Hidden in Plain Sight:

The Importance of Scale on Organizational Attention to Issues

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ABSTRACT

The organizational attention literature has an epistemological bias, in that it explains how and why organizations notice issues. The ontological or real attributes of the issues are largely ignored, subordinated or confounded with this epistemological orientation. In this paper, we argue that organizations sometimes miss issues, not only because of attentional failures, but also because of the temporal and spatial scale of the underlying processes related to the issue. Some processes are of such large or small scale that they escape organizational attention. We argue that large-scale processes, such as those related to climate change, require broad attentional extent, whereas small-scale processes, such as those related to local variations in poverty, require fine attentional grain. This work aims to shed light on the relatively underexplored question of why some issues are not noticed, with important implications for both theory and practice.

Keywords: Organizational attention; Issues; Scale; Grain; Extent, Critical realism; Process

On April 7, 2010, the former CEO of Citigroup, Charles Prince, was questioned in a US Congressional hearing about Citigroup's exposure to the sub-prime mortgage market that led to the 2008 financial crisis. Prince stated, "I can only say that I am deeply sorry that our management—starting with me—was not more prescient and that we did not foresee what lay before us." His advisor, Robert Rubin, added, "[a]lmost all of us ... missed the powerful combination of forces at work and the serious possibility of a massive crisis" (Younglai & Drawbaugh, 2010: 1).

Commentators have been trying to figure out why so many U.S. based businesses did not anticipate the 2008 financial crisis – an event of such magnitude that eliminated $17 trillion in net worth in just 15 months, wiping out more than the $14.5 trillion of GDP created in 2007 (Financial Crisis Inquiry Commission, 2011). They point to securitization, deregulation in the financial services industry, failures in risk management, and lax lending practices (Davis, 2010; Gennaioli, Shleifer & Vishny, 2013; Jiang, Nelson & Vytlacil, 2014; Rajan, Seru & Vig, 2015). After 19 days of hearings, 700 interviews, and millions of pages reviewed, the Financial Crisis Inquiry Commission added one more factor to that list: many financial institutions simply missed the signals of the impending crisis altogether (Financial Crisis Inquiry Commission, 2011). Financial institutions were too focused on macroeconomic indicators, such as housing prices, which masked the underlying risks of a cascade of mortgage defaults related to subprime mortgages (e.g., Demyanyk & Van Hemert, 2011; Hulten & Reinsdorf, 2015).

Prior research acknowledges that organizations may not act on these latent issues because of failures in organizational attention, such as inappropriate labeling of an issue so that it is not deemed salient (Bundy, Shropshire, & Buchholtz, 2013; Dutton & Jackson, 1987), missing the cues associated with an issue (Rerup, 2009; Weick & Sutcliffe, 2006), or lacking the attentional

structures, such as the procedural and communication channels, to act on these issues (Ocasio, 1997). The focus of this prior work, however, has been on the organizations' attentional capabilities and resources. In this paper, we argue that the physical or real aspects of the issue also matter.

In this paper, we aim to answer *why organizations fail to notice latent issues*, which are events, developments, and trends that have potential organizational consequences. Taking a critical realist perspective, we argue that issues arise from 'real' processes with specific temporal and spatial properties. Organizations fail to notice issues with temporal and spatial properties that lie outside their attentional structures (e.g. procedural and communication channels). Whereas some financial institutions and regulators foreshadowed the impending 2008 financial crisis because they understood the underlying processes and structures of the banking industry, most others had focused their attention on processes that were too macro, lacking the granular understanding to see the latent risks. Given limited attentional resources, organizations must focus their attention. If their attention is too narrow for large-scale processes or too coarse for small-scale processes, organizations may fail to notice latent issues.

Our arguments can be extended to many issues with organizational consequences, such as climate change, poverty, and terrorism. For example, in 2014, the *Intergovernmental Panel on Climate Change* (IPCC) reported that climate change will lead to more frequent and intense natural disasters, such as hurricanes and forest fires (IPCC, 2014). Although the IPCC comprises more than 800 of the world's most notable climate scientists who have repeated this message with increasing intensity over the last two decades, many organizations have not responded meaningfully to adapt to climate change even though individual managers and employees are attuned to the climate change issue.

Lee (1993: 561) argues that "when human responsibility does not match the spatial, temporal, or functional scale of natural phenomena, unsustainable use of resources is likely, and it will persist until the mismatch of scales is cured." We believe that the implications of this research are important, not only to organizations but to society. The anthropogenic impacts of organizations call for theorizing that brings the real aspects of issues into sharper focus (Sayre, 2005).

DISCRIMINATING ATTENTION TO ISSUES FROM REAL ISSUES

The Epistemological Bias of Organizational Attention Research

Organizational attention is defined as "the noticing, encoding, interpreting, and focusing of time and effort by organizational decision-makers on both issues and answers" (Ocasio, 1997: 189). Organizations are bombarded by numerous external and internal signals that give information about potential issues (Barnett, 2008; Dutton & Dukerich, 1991; March, 1994). Given limited attentional resources (e.g., time and capabilities), organizations cannot notice all signals (Cyert & March, 1963; March, 1994; Ocasio, 1997; Rerup, 2009) and as a consequence they focus their attention on a subset of these signals (March & Simon, 1958; Simon, 1947).

The definitions of issues in the organizational attention literature exhibit an epistemological bias, that is, they are issues only when they are identified as such. Dutton and Dukerich (1991: 518) define issues as "events, developments, and trends that an organization's members *collectively recognize* as having some consequence to the organization" (italics added for emphasis). Ocasio (1997: 189) defines issues as "the available repertoire of categories for *making sense* of the environment: problems, opportunities, and threats" (italics added for emphasis). From this perspective, an issue is salient only when it "resonates with and is prioritized by management" (Bundy et al., 2013: 353). Table 1 illustrates the tendency of prior

research on organizational attention to conceptualize issues as problems, opportunities, and threats, implying issues only become issues once they have been noticed and interpreted by organizations.

Insert Table 1 about here

Such an epistemological bias is understandable, given that attentional scholars are interested in the cognitive limits of organizations (epistemology), specifically the organizational structures and processes that shape organizational attention. However, this has meant that either ontology is confounded with epistemology, or ontology is subordinated or ignored. For example, Hoffman and Ocasio (2001) explained the transformation of the U.S. chemical industry by investigating its response to external events affecting the natural environment, such as the magnitude of oil spills (in gallons). The authors state explicitly that "selective attention is driven not by the objective characteristics of the situation or event, but by its *enactment* in the environment (Weick 1979, Ocasio 2001). According to Weick (1979: 164), 'enactment emphasize(s) that managers construct, rearrange, single out, and demolish many of the objective features of their surroundings.'" (Hoffman & Ocasio, 2001: 415, italics in original).

A logical extension of defining an 'issue' only after it has been noticed and acknowledged as such would logically point to attentional failures. For example, Rerup (2009) showed that a major Danish pharmaceutical firm failed to comply with regulations, despite plant managers' and shop floor employees' efforts to alert senior managers of the issue. Rerup found that senior managers were so focused on an organizational merger and the related post-merger challenges that they did not notice that the organization was not complying with regulations,

which led to substantial organizational losses. He argued that the organization failed to notice the compliance issue because different levels, units, and people within the organization lacked 'attentional coherence.' Organizations can improve their ability to notice issues by improving their attentional stability (i.e., focused and prolonged without interruptions), vividness (i.e., rich with understanding at the removal of distractions), and coherence (i.e., similar or compatible across an organization) (Rerup, 2009; Weick & Sutcliffe, 2006).

By explicitly speaking to the ontological aspects of an issue, in addition to the epistemological, we can offer new explanations for why issues might be missed. Organizations may simply fail to see the signals associated with the issue (Bazerman & Chugh, 2006; Dane, 2013) because the organization's attentional structures do not match the characteristics of their environments (Winter, 2004). In our opening example, financial institutions were carefully scanning for systems risks, but their focus on global indicators of debt failed to reveal the real risks that were mounting among homeowners. To illuminate our arguments, we have introduced a number of terms, which are summarized in Table 2.

Insert Table 2 about here

The Ontological Focus of Critical Realism

To discuss events, processes, and developments outside of the organizational experience requires assumptions about a 'real' world that exists outside of and independent of organizations' knowledge of that world. Such a position is consistent with critical realism (Bhaskar, 1975; Sayer, 2000; Tsang & Kwan, 1999). Whereas attention research offers epistemological explanations (e.g. cognitive limits) for the fallibility of human knowledge and organizational

actions, critical realism brings ontological explanations into sharper relief. If the world exists independently of our knowledge, the ontology of the 'real' world becomes salient to epistemological interpretations (Sayer, 2000).

Critical realism suggests that there are 'real' structures and events that reflect the dynamic mechanisms in both natural and social worlds that are distinct from the organizations' epistemological experience (Bhaskar, 1975; Sayer, 2000; Tsang & Kwan, 1999). The financial crisis occurred even though many organizations did not see it, or as we describe later, climate change is happening and can have real consequences on organizations even though many organizations are not including any mentions of climate change in internal communications.

In this paper, we adjust Dutton and Dukerich's (1991) definition of issues to define them as *events, developments, and trends that have organizational consequences*, having dropped the epistemological requirement that organizational members must "collectively recognize" issues to be labeled as such. Our revised definition of issues allows us to consider the gap between the 'real' and the 'observed', or the ontological and the epistemological, and offer new explanations for why organizations sometimes fail to notice issues.[1]

Issues as Processes

We assume a 'process ontology,' which argues that the 'real' world is fundamentally made up of processes (Langley, Smallman, Tsoukas, & Van de Ven, 2013; Tsoukas & Chia,

[1] Critical Realism assumes three overlapping domains of reality, i.e., the 'real', the 'actual', and the 'empirical' (Bhaskar, 1975). *Real* structures and mechanisms provide a basis for *actual* patterns of events, which in turn provide a basis for *empirical* experiences. We have omitted the distinction between the real and the actual in this paper, as our theorizing concerns latent issues, which emanate in real structures and mechanisms and cross the boundary to become actual events (Bhaskar, 1986). We acknowledge that the distinction between the real and the actual may be useful in future theorizing, but the distinction between the real/actual and the empirical is more salient to our theorizing than the distinction between the real and the actual. Our approach is consistent with that used by others (e.g. Tsang & Kwan, 1999).

2002). In this view, entities (e.g., the natural environment, organizations) are understood as temporary instantiations of ongoing processes. Rather than entities being fixed objects that occasionally change, entities undergo constant and often unpredictable change, produced by not only agentic decisions and actions but also chance events and unintended consequences of purposeful choices (Tsoukas & Chia, 2002; MacKay & Chia, 2013).

However, we extend beyond the existing focus of process studies in organizational research. Process studies in organizational research have understood the world as "composed of events and experiences" (Langley et al., 2013: 5) and particularly focused on the empirical experiences of events (e.g., Gehman, Treviño, & Garud, 2013; Lok & de Rond, 2013). In contrast, we highlight the real attributes of processes that are distinct from their empirical understanding. From a critical realist perspective, *process* refers to "the mode of becoming, bestaying and begoing of a structure or thing, i.e., of its genesis in, distantiation over and transformation across space-time" (Bhaskar, 1986: 145). Processes are essentially real structures and things in constant formation, reformation, and transformation over space and time (Bhaskar, 1986), and thus exhibit real spatial and temporal attributes that exist irrespective of empirical experiences. Commentators may disagree in their interpretation of the timing of an issue and its geographical reach, but there is often little debate that processes are situated in time and space.

The Scale of Processes

If entities are fundamentally constituted through processes, they can have scale, which is the *spatial and temporal attributes of processes*. Entities comprise a dense network or scaffolding of entangled, interdependent processes (Brenner, 2001). These processes are produced and reproduced within regular spatial and temporal boundaries and tend to form structures with scale (Brenner, 2001). These scales can be anchored by *physical changes*, such as

the emissions and absorption of carbon, by *resource considerations*, such as the availability of capital, by *power relationships*, such as in modes of organizing, or *social interactions*, such as in competition or cooperation (Swyngedouw, 1997, 2004). It is important to stress that scale does not mean size. Changes in scale reflect qualitative shifts in the dominant relationships (O'Neill and King, 1998). For example, industries are 'bigger' than any single organization that constitutes the industry, but the dominant processes within industries differ from those within organizations.

The differences in dominant processes at different scales can be illustrated through the example of predators and prey in the natural world (e.g., Rose & Legget, 1990). At a scale of meters and days, the number of prey tends to decrease as the number of predators increases and vice versa. However, at a larger scale of kilometers and years, the number of predators and prey are positively correlated, because both predators and prey rely on the same nutrient cycling or seasonal vegetation cycles. The smaller scale processes in this example affect each species differently and operate somewhat independently (e.g., reproductive cycles, genetic diversity) thereby influencing the ability of the predator (or the prey) in catching their prey (or avoiding capture). However, larger scale processes affect both predator and prey populations (e.g., changes in habitat, ecosystem health).

We have taken a systems perspective to processes so that processes are entangled with other processes, and some processes are nested in other processes. Smaller scale processes can shape larger scale processes, and vice versa. Easterling and Polsky (2004) say that these different process scales can be described by qualitative descriptors, such as macro and micro. However, such broad descriptors for processes only work if time and space are coupled so that one can describe process scale by their spatiotemporal scale.

The natural environment tends to exhibit such spatiotemporal coupling; small-scale processes cycle rapidly over small geographies, relative to larger-scale processes that cycle more slowly over large geographies (Holling, Gunderson, & Peterson, 2002). This is because many natural systems self-organize so that order is achieved and structured through repeated processes. In Figure 1, we illustrate this correlation for weather and climate systems.

Insert Figure 1 about here

Such coupling can also occur in the organizational context. Klein & Kozlowski (2000) theorize a spatiotemporal relationship among elements within levels of analysis, such that lower-level phenomena tend to have more rapid dynamics than higher-level phenomena. For example, individuals are likely to change more quickly than organizational cultures.

However, not all systems are tightly coupled, especially those characterized by dominant processes governed by human agency. Organizational hierarchies provide structures and mechanisms that enable top-down broad, but quick, changes over the organization (Simon, 1969, 1973). Further, as humans are better able to shape their physical environment, they can decouple time from space even in the natural environment, such as through industrial farming. Farms have historically occupied small plots of land that accommodated diverse agriculture. With the advent of technology, biological controls, fertilizers, and machines, farms are increasing in size and accelerating their temporal scales. As farms and organizations, more generally, ‘scale up’ their processes to cover a broader geography, they also aim to accelerate product life cycles, thereby decoupling spatial scales from temporal scales. In cases when the temporal scale of processes are decoupled from their spatial scale, temporal scale and spatial scale can be referred to separately.

Spatial scale is the geographical area in which the dominant process(es) of interest manifest. Spatial scale provides a snapshot of elements in space, which can vary in form, function, and position. To assess spatial scale requires an understanding of the complex, systematic relationships among those elements. Spatial scale reflects the geographical space over which the highest density of relationships is bounded. The spatial scale of some processes can be local such as the work completed by community service agriculture (CSA), where local farms produce food for their community. These farms tend to be self-contained and exhibit highly diverse, yet symbiotic crops. The spatial scale of technology-intensive industrial farms, on the other hand, tends to be much larger or more macro than community service farms.

Temporal scale refers to the patterned variations in processes over time. This perspective captures the tendency for processes to sustain a dynamic equilibrium over time, so variations are expected over time. Temporal scale is reflected by the cycling of these normal variations. A smaller or micro-temporal scale cycles more rapidly, whereas a larger or macro temporal scale cycles more slowly. For example, climate change is "a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer" (IPCC, 2007: 30). The scale for climate change, therefore, is very long.

Sometimes systems will transition over a threshold to a new system. These punctuated changes or shifts from one equilibrium to another can lead to changes in the spatial and temporal scales of the process, and therefore the dominant processes. For example, the 2008 financial crisis started with relatively small geographical scale bounded by the housing markets of some US cities, but it very quickly crossed global thresholds.

It is important to stress that scale is not absolute, but often relative to a reference point. Community service agriculture is of smaller spatial scale to industrial agriculture, but comparing these with climate change loses meaning.

MISSING LATENT ISSUES

Process dynamics can harbor latent issues, which are events, developments, and trends that have *potential* organizational consequences. In this section, we propose that the process scale is salient in identifying these latent issues and can, therefore, explain why organizations sometimes miss these issues.

Specifically, the analysis that is applied at one scale cannot be simply extended to processes at a different scale because of the differences in the dominant process. Organizations risk making attribution errors if they apply patterns at one scale to another (O'Neill, 1979; Wiens, 1989). For example, the *global* 2008 financial crisis issue was activated by *local* processes. By pooling and repackaging high-risk loans -- a process known as securitization -- financial intermediaries (e.g., banks) could offer high risk, high return loans to individuals. The high degree of interconnectedness among intermediaries elevated individual risks to systematic risk within the financial system at a global scale (Gennaioli et al., 2013). Most analysts were looking for abnormalities at this macro scale and therefore did not detect abnormalities that were being created at the micro scale. Similarly, in the opposite direction, weather events such as tornadoes, floods, and heat waves have occurred throughout history and cannot signal climate change. To detect climate change, weather-related data must be collected over an extended period of time and across the entire globe to detect systematic anomalies.

Most processes, whether biophysical or social, exhibit variance over time and space, which constitute the 'normal' frequency or amplitude of the cycle. Deviations from the 'normal'

frequency, amplitude, mean or variance constitute abnormalities in the spatial or temporal patterns of processes and signal latent issues. Research into organizational sensemaking (e.g. Weick, 1995) and statistical process control (e.g. Shewhart, 1931) are examples of bodies of work that are targeted at improving organizational processes to identify latent issues. Given that processes are nested, abnormalities observed at one scale may not be noticed at another. Organizations can miss latent issues because they do not adequately understand the scale of the processes that generate the issues. In the remainder of this section, we describe the attentional focus needed to identify processes at different scales.

Attentional Grain and Extent

An organization's attention, specifically the procedural and communication channels, shapes its ability to see processes and detect latent issues. In particular, our propositions are based on two important constructs, attentional grain and extent, which we describe briefly here and illustrate more fully in the development of the propositions.

Attentional grain is defined as the smallest unit of measurement used to observe a process in space and time, and can range from fine to coarse (Gibson, Ostrom & Ahn, 2000; Sayre, 2005). It is equivalent to the resolution of the organization's attention, such that the finer the grain, the greater the resolution. *Attentional extent* is defined as the range of measurement used to observe a process in space and time and can range from narrow to broad (Gibson et al., 2000; Sayre, 2005). It is equivalent to the span of the organization's attention, such that the greater the extent, the broader the span.

Sayre (2005) illustrates the difference between grain and extent by using the analogy of a meter stick, with grain being the smallest unit of measure (i.e. a millimeter) and extent being the full range of the entity (i.e. expressed in meters). Using a meter stick to measure a chair is

appropriate, as the size of the chair can be expressed in meters, abnormalities can be expressed in millimeters, and variations (i.e., errors) smaller than a millimeter are inconsequential. In contrast, a meter stick would be inappropriate to measure a farm (i.e., a meter is too narrow) or microchips (i.e., a millimeter is too coarse).

The differences between climate change and weather events are helpful in illustrating attentional grain and extent in temporal scales. Climate change is measured in years (grain) and over hundreds of years (extent). However, the grain would be too coarse and the extent too broad to identify weather events, such as tornadoes or floods.

Organizational attention tends to be biased towards specific grains and extents, either deliberately or unconsciously through the attentional structures embedded in organizational routines. For example, many firms observe stock prices daily (grain), and forecast income statements for three to five years (extent). Or, firms may collect facility level sales data (grain) to forecast sales for the entire enterprise (extent). Organizations use these data to identify latent issues reflected in abnormal stock prices, profitability, sales, etc.

Further, organizations in Western cultures have been accused of focusing too much on customers and shareholders, which have a short-term focus (Chen & Miller, 2011; Hofstede & Hofstede, 2005). These organizations tend to set annual performance targets (narrow extent) and collect daily stock price data (fine grain). Organizations in Eastern cultures, on the other hand, are argued to adopt a longer-term orientation, setting targets beyond a decade (broader extent) and do not become as distracted by the daily fluctuations of stock prices (coarser grain).

Latent Issues and Attentional Grain

An organization's ability to identify latent issues depends on its attentional grain relative to the scale of underlying processes. If the grain is appropriate, then the organization can identify

patterns in the processes that signal abnormalities. If the grain is too coarse, abnormal signals can be missed as the data are not collected. For example, an organization that collects national level data cannot see significant changes in regional buying behavior, especially if changes in one region are equal and opposite to changes in another region. When processes are observed through too coarse a grain, abnormalities in the variance must be sufficiently significant to exhibit abnormalities at large scales. Therefore, observing processes with a coarse grain, or low resolution, increases the likelihood of missing latent issues. The attentional grain must be at least as fine as the spatial and temporal variance in the process. The smaller the scale of processes, the finer the attentional grain must be in order to notice latent issues.

This point can be illustrated through the prior literature on globalization. In the increasingly global market environments, many organizations must observe and interpret information from distant and unfamiliar regions of the world (Gupta & Govindarajan, 2002; Levy, Beechler, Taylor, & Boyacigiller, 2007). At no point in human history has business been more global than now (Harvey, 1989, 1990; Massey, 1994). These global or transnational organizations focus their understanding and experience of the 'global,' and fail to see temporal and spatial experiences of the 'local' (Massey, 1994). Either organizations apply insights from one familiar local geography to all geographies, or they apply the average of global geography to the local, yet no one local community may actually be 'average'. This bias towards the global is pervasive in the international business literature that prescribes a broad attentional extent through a 'global mindset' (Gupta & Govindarajan, 2002; Levy et al., 2007) and 'international attention' (Bouquet, Morrison & Birkinshaw, 2009), but without commensurate local granularity that can help organizations understand local phenomena (Caprar, 2011). For example, country-level effects (assumed homologous within-country) have been shown to affect foreign affiliate

performance (e.g., Makino, Isobe & Chan, 2004), yet subnational region effects, such as factors of production, regional institutions, and agglomeration, have been shown to be significant predictors in explaining affiliate performance in China (Ma, Tong & Fitza, 2013).

When organizations assume an attentional grain that is too coarse for small-scale processes, they are likely to miss important latent issues. While it is practically difficult to apply a fine grain throughout the globe and over a long period of time, organizations need to selectively employ a fine grain either intentionally or through their embedded routines. We, therefore, propose the following.

> *Proposition 1: Organizations are likely to miss latent issues if their attentional grain is too coarse vis-a-vis the scale of processes. Specifically, if the attentional grain is coarser than the scale of processes, latent issues will be missed.*

Please see the Appendix A for a precise mathematical representation and a graphical illustration of this proposition.

Latent Issues and Attentional Extent

To identify latent issues, organizations must apply a sufficient attentional extent in relation to the scale of underlying processes. Attentional extent is deemed sufficient when its breadth captures the range of variance in underlying processes. If the extent is too narrow relative to underlying processes, it is difficult to discriminate a stochastic aberration from a systematic trend. For large scale issues (as compared to smaller scale issues), the attentional extent must be sufficiently large relative to the temporal and spatial scales of the processes to detect abnormalities.

Prior work in organizational attention has acknowledged that broader attention is generally better, even though the concept of attentional extent is not referenced. Crilly and Sloan (2012) found that firms that attended to a large number of stakeholder groups had higher social performance and saw a broader span of issues; Slawinski and Bansal (2015) found that organizations with longer time horizons are better able to tackle issues of climate change; and, Souder and Bromiley (2012) showed that organizations with shorter time frames had less durable assets. Although these studies do not explicitly discuss attentional extent, their findings are consistent with our argument that a broad extent is necessary to observe slowly changing and geographically distributed issues and that broader extent leads to better organizational or societal outcomes.

We illustrate this point by drawing on the processes of climate change that we described above. Insurance companies tend to focus on local claims, which are affected by local weather events. Actuaries use historical data to model and price risk on a customer-by-customer and property-by-property basis. However, the local impacts of climate change are difficult to predict, and actuaries were finding their risk models unreliable as the frequency and intensity of extreme weather have been increasing. In addition, customer contracts tend to extend over 12 months, so that longer-term risks cannot be easily incorporated into insurance policies. Thistlethwaite (2012) studied the response of the insurance industry to climate change and found that only some insurance companies had applied the ClimateWise Principles that aligned actuarial tables with the spatial and temporal scale of climate change.

However, reinsurers offer the counterpoint. Reinsurers are very large, multinational companies that insure these primary insurance companies and cover losses above a certain threshold. They buffer primary insurers against significant losses from, say, extreme weather

events (e.g., hurricane). Reinsurers responded to climate change much earlier than primary insurance companies because they model global, long-term risks. They were able to see the relationship between the macro issue of climate change and its effect on extreme weather events. Although weather tends to be local and unpredictable, an extreme weather event in New Orleans can inflict major losses for the reinsurer and reduce the amount of reinsurance available in other markets (Haufler, 2009). At a macro scale, the increased frequency of extreme weather events and their impact on insurance claims become more apparent. Climate change has been an important issue for Munich RE, one of the world's largest re-insurance companies, for more than 40 years.

> *Proposition 2: Organizations are likely to miss latent issues if their attentional extent is too narrow vis-a-vis the scale of processes. Specifically, if the attentional extent is narrower than the scale of processes, latent issues will be missed.*

Please see the Appendix B for a precise mathematical representation and a graphical illustration of this proposition.

Attentional Resources

Given that issues will likely be missed if processes are observed through too coarse a grain or too narrow an extent vis-à-vis the scale of processes, observing all processes with a fine grain over a broad extent might appear to be an attractive choice. However, observing processes with fine grain and broad extent requires intensive attentional resources. It will produce a high-resolution image over a broad span of attention, generating significant data. If the data are inconsistent and cannot be easily reduced, organizations experience information overload

(Hansen & Hass, 2001). Organizations may have difficulty discriminating latent issues from noise or spurious patterns (Cash et al., 2006; Vaughan, 1996).

Bouquet and colleagues (2009) recognized that attention to the global environment might not always facilitate better performance, due to the scarcity of attentional resources in organizations. Based on an empirical study of 135 multinational enterprises (MNEs), they found a curvilinear, inverted U-shape relationship between 'international attention', defined as "the extent to which headquarters executives invest time and effort in activities, communications, and discussions aimed at improving their understanding of the global marketplace" (Bouquet et al., 2009: 108), and MNE performance. Given the limits to attentional resources, organizations tend to focus on the most familiar or most proximate signals (Dahlander & Piezunka, 2014; Haeckel, 2004). As a result, organizations may inadvertently miss the most important issues.

While frequent and broad scanning of the environment might be seen as beneficial for the firm's activities (Daft, Sormunen, & Parks, 1988), excessive international attention that seeks to obtain detailed information across various geographies can take up too much time and effort from the limited executive attention, leading to a negative impact on the MNE performance (Bouquet et al., 2009). Our interpretation of this finding is that a broad extent is necessary for understanding large-scale processes in the global marketplace, yet observing processes through a fine grain over a broad extent (e.g., a frequent and broad scanning of the environment over various geographies) requires intensive attentional resources.

Undisciplined fine grain, broad extent observation of all processes without recognizing the scale of the salient processes will tax organizational resources and potentially yield conflicting signals, increasing the likelihood of missing issues. We illustrate this phenomenon with an example of what is referenced colloquially as 'Big Data', which is the "capacity to

search, aggregate, and cross-reference large datasets" (Boyd & Crawford, 2002: 663) to "enhance decision-making by employing algorithmic power to gather worthy information out of unstructured data sets" (Strauß, 2015: 836). In the search for more information, organizations (e.g., retail, technology firms, and intelligence agencies) are collecting vast amounts of data and applying sophisticated analytics to identify signal patterns and to see latent issues (Feldman & March, 1981; George, Haas, & Pentland, 2014). However, the volume, velocity, and variety of data have inhibited some organizations from finding relevant and meaningful information (Bollier & Firestone, 2010). Data sets have become "so large (from terabytes to exabytes) and complex (from sensor to social media data) that they require advanced and unique data storage, management, analysis, and visualization technologies" (Chen, Chiang, & Storey, 2012: 1166). Wal-Mart is estimated to collect 2.5 petabytes (one quadrillion bytes) of data every hour from its customer transactions (McAfee & Brynjolfsson, 2012).

While the size of Big Data has received much attention of researchers, George and colleagues (2014) argue that the defining parameter of Big Data is essentially the grain. A big dataset usually contains information from a large number of participants, but even more importantly, contains complex information about individual behavior and actions (George et al, 2014). However, as technology has opened up opportunities to collect large quantities of data, decision makers are failing to consider the quality of data, mining datasets for correlations rather than solving problems (Mayer-Schönberger & Cukier, 2013). Schneier (2015) argues that data mining works best when there is a well-defined profile, the frequency of occurrence is consistent, and the cost of errors is low. For example, Big Data have been useful in identifying fraudulent credit card use by identifying purchase patterns that deviate from well-established purchasing

patterns. However, credit card companies will often freeze credit cards even when the purchases are legitimate, which can place consumers in peril.

Intelligence agencies have applied similar analytical techniques to counter-terrorism investigations. For example, the National Security Agency (NSA) developed Co-Traveler, which maps relationships among cell phone users' to identify significant correlations and hot spots of terrorist activities (Gellman & Soltani, 2013; Lyon, 2014). Edward Snowdon's files revealed that the NSA collects about 20 billion communication events per day (Greenwald, 2014). Yet terrorist attacks are rare and the costs of false-positives (or false-negatives) are high, as any signal of a potential terrorist threat warrants a lengthy and costly investigation to assess its validity (Schneier, 2015). The two terrorist attacks in Paris in 2015 -- the Charlie Hebdo in January and the Paris Massacre in November -- have been attributed to a lack of sufficient and focused attentional resources by intelligence agencies (MacAskill, 2015). MacAskill (2015) reported that 30-40 investigators, or 10% of French intelligence staff, are needed to investigate just one of the 11,000 people identified as potential threats to national security in France in order assess whether the threat is valid or merely a spurious correlation. The failure to stop the two Paris attacks raises questions about the value and suitability of Big Data to counter terrorism.

The example of Big Data shows that organizations can make costly errors in finding spurious relationships when they are collecting fine-grained data over a broad extent because such a vast amount of data requires significant resources to process and investigate. More significantly, at least for our theorizing, organizations will likely miss latent issues in Big Data because of limited attentional resources. Important variations may be suffocated by the noise of non-salient variations borne of spurious correlations. As Schneier (2015) suggests, "when you're

watching everything, you're not seeing anything" (p.17). The relationship is summarized in Proposition 3 and illustrated in Figure 2.

Proposition 3: Attentional grain and extent interact, so that increasingly more attentional resources are needed the finer the grain for a specific extent.

Insert Figure 2 about here

THEORETICAL CONTRIBUTIONS AND PRACTICAL IMPLICATIONS

Drawing on a critical realist perspective, we argue in this paper that prior research on organizational attention has either ignored the ontological features of issues or, inadvertently, confounded the epistemological concerns with those that are ontological. As a result, prior work has missed the opportunity to explore the dialectical relationship between the epistemological and ontological aspects of issues.

In particular, we highlight the importance of understanding the objective temporal and spatial attributes of processes, in other words, their scale, in assessing the ability of organizations to effectively notice latent issues. Based on our analysis of attentional grain and extent vis-à-vis the scale of processes, we advance prior research on organizational attention (Ocasio, 1997, 2011) by explaining why issues may be missed, even with high attentional quality (Rerup, 2009; Weick & Sutcliffe, 2006).

In this paper, we argued that organizations could miss latent issues because their attentional grain or extent are not appropriate for the scale of the processes being observed. We argued that organizations with attentional grain that is too coarse or attentional extent that is too narrow vis-à-vis the scale of processes are likely to miss latent issues. To counteract this risk,

organizations may seek to observe processes through fine grain and broad extent; however, such an approach could result in so many, potentially conflicting, signals that the organization would also miss latent issues. Figure 3 illustrates the conceptual model that we propose.

Insert Figure 3 about here

In this section, we describe in further detail some of the key contributions of our arguments and how they inform future research agendas and management practice.

Finding the Appropriate Attentional Grain and Extent for the Scale of Processes

We argue, in this paper, that processes harbor latent issues. To identify these latent issues, organizations must direct their attention to the appropriate grain or extent. Failing to apply the appropriate attentional grain and extent, relative to the scale of the process, will result in the possibility that latent issues will be misdiagnosed or missed altogether. The reason is because the dominant set of relationships associated with a process differs by the scale of the process. This matching of grain and extent with process scale is illustrated in Figure 4. A central question, then, is how can organizations know the appropriate grain and extent to match the scale of the process?

Insert Figure 4 about here

Before we answer this question, let us illustrate the challenge by returning to our opening example of the 2008 financial crisis. Firms and regulators were continuously monitoring and

assessing the stability of financial markets, but their data were insufficiently granular (lacked detail). Instead, analysts were collecting coarse, macroeconomic data, such as housing prices, which concealed the deterioration in loan quality (Demyanyk & Van Hemert, 2011). Hulten and Reinsdorf (2015) state that

> *"…macroeconomic statistics have other inherent limitations as leading indicators of emerging risks to financial stability. Their economy-wide perspective means that breadth of coverage is emphasized over depth of detail, and this bias is reinforced by the need to suppress much of the underlying detail in order to keep the databases manageable. In the process, important crisis-related microeconomic information may be buried in the statistical aggregates*" (p.2).

Fine grain, loan-level data would have revealed the high delinquency rates for loans lacking documentation (e.g., income verification) and originating with mortgage brokers (Jiang, et al., 2014).

Michael Lewis (2011) describes in his book, *The Big Short*, how savvy investors uncovered the risk associated with subprime mortgage bonds through fine grain data. Michael Burry, founder, and head of Scion Capital, was worried that the appreciation in housing prices would lead individual home buyers to default on their loans, so he reviewed the prospectuses of more than 100 subprime mortgage bonds, calculating more than 10 indicators including loan-to-value ratios, locations of homes, and proof of income of the borrower. As well, Lewis (2011) describes how Steve Eisman, of FrontPoint Partners, wondered why the mortgage default rate in Georgia was five times higher than in Florida, despite similar unemployment rates (Lewis, 2011). Eisman sent staff to Miami to knock on doors in neighborhoods built with subprime loans, only

to discover that many of those houses were empty (Lewis, 2011). In both cases, only the fine-grained data (i.e., lending and borrowing practices) illuminated the risk of the financial crisis – a risk that the former CEO of Citigroup, Charles Prince, and his advisor, Robert Rubin, did not foresee.

To identify latent issues, organizations must understand the dominant processes and the nature of the relationships among the elements of a system. The failure to identify latent issues may mean that either there are no latent issues, or the analyst is investigating the processes through the wrong attentional grain and extent.

Unfortunately, there is little guidance that we can gather from prior research to guide organizations' attentional grain and extent when issues remain latent. Metcalf (1940) argues that the 'practically unobservable' requires the use of senses and intuition to understand the dominant processes before data are gathered. Further, ecologists advise that researchers start with fine grain and narrow extent, when there is little a priori knowledge, to identify process anomalies and then broaden their extent and coarsen their grain to see if other anomalies arise (Thompson & McGarigal, 2002). We could also see an alternative possibility, where researchers should start with a coarse grain over a broad extent and increase the resolution where they suspect latent issues may lie. Montello (1998) recommends that researchers learn by trial and error, sampling data with a range of grain and extent and systematically building insights about the relationships that define the various processes.

Where we find the strongest guidance in determining the appropriate grain and extent is through our experience as organizational researchers, who must determine the appropriate level of analysis in investigating a research phenomenon. Researchers often commit cross-level fallacies by inferring outcomes from one level of analysis to another. Researchers are often

required to defend their choice of level of analysis (that is, their epistemological assumptions), in order to justify their investigation of the empirical phenomena (that is, their ontological target).

The level of analysis should not be confused with scale. The *level of analysis* is inherently epistemological and scale is ontological (Allen 1998). The level of analysis aims to uncover patterns of variations in the scale of processes. Further, the researchers' *unit of analysis* is the grain and the research *time frame* and *geographical scope* reflects the temporal and spatial extent. Researchers must choose the appropriate unit of analysis and scope to justify their ability to detect variations in space or time. And, increasingly, researchers are encouraged to explore phenomena at multiple levels of analysis (Hitt, Beamish, Jackson, Mathieu, 2007).

From this analogy, we gain some insights that can inform the question of how organizations can identify the appropriate attentional grain and extent. First, organizations must understand the dominant processes for the processes that they are exploring. Just as researchers must justify their research frames based on their specific context, organizations must systematically and deliberately understand the relationships among the elements of the system. Second, organizations will benefit from capturing insights from multiple spatial and temporal scales, as processes are inherently connected. Micro-processes can affect macro processes and vice versa. Finally, given the dynamic nature of processes and the presence of thresholds of change, organizations should contextualize current insights with historical data and be open to non-linear changes as processes move to new equilibria.

However, organizations tend to routinize their attentional structures to focus on specific grain and extent (Ocasio, 1997). A dominant attentional perspective is "equivalent to the dominant strategy of the firm, when strategy is defined as a perspective on how to allocate resources in the firm" (Ocasio, 2011: 1288). Entrepreneurial, high growth firms are more likely

to exhibit narrower temporal extent and finer grain than large multinationals because of the differences in their dominant strategies. Similarly, family owned firms tend to exhibit broad temporal extent because of the emphasis on intergenerational succession as opposed to the daily trading of stock markets (Miller, Steier, & Le Breton-Miller, 2003). It is important, therefore, for organizations to be cognizant of their attentional biases and deliberately impose structures that will focus attention on the salient processes that harbor latent issues.

Extending Ontological Considerations to Organizational Attention Research and the Carnegie School

Our theory of scale and organizational attention challenges the epistemological bias of prior literature on organizational attention, and more broadly, organizational research in the Carnegie School tradition. Indeed, the epistemological and ontological considerations of scale are often confounded, so that researchers and managers alike fail to discriminate between the scale of *what* they are seeing (the scale of the process) from the scale of *how* they are seeing (the grain and extent of their attention). Before we discuss our contributions, we first describe the organizational processes of search within the Carnegie School – a stream of literature closely connected to other streams of literature such as adaptation and "long jumps" on rugged landscapes.

The concept of search is critical in the work of the Carnegie School, which fundamentally challenges the assumption of rational choice, which assumes that choices can be known and consequences determined and optimized. The Carnegie School argues that rather than optimizing, organizations tend to satisfice given attentional limitations and search costs (Cyert & March, 1963; Simon, 1947). As a result, organizations will often confine searches to familiar experiences in proximate times and places, despite the importance of distant search for

significant transformations (Levinthal, 1997; Li, Maggitti, Smith, Tesluk, & Katlia, 2013). Levinthal (1997) argues that the organizational tendency to prioritize local search over distant search can threaten the organizations' survival.

The Carnegie School has focused on organizational processes, specifically the cognitive processes for acquiring and evaluating knowledge. For example, researchers argue that decision makers can engage in more distant search by making cognitive connections between proposed actions and their outcomes (Gavetti, Greve, Levinthal, & Ocasio, 2012; Gavetti & Levinthal, 2000; Gavetti & Ocasio, 2015; Levinthal, 2011). The ontology of the real world, which constitutes the repertoire of alternative choices and their consequences to organizations, has received limited research attention.

The realist ontology that we employ brings into sharper relief the dialectical tension between the epistemological experience of organizations and the ontological properties of issues. By discriminating the epistemological from the ontological, we can analyze the attributes of real processes that are salient to real issues. Specifically, we believe that the abnormal variations in real processes, over time and space, are central in identifying latent issues. We, therefore, complement the work of the Carnegie School and attention researchers by suggesting that, no matter how good the quantity and quality of the cognitive resources for search and decision-making are, organizations may miss latent issues when their cognition is not aligned with the temporal and spatial attributes of the relevant real processes.

Our work offers new insight into previous studies. For example, Katila (2002)'s study in the robotics industry found that searching for old intra-industry knowledge hurt innovation, but old extra-industry knowledge promoted innovation. The results can be explained by the different temporal attributes of processes within and outside of the robotics industry. If the intra-industry

processes were rapidly changing and the external processes were evolving slowly, a broad temporal extent (i.e., searching for old knowledge) would be necessary to acquire and evaluate extra-industry knowledge. In contrast, a broad extent would be less relevant or even harmful to the understanding of intra-industry knowledge, which primarily requires observation through a fine grain (e.g., more frequent search for information).

Furthermore, our theory differentiates attentional grain and extent, thereby providing a deeper understanding of epistemological acts in organizations and their interaction with the real world. Prior research presents a puzzle that distant search can lead to a large pool of information (i.e., "crowding"), so that organizations prioritize familiar knowledge – which is a process often associated with local search (Piezunka & Dahlander, 2015).

Our argument on the practical challenge of combining a fine grain with a broad extent helps to explain why this might be the case. If an organization's distant search involves not only a broad extent but also a fine grain, the search is likely to result in a large amount of information, which requires intensive cognitive resources. Firms will ultimately shortcut to familiar knowledge. Whereas the Carnegie School has focused primarily on local and distant search as binary distinctions, we offer insight into the cognitive structures that would make some jumps more distant -- those that have very different grain and extent than currently being applied by the organization. Organizations do not need to necessarily widen their extent and focus their grain in order to make long jumps; instead, we are proposing that they more closely align their grain and extent to processes that are outside of their normal field of view. We expect that future research can apply the concepts of attentional grain and extent to clarify different types of search and investigate their effectiveness in understanding processes, which have different temporal and spatial attributes.

Sizing Up Versus Scaling Up

The conceptualization of scale as temporal and spatial attributes of processes has implications for the wider organization and management scholarship in rethinking size and scale, such as those pertaining to 'economies of scale' and 'scaling up'. Scale is frequently equated with organizational size and 'scaling up' often simply means 'sizing up' (Josefy, Kuban, Ireland & Hitt, 2015). Our theorizing suggests that moving across scales requires an understanding of the processes that ground the scale of activities. Size is often decontextualized from the spatial and temporal context, but scaling up requires a deeper understanding of the relationship between temporal and spatial attributes of underlying processes. Successful 'scaling up' requires not only shifts in geographical coverage but also temporal horizons. Organizations that 'size up,' without taking care to 'scale up,' will shift attention to a broader extent and coarser grain, without seeing the blind spots in fine grain. There are both ontological and epistemological considerations.

Scholars have argued that time and space are being compressed in organizations (Bansal & Knox-Hayes, 2013), as organizations' temporal horizons are becoming increasingly short term (Laverty, 1996) and their global horizons becoming increasingly broader (Harvey, 1989; Massey, 1994). In other words, organizations' spatial scale is increasing, while their temporal scale is decreasing. Organizations are speeding up while also spreading out and sizing up. These 'real' changes to organizations are causing unintended consequences. For example, short-termism among organizations has been argued to be the source of global sustainability challenges (Bansal & DesJardine, 2014). Organizations are failing to make necessary investments in long-term organizational processes, such as research and development and stakeholder engagement, which helps secure the long-term stability of the organization.

As well, this time-space incongruity is causing incongruities in organizational attention. Organizations risk missing important latent issues that arise from fast, local processes (as their spatial scale is increasing) as well as slow, global processes (as their temporal scale is shrinking). Furthermore, by sizing up, without scaling up attentional structures, organizations also risk contributing to the variability in processes that will heighten the likelihood in the manifestation of latent issues.

We illustrate this point through the example of poverty, one of the 'grand challenges' for organizations and society (Colquitt & George, 2011; Margolis & Walsh, 2003). Definitions of poverty vary from "lacking sufficient money to meet basic physical needs" (Lister, 2004: 21) and "inability to participate [in society] owing to lack of resources" (Nolan & Whelan, 1996: 193) to "the failure of basic capabilities to reach certain minimally acceptable levels" (Sen, 1992: 109). Whether the focus is on the low level of income and resources or the lack of capabilities, poverty is understood as a condition that prevents human beings to fulfill their needs and 'flourish' in their lives (Nussbaum, 1995).

Poverty is a complex issue that is underpinned by "economic, social, and political structures and processes – from the global to the local" (Lister, 2004: 24). On the one hand, poverty can be created, exacerbated, and perpetuated through large-scale processes. For example, the privatization, deregulation, and trade liberalization policies pursued by International Monetary Fund (IMF) and other international institutions have been criticized as aggravating poverty and inequality around the world, particularly in developing countries (Chossudovsky, 2003; Stiglitz, 2002). On the other hand, poverty is also driven by economic, social, cultural, and political structures and processes in specific local spaces. Local power relations, class systems, religious beliefs, and social norms shape the capabilities of individuals and groups to meet their

needs and participate in society, as can be seen from the exclusion of women from market-based activities in rural Bangladesh (Mair, Marti, & Ventresca, 2012) or the centrality of ethnic relations in governing access to resources in Kenya (Horowitz, 1985; Miguel & Gugerty, 2005). As a result, poverty reduction often requires an ability to target specific geographical areas, i.e., 'pockets of poverty' (Baker & Grosh, 1994; Bigman & Fofack, 2000), based on the observation and understanding of local issues through a fine grain.

Organizations aiming to alleviate poverty, such as nongovernmental organizations (NGOs) and social enterprises, seek to 'scale up' in order to expand their social impact (Uvin, 1995; London, 2016). In practice, the attempt to scale up is often reduced to 'sizing up' by replicating a standardized solution that aims to address poverty across the globe. The 'sizing up' approach neither transforms macroeconomic and political structures nor provides specific solutions to local problems across different contexts. Instead, it replicates a practice from one space to others, without attending to local and global processes that underpin poverty.

The globalization of microfinance is a case in point. Microfinance provides financial services to the poor, most frequently in the form of small-size loans that can be invested in entrepreneurial activities. Muhammad Yunus, who was awarded the Nobel Peace Prize in 2006 for founding the Grameen Bank and pioneering the concept of microfinance, says that he uncovered the original idea of microfinance by observing local practices in Jobra, a village in Bangladesh. Yunus and his students visited the Jobra village, met poor artisans (e.g., bamboo stool makers) who borrowed money from a local moneylender at high-interest rates and found that 42 villagers needed only $27 to buy their raw materials. Yunus made an interest-free loan to the artisans in Jobra, and later established the Grameen Bank as a microfinance institution

(Yunus & Jolis, 2003). In other words, Yunus developed his ideas from a fine-grained understanding of the processes underlying poverty in a specific local context.

Microfinance was 'sized up' across geographies with mixed results (Karnani, 2007, 2011). Many organizations (including the World Bank and commercial banks) have attempted to replicate microfinance services throughout the globe, without the appropriate grain to observe local processes -- specifically the social, economic, cultural, and political processes that underpin poverty in local communities (Bateman, 2010; Hulme & Arun, 2011). Despite the success stories in some regions and communities, microfinance programs led to negative consequences in other areas, including suicides resulting from problems of repaying loans – which have become known as "microfinance suicides" (Hulme, 2000; Hulme & Arun, 2011). In other words, the effort to 'size up' microfinance resulted in a coarse attentional grain and the failure to recognize regional differences. As a result, organizations did not see the latent issues of local distress, such as harassments by loan officers and collection agents to increase loan recovery rates and their implications in a specific cultural setting (e.g., rural India), which eventually led to the suicides of borrowers (Hulme & Arun, 2011; Sinclair, 2012).

Furthermore, some of the negative consequences were related to the effect of sizing up itself, because the distribution of small loans to a large number of low-income individuals led to the rapid growth of microenterprises, which fiercely competed against one another in the limited local market (i.e., comprised of poor consumers) and often failed to produce returns to lift their households out of poverty (Bateman, 2010). In townships around Johannesburg in South Africa, for example, the informal microenterprise sector was already crowded with local street traders who were struggling to survive. With microfinance services for refugees from crisis-torn Mozambique and Zimbabwe, the number of street traders further increased and their returns fell,

which was seen as one of the factors behind violent attacks towards refugee camps around Johannesburg in 2008 (Bateman, 2010; The Economist, 2008). However, with the sizing up of microfinance across the globe, most international donors and microfinance institutions did not have the fine grain necessary to observe the issues of poverty in specific local spaces. The problem of a spatially coarse grain was further aggravated by the problem of a temporally narrow extent, as microfinance institutions often focused on the immediate results (e.g., loan recovery rates, the number of borrowers) to attract more investment, rather than the long-term impact of their programs (Bateman, 2010; Sinclair, 2012).

Through a deeper understanding of scale and its implications for organizations, our theory provides an opportunity to reflect on the difference between scale and size. Whereas size does not make attributions to real processes, scale assumes both temporal and spatial properties with correlated processes. Organizations that 'scale up' require organizational processes that are not only able to cover a broad geographic, but also temporal, extent. If the underlying processes in which the organization is engaged are inherently local or long-term, then they are at risk of missing latent issues if they size up.

Further research can apply the concept of scale to critically examine the existing practice of scaling up and explore alternative ways for organizations to engage in the temporal and spatial attributes of different processes. For example, large-size, centrally mandated and controlled organizations (e.g., multinational corporations, international NGOs) might not be able to effectively notice and act upon local, regional, and global issues. However, through alternative organizational structures, such as partnerships or distributed governance, organizations might be able to employ multiple attentional grains and extents. For example, Oxfam (an international NGO) works with over 3,000 partner organizations in more than 90 countries to carry out

specific projects which address the issues of poverty in local contexts, whilst simultaneously leading a campaign to reform global food system as a structural cause of poverty (Oxfam, 2015). We call for more research that attends to the concept of scale beyond organizational size and the different ways of scaling up.

Final Thoughts

We were motivated to explore the ontological and epistemological interface of issues because of the authors' shared interest in organizations and sustainable development. Sustainability issues include financial crises, climate change, and poverty – the issues that have animated the theory in this paper. Sustainable development ensures that the needs of present generations do not compromise the needs of future generations (World Commission on Environment and Development, 1987). Although the aspiration of sustainable development is laudable, organizations often do not meet these aspirations. We were motivated in understanding why.

Much research into sustainable development within business schools enters the analytical frame from the perspective of the organization. Researchers tend to investigate the antecedents and consequences of organizational actions for sustainable development. However, these factors tend to be constructions of the organization.

As researchers of sustainable development, we find our interests lie in 'real' issues. We wanted to shift the focus to the issue itself, raising the possibility that organizations may not act on sustainability, not because individuals in the organization do not care, but because the organization has not established the procedural or communication structures to see the issues. By providing the linguistic and analytical toolkit to explore the ontological and epistemological interface of issues, we believe that we can help shift organizational attention to those issues that

are often missed – issues that are not only salient to organizations, but also to society. In doing so, we hope that we can intensify the message conveyed by Ulrich Beck (1992) and others (e.g. Harvey, 1989) of the real risks created by industrialization and technology.

As organizations extend their global reach and become increasingly interconnected, the risk of latent issues is amplified. Furthermore, organizations may not only fail to respond to issues, they may potentially further disrupt the processes that harbor such latent issues. In this paper, we argue that the costs lie not just to organizations, but that they can create real harm to social and biophysical environments (e.g., poverty, climate change). Further, as organizations size up, without scaling up, organizations risk missing the dynamics of the connections among different elements in processes, which further amplifies the risks. Organizations have the ability to inadvertently impact real processes in potentially unimaginable ways. We hope, in this paper, to have provided the toolkit to allow for a deeper appreciation of organizations to scale. In doing so, we hope that organizations will be better equipped to address some of these important latent issues.

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TABLE 1

A Review of Issues in Organizational Attention Research

Author(s), (Date)	Conceptualization of Issues
Barnett (2008)	Opportunities in real options reasoning
Barreto & Patient (2013)	Opportunities and threats in exogenous shock (e.g., natural gas deregulation)
Blettner, He, Hu & Bettis (2015)	References points (i.e., prior aspirations, prior performance, and prior performance of reference groups)
Bouquet & Birkinshaw (2008)	New products or services, or new market opportunities
Bouquet & Birkinshaw (2009)	Issues central to the purpose of the organization that arise in the global marketplace
Bouquet, Morrison & Birkinshaw (2009)	Opportunities and threats through global scanning
Bundy, Shropshire & Buchholtz (2013)	Opportunities and threats in issues raised by stakeholders
Castellaneta & Zollo (2015)	Strategic activities (e.g., alliances, acquisitions, divisions in a multi-business firm)
Cho & Hambrick (2006)	Problems, opportunities, and threats (e.g., deregulation in the airline industry)
Crilly & Sloan (2012)	Opportunities and threats associated with attending to stakeholders
Crilly & Sloan (2014)	Social and environmental issues related to stakeholders
Collet & Philippe (2014)	Threats and opportunities in the formation of alliances
Dane (2013)	Opportunities and threats in legal trials
Desai (2014)	Notable events or important categories of performance
Durand & Jacqueminet (2015)	Normative demands from headquarters and local external constituents
Hoffman & Ocasio (2001)	Interpretation of events that affected the natural environment and

	the U.S. chemical industry (e.g., Exxon Valdez spill)
Joseph & Gaba (2015)	Historical and social performance assessments
Joseph & Ocasio (2012)	Divisional opportunities and threat (e.g., strategic, planning, financial, human resource, technological, or operational)
Levy (2005)	Opportunities for expansion beyond the domestic market
Li, Maggitti, Smith, Tesluk, & Katila (2013)	New information and knowledge that can be used for new product development and innovation
McMullen, Shepherd & Patzelt (2009)	Competitive threats
Muller & Whiteman (2016)	Emergent human need
Nadkarni & Barr (2008)	Strategic issues (e.g., a regulatory change or new technology)
Ocasio & Joseph (2005)	Internal problems/concerns or external opportunities
Ocasio & Joseph (2006)	Corporate strategic issues (e.g., operating and planning)
Ocasio & Joseph (2008)	Problems, opportunities, or threats
Peeters, Dehon & Garcia-Prieto (2014)	Global sourcing initiatives
Peeters Massini & Lewin (2014)	Internal innovation objectives
Piezunka & Dahlander (2015)	Suggestions from external contributors
Ren & Guo (2011)	Entrepreneurial opportunities
Rerup (2009)	Collaboration, marketing, regulatory compliance and product quality assurance following a merger
Surroca, Prior & Tribó Giné (2016)	Strategic dimensions of environmental threats and opportunities
Vuori & Huy (2016)	Emerging strategic issues in the external environment
Wei, Zhao & Zhang (2014)	Competition and market opportunities
Wilson & Joseph (2015)	Problems within and between business units
Zbaracki & Bergen (2015)	Price adjustment problem

TABLE 2

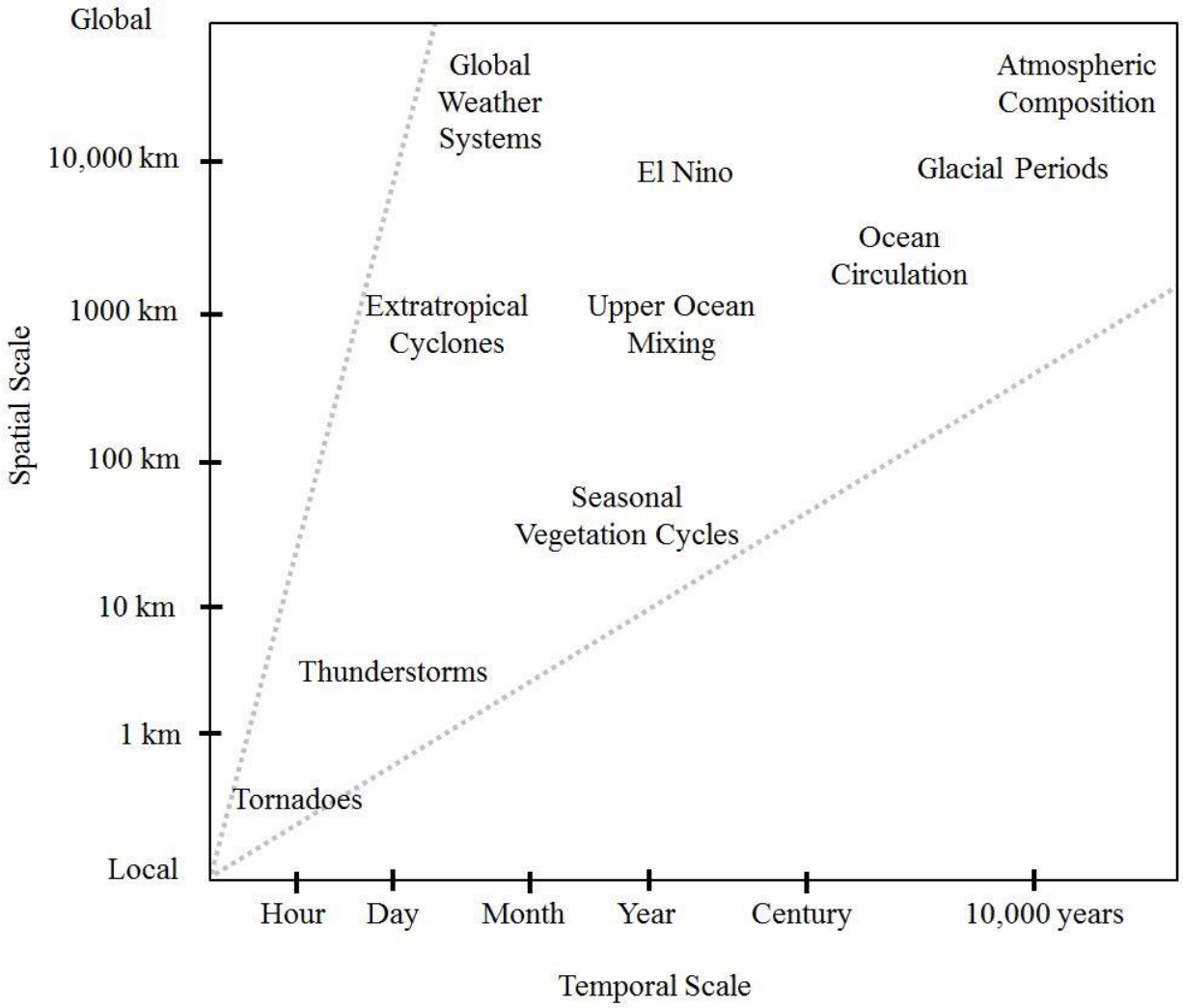
Theoretical Concepts and their Definitions

Concept	Definition
Attentional extent	The range of measurement used to observe a process in space and time and is measured along a continuum from narrow to broad
Attentional grain	The smallest unit of measurement used to observe a process in space and time, which can range from fine to coarse
Empirical	The domain of epistemological experience (e.g., measurement)
Epistemology	The study of the nature of knowing
Issues	Events, developments, and trends that have organizational consequences
Latent Issues	Events, developments, and trends that have potential organizational consequences
Ontology	The study of the nature of being
Organizational attention	"[T]he noticing, encoding, interpreting, and focusing of time and effort by organizational decision-makers on both issues and answers" (Ocasio, 1997: 189)
Process	Real structures and things in constant formation, reformation, and transformation over space and time that exhibit real spatial and temporal attributes and exist irrespective of their experiences.
Real	The domain of structures and events that reflect the dynamic mechanisms in both natural and social worlds

Scale	The spatial and temporal attributes of processes
Signal	A piece of information about a process

FIGURE 1

Spatial and Temporal Coupling of Biophysical Processes



Source: Adapted from Clark (1987) and NASA Advisory Council (1988)

FIGURE 2

The Interaction between Grain and Extent on Attentional Resources

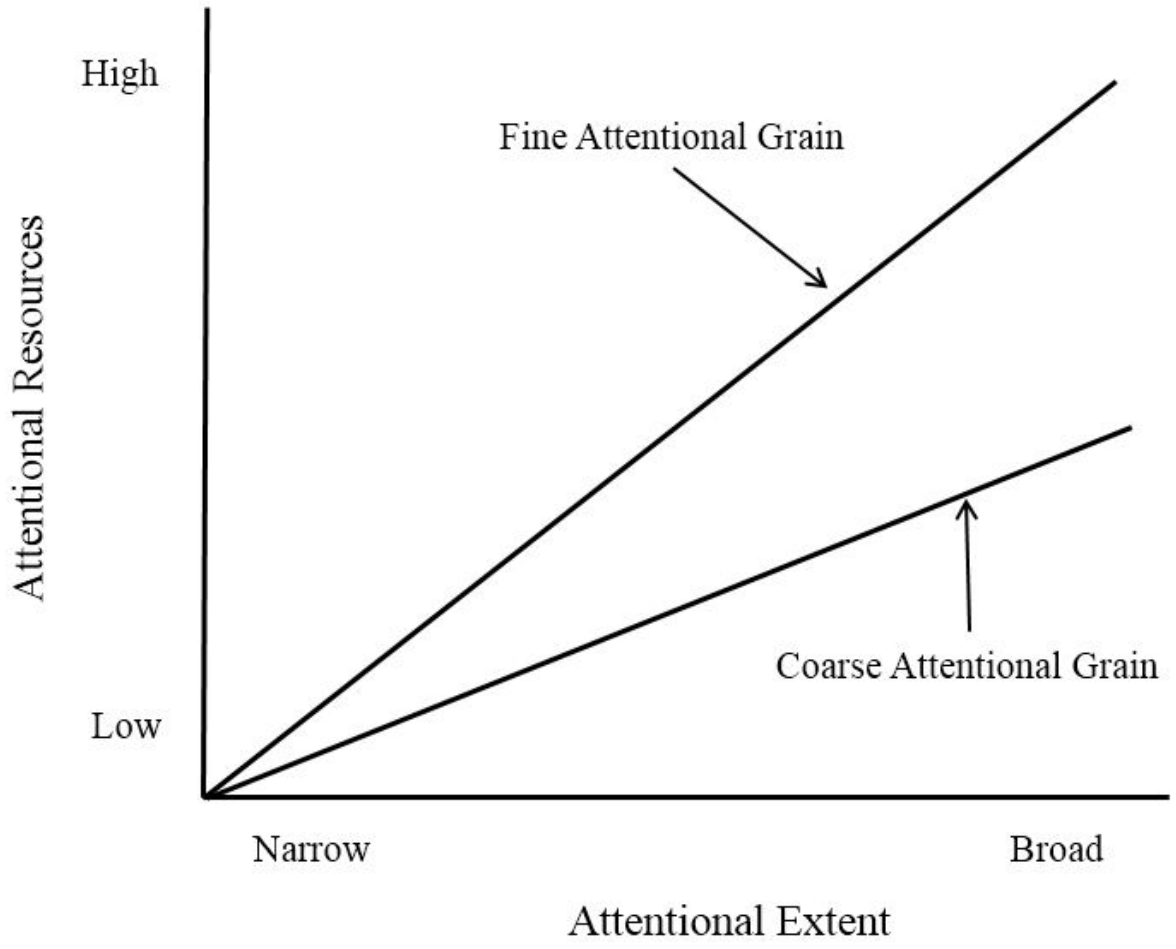


FIGURE 3

A Conceptual Model of Organizational Attention to Latent Issues

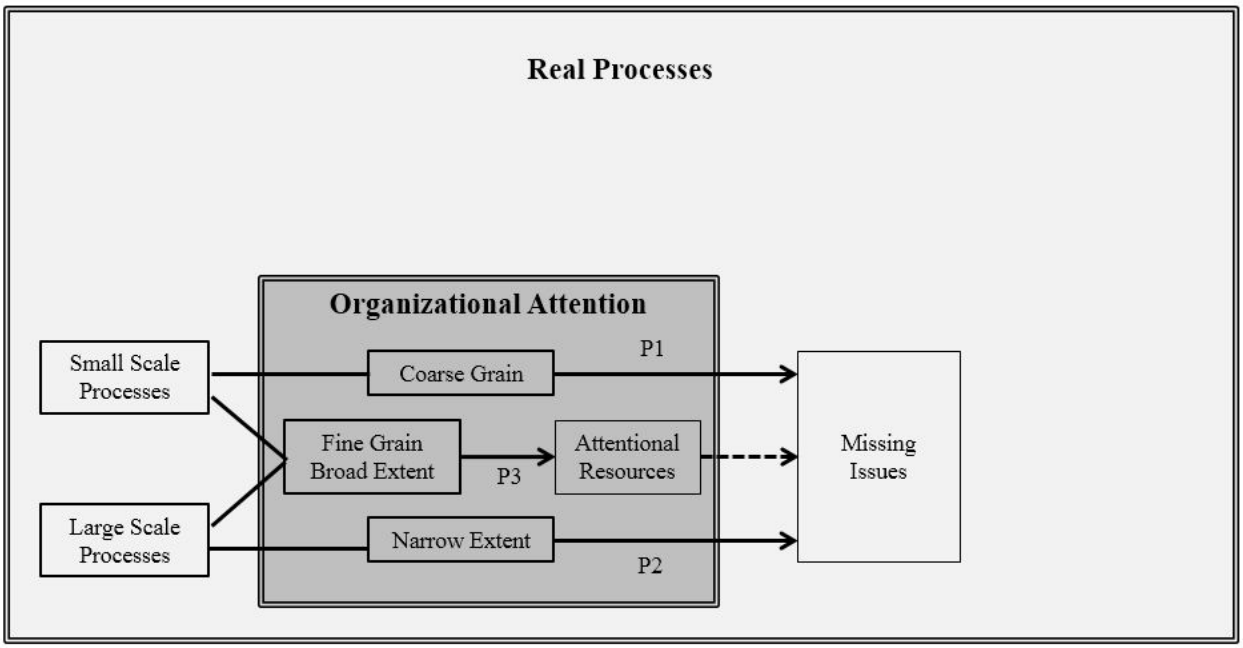
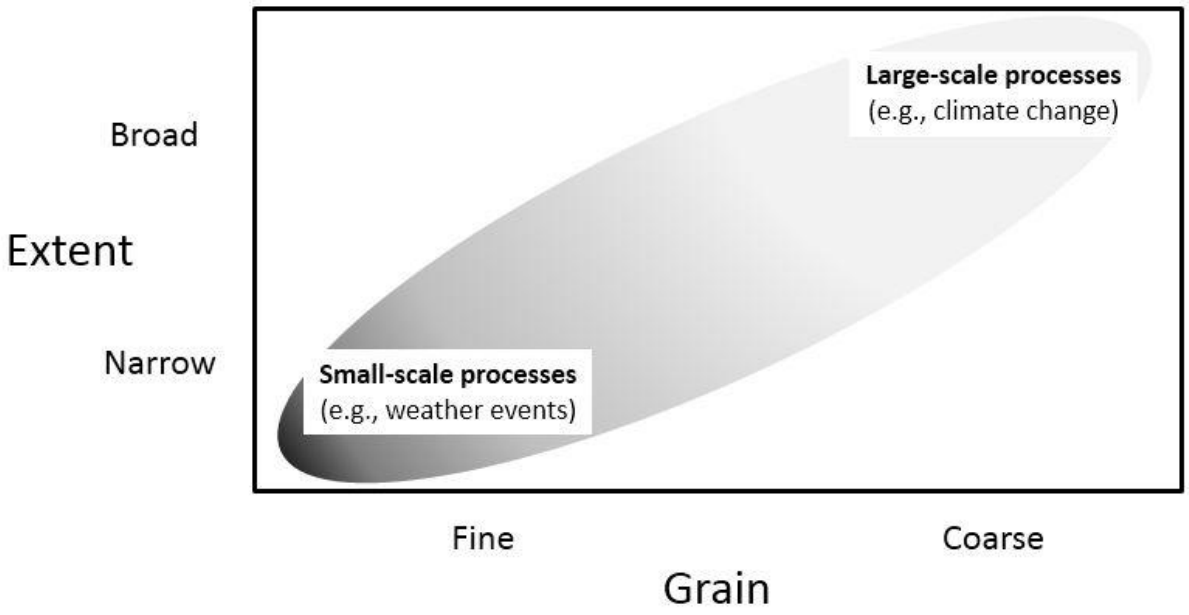


FIGURE 4

Attentional Grain and Extent for Processes of Different Scales



APPENDIX A

Precise Propositions for Grain

Natural Language

Given fixed attentional resources:

(1a) The smaller the scale, the greater the likelihood that issues will be missed for a given grain

(1b) The finer the grain, the less the likelihood that issues will be missed for a given scale

(2a) With very coarse grains, there is very high likelihood that issues will be missed

(2b) At very small scales, there is very high likelihood that issues will be missed with a given grain

(3a) For very fine grains, there is a small likelihood that issues will be missed

(3b) For very large scales, there is a small likelihood that issues will be missed with a given grain

Mathematical Language

Let S=scale

G=grain (the finer the grain, the larger the number)

L(S,G)=likelihood of missing an issue with scale S and grain G

(1a) L(S,G) monotonically increases when G is fixed and S decreases

(1b) L(S,G) monotonically decreases when S is fixed and G increases

(2a) For a fixed scale S, $\lim_{G\to 0^+} L(S,G) = 1$ and $\lim_{G\to 0^+} \left(\frac{\partial L}{\partial G}\right) = 0$

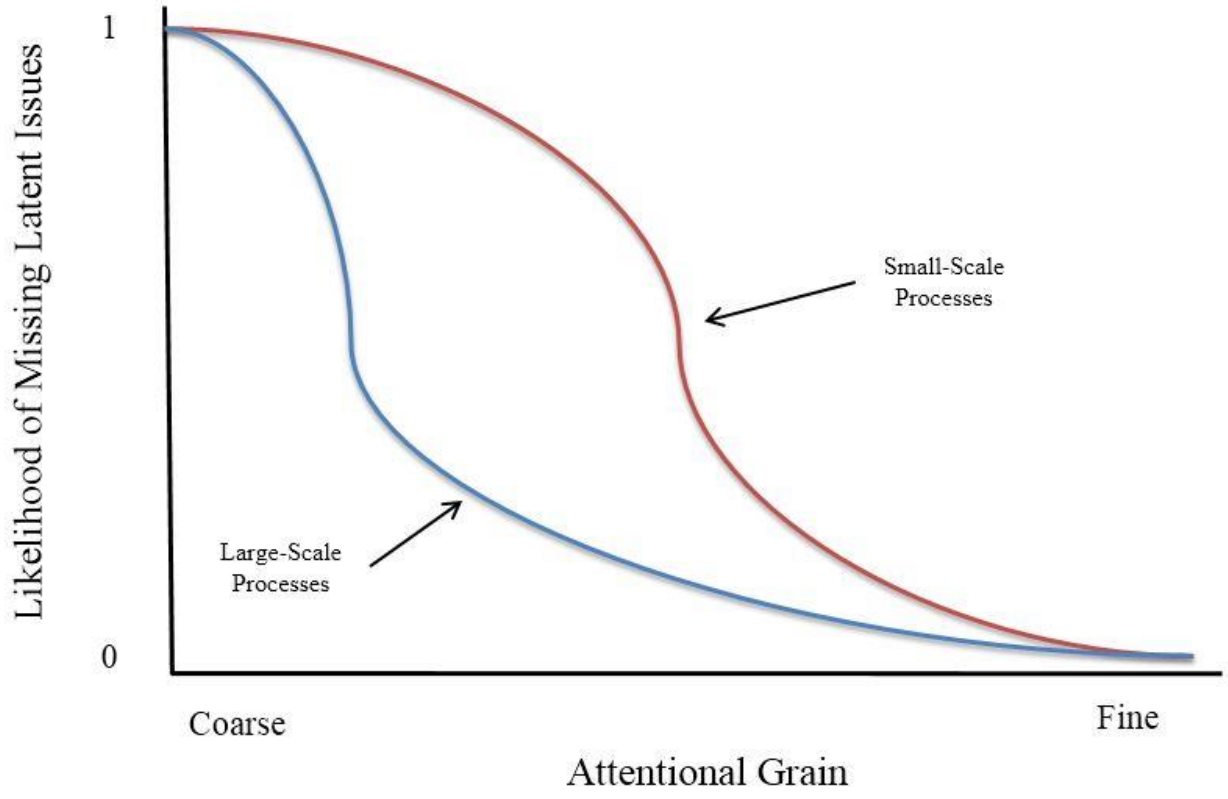
(2b) For a fixed grain G, $\lim_{S\to 0^+} L(S,G) = 1$ and $\lim_{S\to 0+} \left(\frac{\partial L}{\partial S}\right) = 0$

(3a) For a fixed scale S, $\lim_{G\to \infty} L(S,G) = 0$

(3b) For a fixed grain G, $\lim_{S\to \infty} L(S,G) = 0$

L (S, G) is a continuous function, bounded by the conditions above (1a-3b).

The following graphs are illustrative; inflection points will differ based on the empirical context.


1
0
Likelihood of Missing Latent Issues
Small-Scale Processes
Large-Scale Processes
Coarse
Fine
Attentional Grain

APPENDIX B

Precise Propositions for Extent

Natural Language

Given fixed attentional resources:

(1a) *The greater the scale, the greater the likelihood that issues will be missed for a given extent*

(1b) *The greater the extent, the less the likelihood that issues will be missed for a given scale*

(2a) *With very narrow extents, there is very high likelihood that issues will be missed*

(2b) *At very large scales, there is very high likelihood that issues will be missed with a given extent*

(3a) *For very broad extents, there is a small likelihood that issues will be missed*

(3b) *For very small scales, there is a small likelihood that issues will be missed with a given extent*

Mathematical Language

Let S=scale

E=extent (the broader the extent, the larger the number)

L(S,E)=likelihood of missing an issue with scale S and extent E

(1a) L(S,E) monotonically increases when E is fixed and S increases

(1b) L(S,E) monotonically decreases when S is fixed and E increases

(2a) For a fixed scale S, $\lim_{E\to 0^+} L(S,E) = 1$ and $\lim_{E\to 0^+} \left(\frac{\partial L}{\partial E}\right) = 0$

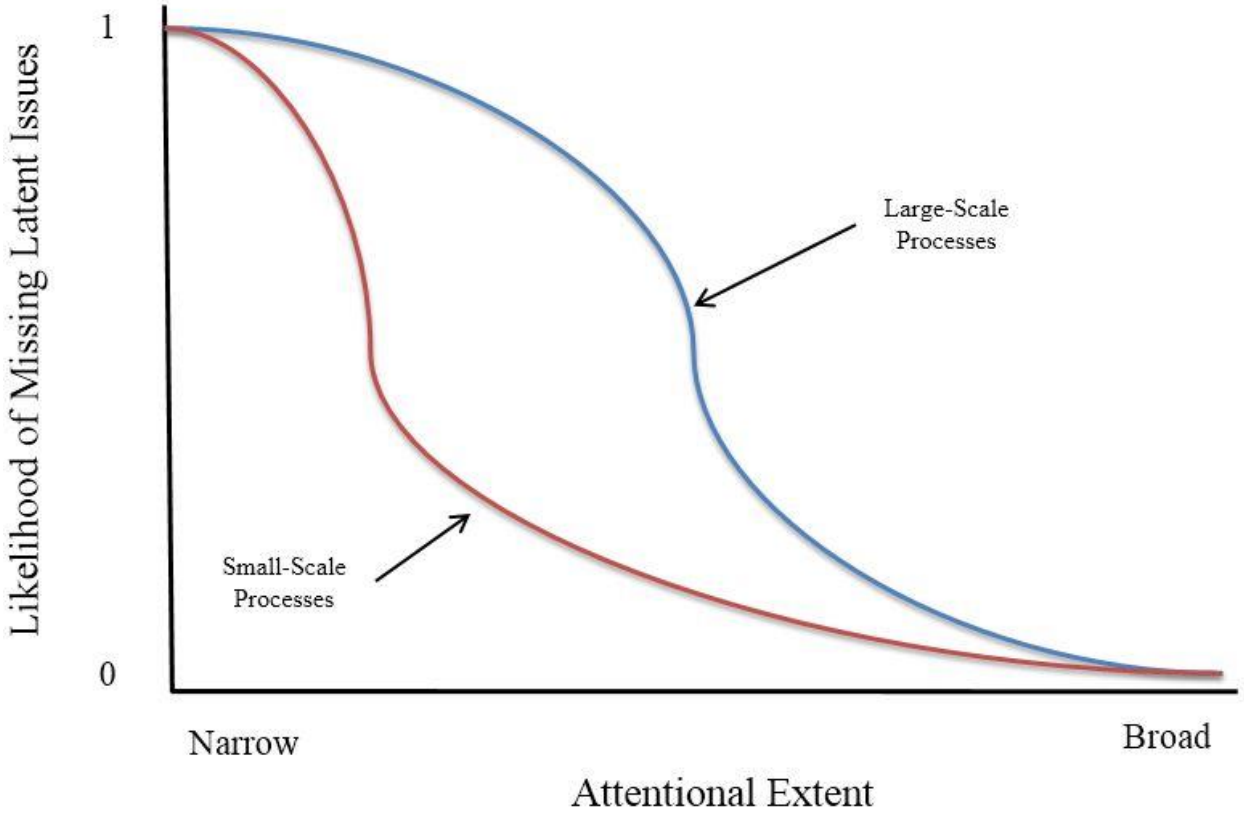
(2b) For a fixed extent E, $\lim_{S\to \infty} L(S,E) = 1$ and $\lim_{S\to \infty} \left(\frac{\partial L}{\partial S}\right) = 0$

(3a) For a fixed scale S, $\lim_{E\to \infty} L(S,E) = 0$

(3b) For a fixed extent E, $\lim_{S\to 0^+} L(S,E) = 0$

L (S, E) is a continuous function, bounded by the conditions above (1a-3b).

The following graphs are illustrative; inflection points will differ based on the empirical context.


1
0
Likelihood of Missing Latent Issues
Large-Scale Processes
Small-Scale Processes
Narrow
Broad
Attentional Extent

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