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Using Semiotics to Analyze Representational Complexity in Social Media

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Abstract

Data from social media offer us multimedia data brimming with multiple layers of meanings. Social media enable rapid-fire digital communications. These communications are incredibly complex in content, form, and meaning. This representational complexity is a stumbling block in data analysis that stands in the way of deeper explanations. These unstructured data rich in social meanings are as complex as the phenomena they represent. While it is possible to formulate an entire research methodology around semiotics, it is not always necessary. We can adapt semiotic analysis within existing methodologies. This paper offers and illustrates an analytical technique to address representational complexity that can be used in conjunction with other methodologies such as case study, ethnography, etc. This analytical technique espouses a critical realist philosophy to develop much needed, deeper explanations from qualitative data.

Keywords: semiotics; critical realism; qualitative research; data analysis; representational complexity

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Using Semiotics to analyze representational complexity in social media

Abstract

Data from social media offer us multimedia data brimming with multiple layers of meanings. Social media enable rapid-fire digital communications. These communications are incredibly complex in content, form and meaning. This representational complexity is a stumbling block in data analysis that stands in the way of deeper explanations. These unstructured data, rich in social meanings, are as complex as the phenomena they represent. While it is possible to formulate an entire research methodology around semiotics, it is not always necessary. We can adapt semiotic analysis within existing methodologies. This paper offers and illustrates an analytical technique to address representational complexity that can be used in conjunction with other methodologies such as case study, ethnography, etc. This analytical technique espouses a critical realist philosophy to develop much needed, deeper explanations from qualitative data.

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1. Introduction

Mingers and Willcocks (2017) have positioned semiotics as a type of case study, offering it as a methodology on its own. Previously it was positioned as an analytical tool (Myers, 2013), widely known, yet, scarcely used. While Mingers and Willcocks rightly point out the relevance of semiotics for the IS discipline, let us not overlook its original value as an analytical protocol (not a complete methodology). Semiotic analysis has a specific and growing interest to IS researchers because of its relevance for analysis of social media data.

The Internet has become a powerful technological tool that is increasingly central in our society. It is capable of delivering both the *wonderful* (Bennett & Segerberg, 2011; Benson, 1977; Braa, Hanseth, Heywood, Mohammed, & Shaw, 2007; Castells, 2011; Deng, Joshi, & Galliers, 2016) and the *terrible* (Bhuller, Havnes, Leuven, & Mogstad, 2013; Chan & Ghose, 2014; Chan, Ghose, & Seamans, 2016; Greenwood & Agarwal, 2016; Lowry, Zhang, Wang, & Siponen, 2016). But how do we tell the difference? For example, the Internet has revolutionized our travel habits, but this helps spread disease. It has delivered worldwide, online communities for us, but this has also scaled up the planning of hate crimes. It has fomented a wealth of big data, but this is destroying our privacy. This rapid-fire digital communication can be incredibly complex in content, in form, and in meaning. The proliferation of rich, Internet-borne multimedia technologies burrows meanings under a myriad of representations.

We should expect that IS researchers would be highly expert at the discovery of meanings in the Internet communications. Our theoretical and practical contributions should at least explain the contrasting meanings delivered when hyper-connectivity spreads across all industries and every layer of society. It couldn't be more important. These complex sociotechnical systems are now essential to our political, economic and even entertainment behaviors. Individuals, organizations, and institutions use this digital world to manage their complexity and maintain their stability. At the societal level, for example, protests have leveraged social media to create a supersizing impact. As IS researchers, we are in a unique position to help society make sense of this sea of communications. But do we really have the tools we need to confront the complex, ubiquitous and versatile nature of the information and data pervading everyday life? Despite wide acknowledgement of the value of semiotics (Baskerville, 2010; Grover & Lyytinen, 2015; Mingers & Willcocks, 2017), semiotics remains neglected if not ignored.

One particular challenge for IS researchers is the harvesting of insights from social media data (McKenna, Myers, & Newman, 2017; Vaast & Urquhart, 2017; Whelan, Teigland, Vaast, & Butler, 2016). Data from social media is often assumed to be similar to other qualitative data such as interviews or documentation. Such an assumption neglects important social and technological distinctions. Instead of texts from few known sources, social media data are characterized by *representational complexity*: multimedia data (e.g. photos, texts, videos, external links) brimming with interactions and thus, multiple meanings. Because data from social media are representationally complex communications, such data should be analyzed accordingly.

One solution would be to adopt an entire semiotic methodology (such as that proposed by Mingers & Willcocks, 2017). However, this is not always ideal for every research question. Instead we offer a semiotic analytical technique (SEANT) that can be adopted to study representationally complex data within a broader framework of other methodologies such as case studies, grounded theory, netnography, etc. As such, a method component or fragment like SEANT might be viewed as a substitute for the data coding techniques frequently adapted in qualitative studies, for example, those found in Strauss and Corbin (2008). SEANT is particularly suitable in Information Systems because any IS is a semiotic system (Baskerville, 2010; Grover & Lyytinen, 2015). Our SEANT is neither a new philosophical stance nor a new research method.

Semiotics is a valuable foundation to help establish and advance the qualitative identity of the field (Weber, 2003). The rich semiotic tradition has made it mostly unstructured, which has drawn vivid criticism (Chandler, 2001). Even though Locke casts it among the three necessary sciences next to physics and ethics, its lack of systematic procedure has generated more suspicions to the conclusions drawn from semiotic studies. Mingers and Willcocks (2017) offer a structured framework using concepts from different traditions (p.30). While this effort aims at formulating a general methodology, semiotics needs to be more narrowly structured to serve as an analytical technique to interpret

representational complexity. Furthermore, narrower structuring may more easily substitute for unstructured components, making adaptation within other methods simpler and clearer. In this way, the additional structure poses a fine alternative to previous assumptions about the necessity for unstructured analysis. We see a more structured framework as necessary to provide a workable way to introduce semiotic analysis into existing research methodologies. The structured aspect of semiotics is also very valuable as a means to ensure rigor in our analytical work. Stamper's concepts have been previously explored as a more structured way to study IS phenomena (Liebenau & Backhouse, 1990); we pursue that endeavor by extending the technique to fit with existing research methodologies.

This approach integrates semiotics (to deal with representational complexity) and critical realism (to deal with layers of meaning and their consequences). While semiotics regards theories of signs and symbols (De Saussure, 1959; Peirce, 1931; Stamper, 1973), critical realism offers an epistemology of explaining rather than predicting (Bhaskar, 1975; Wynn & Williams, 2012). Such an approach guides us in the realms of the social world, the personal world and the material world (Mingers, 2001; Mingers & Willcocks, 2014, 2015, 2017). It also pursues empirical work by adopting a critical realist stance (De Vaujany, 2008; Volkoff, Strong, & Elmes, 2007; Williams & Karahanna, 2013; Wynn & Williams, 2012; Zachariadis, Scott, & Barrett, 2013).

This research aims at (1) applying semiotics for the purpose of analysis of IS research data, (2) providing actionable principles with a case example and (3) addressing current IS questions. We do so by reinforcing legitimate concerns that motivated Mingers and Willcocks (2017) to formulate their methodology and explaining our points of departure. With this article, we hope to advance the methodological and analytical discussion that our colleagues (McKenna et al., 2017; Mingers & Willcocks, 2017) have started in *Information and Organization*.

This paper is organized as follows. First, we define the analytical challenges within social media that beg for semiotics. Second, we introduce semiotics. Then, we highlight the main features of our framework and present our semiotic analytical technique (SEANT). Before discussing the implications of SEANT, we demonstrate its potential in a use case.

2. Representational Complexity in Social Media Data

The rising interest of researchers for social media (McKenna et al., 2017) and its widespread use in society have both highlighted new challenges for data analysis. We aim to address the subsequent stumbling block that has been created for data analysis (Vaast & Urquhart, 2017). We term representation complexity the conjunction of two conditions: (1) the multimedia nature of data (e.g. texts, videos, images, hyperlinks) and their combination, and (2), the multiple, overlapping layers of meanings created when senders and receivers interact.

2.1. The multimedia nature of data

Social media are “Internet-based applications that build on the ideological and technological foundations of Web 2.0 and that allow the creation and exchange of user-generated content” (Kaplan & Haenlein, 2010). Unlike online discussion communities or open-source software communities, social media have made it dramatically easy to create and share contents other than text. These digitally-enabled social environments broaden the definition of digital text (McKenna et al., 2017; Vaast & Urquhart, 2017). Digital texts in this context cover discussion threads (posts and comments), images and pictures, videos, hyperlinks, emoji, likes, etc. Collecting all these digital texts leads to large amounts of data.

Constant innovations of platform features extend our modes of representation of our social world. The visual dimension of digital texts is an increasingly important and challenging one. Social media afford to communicate with pictures or videos. There are many insights to be gained about the context or non-verbal cues from visual contents. Yet, the most common data collection technique for research related to social media remains interviews with social media users (McKenna et al., 2017; Müller, Junglas, Brocke, & Debortoli, 2016). The potential of multimedia data remain untapped such that qualitative design remains a supplement to social network studies (Whelan et al., 2016).

2.2. Overlapping layers of meanings

Moreover, none of these digital texts is a stand-alone text (Vaast & Urquhart, 2017). Social media are highly interactive media (McKenna et al., 2017): the user-generated contents are co-produced by more than one user. Users can create contents for an intended audience (e.g. network of “Friends” on Facebook) or for an unknown audience (e.g. public pages or Twitter). As users address multiple other users, the audience replies, comments and complements the content initially posted. Interactions can be in real time or asynchronous, one-to-one, one-to-many or many-to-many and create feedback loops with the audience (McKenna et al., 2017). Consequently, recipients contribute in the elaboration of the shared message.

Nevertheless, the context may slip away from the audience or the researcher analyzing the digital texts: “the meaning of a particular page or site may only emerge through automated filtering and synthesis of the input of many people. ... determined not by the conscious editorial decisions of an individual or group, but rather by the clicks of thousands of people around the world.” (Warschauer & Grimes, 2007, p.14). Thus, a conversation thread may collapse many contexts, on top of which we need to add the context of the researcher analyzing the data.

In social media environments, it is not reasonable to track down every user. The issue of context is critical to be able to interpret the data. These overlapping layers of meanings have consequences for the unit of analysis. In the context of microblogging, tweets cannot be isolated; they need to be understood in their thread of tweets and retweets (boyd, Golder, & Lotan, 2010; Marwick & boyd, 2011).

Online social networks give access to unstructured, rich social meanings in data. Such meanings can be overwhelming, not only because we can access data faster than we can process and analyze them, but also because of their rich, multimedia nature. Qualitative researchers take this richness of data as their strength and their challenge (Miles, Huberman, & Saldana, 2014; Myers, 2013). But the rigor in their techniques thus far has been largely oriented to texts. Therefore, representational complexity is a challenge for deeper explanations. The represented phenomena are complex by nature. These phenomena are political *and* economic *and* entertainment. There are layers of representations of phenomena that have layers of meanings. The current state of the field offers accurate models to predict the online spread of ideas, but fails “to predict the behavior change produced by this very same campaign” (Cebrian, Rahwan, & Pentland, 2016, p.37). We lack focus on “the underlying incentive structures—the hidden network of interpersonal motivations that provide the engine for collective decision making and action.” (Cebrian et al. 2016, p.37). We need explanation rather than prediction. If we focus only on the media (the representations) we lose touch with the content (Halverson, Ruston, & Trethewey, 2013). A shallow approach would single out the interactive and multimedia nature of communication from the study of change.

3. A Brief History of semiotics

Research using semiotics for data analysis is scant; IS has not embraced it yet, despite its roots in semiotics (Baskerville, 2010; Grover & Lyytinen, 2015). Instead, the management and marketing fields have drawn more vibrantly on semiotics. For example, management research has relied upon semiotics to investigate meanings in occupational context (Barley, 1983). Brannen (2004) showed how Disney Company faced important losses because they downplayed the meaning of cultural signs in Europe. Brannen brings compelling evidence of the utility of semiotics in understanding a market. Advertising and consumer research has drawn heavily on semiotics as a method (Hackley, 2003; Levy, 1959; Mick & Oswald, 2006; Umiker-Sebeok, 1987). Their main reasoning revolves around consumers’ process of sensemaking in marketing communications: “how culture and collective understanding is formed and sustained” (Hackley, 2003, p.165). Semiotics provides an understanding of cultural values in the communication process, and offers an alternative to the economic rationality approach to consumer behavior.

As the theory of signs pervades history, the first explicit reference arises in the work of John Locke (1690/1959). He describes *semiotike* or “the doctrine of signs” as one of the three kinds of knowledge including physics and ethics. However, it is not before the 20th century that semiotics work developed through the European tradition of Ferdinand de Saussure (1857-1913) and the American tradition of Charles Sanders Peirce (1839-1914). This section aims at situating Stamper’s framework for the rest of

the paper and does not aim at providing an exhaustive review of semiotic traditions. Numerous authors (Chandler, 2001; Deely, 1990; Eco, 1976; Hodge & Kress, 1988; Nöth, 1995) have skillfully introduced semiotics for beginners and for more experienced readers.

3.1. Two Traditions

Swiss linguist De Saussure argued that language was the most important system: “A *science that studies the life of signs within society* is conceivable; (...); I shall call it semiology (from Greek *semeion* ‘sign’). Semiology would show what constitutes signs, what laws govern them.”¹ (De Saussure, 1959, p.16, original emphasis).

Semiotics initially developed alongside linguistics and structuralism. The structuralist (or Saussurean) tradition focuses mostly on formal, explicit and visible structures sign systems (e.g. language). These approaches aim at finding linear and exact patterns between signs and meanings. It extended to other disciplines such as anthropology with the work of Claude Levi-Strauss, psychoanalysis with Jacques Lacan or literary work with Roland Barthes to only cite a few.

Ferdinand de Saussure defines the sign in a dualistic fashion as the relationship between the signified and the signifier. The latter refers to the mental image that its written or spoken form generates and the former bears the meaning of the latter. He adopted a relational perspective of the sign (Figure 1.1.). This focuses on *what* builds the basis for the structuralist (and most often European) tradition. Such a stance provides a universal grammar that enables an understanding of language beyond its historical and cultural context. The arbitrariness of signs implies the autonomy of language as a formal system. Critics of his ahistorical approach opened the way to a post-structuralist view that included both historical and cultural dimensions of language.

Despite being a contemporary of De Saussure, Charles Sanders Peirce developed his own definition of a sign and a taxonomy of signs. Peirce’s American tradition of semiotics defines a sign as “something which stands to somebody for something in some respect or capacity”. Signs include words, images, sounds, gestures and objects. This set expands nicely to encompass the kinds of content than can be generated on social media like Facebook nowadays. Peirce adopts a triadic and not dyadic definition of the sign (Figure 1.2.). The *interpretant* – without designating the interpreter – refers to some form of meaning drawn from the *representamen* (the form of the sign). The *object* commits Peirce to some realism (Mingers & Willcocks, 2014) as it designates what the sign refers to. The representamen is similar to De Saussure’s signifier. Peirce also offers a typology of signs: symbol, icon, index. A symbol refers to a signifier that is not fundamentally tied to the signified: its meaning needs to be learned such as traffic lights. An icon refers to a signifier that share similar characteristics with the signified

¹ We will solely use “semiotics” as it became the most dominant usage in the literature for the study of signs.

such as a metaphor. An index refers to “a natural sign”, i.e. a signifier that evoked the signified such as smoke would evoke fire.

Building on Peirce, Morris (1938) further decomposed the structure of semiotics in terms of *pragmatics*, *semantics* and *syntactics* to cover the intentional use of signs, their meaning, and the relationships between signs. While Peirce adopts a triadic definition of a sign, Morris expands on a triadic relation definition (Dewey, 1946; Nöth, 1995) (Figure 1.3.).

$$Sign = \frac{Signifier}{Signified}$$

Figure 1.1.: De Saussure's dyadic relationship

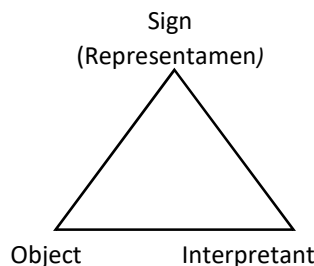


Figure 1.2.: Peirce's Semiotics Triangle

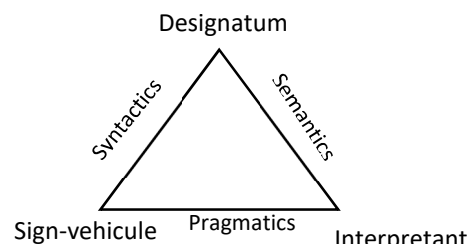


Figure 1.3.: Morris (1938) after Nöth (1995)

Figure 1: Conceptions of Sign

3.2. Stamper's ladder of semiotics

Ronald Stamper's approach (1973, 1991, 1996) is very much inspired by Peirce as his definition clearly shows: “something which stands to somebody for something in some respect or capacity, in some community or social context”. Stamper formulated a semiotic ladder that includes human and technological information functions (Figure 2).

The technological dimension highlights that signs are physically available to our investigation. The technical features of information systems do not depend on humans. Therefore, he adopts a narrower definition of information as “precisely defined properties of signs, all of them capable of empirical investigation”. Stamper's ladder of semiotics (Figure 2) extends Morris' framework by adding *empirics* as a semiotic layer of information. It ties the physical existence of a sign (*physical world*) to its social consequences (*social world*). Empirics and syntactics are essential to information systems development to convey signs, while semantics and pragmatics are keys in drawing meaning from signs: “Meanings express personal views of reality. When there is a firmly established consensus, and only then, we can pretend that meanings are independent of people. Many semantic problems cannot be solved until one has established who is responsible for the meanings expressed.” (Stamper, 1987) As Deely (1990) observes, “at the heart of semiotics is the realization that the whole of human experience, without exception, is an interpretive structure mediated and sustained by signs” (p. 5). This approach considers then semiotics as accessing one specific view on the world. Therefore, semiotics is

not “the reality” but limits our knowledge to our experience of the world: the social construction of reality (Chandler, 2001). Consequently, our mode of inquiry into the world is dependent on our past experiences. Human beings are drawing understanding from previous human experiences and not just from the object under study. This mode accounts for the development of the researcher’s analytical commitment while engaging with data.

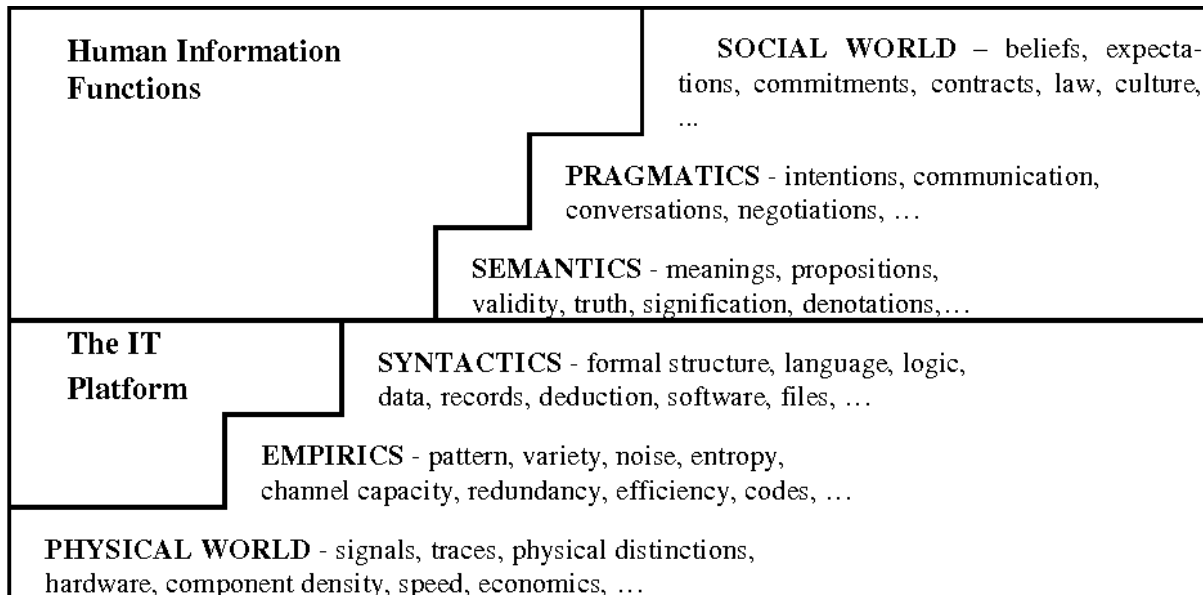


Figure 2: Stamper's Semiotic Framework

4. Features of our framework

If dozens of data analysis approaches exist, hermeneutics, semiotics and narrative analysis are the most common in business and management research (Myers, 2013). Despite its peculiar relevance for IS research, semiotics is still scarce in the field. Mingers and Willcocks (2017) develop semiotics into an entire semiotic research methodology. But by making semiotics into a full, stand-alone research methodology we inhibit our ability to employ semiotics to understand data and the role of the medium from within other research methodologies. The alternative we present in this paper is a version of semiotic data analysis that can fit within other overall methodologies. Semiotics is particularly relevant for studying digital texts and meaning-producing events as “the exchange of any messages whatever and of the systems of signs which underlie them” (Sebeok, 1985, p.1).

Our semiotic analytical technique –SEANT- is organized around three features: a structured framework, the researcher’s analytical commitment and abductive reasoning.

4.1. Structured Framework

Mingers and Willcocks’ (2014; 2017) overview of semiotics highlights two characteristics of the semiotic literature. First, there are many different and useful concepts. Second, there is no such thing

as methodological guidelines. We agree that semiotics offers an overflowing toolbox of useful analytical concepts. But each of the tools and ideas in this plethora is so rich, so complex, and so hard-to-grasp, that it is difficult for different qualitative research traditions to converge on their meaning and their methodological value. Not surprisingly, the use of semiotics in IS remains limited.

Moreover, semiotics is highly criticized for being unsystematic and for having shown little evident practical applications (Chandler, 2001). Some consider that semiotic analyses are only individual readings of signs. As we retraced the origins of semiotics, we notice that semioticians build on each other more or less faithfully depending on their interpretations of previous work. For semiotics – a much-needed - analytical technique to be adopted, we need to carefully structure into a workable way to introduce semiotics. Mingers and Willcocks (2014; 2017) have offered an attempt, yet they combine concepts from multiple traditions without showing practical applications of their methodology. Liebenau and Backhouse (1990) have already introduced in simple terms Stamper’s ladder of semiotics to IS students and scholars and have articulated concepts for each step of the ladder. We offer to tap into semiotics potential to offer, “a systematic, comprehensive and coherent study of communications phenomena as a whole, not just instances of it” (Hodge & Kress, 1988, p.1) because there is “no discipline concerns itself with representation as strictly as semiotics does” (Mick, 1988, p.20).

We do so by formulating questions that guide the researcher’s endeavor for each semiotic dimension and concept. As researcher investigating social media environment are overwhelmed with digital texts, a structured approach can help address criticisms and ensure rigor. Stamper’s ladder is a relevant candidate to offer a structured approach, as we will illustrate in an empirical example.

4.2. *Researcher’s analytical commitment*

A hurdle in analyzing semiotic systems emerges from the difficulty of thinking and perceiving our own signifying system. The lack of an account for this analytical commitment by an individual researcher has been previously highlighted (Mingers, 2001). The role of the researcher has been discussed in interpretive research (Walsham, 1995, 2006) and more recently with the increasing interest of researchers for social media data (McKenna et al., 2017). We need to account for subjects’ and researcher’s sensemaking processes.

While researchers in IS have used sensemaking to understand the interpretative process of their subjects, they rarely apply a sensemaking approach to their own data analysis (i.e., how they make sense of their subjects’ sensemaking process). The researcher’s sensemaking culminates in an *analytical commitment*: the projection of the researcher’s own interpretative orientation onto the entirety of a communication. Exploring semiotics raises our awareness of the role of the signs systems and our own roles in constructing our understanding of reality.

The researcher’s commitment to explain the observed social phenomenon requires deciphering his/her own analytical commitment. An analytical commitment arises once the researcher has deciphered the

intended meaning in the communications that led to actions and thus projected his/her own sensemaking process in this interpretation of the signs. In this way, the researcher is a research instrument whose sensemaking process is an attentional process (Weick, 1995). In other words, when the data analysts pay attention to their own analytical commitments. They include an awareness of how the researcher's own position within the analytical social setting may have affected the analysis.

Thus, our semiotic analytical tool extends that effort by accounting for the social context of the events and of the researcher. Nowadays, signs become transient or ephemeral in the cyberspace where they are used, combined and reproduced by whoever, wherever and however, as illustrated in the use of signs in protests. That is why our framework proposes to analyze the researcher's own personal context and background in addition to the social context of the place and time of the events. To do so, we suggest applying the semiotic ladder itself to the interpretations made by the researcher. Therefore, an analytical commitment is a commitment to his/her analysis of the entirety of the communication. It accounts for how the researcher has loaded his/her own interpretation into the explanation of the communication. We develop the coding guidelines in section 5.2.

4.3. *Abductive reasoning*

4.3.1. *Philosophical Assumptions*

Critical realism (CR) has been adopted because of its consensus between empiricism and social construction (Mingers, 2004; Mingers, Mutch, & Willcocks, 2013; Zachariadis et al., 2013). Only a few studies (Mingers & Willcocks, 2014, 2015, 2017) have drawn on the mutual benefits of CR and semiotics from an IS perspective. In CR, causal explanations are developed under "empirical scrutiny" (Bhaskar, 1975) but are still subject to meaning-making from the data. Semiotics offers an approach to achieve this empirical scrutiny by deciphering the meaning behind interwoven signs. By developing a SEANT that is available to other methodologies, we extend the current critical realist approach of semiotics in IS research (Mingers & Willcocks, 2017).

A SEANT that articulates selected semiotic concepts with an inference mode (abduction) is much needed at the empirical level to uncover the enduring structures and mechanisms ("*the real*").

The stratified, complex and dynamic ontology of reality is denoted as the real, the actual, and the empirical (Bhaskar, 1975, 2013). The *real* refers to causal powers or tendencies or structures powering causal effects in society. A subset of the real is the *actual* and includes the events that do or do not happen when (all or some) structures are actualized. The *empirical* includes the actual observable and experienced events as a subset of the actual. IS researchers have argued for a critical realism approach (Table 1).

Semiotics enables the investigation of the empirical realm. Semiotics is embedded in the material world; but not only in the affordances and the liabilities of the material world (*The IT Platform* in Stamper's ladder), but also in the character of the social or conceptual aspects inherent in that material world

(*Human Information Functions* in Stamper’s ladder). Our approach extends previous attempts to develop methodological guidelines based on CR (Venkatesh, Brown, & Bala, 2013; Wynn & Williams, 2012) to the analytical stage of research (hereby semiotic analysis).

Strata of Reality (CR)	Main aspects	Examples in IS Research
Real	Causal mechanisms and structures coproducing events (objects)	Technological artifact, language and culture (Wynn and Williams, 2012), Affordances (Volkoff and Strong, 2013), coordination governance mechanisms (Williams & Karahanna, 2013)
Actual	Events or Outcomes (e.g. human action, historical events)	Concrete outcomes actors experienced or expected to (Volkoff and Strong, 2013), events in coordinating efforts as specific changes in the structure (Williams & Karahanna, 2013)
Empirical Realm of semiotic analysis	Experiences (e.g. observations, documents)	Observations, Interviews (Volkoff and Strong, 2013) and archival data (Williams & Karahanna, 2013)

Table 1: Strata of Reality in IS CR research

4.3.2. Defining Abduction

CR relies on *retroduction or abduction*², i.e., through access to the empirical, researchers propose and describe causal mechanisms that explain the activation (or not) of reality. Semiotics concepts enable the investigation of the empirical layer of reality while CR offers retroduction to generate the further knowledge that flows from beyond that empirical layer. It is an iterative, creative process that identifies and empirically corroborates the mechanisms at play (Wynn & Williams, 2012). This process aims at answering: “What properties must exist for [the phenomenon of interest] to exist and to be what [it] is? Or...more briefly: What makes [the phenomenon of interest] possible?” (Danermark, Ekstrom, & Jakobsen, 2002, p. 97).

We work from the empirical realm to formulate explanations at the real strata. Eco (1976, 1986; 1983) builds on Peirce’s definition of abduction. According to Peirce, interpretation implies adopting and trying hypotheses such as "abduction (...) furnishes the reasoner with the problematic theory which induction verifies. Upon finding himself confronted with a phenomenon unlike what he would have expected under the circumstances, he looks over its features and notices some remarkable character or relation among them” (Peirce, 1931). Eco (1983) develops a typology of abductions: overcoded abduction, undercoded abduction and creative abduction.

² Retroduction and Abduction are considered as essentially the same by Mingers et al. (2013) and Wynn and Williams (2012). We will use abduction in the rest of the paper.

Overcoded abduction aims at eliciting the prior knowledge and experiences that influence interpretation. Thus, it implies identifying rules that govern interpretation, i.e. rules and values with which the researcher works. We tend to apply what we already know in a quasi-automatic reasoning process, which does not require much effort from us. Prior knowledge and experiences serve as a basis of the sensemaking process. Therefore, overcoded abduction requires understanding how our perceptions and cognitions produce working hypotheses and identify prejudices. Eco suggests undercoding to unveil them.

Undercoded abduction aims at trying and testing hypotheses. It involves examining the data to find supporting or contradicting evidence. We offer a structured semiotic framework to guide the researcher in undercoded abduction. Semiotics as an analytical technique goes much closer to meaning and use of information by identifying focal elements.

In practice, overcoded and undercoded abductions are iterative and intertwined. The most thoughtful approach would start with overcoded abduction as a way to surface assumptions with which we start. As the researcher goes through undercoded abduction, working assumptions also need to be surfaced.

Abduction in its most creative form is **creative abduction** and requires observations of signs from different worldviews that at least oppose conventional interpretations or theories. This creative effort implies adjustments or change in our current body of knowledge. Creative abduction aims at developing novel insights. This kind of abduction involves re-description of previously drawn meanings and relations. Each time a new hypothesis is formulated, a new cycle of analysis starts going through over- and undercoded abduction to support, refine or revise the hypothesis or formulate new ones. Abduction also helps organizing clues into a sensible whole.

5. A Semiotic Analytical Technique (SEANT)

This section details our analytical coding technique (SEANT) and its underlying mechanisms. The technique is intended for use by other more comprehensive methodologies. We developed this analytical approach for (offline) social phenomena that leave detailed behavioral traces of what individuals think and do online. Social media are specific platforms where such interactions can take place. Work in this arena has studied communications leading to mass protests (e.g. Castells, 2015; Halverson et al., 2013), which we extend here with an illustrative example of the Arab Spring in Egypt. These studies are powerful inquiries enabled by the highly granular level of data available, but currently lack ideal data analysis approaches that are better suited for the rich and multimedia nature of this granular data. By organizing semiotic concepts and providing a structured analytical technique, SEANT offers a concrete set of tools for researchers to adopt, adapt, and expand.

5.1. Participants and process

Social media gather a number of users: people who post, comments, react to the displayed contents. There are many people interacting on these platforms and with the contents: they are “interactive

participants” (Kress & Van Leeuwen, 2006) in the situation of production, distribution and consumption of contents. Kress and Van Leeuwen (2006) distinguish between “interactive participants”, who contribute to communications and “represented participants” who are depicted or referred to in digital texts but may not always be involved in communications. Moreover, when we analyze the contents, we, the researchers, become participants to the situation of interpretation. Therefore, many participants with different intents and timelines are involved.

We represent a linear pattern of communications, where posts receive reactions (e.g. Likes) and comments. Comments, themselves, may receive reactions and be commented on. Past posts still get comments and reactions once new posts are published. Therefore, the pattern is not as linear as represented. In the case of social movements, communications on social media have been tied to the organization of large-scale protests (Tahrir Square, Egypt, January 25 in Figure 3).



Figure 3: Communications Timeline

Researchers do not always work on communications as they unfold. In this case, researchers work retrospectively (Figure 4). Social media users generate communications in a timeline shown from left to right. In a semiotic analysis, researchers must interpret those signs a posteriori, working backward through the signs from right to left. We start from what we experience and observe. We look for evidence to study these events.

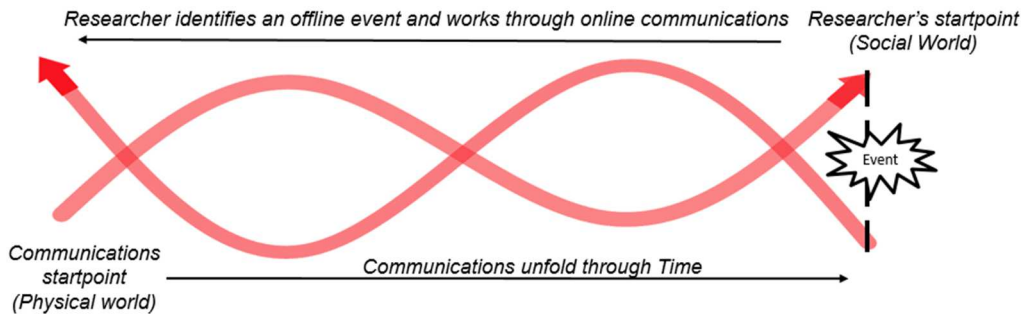


Figure 4: Production and Interpretation of Meaning

Our double-helix representation accounts for (1) the generation of communications by social media users that unfold over time (left-to-right in Figure 4) and (2) researcher's interpretation process (a reversed right-to-left in Figure 4). To inform the processes represented in Figure 4, we develop the double-helix based on Stamper's semiotics ladder and Liebenau and Backhouse's (1990) popularization of Stamper's work (Figure 5).

Semiotics resembles a detective endeavor that explains what happened in the social world by following and analyzing physical signs (Berger, 2004; Eco & Sebeok, 1983). The social phenomenon observed in the social offline world is, following this analogy, a crime scene. A worthy detective derives explanation from clues to solve crimes. Thus, observation is an inferential process. Social media leave behind a trail of valuable evidence.

5.2. The semiotic coding

The empirical research starts as we collect data. In our case, social media offers access to rich and various data.

We assume that social media users in their communicative actions have loaded different dimensions of the semiotic ladder: The user inscribes his pragmatics in the message (framing the user's intentions within the context). Second, the user inscribes his semantics (framing his meaning and truth-of-the-matter). Third, the user inscribes the syntax by making choices in words, pictures and combinations of both (structuring the communication). Finally, the user inscribes the message: once a post is created, liked or commented on, it creates a signal (the empirical signal). This communication loading process moves left-to-right (Figures 4 and 5). While we realize this assumption has a nice, structural appeal for the analyst, the actual process of loading the message is likely to be much messier and less sequential.

The semiotic analytical coding operates in a reverse order than the production of a message. In this process, we operationalize the four semiotics dimensions of Stamper's ladder (Figure 6). The empirical dimension is coded first, dealing with signaling (such as statistical relations between signs or strings of signs). Liebenau and Backhouse (1990) argue that empirics have only interest once the other semiotics

dimensions have been analyzed. However, that may not always be true considering the *chunk* of data that can be retrieved from online sources such as social media. On the contrary, empirics can help to identify where to look for signaling communications that have been (properly) transmitted and identify the ones that have been transparent. The syntactical dimension is coded next, dealing with structuring (relations and rules between signs). The semantic dimension is then coded as explanations (the relations between the signs and behavior). Finally, the pragmatics is coded as descriptions (the relation between agents and social environment). Pragmatics is essential because it relies on shared values, beliefs and assumptions that determine patterns of behaviors and enable coordination. This semiotic analysis takes the form of a disassembly of the signs, and proceeds from right-to-left in the figure. Like the loading process, it is unlikely the coding approach will be so pure. The process must be iterative because, for example, knowledge from the semantic aspect might suggest recoding of the syntactical aspect. In addition, knowledge from subsequent communications might demand recoding previous communications.

The semiotic ladder offers relevant sensitizing devices. However, applying it in a stepwise manner (as climbing a ladder) does not efficiently address the issues of the nature of the content (i.e. representational complexity), its dynamic context and deeply intertwined interpretations of many-to-many communications. We turn the semiotic ladder into a smart briefcase for the researcher. This briefcase accumulates the personal journey that the researcher undertakes to identify clues and analyze them through four dimensions; the briefcase transports these clues and analyses across logical but not sequential relationships in the iterative analysis.

Thus, a semiotic analysis begins by coding each semiotic layer in a first thread of messages. Facing complexity or ambiguity, we parse threads into messages. The coding is repeated for each subsequent thread. For each thread adding to the analysis, the researcher returns to previous coded threads and messages, and revises the meaning if new messages question previous conclusions. The double-helix shape illustrates how the researcher's *analytical commitment* is intertwined with other sensemaking processes (Figure 5). We also guide the researcher with the questions driving the analysis of data (right cell) and the analysis of the analytical commitment (left cell) in Figure 6.

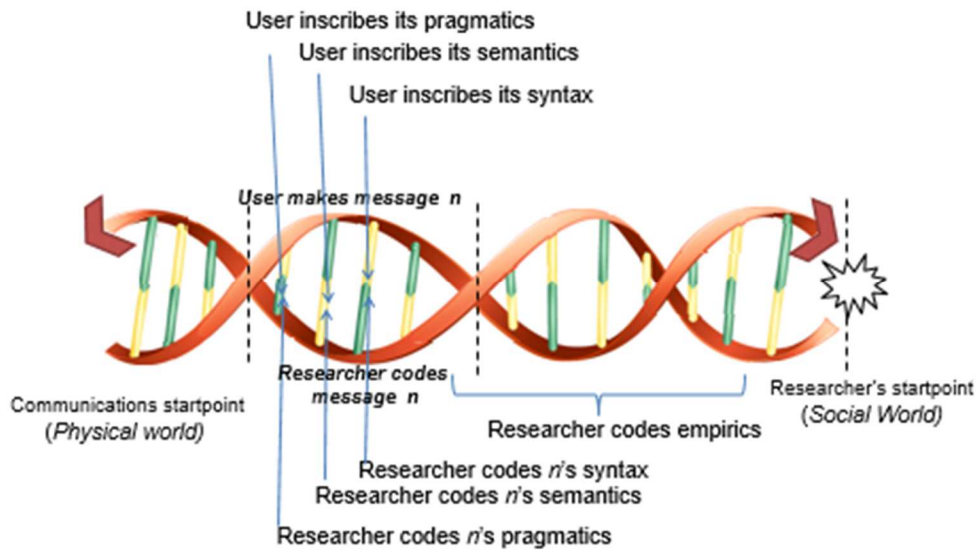


Figure 5: The Researcher's Semiotics Coding Process

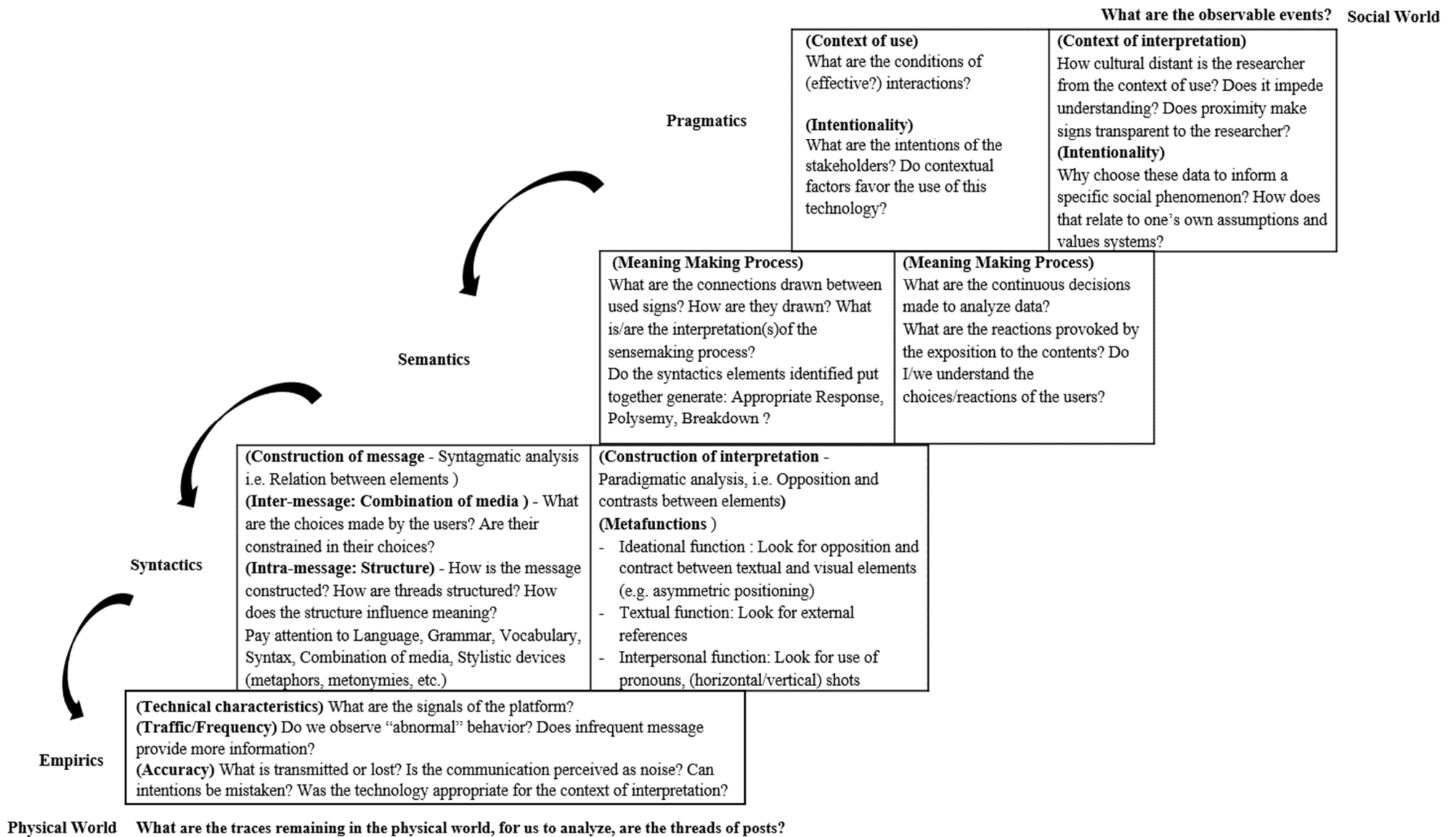


Figure 6: Questioning Guiding Coding Process

6. Use example: Semiotic Analysis of Arab Spring Communications

This section illustrates the semiotic analysis as used within an episode of the case study. In this case study, we were interested in explaining the role of technology in the tide of mass protests. To do so we looked at the Arab Spring protests in Egypt. We observed the offline and social consequences of these events (*social world*).

6.1. The case

The Arab Spring was a series of anti-government street protests in countries such as Tunisia, Morocco, Syria, Libya, Egypt and Bahrain. These protests resulted in regime changes in Tunisia, Egypt and Libya. It started with the Jasmine Revolution in December 2010 in Tunisia when Mohammed Bouazizi, a street-food vendor set himself on fire denouncing the cost of living and police abuse. It was the catalyst for large-scale street protests that led to the ousting of President Ben Ali on January 14, 2011. This momentum set off uprisings across the Middle East.

Inspired by the events, Egypt followed. Similarly, economic and political reasons motivated the events. Economically, factors such as the rise of unemployment and inflation of food prices contributed to the protests. Politically, Egyptians were suffering under an autocratic regime that restrained freedom rights and police brutality. A driving event was the death of Khaled Said in June 2010. He was beaten to death outside a cybercafe in Alexandria by police. Khaled Said was depicted by the police as a drug dealer who choked on a drug packet during his arrest. His family and friends reported that Khaled Said had videos implicating police officers in drug dealing. The post-mortem pictures of a disfigured face went viral throughout online communities. His death led to the creation of a Facebook page that further diffused the calls for protest. The protests ran for 18 days on Tahrir (i.e. Liberation) Square, the prime location of the protests until President Hosni Mubarak resigned.

The Arab Spring is an interesting case for a semiotic analysis for multiple reasons. First, it illustrates how social consequences of events are motivated by signs. Starting with the effects in the social world (i.e. large scale protests), Stamper's semiotics ladder leads us through a study of the physical world. Second, semiotics helps researchers avoid becoming overwhelmed by the representational complexity in the data. The Arab Spring data often contained visual documentations of protests and police abuses. Moreover, participants used textual comments widely to make sense of the events. There were many overlapping layers of meanings in the comments section. Further, the episode of the Internet shutdown (on which we focus) stresses the criticality of both dimensions of representational complexity in organizing protests.

6.2. Data Collection


We focused our data collection on social networks. First, we collected data from two Facebook pages named "We Are All Khaled Said", the Arabic version and the English version of the page, because this is where the first call for protest was found. The users – mostly young, urban and educated individuals

- turned to social media like Facebook to organize protests and disseminate information nationally and internationally (Dubai-School-of-Government, 2011). We completed our data collection with Twitter data by following the hashtag #jan25 as it was the most popular.

The data were collected for a research project from the Facebook pages “We Are All Khaled Said” is from June 2010 until February 11, 2011, the day Mubarak stepped down as the fourth Egyptian President. From January 25, protesters took over Tahrir Square in Cairo for the 18 days prior to Mubarak’s resignation (February 11). For the purpose of this paper, we focus on the data of four days of protests January 27-29. The Internet was shut down on January 27 to quell the organization of a protest on January 28.

6.3. Identifying a thread of data

While we collected data from Facebook, Twitter and YouTube, the Facebook thread of posts was most prominent. The three media complement themselves in the Internet shutdown episode. We looked at Twitter for triangulation and identified cross-posting. While we found posts and tweets of similar content, we reproduce here one tweeted picture and shared on Facebook, that then was extended as a video on Facebook. Therefore, we also collected YouTube videos. For the purpose of this paper, we chose a thread of posts mixing multimedia content starting from the first rumors of Internet shutdown to the “Friday of Anger” protest on the 28th. We report timestamps, Likes (L) and comments (C) in addition to the posts (Table 2). The thread of posts reproduced here aims at showing how the events unfold, and builds on a larger data analysis.

	Timestamp	Post	L	C
1	01/27/2011 4:36 PM	Many reports that the internet and the mobile network will be switched off tomorrow to stop the communication between protesters and try to stop all protests.	22	43
2	01/27/2011 6:39 PM	The Egyptian government cut off the Internet in Egypt and the news about cutting mobile phone lines	476	799
3	01/27/2011 6:41PM	Government has shut internet down. Mobile networks may be next	469	875
4	01/27/2011 7:22PM	Egypt Internet users report major network disruptions http://www.reuters.com/article/idUSLDE70Q2P220110127	665	2603
5	01/28/2011 2:14PM	Police attack protesters with water cannons while they are praying 	25	30
		(1) Tweet #jan25 January 27 (2) Post on English Facebook Page (3) Footage used in the video on February, 3 rd on Arabic Facebook page with 1919 likes and 6770 comments		
6	01/28/2011 2:12AM	I received tens of confirmation from people in Egypt that Internet is completely cut. Police is withdrawing from all main squares and centers and tens of government hired thugs / criminals and convicts are pouring petrol on cars and setting them on fire. This will be the excuse Egypt will use to show that Police had to interfere violent to save people's lives. http://apne.ws/eEC1I5	37	32
7	01/28/2011 3:01AM	It's now 3 am in the morning in Egypt. Hundreds of political activists are being arrested from their homes at this moment in a very large scale operation. Almost all leaders of Muslim brotherhood are confirmed arrested. More reports that Police agents are pouring petrol in the streets of main squares to set them on fire during protest. Please act. Government is planning war crimes tomorrow. Please contact the media, governments, leaders and everyone you can. Coverage and Awareness could help save lives in Friday protests.	115	88
8	01/28/2011 4:34AM	Internet is down in Egypt. There is one or two ways left to connect to the World. I won't disclose what they are in case Egyptian government finds out. Landlines are back working now in Egypt. Techie Activists are looking at broadcasting long wave radio broadcasts out of Egypt to update the world.	93	52

9	01/29/2011 10:20AM	“Tahreer square. Cairo is on fire. Burnt army vehicles in Tahreer square and several buildings are on fire.”	41	32
				
10	01/29/2011 5:02PM	“Photos from Egypt today. Protests Continue in Egypt - Interactive Feature - NYTimes.com”	59	9
				

Table 2: Thread of Data (Jan 27- 29)

6.4. Using Stamper’s ladder for Coding

We apply concepts of the semiotics ladder to analyze the data and to analyze our interpretation of the data (Figure 7).

First, in the left cell, we analyzed the users’ posts and developed our interpretation. Posts on the Arabic page warn about the Internet shutdown and possibly the cellular network too, and calls on the international community, the Egyptian diaspora, to help. Then, the page goes silent on the eve of the protests until the 30th. However, by considering the content of both the Arabic and the English Facebook pages, we can associate the absence of signals on one side (Arabic) with the continuation of signals (English) on the other side (revealed by semiotic coding of the empirics). The signals and the absence of signals indicate where data is to be found, such as in this case. Evidence missing in the Arabic page may be found in the English page.

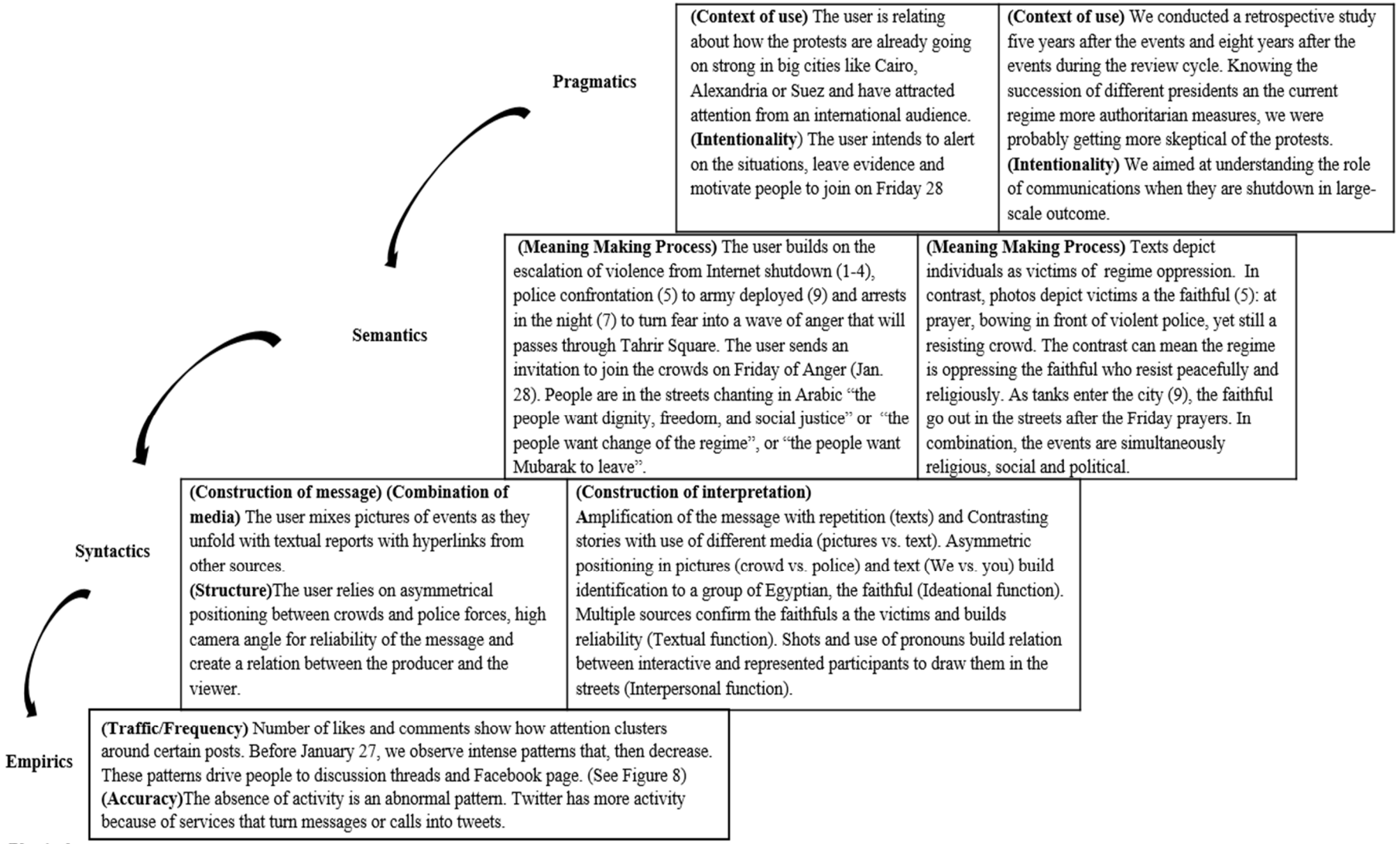
Second, in the right cell, we applied our coding technique to our interpretation to uncover our analytical commitment. There are two common interpretations of the events used previously to explain them. First, a technological analysis celebrates the emancipatory powers of social media (like Facebook and Twitter) and their use by the young to defeat a stable autocratic regime (Ghonim, 2012; Oh, Eom, & Rao,

2015). A second interpretation is contextual; Egyptians were afflicted by unemployment, soaring commodity prices, corruption and oppression (Gladwell, 2010; York, 2011). These explanations are rooted in two influential streams of collective action literature: resource-mobilization theory (Tilly, 1978) and Marxist theories where a collective consciousness is built around grievances. We started with these frameworks in mind (overcoded abduction).

6.5. *Making Inferences*

From the analyses and interpretation of data, theoretical explanations still need to be formulated. We analyzed the data in 2016, five years after the events took place and went back into the analysis in 2018 and 2019 knowing how the outcomes and the current situation eventually evolved (*overcoded abduction*). We explicitly coded pictures and texts according to semiotics approach developed in the previous section (*undercoded abduction*). Detailed examples of this coding, including User loaded images and text are shown in Figure 7.

Despite few days of complete shutdown, the protests never stopped. On the opposite, people still rallied the protest sites such as the size of the movement grew.



Physical World What are the traces remaining in the physical world, for us to analyze, are the threads of posts (Table 2)

Figure 7: Semiotic Coding of Jan 27-29 thread (Table 2)

6.5.1. Going through the ladder

Despite the shutdown, people still rallied the protest sites (*social world*). Therefore, we looked for traces explaining the massive turnout, which are the acts of communication (*physical world*). We worked the dimensions of the semiotic ladder to investigate. We report in the following analysis (Figure 7) the user's perspective in the left cell and the researchers' perspective in the right cell. We illustrate the abductive process through which the researcher went (Figure 9). We started from empirics.

Empirics tells us where to look (Figure 8). We look for patterns in signals by identifying a number of posts. Comments, and Likes are common signals on Facebook to express support and opinions. Both indicated a strong dropdown in traffic and frequency. Thus, we followed the variations in number of Likes and Comments and investigated the absence of signals. The dropdown does not represent an accurate picture of the events. It does not signify a loss in interest or in intensity, but that the circulation of signs is impeded. The absence of perceptible events on Facebook signaled abnormal behavior, similar to a broken telephone game. However, the absence of semiotic data on the Arabic Facebook page drove more consideration of other online media such as the English Facebook page and news media. As more people living abroad are active on the English Facebook page, they explained what was happening and offered different tactics to circumvent the shutdown.

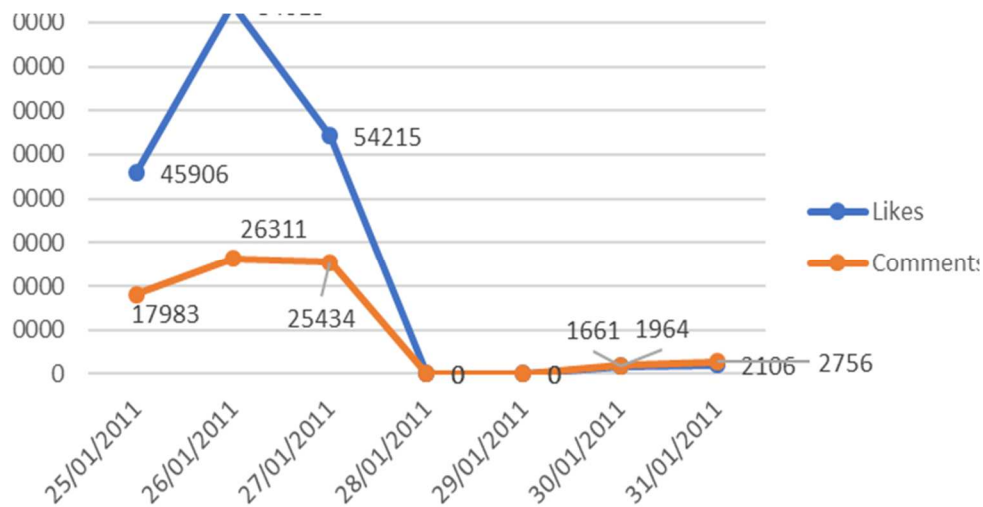


Figure 8: Empirics (Likes & Comments) for January 25-31

Empirics, alone, can be misleading. By looking at multiple platforms (e.g. Twitter) and multiple sources, we can investigate the accuracy of the signals. That's why we need to look into the communications. We do so by looking at the structure of the message (syntactics) and the meaning it conveys (semantics).

Syntactics tells us what to look for in the messages and calls for reflection on the effects of structure. Syntactics reveals how the user's production of the message is pulling the reader into the event. From

these signals, we see that the syntactics concepts reveal the use of icons to maximize transparency and minimize efforts of interpretation, and the use of different media to communicate different messages. The reliance on iconic representations communicates the emergency of the situation and helps build courage. Semiotics drives us to look at the syntactics between texts and pictures. Three metafunctions structure the message: ideational, textual and interpersonal (Kress & Van Leeuwen, 1996).

The *ideational* metafunction puts in relation “interactive participants” who communicate and “represented participants” in the picture. The asymmetric positioning supports the claims of police brutality, regime oppression and builds a shared narrative to drive the interactive participants in the streets.

The *textual* metafunction frames the reliability of the message, as more sources and hyperlinks are added. Moreover, the composition of image supports the claims: the *overlap* between the content communicated in texts and pictures amplify the message. In the comments we read the anger provoked by the Internet shutdown and the fear from escalating violence against citizens. We also observe the use of *contrasting* messages with different media to communicate different messages. Text and pictures communicate different narratives: while texts depict the general social and political conditions of duress, pictures add a religious interpretation of the events.

The *interpersonal* metafunction builds the relationship between the producer and the viewer by creating the contact and reducing social distance. Whether it is a peaceful crowd being hosed (5), tanks entering the city (9) or crowds taking over the streets after Friday prayers (10), the pictures build *contact*. As they communicate visual information, they request attention: they are demand-images. The shots also reduce *social distance* by capturing the crowd in horizontal shots and thus, call for the involvement of the viewers who are not yet part of the crowd. Photographs are striking the reader by the depiction of events such that the relation between the object and the signs is perceived as objective.

The syntactics relies on pictures, representing the protester-citizens’ opposition and the size of the movement. Despite the anger and fear of being victims of police violence, the size of the movement provided courage to act and to go down in the streets. Syntactics reveal multiple narratives, which requires the study of semantics.

Syntactics leads us to look at the *semantics* between texts and pictures. As we identified different messages, we need to understand what they mean in contrast. The circulation of these pictures and texts builds intensity in exchanges, whether crowds drive positive affect “Wow! Amazing picture!” (5) or “they are killing thier own people so dont care to cut mobile services from them” [sic] (1). The narrative of the faithful builds up a shared narrative that aims at reducing fear, yet building up on anger and positive affect “People in Egypt, hold your position, keep your courage, comfort and motivate you mutually, persuade the military with your euphoria, with your belief in a better world. Do not surrender” (5). The posts and the comments engage the reader in a reciprocal relationship through

interpretation. Semantics tells us how the message was received and requires the researcher(s) to analyze how (s)he has received the communications too.

Semantics leads the audience to be angry and to courageously commit to action. We need pragmatics to provide rich and varied information about the world represented in posts.

Pragmatics accounts for the context of production, distribution, consumption and interpretation. By accounting for the situation of interpretation the researcher is in too: the technique acknowledges the productive role of the interpreter. The researcher may need to revise the analysis in other semiotic dimensions, as (s)he becomes aware of his/her values influencing data analysis. The pictures showing the movement growing in the streets captures disorder and chaos as the regime increasingly loses control. The analysis of the pragmatics is valuable to reveal the disjunction between (1) the context and intention of the producer of the message and (2) the researcher's context. In the first posts, the user intends to communicate as much as possible before he loses the ability to comment.

6.4.2. *Semiotic interpretation*

While the two most common interpretations presented in section 6.3. offer an either/or explanation, the semiotics analytical technique demonstrated here explains how we can move from explicit and most common interpretation to more subtle, sometimes intuitive interpretations (Figure 9). This is not about showing whether these explanations are right or wrong, but rather identifying a different explanation that sheds light on a more complex reality conveyed through its representations.

The empirics reveals insights that downplay the emancipatory role of social media and downplay one of the common interpretations (Ghonim, 2012; Oh, Eom, & Rao, 2015). Even though social media has been shown to have acted as a catalyst to trigger protests, its role has been challenged. Our initial overall analytical commitment might be described as a *Broken Telephone Explanation*. It was named after *telephone*, a cumulative error game in which players whisper a message from player to player until the distorted outcome is announced to the group and compared with the original.³ With the media curtailment, we initially interpreted the messages as distorted and not properly executed. Communications became sparse and included a struggle to counter censorship. The absence of perceptible events on Facebook signaled abnormal behavior, similar to a broken telephone game.

Nevertheless, a focus on representations of the events dissolved the analytical commitment to the broken telephone explanation. The Egyptian Internet shutdown did not quell the protests. On the contrary, reports in press show that it likely increased the number of people in the streets and intensified the movement. Because of the shutdown of cellular services, many Egyptians experienced the first

³ Also known as Chinese whispers, Russian scandal, whisper down the lane, operator, grapevine, gossip, don't drink the milk, secret message, the messenger game, and pass the message. See https://en.wikipedia.org/wiki/Chinese_whispers

government-imposed limitation on their ability to communicate freely. The government had, in effect, achieved the opposite of their intended effect. The government's action boomeranged. They had mobilized almost the entirety of the country in support of the protests. Their shutdown backfired. We might describe this as the *Boomerang Explanation*. This explanation reinforces the contextual explanation, but also reinstates the technological analysis, because it also highlights the other technologies used to circumvent the regime oppression.

Yet, neither explanation explains how the government's action boomeranged. By looking into the composition of the communications (syntactics) and the meaning conveyed (semantics), semiotic analysis offers novel insights. Syntactics shows how the crafting of the message is pulling the reader into the event. The brutality against a peaceful crowd depicted by syntactics leads to a complex emotional state revealed in semantics. Anger and fear are simultaneously expressed. While fear may lead to indecisiveness or inhibit action, fear of losing even more, mixed with anger, becomes a motivational mechanism for action. Moreover, the size of the movement captured in pictures builds up courage. The pragmatics reveals the reliance on common values conveyed in religious practices. These values bind people together.

Thus, the concomitance of anger, fear and awareness of the size of the movement (composed of the faithful victims of oppression) leads to courage and action, which created the anarchy driving toward Mubarak's resignation.

Our analysis reveals a more complex explanation of the events as it appeals to one's reactions to the contents. Each step yields rich insights that provide an overall story. The pictures and texts are emotionally loaded by their composition and the elicited meanings. By relying on the more emotional cues that the users communicate, we offer an explanation that is neither just technological nor just contextual but relies on both to highlight a religious and emotionally-driven explanation.

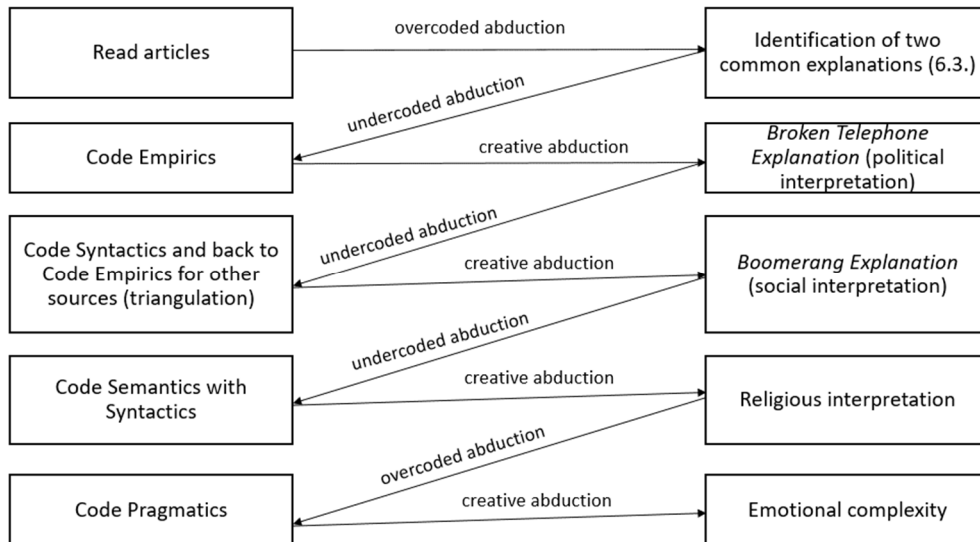


Figure 9: Illustration of a sequence of abductions

7. Discussion and Conclusion

This paper describes a method component that allows semiotic analysis to be integrated into existing methodologies. This technique can be helpful in cases where research is best framed as any of myriad research methodological frameworks instead of imposing adoption of a full semiotic methodology. This component, SEANT, offers a helpful alternative to Mingers and Willcocks' (2017) full semiotic methodology. We argue that semiotics is a powerful addition to any research toolkit once its richness is better structured. Our research makes several contributions to improve qualitative IS research.

First, our paper discusses advances of qualitative research in IS. Social media data has become more and more prominent in IS research and has taken an important place in the study of societal challenges of technology (Oh, Eom, & Rao, 2015; Selander & Jarvenpaa, 2016; Vaast & Urquhart, 2017). Numerous authors have discussed the challenges and the opportunities of conducting qualitative research in the era of social media (McKenna et al., 2017; Vaast & Urquhart, 2017; Whelan et al., 2016). Yet, most of the research based on social media data rely on interviews with social media users as primary data (McKenna et al., 2017). We have conceptualized the challenges in analyzing social media data as representational complexity, i.e. the multimedia nature of data that represent phenomena with different layers of meaning. This paper extends previous invitations and recommendations to tap into the potential of qualitative analysis of social media data (McKenna et al., 2017; Vaast & Urquhart, 2017). The SEANT leverages semiotics as an empirical science to provide a basis for an analytical technique that can be adopted within other methodologies. By advocating a semiotic analytical approach, we embrace the information core of the IS field and the qualitative insights. The practical guidelines, and their illustration in a current case study, aim at advancing the impact of qualitative

inquiries. Instead of being solely focused on the data materials, our framework integrates explicitly a sensitivity to context (*pragmatics*), and a sensitivity to the medium (*empirics*).

Second, semiotics remains of marginal interest in academia despite its benefits for the IS discipline (Baskerville, 2010; Grover & Lyytinen, 2015; Mingers & Willcocks, 2017). We have seen some restoration of attention (Oshri, Henfridsson, & Kotlarsky, 2018). But semiotics still needs appropriate methodology with definition of a specific knowledge domain. Mingers and Willcocks (2017) have offered a methodological approach and its first use (Oshri et al., 2018) advances promising results. Our analytical technique contrasts with a full semiotic methodology. It is a more structured technique that is more easily adapted to a more general research methodology such as case study, grounded theory, ethnography, as examples.

A structured framework for semiotics is much needed to address critics (Hodge and Kress, 1988; Chandler, 2001) and ease its accessibility for IS researchers. For this reason, we focused on the benefits of Stamper's ladder of semiotics (Liebenau & Backhouse, 1990) and specifically grounded our discussion around social media data. Furthermore, we show how Stamper's ladder of semiotics can be operationalized to achieve empirical scrutiny in addressing two analytical concerns: representational complexity (to deal specifically with social media data) and the researcher's analytical commitment. We complement Mingers' and Willcocks' more comprehensive semiotics methodology by providing a kind of "plug-in" SEANT for adaptation within other methodologies to enable additional rigor, relevance and deeper insights. Even though Stamper is acknowledged in formulating their methodology, the benefit of his more structured conceptualization remains underexploited. As an aid, we propose a set of four principles for conducting semiotics data analysis and summarize the guidelines in Table 3 that complements the questioning guiding the coding process (Figure 6).

This research also extends the efforts of previous empirical research that adopts a critical realist approach (De Vaujany, 2008; Volkoff et al., 2007; Williams & Karahanna, 2013; Wynn & Williams, 2012; Zachariadis et al., 2013). The philosophy underlying this analytical technique puts emphasis on formulating explanations rather than predictions. Furthermore, CR supports certain sensemaking process assumptions about individuals who are acting to warrant their assumptions of realism (Weick, 1995): "The process of understanding emerges from the need of individuals to construct an external factual order 'out there' or to recognize that there is an external reality in their social relationships" (Ring & Van de Ven, 1989, p.181). Plausibility in the sensemaking process aligns with the search for the *best explanation*. Both focus on "the filters people invoke, why they invoke them, and what these filters include and exclude" (Weick, 1995, p.57). We extend this work by operationalizing *analytical commitment* within our semiotic analytic technique. Analytical commitment accounts for the "habits of the mind" (Mingers, 2001), clarity of underlying values, social environment (Weick, 1995) and intellectual history.

Principle	Guidelines	Illustration in our study
0. Write down previous knowledge, ideas, prejudices about the research setting and objectives.		
1. Empirics <u>Goal:</u> Use empirics to identify signals and patterns.	Identify metrics for each platform.	Number of posts, comments, Likes for Facebook. In our case, we plotted a graph (Figures 7 and 8).
2. Syntactics <u>Goal:</u> Use syntactics to proceed to inter-message (i.e. thread of messages) and intra-message coding (i.e. media used in one message). 2.1. Syntagmatic analysis Identify relation between elements. 2.2. Paradigmatic analysis Identify opposition and contrasts between elements.	Use Kress and Van Leeuwen's (2006) three metafunctions to analyze visual materials and relations between textual and visual materials (Ideational, Textual, Interpersonal).	The asymmetric positioning of represented participants in pictures (ideational) communicate a religious reading of the events, while texts communicate a political and social narratives (textual). We also analyze how shots were taken to pull the viewers into the events by reducing social distance (interpersonal).
3. Semantics <u>Goal:</u> Use semantics to identify narrative(s). Use communications between "interactive participants" to identify narrative(s). Confront their narratives researcher's narrative(s).	From syntactics elements, identify if: - One narrative is amplified and/or - Multiple narratives are contrasted Identify elements of interactive space (e.g. Comments) to understand the meaning making process of interactive participants	We coded semantics very closely with syntactics to reveal narratives. The textual function analyzed in syntactics revealed some overlap in the message communicated in pictures and texts, which amplify the oppression narrative. Yet, the contrast in religious resistance in the pictures and the comments communicate the emotional complexity that has driven behaviors (section 6.4.).
4. Pragmatics <u>Goal:</u> Use pragmatics to surface contextual elements. 4.1. Context of Use Identify characteristics of participants, context and acts of communication which affect behaviors. 4.2. Context of Interpretation Confront users' context to researcher's context and identify biases due to social distance or proximity.	Identify social, economic, political and cultural dimensions from users' and researchers' context.	We described the local context and identified users' intents using different data sources. We wrote down researcher's own contextual elements and research agenda to take into account for cultural bias.
5. Iterate <u>Goal:</u> Refine analysis.	Revise coding in each step as insights proceed from previous or succeeding steps.	Once we formulated a political explanation, we coded syntactics and went back to code empirics. We also coded syntactics and semantics iteratively to understand how religious and emotional elements have affected behaviors.

Table 3: SEANT Guidelines

The analytical toolkit above also supports further work in the rigor-relevance discussion. Relevance arises by linking a social phenomenon and its social consequences. The technique sets opportunities for IS researchers to conduct powerful inquiries by following threads of online human behavior. These

online phenomena illustrate the bright side (Bennett & Segerberg, 2011; Benson, 1977; Braa et al., 2007; Castells, 2011; Deng et al., 2016) as well as the dark side (Bhuller et al., 2013; Chan & Ghose, 2014; Chan et al., 2016; Greenwood & Agarwal, 2016; Lowry et al., 2016) of socio-technical phenomena. Using semiotic analysis, future research can investigate the perlocutionary effects of representationally complex communications, especially when these effects have societal consequences.

Rigor arises by bringing structure into the analysis of unstructured, rich social meanings in representationally complex data and by making explicit the inference mode (i.e. abductions). This rigor is extended by explicating the researcher's *analytical commitment* in making interpretations. Researchers can better demonstrate the trustworthiness of their conclusions by applying our semiotic toolkit to their perceptions and understandings of observed phenomena. Furthermore, using the semiotic toolkit to code data and the researcher's analysis integrates systematic *jottings* (Miles et al., 2014) to strengthen the coding process itself. The trustworthiness of the SEANT is still to be demonstrated in future research. Moreover, the complementarity between insights driven from big data analytics and insights from semiotics is still an unexplored area. Big data covers a range of analytical techniques to study large datasets; semiotics investigates interpretations. There are limits to datasets and there are limits to questions such datasets can answer through applied mathematics. These limits do not call for richer data but for richer analyses. These limitations open the path for mixed method research (Mingers, 2001).

In comparison to other techniques, SEANT has merits in the way it integrates visual and textual materials together for data analysis. SEANT has some shortcomings in the study of emergent and large-scale phenomena like the Arab Spring. Defining the extent of data collection can be challenging because it is hard to pin down the beginning of the events. Consequently, the researcher often ends up with a subset of the data. Lacking guidelines for data collection, we proceeded by following concordant items of evidence that led us to specific posts and tweets that identified specific Facebook pages and hashtags. In addition, even with just a subset of data, sorting out the pragmatics and semantics for visual materials remains a challenging task. The comments on pictures and videos already represent individual levels of interpretations. Analysis takes a deep understanding of the context of the event in order to parse a sign from the other signs that are about it. This deep understanding extends to individuals' (users and researchers) contexts. This complexity can be overwhelming for the researcher who needs simultaneously to zoom in to each individuals' context and to zoom out to consider the overall research question. These limitations are provide good opportunities to further develop and improve the SEANT guidelines.

Third, semiotics and critical realism have a more extensive contribution to each other than previously demonstrated and open up a research agenda for new qualitative research into the social phenomena reflected by social media data. For example, how does social media restructure social activities, social

practices, and knowledge? Researchers can use semiotic analysis within ethnographic or case study methods to study specific uses of social media, such as political mobilization, identity construction, as examples. Within an interpretive case study, SEANT can address: how do features of the user profile affect users' behaviors and influence the way content spreads? Researchers can also use SEANT within design science research by studying how designed features of a platform influence users, or how to design the interactive space to generate participation and engagement. These questions are relevant to multiple domains whether we focus on democratic participation (e.g. protests, voting behaviors) or brand engagement (e.g. online or offline visit to a store to buying decision). As a last example, SEANT can also be mobilized in an action research design to identify what kind of multimedia representations are the most effective (e.g. from effective/timely decision-making to crowd mobilization).

Finally, the toolkit above should further stimulate constructive critics and debates that advance our modes of inquiry. Hopefully such advancements will rise in the face of novel challenges, such as representational complexity, as technology and society continue their interlocking emergence.

8. References

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