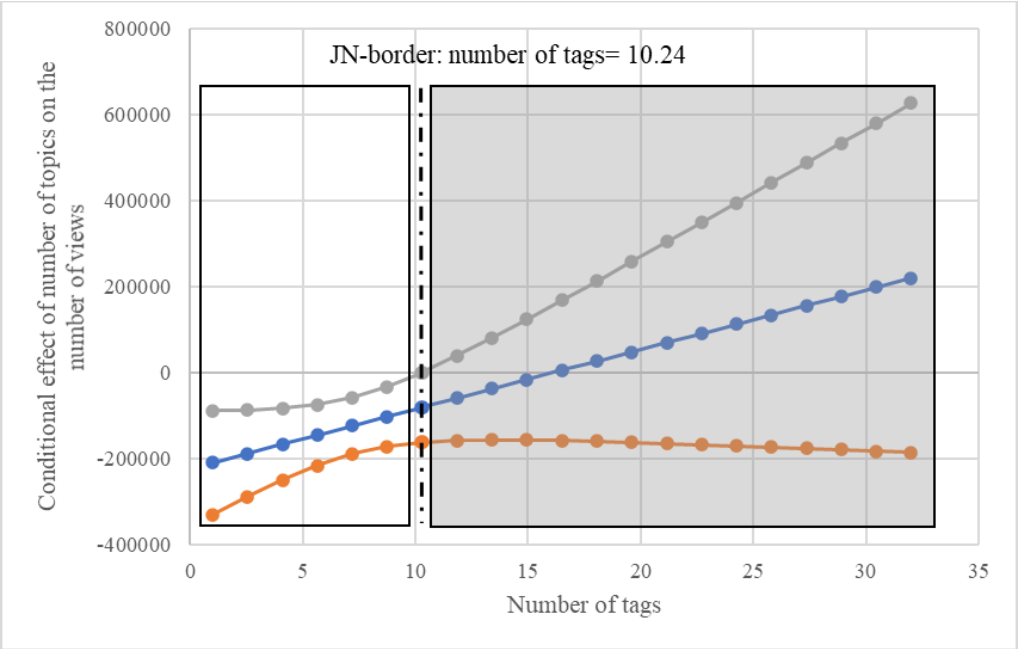

Figure 3. Conditional effect of the number of topics on the number of views at varying levels of the number of machine-generated tags provided by the platform

The fact that the number of tags and the number of topics operate similarly and yet, independently, indicates that there two different processes giving rise to the negative influence on viewers' evaluations:

(i) Over-tagging: Unnecessary and irrelevant tags cause negative evaluations. As the number of tags attached to a talk increases, so does the likelihood of those tags being loosely relevant. Moreau et al. (2001) show that consumers base their judgments and evaluations of a product on the category under which the product is perceived. The tags, acting as the reference categories, influence the keyword search results displayed to a viewer. In turn, if the talk displayed to the viewer is only tangentially related to the desired keyword, the evaluations of the talk will be worse.

(ii) Information overload: As alluded to earlier, the more information presented within a single delivery, the more difficult the talk will be to comprehend, which in turn leads to worse evaluations of the talk. Rather than being a search algorithm issue, information overload is directly caused by the content of the talk.

In the remainder of this thesis, we continue to investigate the latter cause mentioned above for two reasons. First, over-tagging is a search-algorithm issue and does not lend itself to the lab experiments and individual-difference explorations. Second, the tags are generated by an algorithm on the TED platform. Although we are not aware of the specifics of that algorithm, it makes sense to believe it is based on the content of the talk. Therefore, the content seems to be the root cause of both problems. Hence, we have decided to focus our scrutiny on the content and number of topics covered in the talks.

Discussion

The purpose of study 1 was to test H1 in a real-world, naturalistic setting. For robustness, we approached the task from two different angles (i.e., by operationalizing information load as either (i) the number of tags describing a talk, or (ii) the number of topics actually discussed in a talk). Regardless of the approach, we find that information load hurts consumer adoption. Moreover, our results hold controlling for duration and primary topic of each talk (appendix B).

Study 2. Replicating the Effect in the Lab

Building on its predecessor, study 2 tests H1 in a controlled, lab environment (i.e., with the benefits of random assignment). To this effect, we invited volunteers to partake in a "TED talk" study.

Participants and Design

Two hundred volunteers (M_{age} = 28.53; 47.5% female) were recruited on Prolific Academic and allotted to one of two conditions following a between-subjects design (information load: low vs. high).

Procedure

As alluded earlier, TED posts on its platform the transcripts of its talks. In study 1, we mined (i.e., topic-modeled) these transcripts to identify how many distinct topics were discussed in each talk. Bringing this product intel to study 2, we were able to manipulate information load naturally and unobtrusively. How? We drew talks from our repository that discussed either 4 or 8 topics (i.e., low vs. high information load) and observed participants' response to them.

Two talks would have sufficed to test H1 (i.e., one discussing 4 topics and another discussing 8 topics). For robustness, however, we tested H1 through *eight* talks. In the low information-load (high information-load) condition, participants viewed one of four possible talks that each discusses 4 (8) topics.

By rotating talks within-condition while keeping constant the number of topics discussed at either 4 or 8, we ensured our results would not be driven by the specificities of one particular talk. Stated differently, by broadening the operationalization of our IV, we endeavored to buttress the confidence one can place in our findings. Moreover, to avoid alternative explanations related to length (e.g., talks covering 4 (8) topics are liked more (less) simply because they are shorter (longer)), we made sure all eight talks were of similar duration (i.e., $M_{4\ topics}$ = 318 seconds; $M_{8\ topics}$ = 337 seconds).

Dependent Variable

Whereas study 1 captured consumer adoption via the number of views received by each talk, study 2 does so through interest and liking (i.e., How interesting did you find the talk? How much did you like the talk?). To avoid order effects, items were presented in a random sequence ($r = .88$). Answers were collected from 1 (not at all) to 7 (very much).

Results and Discussion

An analysis of variance revealed a negative main-effect. As information load increased, consumer response worsened ($M_{4\ topics} = 5.73$, $SD = 1.44$ vs. $M_{8\ topics} = 4.97$; $SD = 1.69$; $F(1, 198) = 11.93$; $p = .001$).

The purpose of study 2 was to retest in the lab an effect unearthed in the field. To this end, we randomly assigned participants to view a talk covering either 4 or 8 topics before probing their interest and liking, two proxies of consumer adoption. Echoing the field results of study 1 and supporting H1, we find that talks with greater information load generate less interest.

Study 3a. Mechanism Through Mediation - Between-subjects design

To explain the phenomenon documented in studies 1-2, we proposed in H2 that processing disfluency underlies the effect of information load on consumer adoption. Study 3a tests our reasoning by way of mediation.

Participants and Design

Two hundred and forty-nine volunteers ($M_{age} = 30.01$, 45% female) were recruited on Prolific Academic and assigned to one of two conditions following a between-subjects design (information load: low vs. high).

Procedure

The procedure resembles study 2's. Upon signing a consent form, participants viewed a talk discussing either 4 or 8 topics. The main difference comes with the addition of three measures intended to test H2. Immediately after assessing interest and liking (i.e., our proxies for consumer adoption), we gauged processing disfluency with measures typical of this literature (Alter and Oppenheimer 2009; Lee and Aaker 2004; Schwarz 2004). Specifically, we asked: How complex was this talk? How difficult to understand was this talk? How complicated was this talk? These items have been extensively used in previous literature to measure processing (dis)fluency (for a review see Graf, Mayer, and Landwehr 2018). Once again, to avoid order effects, items were presented in a random sequence (Cronbach's alpha = .86). Answers were collected from 1 (not at all) to 7 (very much)[7].

Results

Mirroring the results of studies 1-2, an analysis of variance revealed a negative main-effect. As information load increased, consumer response worsened ($M_{4\ topics}$ = 5.84; SD = 1.38 vs. $M_{8\ topics}$ = 4.95; SD = 1.48; F(1, 247) = 24.11; $p < .001$). This validates H1.

To test H2, we then examined processing disfluency as a function of information load. As expected, talks with greater information load proved harder to process ($M_{4\ topics}$ = 1.91; SD = 0.94 vs. $M_{8\ topics}$ = 3.11; SD = 1.46; F(1, 247) = 58.99; $p < .001$). We thus proceeded to testing the "information load → processing disfluency → consumer adoption" chain of events with PROCESS model 4 (Hayes, 2017; $B_{Indirect\ effect}$ = -.13; SE = .05; 95% CI = [-.23, -.03]). We find that increases in information load spike processing disfluency, which in turn erodes interest and liking (see illustration in figure 4).

[7] Once again, though two videos would have sufficed to test H1 (i.e., one discussing 4 topics vs. another one discussing 8 topics), we opted to test our prediction through eight videos for the sake of robustness (i.e., four covered 4 topics; another set of four covered 8 topics).

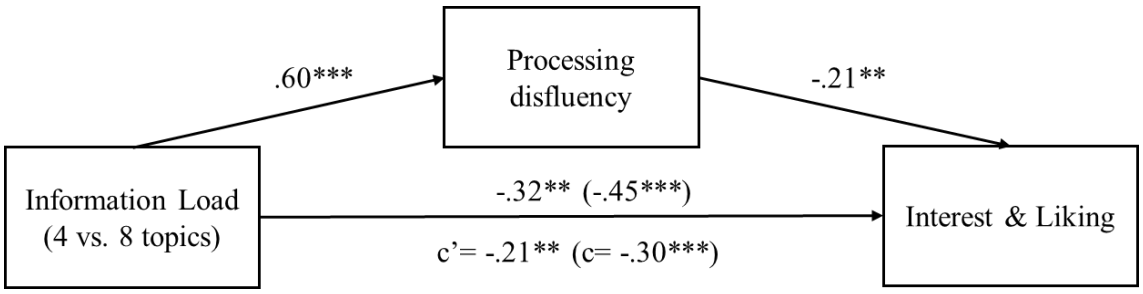

Figure 4. Mediation results (study 3a)

Discussion

The purpose of study 3a was twofold. First, we sought evidence corroborating the findings unearthed in studies 1-2. Supporting H1, we found again that information load hurts consumer adoption. Second, seeking to test H2, we found that processing disfluency underpins our effect. As the number of topics discussed in a talk increases, it becomes harder for audience members to understand it, which in turn reduces interest and liking.

Study 3b. Mechanism Through Mediation - Within-subjects design

This study builds on the previous study in three ways: a) we use a within-subjects design whereby each participant watched two videos, one covering 9 and one with 3 topics, b) we use a different set of 8 videos than the ones shown in previous studies, and c) unlike the other studies in this paper, we recruit a sample of "student" participants in this study.

Participants

We recruited 378 undergraduate students (M_{age} = 19.36, 46.3% female) at a large university in North-America to take part in our study in exchange for course credit.

Procedure

Eight videos were selected from our dataset. Half of these videos comprised of 9 topics (high information load) whereas the other half did only 3 (low information load). We had a within-subjects design whereby each participant watched 2 online talks randomly chosen from each high and low information load sets. The order of display was counter-balanced. The dependent and mediator measures were the same as previous study.

Results

We used repeated measures ANOVA to test our main effect and the MEMORE macro (Montoya 2019) to test our indirect effect. MEMORE takes a path-analytic appraoch to calculate mediation effects with percentile or bias-corrected bootstrap confidence intervals. Mirroring the results from study 3a, we find that talks covering a high number of topics (M_{liking} = 4.28, SD= 1.60) were liked less than the talks comprising of a low number of topics (M_{liking} = 4.87, SD= 1.62; F(1,377)= 27.79, p< .001). Moreover, the talks covering a high number of topics were more difficult to process ($M_{9\ topics}$ = 3.45, SD= 1.50) than their counterparts with a lower number of topics ($M_{3\ topics}$ = 2.59, SD= 1.42; F(1,377)= 74.69, p< .001).

Next, we proceeded to testing the proposed mechanism account. MEMORE macro results indicate that processing disfluency mediates the effect of number of topics on liking ($B_{indirect}$ = -.23, SE= .06, 95% CI= [-.34, -.12]. Similar to the results of study 3a, we find that as information load increases, so does processing disfluency, which in turn leads to lower liking (see illustration in figure 5).

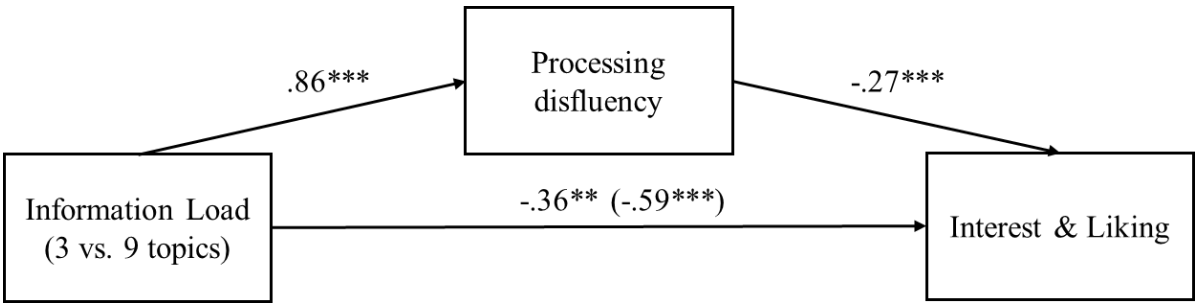

Figure 5. Mediation results (study 3b)

Discussion

Study 3b extends its predecessor in two ways. First, we replicate the main effect and mediation results using a different set of 8 videos which adds robustness to our findings. Second, we do so by using a within-subjects design whereby the effects are obtained within each participant. Offering converging evidence, studies 3a and 3b shed light on the mediating role of processing disfluency in explaining the negative effect of information overload.

Study 4. Mechanism Through Moderation: Need for Cognition to the Rescue

Study 4 was designed with two goals in mind. First, we sought to buttress H1 by employing yet a new set of videos. This was meant to further generalize our findings.

Second, we sought to explore process by way of moderation. Studies 3a and 3b showcased indeed the role played by processing fluency (or lack thereof) in driving the effect of information load on consumer adoption. From a marketing/strategic standpoint, this process evidence offers opportunities. For instance, for which consumers is information load less (vs. more) likely to impede adoption? As discussed at the onset, we posit that a personality trait speaks directly to the psychological mechanism uncovered in studies 3a and 3b: need for cognition (Cacioppo and Petty 1982). Lower (higher) NFC marks an aversion toward (a penchant for) debate, idea evaluation, problem solving, and deep as well as broad information processing. Accordingly, we predicted in H3 that the negative main-effect hypothesized in H1 should be moderated (i.e. lessened) among audience members with greater need for cognition.

Participants and Design

Two hundred volunteers (M_{age} = 29.08, 49% female) were recruited on Prolific Academic and assigned to one of two conditions following a between-subjects design (information load: low vs. high). Need for cognition, the second factor of interest in this study, was measured by an individual-difference scale.

Procedure

The procedure resembles study 2's. Upon signing a consent form, participants viewed a talk discussing either few or many topics before reporting their interest and liking for it. The main differences between studies 2 and 4 come in two forms.

First, to instill further confidence in our findings, we used a different set of eight videos. Participants in the low (high) information-load condition viewed one of four possible talks that each discussed 3 (9) topics[8]. Here again, using eight talks rather than two ensured that our results would not be driven by the idiosyncrasies of any particular talk.

Second, to test H3, we administered at the end of the session Cacioppo, Petty, and Kao's (1984) need-for-cognition scale. Made of 18 items, this scale is arguably the most recognized in the literature. Sample items include: I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought; I usually end up deliberating about issues even when they do not affect me personally; I really enjoy a task that involves coming up with new solutions to problems; Thinking is not my idea of fun (reversed-coded); I would rather do something that requires little thought than something that is sure to challenge my thinking abilities (reversed-coded); I try to anticipate and avoid situations where there is likely a chance I will have to think in depth about something (reversed-coded). Answers were collected from 1 (very uncharacteristic of me) to 5 (very characteristic of me).

[8] These topics had been identified by mining talks' transcripts (i.e., through topic-modeling; see details in study 1).

Results

Echoing the results of studies 1-3, information load had a negative main-effect. As information load increased, consumer response worsened ($M_{3\ topics}$ = 5.30, SD = 1.76 vs. $M_{9\ topics}$ = 4.64, SD = 1.52; F(1,198)= 8.07; p = .005). This validates H1.

More importantly, we found a positive information load×NFC interaction (B = .44, SE = .19, *p* = .022). Beyond a certain threshold in need for cognition (i.e., beyond 3.8 on a 5-point scale), information load no longer obstructs consumer adoption (see floodlight illustration in figure 6). For perspective, 35% of sample participants scored 3.8 or more in need for cognition. This validates H3. For completeness, we note that NFC showed a positive effect on interest and liking (B = .45, SE = .19, *p* = .019). Watching TED talks is an intellectual activity and it is reasonable that on average, high-NFC individuals like these talks more than low-NFC individuals.

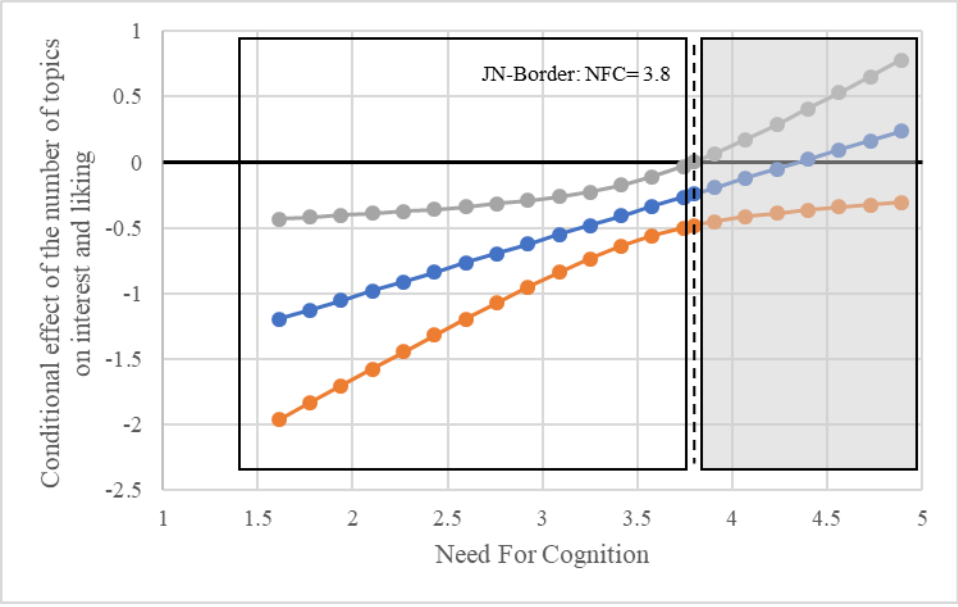

Figure 6. Conditional effect of the number of topics on consumer adoption (i.e., interest & liking) at varying levels of NFC (study 4)

Discussion

Study 4 makes two contributions. First, it validates H1 under yet another set of experimental conditions (i.e., with eight new talks). This adds to the robustness of our findings.

Second, the results reported herein support H2 and validate H3 by documenting a boundary condition to H1. As predicted, the deleterious impact of information load on consumer adoption is mitigated by need for cognition. Circling back to the magnet metaphor invoked at the onset, there is a class of people for whom information load is no deterrent. This group is minority but substantial nonetheless (i.e., about 35% of our sample). Its members enjoy intellectual workouts (e.g., processing information with depth and breadth to comprehend the world and/or solve problems). When addressing this group, communicators do not need to curtail the number of topics covered in their speech for fear of losing their audience. In the general discussion, we discuss the implications of these findings for public speakers in terms of segmentation, targeting, and product adaptation.

Study 5. From Video to Text: Does the Effect Replicate?

As announced at the onset, online talks constitute our locus of interest. Accordingly, our empirical investigation focused on videos, a medium mixing visual, motion, and auditory signals. In the present study, we consider the generalizability of our findings to a mode of delivery where visual and auditory cues are absent: text.

Mindful indeed that public addresses can take various forms (e.g., in-person delivery vs. in-text delivery), we test H1 (i.e., the effect of information load on consumer adoption) and H2 (i.e., mediation by processing disfluency) at each level of delivery. Uncovering similar results across mode of delivery would highlight the robustness of our findings. More importantly,

symmetric findings would rule out confounds related to speaker idiosyncrasies (e.g., body language, showmanship, tone of voice, attractiveness).

Participants, Design, and Procedure

Four hundred and two volunteers (M_{age} = 28.46, 51% female) were recruited on Prolific Academic and assigned to one of four conditions following a 2(information load: low vs. high)*2(message delivery-mode: video vs. text) between-subjects design.

The procedure mirrored study 3a's in all aspects except one. Per study 5's goals and design, the mode-of-delivery manipulation had participants either (i) watch a TED talk, or (ii) read its transcript. By keeping *identical* the topics/content broached across modes of delivery, this approach enables us to test cleanly H1 and H2 for each mode of delivery (i.e., without introducing confounds). Everything else follows study 3a (i.e., same eight talks, same three mediation-items[9], and same two adoption-DVs[10]).

Results

Echoing our earlier findings, information load had a negative main-effect on consumer adoption ($M_{4\ topics}$ = 5.28, SD = 1.67 vs. $M_{8\ topics}$ = 4.61, SD = 1.74; F(1, 400) = 15.11, $p < .001$). This validates H1.

But the most important result of study 5 is as follows. As alluded, study 5 tests a moderated-mediation model wherein information load acts as IV, mode of delivery as moderator, processing disfluency as mediator, and consumer adoption (i.e., interest and liking) as DV. Testing this framework, PROCESS model 8 (Hayes 2017) revealed a significant index of moderated mediation on a 95% confidence interval (B_{IMM} = -.064; SE = .037; 95% CI = [-.147, -.006]).

[9] Cronbach's alpha = .87.
[10] r = .83.

The indirect effect (information load → processing disfluency → consumer adoption) was significant in *both* modes of delivery. Replicating the results of study 3a, then, increases in information load spiked processing disfluency, which in turn eroded interest and liking. However, this chain of events was significantly more pronounced when addresses were delivered in text than through videos (B_{Text} = -.13, SE = .05, 95% CI = [-.24, -.03] vs. B_{Video} = -.07, SE = .03, 95% CI = [-.14, -.01]; table 2).

Table 2. Direct and indirect effects of information load on consumer adoption for video- and text-delivery (study 5)

	Indirect effect through disfluency			Direct effect	
	Delivered in video	Delivered in text		Delivered in video	Delivered in text
	B (CI)	B (CI)	IMM (CI)	B (CI)	B (CI)
Consumer adoption (interest & liking)	**-0.07 (-.14, -.01)**	**-0.13 (-.24, -.03)**	**-0.064 (-.147, -.006)**	**-0.33 (-.57, -.10)**	-0.13 (-.38, .12)

Notes: (1) Hayes Model 8 (Bootstrap samples = 5,000, CI 95%). (2) Moderation is supported only if the IMM (index of moderated mediation) excludes 0 (Hayes, 2018). (3) Bold coefficients are significant on a 95% confidence interval.

Discussion

Though the focus of our inquiry lays squarely in what makes online talks popular vs. not, study 5 took a side-step to enlarge our realm of investigation. Mindful indeed that some real-world addresses occur through text (e.g., blogs, corporate websites, political newsletters, op eds, scientific manuscripts), we endeavored to examine whether our propositions hold beyond videos. Once again, we find that higher information load proves harder to understand (i.e., is less fluent), which in turn causes consumers to lose interest and liking, two proxies of adoption. These findings support H1 and H2.

Interestingly, we also find that what is true for in-person communications (e.g., video addresses) is even more true when communicating by text (i.e., the indirect-effect size is twice as large). These findings are consistent with those of Townsend and Kahn (2014) showing text stimuli (vs. visual stimuli) can lead to more complexity and overload in the context of choice.

These results speak to the generalizability of our core effect and of its underlying mechanism. They also sound a tune of caution for public speakers who communicate rich messages to large audiences (e.g., professors, politicians, news commentators and editorialists, scientists). As they alternate between modes of delivery, their messaging should change (i.e., they should not aim the deliver the same level of information load across platforms). We revisit these notions in the general discussion.

Study 6. Impact of Information Load on Consumer Learning

Study 7 was born out of curiosity. After examining in studies 1-6 the impact of information load on *consumer adoption*, we explore here an altogether separate outcome: *consumer learning* (i.e., how much consumers understand and retain from the talks they watch).

Incidentally, consumer learning touches (tangentially) on process. Indeed, whereas studies 3 and 5 tested the mediating role of disfluency with self-reported, subjective perceptions of processing difficulty, study 7 introduces *objective* measures of comprehension and learning (i.e., multiple-choice questions with right and wrong answers). Such measures relate to processing (dis)fluency in that they gauge the efficacy/accuracy with which information was processed in the first place. Stated differently, by virtue of examining through right-and-wrong questions participants' understanding of the talks they watched, study 7 offers *objective*

measures of processing difficulty that are complementary to the *subjective* ones used in traditional fluency-research.

Participants and Design

Three hundred and ninety-seven volunteers (M_{age} = 27.21; 48.6% female) were recruited on Prolific Academic and assigned to one of two conditions following a between-subjects design (information load: low vs. high).

Procedure

Participants in the low information-load (high information-load) condition viewed a video that discusses 4 (8) topics. As in previous studies, though two videos would have sufficed to conduct study 7, we used eight videos to ensure that whatever effect would ensue is the result of information load rather than the by-product of idiosyncrasies in our stimuli. Accordingly, four videos covered 4 topics and an additional four videos covered 8 topics. All eight videos were of similar duration.

Upon watching their assigned video, participants answered six multiple-choice questions testing content-comprehension. To this end, 48 questions (i.e., six for each of the eight videos) had been devised ex ante by a research assistant blind to our research purpose (e.g., What is this video about? How is called light emitted by biological creatures? What creature blends into its surroundings?). The dependent variable simply consisted of the number of correct answers, ranging from 0 to 6.

Results and Discussion

An analysis of variance revealed a negative main-effect. As information load increased, consumer learning worsened ($M_{4\ topics}$ = 5.60, SD = .80 vs. $M_{8\ topics}$ = 5.25; SD = 1.11; $F(1, 395) = 12.98$; $p < .001$). This finding makes two contributions.

First, study 7 extends the results of studies 1-5 by suggesting that information load hurts not only consumer adoption but also consumer learning. This finding echoes work by Hutchinson & Alba (1991) and Tellis & Gaeth (1990) showing that (i) it is difficult to learn from multi-attribute information, and (ii) the knowledge obtained is often imperfect. In our context, however, product "attributes" should be thought of as "topics" discussed within a talk.

Second, study 7's results reinforce the process evidence unearthed in studies 3 and 5. Indeed, whereas S3 and S5 measured processing disfluency through classic, subjective, self-reports of processing difficulty, S7's learning DV provides an *objective* gauge of the inefficacy/inaccuracy with which information was processed in the first place. This insight intersects with research by Carver & Scheier (1990), Simon (1967), Vallacher & Nowak (1999) and Winkielman et al. (2003) suggesting that one mechanism through which processing fluency drives liking is by serving as a cue of cognitive progress (i.e., processing fluency informs one of their progress toward recognition and comprehension of a target stimulus). Study 7's learning DV aligns with this interpretation by providing objective markers of comprehension.

Study 7. What do Consumers (Think They) Like? Consumers' Misguided Predictions

Would one predict *ex ante* the main effect documented across studies 1-5? Asked differently, would one foresee that consumers favor talks characterized by *less* information load?

We submit one would not. In fact, we contend consumers are misguided when it comes to predicting which talks would actually garner their interest.

If true, our proposition would have implications for communicators (e.g., for how to plan their addresses). Indeed, since the very purpose of forums such as TED is to "spread ideas" far and wide, speakers craft their addresses with the goal of generating public interest, likes, shares,

reposts, etc. But if consumers' own intuitions/lay beliefs regarding what interests them are faulty, it follows that speakers too may be misguided when planning their addresses.

Study 6 tests these considerations quite simply. With little fuss, we go to the end-consumer and ask candidly "what TED talk would you rather watch?".

Participants and Design

Two hundred volunteers (M_{age} = 29.56, 40% female) were recruited on Prolific Academic and assigned to a single, within-subjects condition (information load: low vs. high).

Procedure

Upon signing a consent form, participants saw snippets (i.e., introductory teasers) of two TED talks. Per TED's presentation template, both snippets looked and felt similar. That is, they both showed a screenshot of the speaker in action, his name, and the talk's title (see illustrations in appendix E).

The only difference between the two snippets came with our manipulation of information load. Staying true to the TED platform, each talk was accompanied by descriptive "tags" (i.e., 3 (vs. 9) in the low (vs. high) information-load condition). This approach conforms to the website's practice, thereby upholding realism.

To capture participants' relative interest, we asked them "Which talk would you prefer to watch?". Answers were collected on a 6-point scale (1 = I strongly prefer talk A, 2 = I moderately prefer talk A, 3, I slightly prefer talk A, 4 = I slightly prefer talk B, 5 = I moderately prefer talk B, 6 = I strongly prefer talk B).

To rule out alternative explanations, we took a series of precautions. First, we selected talks on the *same topic* (i.e., urban planning). To preserve realism, it was indeed essential that all tags apply legitimately to each talk. Without it, the believability of the experience might have

been compromised. Second, to avoid primacy or recency effects, we varied the sequence in which talks appear on screen (i.e., we alternated which talk shows first vs. second). Third, we rotated across talks the allocation of our 3 (vs. 9) descriptive tags. Whatever the findings, then, they could be confidently attributed to our information-load manipulation, not to idiosyncrasies in speakers' looks, warmth, perceived competence, etc.

Results

For robustness, we tested our proposition not once but twice. First, we conducted a one-sample t-test with a test-value of 3.5 (i.e., the midpoint of our 6-point scale). For interpretability, let us preface our results by noting that a low response (i.e., up to 3) would connote preferences for the talk broaching 3 topics whereas a high response (i.e., 4 or more) would convey preferences for the talk broaching 9 topics. Participants' mean response was 4.16 (SD = 1.61), which is significantly greater than the scale's midpoint ($t(199) = 5.75$, $p < .001$).

Our second analysis dichotomized participants' response to turn our measure into a binary DV. All participants responding 1, 2, or 3 (4, 5, or 6) were categorized as opting to watch the talk broaching 3 (9) topics. Out of 200 participants, 133 (i.e., 66.5%) preferred to watch the talk with more topics (Observed $N_{3\ topics} = 67$, Observed $N_{9\ topics} = 133$, $\chi 2(1) = 21.78$, $p < .001$).

Discussion

Study 6 suggests that S1-5's findings were not obvious from the get-go. Indeed, whereas consumers genuinely prefer watching talks with *less* information load[11], two thirds of participants in the current experiment thought they would prefer the talk described as covering more topics. This finding showcases a disconnect between (i) what people actually like and (ii) what they *think* they like.

[11] Evidence comes from the fact that talks with *less* information load receive more views on TED (S1) and generate greater liking/interest (S2-5).

This gap supports our conjecture that consumer intuitions are misguided. And relatedly, if consumers themselves are misguided about which talks will actually garner their interest, speakers too may be misguided when planning/crafting their addresses (i.e., ill-informed intuitions may nudge public speakers into covering numerous topics in their address, a practice that would ultimately curb their message's spread and appeal). We revisit these notions in the general discussion for speakers of all creeds (e.g., politicians, professors, scientists, journalists, bloggers, podcasters, etc).

General Discussion

We began our inquiry with a specific question: what makes public addresses such as online talks successful vs. not? Guided by information-processing and fluency theories, we examined the impact of information load (i.e., the number of topics discussed in a talk) on consumer adoption. Across six studies, we find that talks characterized by less (more) information load are more (less) popular. Speaking to robustness, the effect manifests both in the real world (i.e., on the TED platform) and in laboratory settings. It also manifests whether consumer adoption is gauged by the number of views garnered online (study 1) or by the extent of interest and liking generated in the lab (studies 2-6). Four theoretical insights may be derived from these findings.

Theoretical Contributions

Our first contribution lies in documenting a phenomenon not only unaccounted in the literature but also counter-intuitive. As shown in study 6, a majority of consumers would opt to

watch a talk that apparently covers more topics. Yet, we found repeatedly that such talks are in fact liked less and found less interesting (studies 1-5). This gap showcases a disconnect between what people *think* they like and what they actually do like, thereby adding to the literature on preference inconsistencies and consumer welfare (Shafir, 2016; Shafir, 1998).

Our second contribution comes in the form of process evidence. Through mediation analyses, studies 3 and 5 revealed that processing disfluency drives the aforementioned main-effect (i.e., as information load rises, so does processing difficulty, which in turn hurts consumer adoption). This finding adds to the fluency literature by documenting a novel perspective through which processing difficulty manifests (Alter and Oppenheimer 2009; Winkielman et al. 2003). Rather than being engendered explicitly (e.g., by multiplying the number of options in the consideration set or the number of product attributes; Iyengar & Lepper, 2000; Jacoby, 1984; B. K. Lee & Lee, 2004; Malhotra, 1982) disfluency was here engendered *implicitly* (i.e., sheerly through the number of topics discussed in talks of otherwise similar duration).

Study 4 brings our third theoretical insight by way of moderation. Building on the above causal evidence, we examined a personality trait related to processing fluency: need for cognition (i.e., a penchant for debate, idea evaluation, problem solving, deep and broad information-processing). We find the latter mitigates the otherwise deleterious impact of information load on interest in and liking of talks. This finding aligns with and extends (in a different domain) research suggesting that higher need for cognition causes consumers to favor websites characterized by (i) verbal complexity (i.e., more in-depth information) and (ii) visual simplicity (i.e., still images rather than moving animations; Martin et al., 2005).

Our fourth and last theoretical contribution is to document a boundary condition. The harmful effect of information load (on consumer adoption) is even more pronounced when

consumers read an address than when they watch one. This too was not obvious at the onset. Indeed, unlike talks wherein rhythm is dictated by the presenter, reading text is self-paced (i.e., one can slow down in and/or re-read certain passages, which, in and of itself, would help information processing).

Several practical implications may be derived from these findings.

Practical Implications

Though TED is the market leader in talk offerings with >3 billion views each year, it is by no means the only player. Other actors include PechaKucha, Talks@Google, Big Think, Idea City, Ignite, 99U, The Moth, etc. The industry is therefore rife with competition near and far, old and new. Given this rivalry, producing talks of the highest quality has become a strategic imperative to gain (or retain) market share. By pinpointing how one specific ingredient (i.e., information load) contributes directly to the success (or failure) of online talks, our results offer a key insight to industry players. For perspective, we remind the reader that each additional topic discussed in a talk costs >124,000 views on average (see topic-modelling results in study 1). Meanwhile, the business model of these platforms rests squarely on attracting eyeballs, keeping them onsite, encouraging shares and reposts, etc.

A second implication of our findings goes to communicators/public speakers (e.g., politicians, editorialists, scientists, bloggers, podcasters, etc). Per study 6, they too may fall prey to misguided intuitions regarding what is (vs. what *appears*) interesting. If so, these faulty lay-beliefs may in turn bias their craft (i.e., they may deliberately aim to cover many topics in their addresses). Hence, assuming that their goal is to reach and appeal to large audiences, our results yield a prescriptive insight: a successful address is one that limits (if not altogether *decreases*) the number of topics it broaches.

Relatedly, a third implication concerns communicators and their medium of delivery. Not all addresses are made face to face or in video. In fact, much communication to date is still done in text (e.g., press articles, op eds, blogs, research manuscripts, political newsletters, corporate websites, etc). Study 5 shows unambiguously that the deleterious effect of information load on consumer adoption is even more pronounced when one communicates in text than face to face or in video. This insight should guide communicators as they craft their future messages.

Fourth and last, our findings sound a tune of caution for academics. Worldwide, the trend nowadays is to enrich scientific pursuits through interdisciplinary research (e.g., neuroscientists and anthropologists teaming up with economists; biologists and engineers joining forces with astrophysicists). Inevitably, however, interdisciplinary research entails the juxtaposition of multiple ideas, concepts, and methodologies. While much is to gain scholarly from such an approach, special care should be given when (i) communicating its merits to funding agencies (e.g., in grant applications), and (ii) disseminating its findings (particularly to lay, low-NFC audiences).

Future Research

We operationalized information load as the number of topics broached in a talk. A potentially-interesting follow-up may be to sift through the fine-grain nuances of information load. Specifically, rather than modelling the *number of topics* discussed in an address, future research may consider the *semantic distance* between topics. For instance, keeping constant the number of topics, a word2vec approach (Mikolov et al. 2013) may examine whether a talk discussing (i) economics, (ii) unemployment, and (iii) sociology generates more consumer adoption than one discussing (i) economics, (ii) botany, and (iii) poetry (i.e., low vs. high semantic distance). And relatedly, what role does disfluency play in this midst (e.g., compared to

counterparts lacking cohesiveness, are semantically-cohesive talks easier to process, hence liked more?)? Such findings would align with our own.

The outcome variable in our research was *consumer adoption* of online talks, which was captured by the number of views received as well as by the interest in and liking of talks. A distinct outcome that may be worth examining in the future is *consumer learning* (e.g., how does information load impact what consumers retain/take away from a talk?). Out of curiosity, we took one modest step in this direction by running a study. Much like study 2, study 6 manipulated information load by assigning participants to one of two groups (i.e., between-subjects design). In the low (high) information-load condition, participants watched one of four possible videos covering 4 topics (8 topics) before answering a series of multiple-choice questions. Beforehand, 48 questions (i.e., six questions for each of the eight videos) had been designed by a research assistant to test consumer learning[12]. Lo and behold, we find that information load impedes learning too. This result contributes to past research showing that (i) it is difficult to learn from multi-attribute information, and (ii) the knowledge obtained is often imperfect (Hutchinson and Alba 1991; Tellis and Gaeth 1990). In our context, however, product "attributes" should be thought of as "topics" discussed within a talk.

We conclude by noting that our outcome measures in studies 1-5 and 7 were robust tests of virality. Indeed, the number of views received by a talk very much aligns with consumer adoption. Similarly, interest in and liking of a talk are determinants of shares and reposts. Whether it is through these measures or through other (e.g., pupil dilation, galvanic skin response), we hope this work will spur more interest in the psychology of virality, particularly as it relates to cultural products such as talks. Indeed, communicators of all creeds (e.g., politicians,

[12] To prevent bias, the RA was blind to our research purpose.

professors, scientists, journalists, bloggers, podcasters, etc) stand to gain from a better understanding of how to address their audience.

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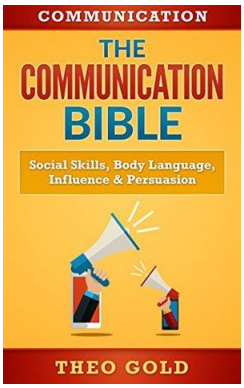
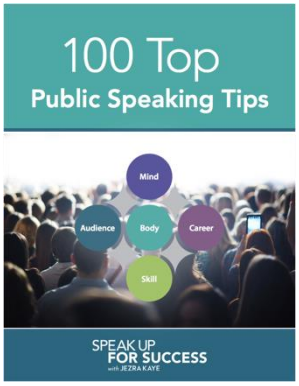
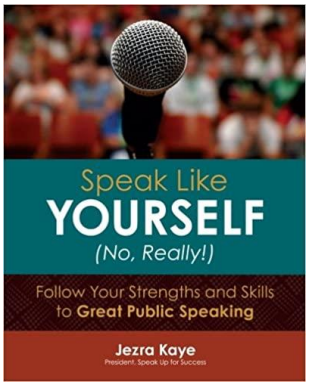
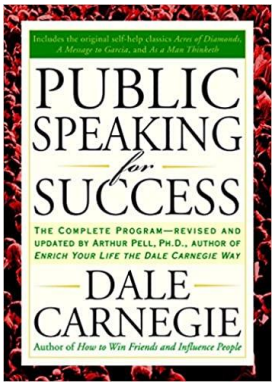
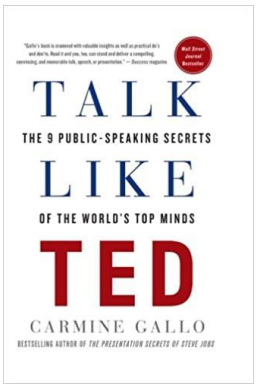
Appendix A. Appetite for communication/public speaking tips and tricks

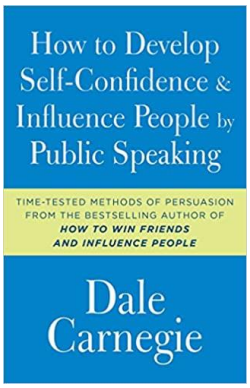


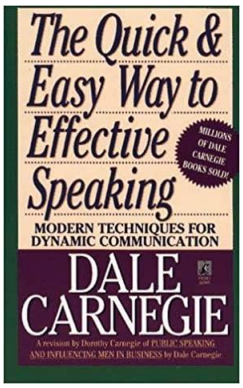












Article source	Title
Harvard Business Review	**What It Takes to Give a Great Presentation** (https://hbr.org/2020/01/what-it-takes-to-give-a-great-presentation?referral=03758&cm_vc=rr_item_page.top_right)
Harvard Business Review	**How to Give a Killer Presentation** (https://hbr.org/2013/06/how-to-give-a-killer-presentation)
Harvard Business Review	**Structure Your Presentation Like a Story** (https://hbr.org/2012/10/structure-your-presentation-li?referral=03758&cm_vc=rr_item_page.top_right)
Forbes	**Best Practices In Webinars And Online Talks** (https://www.forbes.com/sites/forbestechcouncil/2018/08/22/best-practices-in-webinars-and-online-talks/#aa116d712b84)
Inc.	**10 Tips for Giving Great Online Presentations** (https://www.inc.com/kevin-daum/10-tips-for-giving-great-online-presentations.html)
Lifehack	**10 Secrets of Making Every Presentation Fun, Engaging, and Enjoyable** (https://www.lifehack.org/articles/productivity/10-secrets-making-every-presentation-fun-engaging-and-enjoyable.html)
American Psychological Association	**10 tips for speaking like a Ted Talk pro** (https://www.apa.org/monitor/2017/02/tips-speaking)

Appendix B. Full results of analyses controlling for duration

Dependent variable: Number of views

Number of tags as the IV:

		Coefficient	SE	Beta	t	p
Model 1						
	Constant	1967801.27	102662.942		19.168	<.001
	Number of tags	-30793.705	11831.113	-0.052	-2.603	0.009
Model 2						
	Constant	1564218.001	161085.345		9.71	<.001
	Number of tags	-32504.278	11819.96	-0.055	-2.75	0.006
	Duration of the talk	508.779	156.695	0.065	3.247	0.001

Number of topics as the IV:

		Coefficient	SE	Beta	t	p
Model 1						
	Constant	2495170.379	209757.14		11.896	<.001
	Number of topics	-124445.806	33347.492	-0.075	-3.732	<.001
Model 2						
	Constant	2084483.03	254058.676		8.205	<.001
	Number of topics	-117235.555	33394.598	-0.071	-3.511	<.001
	Duration of the talk	447.951	156.837	0.058	2.856	0.004

Standard deviation of topic proportions as the IV:

		Coefficient	SE	Beta	t	p
Model 1						
	Constant	792998.268	268741.091		2.951	0.003
	SD of topic proportions	14387253.27	4027509.409	0.072	3.572	<.001
Model 2						
	Constant	665238.463	274593.801		2.423	0.015
	SD of topic proportions	11808573.37	4187780.532	0.059	2.82	0.005
	Duration of the talk	362.485	162.886	0.047	2.225	0.026

Appendix C. Full results of analyses with analytic score

Dependent variable: Number of views

Number of tags as the IV:

		Coefficient	SE	t	p	LLCI	ULCI
Model 1							
	Constant	3781169.52	338385.785	11.1741	0.000	3117618.55	4444720.48
	Number of tags	-108827.2	41037.312	-2.6519	0.0081	-189298.51	-28355.887
	Analytic score	-33396.311	5850.7607	-5.708	0.000	-44869.246	-21923.377
	Number of tags × Analytic score	1460.025	701.9006	2.0801	0.0376	83.6469	2836.4032
Model 2							
	Constant	3424738.63	362186.125	9.4557	0.000	2714516.71	4134960.55
	Number of tags	-112098.57	41000.6908	-2.7341	0.0063	-192498.08	-31699.049
	Analytic score	-33023.619	5844.6407	-5.6502	0.000	-44484.555	-21562.683
	Number of tags × Analytic score	1491.1463	701.0682	2.127	0.0335	116.4001	2865.8925
	Duration of the talk	424.6907	155.2411	2.7357	0.0063	120.2736	729.1078

Number of topics as the IV:

		Coefficient	SE	t	p	LLCI	ULCI
Model 1							
	Constant	4467820.55	639411.663	6.9874	0.000	3213978.79	5721662.3
	Number of topics	-261406.42	107640.225	-2.4285	0.0152	-472481.41	-50331.432
	Analytic score	-42217.391	11044.4207	-3.8225	0.0001	-63874.731	-20560.051
	Number of topics × Analytical score	3459.7923	1795.3967	1.927	0.0541	-60.8557	6980.4402
Model 2							
	Constant	4093704.53	656485.519	6.2358	0.000	2806381.87	5381027.19
	Number of topics	-255290.25	107557.342	-2.3735	0.0177	-466202.75	-44377.744
	Analytic score	-41683.985	11035.1038	-3.7774	0.0002	-63323.06	-20044.911
	Number of topics × Analytical score	3440.5336	1793.5551	1.9183	0.0552	-76.5038	6957.571
	Duration of the talk	383.6818	155.4405	2.4684	0.0136	78.8737	688.4899

Appendix D. Full results of analyses controlling for the primary topic fixed-effects

Dependent variable: Number of views

	Model 1	Model 2	Model 3	Model 4
Constant	2495170.379***	2084483.03***	2009762*	1606347.5*
Number of topics	-124445.806***	-117235.555***	-124686***	-118366.5***
Duration	-	447.951**	-	376.6*
Primary topic fixed effects	-	-	YES	YES

Note: ***: <.001, **: <.01, *: <.05

Appendix E. Stimuli (study 7)

Tags in the LOW information-load condition: Maps, Infrastructure, Urban-planning

Tags in the HIGH information-load condition: Future, Society, Global issues, Inequality, Global Development, Cities, Economics, Politics, Government

**Note*: The two sets of tags (above) were attached randomly to the snippets/visuals below. This rotation prevents confounding the impact of information load with the idiosyncrasies of a particular visual/snippet.


Share
Add to list
Like
Recommend
Robert Muggah | TEDGlobal>NYC
The biggest risks facing cities — and some solutions
17:02


Share
Add to list
Like
Recommend
Parag Khanna | TED2016
How megacities are changing the map of the world
20:27