International Journal of Communication 9(2015), 106–132 1932–8036/20150005

A Toxic Crisis: Metaphorizing the Financial Crisis

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The recent financial crisis has been covered in newspapers with metaphors such as *toxic assets* and *toxic loans.* Although these groups of related metaphors (i.e., metaphor families) may strengthen the intended images on the topic under discussion, they have been only seldom studied in metaphor research. This article investigates the ways in which metaphor families fulfill a translator role for emerging terminology in financial discourses. We explore the expansion and evolution of the *toxic* metaphor family, revealing subtle changes of metaphor use in three newspapers over time. Our results show a transition from generic image-creating metaphors toward financial-instrument–targeted metaphors. Overall, the evidence brought by this study is a stepping-stone for further research on metaphor families.

Keywords: metaphor, semantic networks, financial crisis, structural space

"The growing use of the language of toxicity during the past two decades may be attributable to the fact that it conveys a destructive force, a poison, or a dysfunction spreading throughout an environment, a human body, or a human system" (Goldman, 2008, p. 243).

Whereas the metaphors of choice in the late 1990s savings and loan crisis evoked fears of *contagion*, the 2008 financial crisis moved toward "environmental and climatic rather than epidemiological metaphors." (Smith, 2009, p. 409) A set of novel metaphorical combinations such as *toxic assets*, *toxic loans*, and even *toxic banks*, which frame the financial system and its main operations negatively, has increased in use in most newspapers. The repeated use of such related metaphors has the potential to strengthen the images they invoke while at the same time potentially strengthening each individual metaphor to the point of conventionalization.

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Date submitted: 2014–05–21

[1] Authors' note: The first and the second authors gratefully acknowledge the financial support of The Netherlands Organization for Scientific Research, NWO, grant number NWO-Aspasia 015-007-047.

Metaphors are defined as cross-domain mappings across two separate domains of experience: a source and a target domain (Lakoff & Johnson, 1980). Discussing the financial crisis in terms of *toxic loans*, for example, maps together the source domain of *toxic* and the target domain of *loans* and builds an image of loans as something highly negative and perhaps even lethal. The same source domain can be used for describing several related issues, such as *toxic banks* and *toxic assets*. In metaphor research, such related metaphors have seldom been studied despite the important role they play in strengthening a specific image or a frame of the issue. Metaphors may be regarded as "condensed" ways of framing issues (Snow & Benford, 1992) and as providers of specific perspectives on issues (Gamson & Modigliani, 1989). Our focus is on the framing of the financial crisis as toxic by investigating the family of *toxic* metaphors. We define a metaphor family as a set of metaphors that use the same source domain but different target domains.

In this article, we systematically map the evolution of the *toxic* metaphor family in three newspapers, *The Sun* (*Sun*), *The New York Times* (*NYT*), and *The Financial Times* (*FT*), each representing a different level of specialization and audience, over a five-year period prior to, during, and after the financial crisis. We extend metaphor research beyond the analysis of single metaphors to a family of related metaphors. In particular, we are interested in the stage of the financial crisis that leads to the emergence and expansion of the *toxic* metaphor family. We expect the three newspapers to use *toxic* metaphors differently because their audiences are different.

Metaphors of the Financial Crisis

The different metaphor theories that have been developed over the years (e.g., Black, 1962; Johnson, 1981; Lakoff & Johnson, 1980; Ortony, 1993) approach metaphors as discussing a concept in terms of a different concept, thus transferring meaning from one concept to another. Divided into substitution and interaction theories, these theories differ by "locating metaphor either at the level of language and words as opposed to thought and context" and by "emphasising the role of metaphors as either reflecting some already existing similarities as opposed to also creating similarities between things or ideas" (Hellsten, 2002, p. 17). The conceptual metaphor theory we build upon considers metaphors as playing an important role in defining the way we perceive the world and, thus, the way we think and act (Lakoff & Johnson, 1980). According to Lakoff and Johnson, the human conceptual system is metaphorically constructed, and everyday language is largely based on metaphorical ways of thinking. *Conceptual metaphor* refers to the understanding of one domain in terms of a different domain (Lakoff & Johnson, 2003). Lakoff and Johnson (1980) have theorized that a significant part of our everyday language is structured metaphorically, and thus we often use metaphors to understand one idea in terms of a different, more familiar idea. Metaphors are flexible in the sense that they can be mappings between two discrete concepts (e.g., *He's living on borrowed time*) or between a descriptor and an object, in our case *toxic asset.*

Recent metaphor research has shed a different light on the social and communicative roles of metaphors and their effects on our understanding of public issues (Chilton & Ilyin, 1993; Hellsten, 2002; Lakoff & Johnson, 2003). In this tradition, we considers metaphors as tools of communication (Hellsten, 2002), and we take into account their ability to offer common grounds between discourses (Chilton &

Ilyin, 1993) or to function as boundary objects (Star & Griesemer, 1989) that are at the same time flexible enough to allow several interpretations in different social contexts but also to carry a relatively fixed set of associations. The concept *toxic* is engaging because via this concept, a rich web of financial issues (e.g., *toxic assets*, *toxic loans*, and even *toxic banks*) can be translated to something that is expected to be familiar to different discourses. Associating various financial concepts in discussions about the crisis to the term *toxic* puts blame on products, organizations, and their proponents without discussing specifics and personal involvement while at the same time implying a role in the crisis. Such a translation process does not mean that *toxic* carries the same meaning in various social contexts (Zeiss & Groenewegen, 2009). On the contrary, the power of metaphors is in their flexibility in uses and interpretations. *Toxic* can be easily adapted to fit the expected worldviews of the readers of different newspapers.

Metaphors have been studied in economic discourse broadly (e.g., Alejo, 2010; Charteris-Black & Musolff, 2003; Hayes, 1997; Rhodes & Garrick, 2002), but the study of metaphors in debates relevant to the latest financial crisis is still in its incipient stages. The Metaphor Observatory,[2] for example, discusses the financial crisis as the trigger for "one of the largest metaphor spikes in recent history." In recent years, attention has been paid to the use of metaphors in crisis communication by banking executives (Tourish & Hargie, 2012), variations in the use of positive and negative metaphors between Spanish and English financial texts (López & Llopis, 2010), editorial cartoons representing the global financial crisis (Bounegru & Forceville, 2011), and *contagion* in the general press parallel to the avian flu scare (Peckham, 2013).

Kleinnijenhuis, Schultz, Oegema, and van Atteveldt (2013) found that "the news about the crisis became crisis news itself" (p. 287), reinforcing the idea that the way in which journalists report the events of the financial crisis has a major impact on the escalation of the crisis. Journalistic discourse often contains compelling metaphors and warrants investigation. This important role of metaphors in the mass media is confirmed by the vast array of compelling results published by researchers of various fields (e.g., Berdayes & Berdayes, 1998; Hellsten, 2000; Kennedy, 2000a; Kitis & Milapides, 1997; Nerlich, Clarke, & Dingwall, 2000; Paris, 2002; Petersen, 2005). However, not many authors have investigated the use of metaphors in newspaper reporting of the recent global financial crisis (e.g., Bounegru & Forceville, 2011; López & Llopis, 2010; Tourish & Hargie, 2012).

In journalistic discourse, metaphors are used to "popularize, concretize, or dramatize issues" (Hellsten, 2002). The use of metaphors makes issues newsworthy and interesting for audiences, and metaphors may also be used to address different audiences simultaneously (Bucchi, 1998). According to Kennedy (2000b), "metaphors are often said to be helpful in creating and dealing with what is novel" (p. 209). In other words, metaphors can be used by the media to introduce a new issue to their wider audience in terms of something more familiar (Wyatt, 2004) or engaging. In the case of the financial crisis, since 2008, many novel issues and terms have emerged.[3] This abundance of new terms has

[2] See www.metaphorobservatory.com.

[3] See "The Layman's Finance Crisis Glossary" at http://news.bbc.co.uk/2/hi/uk_news/magazine/7642138.stm

prompted the use of metaphors as translators in the media. Using metaphors to describe such terms as *derivatives, collateralized debt obligation* (CDO), or *asset-backed mortgage* translates these terms into what is perceived as more concrete, familiar, or engaging. This is not to say that the translation role of metaphors is restricted to mere descriptors of unfamiliar terms. On the contrary, when part of a growing metaphor family, such metaphors as *toxic* can function as poisonous or even deadly labels for each target domain associated with them. Such metaphor families suggest a specific image—a negative image in the case of *toxic* metaphors—on the issues while suppressing alternative views, thus reducing the complexity of issues.

As tools meant to either popularize or condense complex issues, or to translate highly specialized discourses, metaphors guide our perceptions and interpretations of reality and help us to frame our visions and goals, "playing a central role in the construction of social and political reality" (Lakoff & Johnson, 2003, p. 159). As such, the use of metaphors in news has the potential to influence meanings readers associate with the issues reported (Williams, Davidson & Yochim, 2011), which in turn can manifest changes in behavior and decision making (Williams, 2013).

Aims and Goals

Using data collected from three newspapers, *The Sun* (*Sun*), *The Financial Times* (*FT*), and *The New York Times* (*NYT*) between 2007 and 2011, we contribute to metaphor theory by widening the focus from conceptual metaphors to metaphor families—or hybrid word families (Thelwall & Price, 2006) that share a common source domain. So far, little is known about when such related metaphors emerge and how they develop over time. By identifying metaphors sharing the source domain *toxic* in newspapers and by revealing these metaphors' dynamics in the financial-crisis debate, this study contributes to a better understanding of the ways different publics are drawn into a specific framing of the financial crisis.

To structure our search for variation in the use of *toxic*, we follow the differentiation of the metaphor family by examining the following factors:

1. The evolution of the *toxic* metaphor family across stages of the financial crisis, with attention to the following questions:
   (a) At what stage of the financial crisis did the *toxic* metaphor family emerge?
   (b) At what stage of the financial crisis did the *toxic* metaphor family show most variation in usage of unique metaphors?
2. The structural roles of the shared metaphors identified across newspapers and how they changed across the periods analyzed.

Data and Methods

Data collection. The texts used in this study come from three newspapers: *The Financial Times* (*FT*)*, The New York Times* (*NYT*) and *The Sun* (*Sun*). These three newspapers publish very different content and thus address different types of audiences. *FT* is a highly specialized financial reporting newspaper; *NYT* is the most popular daily newspaper in the United States, publishing a broad

variety of topics; and *Sun* is the largest circulation daily tabloid in the United Kingdom. Each of these newspapers target relatively different audiences and are expected to employ the *toxic* metaphor family differently.

We collected the data from LexisNexis by searching with the keyword *toxic* with no start date but with an end date of December 31, 2011, in each of the three newspapers selected for inclusion in our analysis. All the articles retrieved were then manually selected, and only articles on financial topics were included in the analysis. After removing duplicates, a total of 2,817 articles remained (see Figure 1).

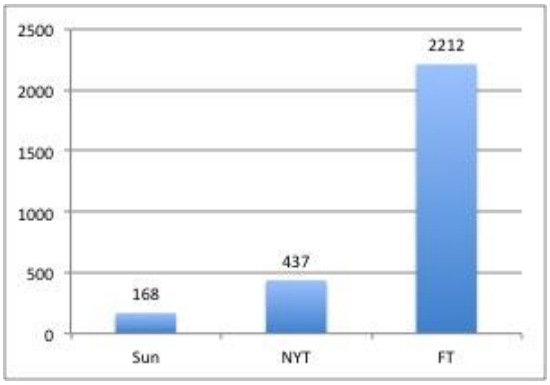


Figure 1. Number of articles collected from each newspaper.

The first article using the *toxic* metaphor in regard to financial issues dates back to 2004, and it was published by *NYT* on February 13. The article discusses the debt created by the building of the Eurotunnel:

> Michael Wilkins, a managing director at Standard & Poor's, says Eurotunnel's senior debt is investment grade, but its lowest-rated debt is in the low junk category, and there are billions in debt below that, most of it *toxic* waste. (Norris, 2004, p. C1, emphasis added)

The articles collected from each newspaper have been separated into three sets that we call the *precrisis period* (2006–2007), the *crisis period* (2008–2009), and the *postcrisis period* (2010–2011). The only exception to this is the precrisis set for *Sun* that used the *toxic* metaphor in only one article in 2007.

Metaphor identification. Repeatedly addressed in natural language processing (NLP) research, automatic identification of metaphors continues to be a challenge (Gedigian, Bryant, Narayanan, & Ciric, 2006; Shutova, 2010) due to the complexity of language. Semiautomated methods such as part-of-speech tagging, sentence clustering, and lexical patterns are still limited because they require manual annotation or other manual coding (Birke & Sarkar, 2006; Fass, 1991; Gedigian et al., 2006; Goatly, 1997; Krishnakumaran & Zhu, 2007; Miller, Beckwith, Fellbaum, Gross, & Miller, 1990; Peters & Peters, 2000).

In this article, we make use of a method that allows for automated text processing and extraction of metaphors based on their target or source domains. Using this method, we identify metaphors that use a specific word or multiword expression as the source domain (i.e., *toxic*) present in large corpora of unstructured text documents.[4] Specifically, we will focus on metaphors where the source domain, *toxic*, precedes the target domain, as this is the most common case for this metaphor family. Research on metaphor identification based on target or source domains remains limited to this day, and only a few authors have undertaken similar efforts (Mason, 2004; Thelwall & Price, 2006; Ureña Gómez-Moreno & Faber, 2010). After preprocessing the text (removing all noise words), we generated semantic co-reference lists using a window size of two words and a stop unit of one sentence as a method of identifying metaphors. The window size determines the range in which connections are made between words (Diesner, 2012). A window size of two will create a link between each two consecutive words within the limit of one sentence. Because these lists were generated to identify metaphors in the *toxic* family, they are unidirectional. The semantic co-reference lists include co-occurring concepts based on the window size and the frequency with which they occur. This part of the analysis has been used as a method of detecting the unique *toxic* metaphors used by each selected news source. We identified 25 metaphors from the *toxic* metaphor family used by *Sun*, 60 metaphors used by *NYT*, and 171 metaphors used by *FT* (see Figure 2). Of all the metaphors identified, only 8 are common to all the newspapers and will be further analyzed to track their dynamics.

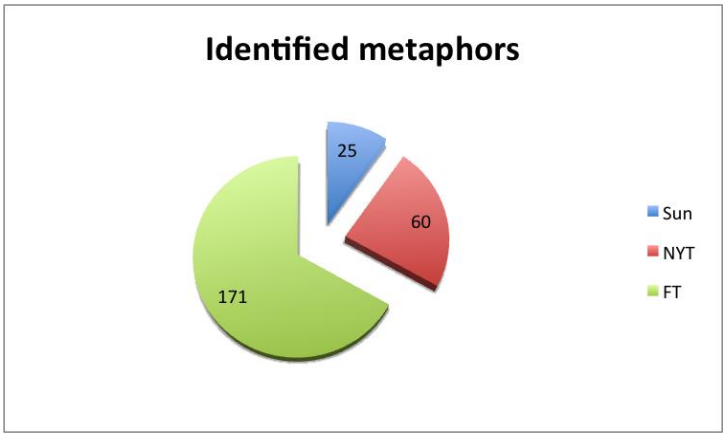


Figure 2. Number of metaphors identified in each newspaper.

[4] Conversely, the method can be used to identify metaphors based on their target domain.

Once the metaphors were identified, each of them was recoded in the corpora by using *n*-gram conversion, which creates single concepts from multiword *n*-grams by replacing the space between the words with an underscore (Carley, Columbus, Bigrigg, & Kunkel, 2011). An example of such conversion is *toxic asset* becoming *toxic_asset.*

Semantic networks. After we identified and recoded the metaphors, we generated semantic maps using Automap (Carley et al., 2011). Semantic networks translate selected text into networks of concepts, in which a concept can be a word or a phrase (i.e., an *n*-gram) (Popping, 2003), and the links between them (in this case, relations among concepts are defined by co-occurrence). The value of the strength of each link is determined by frequency of co-occurrence (Wasserman & Faust, 1994). The methods of extracting networks of concepts from texts have been referred to as maps (Carley, 1997a, 1997b), semantic and communication networks (Lehmann, 1992; Monge & Contractor, 2001; Popping, 2003), networks of concepts (Popping, 2000), and networks of words (Danowski, 1993). Named differently, all these methods focus on content analysis that assumes language can be modeled as networks of words and their relations (Sowa, 1984). Unlike content analysis, our approach does not require extensive manual coding. The semantic networks for all three newspapers were generated using a window size of eight, with a stop unit of two sentences. These choices of window size and stop unit are the most appropriate for generating semantic networks from newspaper corpora (Diesner, 2012). Table 1 contains the descriptive statistics for each of the networks generated.

The structural space method. The resulting semantic networks were analyzed through the structural space method (Nerghes, Lee, Groenewegen, & Hellsten, 2014), which combines total degree centrality (i.e., popularity) and betweenness centrality (i.e., connectivity) of concepts in a semantic network. The total degree centrality of a node in a network is the number of other nodes to which the focal node is tied (Freeman, 1979). In semantic networks, total degree centrality may represent the importance of a concept or its key concept status. Betweenness centrality is the frequency with which a particular node is on the geodesic path between any other two nodes in the network (Freeman, 1979).

The betweenness centrality of a concept in a semantic network is an indicator of its influence (Hill & Carley, 1999; Hooper, Marie, & Kalampokis, 2012). Such a concept controls access to other key concepts in the network (Brandes & Corman, 2003; Grebitus & Bruhn, 2008; Henderson, Iacobucci, & Calder, 1998; Hulst, 2008), serving as a gatekeeper between different domains (Gloor & Krauss, 2009).

Table 1. Descriptive Statistics of Each Semantic Network Generated.

Network	Node count	Link count	Density
Sun precrisis semantic network	37	118	0.177
Sun crisis semantic network	2,738	55,396	0.007
Sun postcrisis semantic network	2,381	40,102	0.007
NYT precrisis semantic network	253	44,852	0.006
NYT crisis semantic network	14,370	699,629	0.003
NYT postcrisis semantic network	7,012	218,618	0.004
FT precrisis semantic network	3,953	90,668	0.006
FT crisis semantic network	20,231	1,550,492	0.004
FT postcrisis semantic network	12,690	665,702	0.004

The combination of node count and link count reveals four structural roles as quadrants of the structural space (see Figure 3), and we use the approach to uncover more subtle structural positions of concepts and changes in discourse over time. The globally central (GC) concepts have high degree centrality and high betweenness centrality. These are very popular and highly connective concepts and become central, key concepts of a hot topic because they are highly connected to other concepts and serve as bridges between parts of the network (or topics). The locally central (LC) concepts have high degree centrality and low betweenness centrality. These concepts are very popular but do not have a strongly connective role. They serve as key concepts of a local hot topic because they are highly connected to other concepts, but they do not serve as bridges between topics. The gatekeeper (G) concepts are characterized by low degree centrality and high betweenness centrality. These concepts serve as connective concepts that are not very popular, but they are influential in the network because although they are not highly connected, they act as bridges, potentially linking themes or topics. Last, the marginal (M) concepts have low degree centrality and low betweenness centrality. These concepts are neither popular nor connective, but they can be emergent concepts. (For more details on this approach, see Nerghes et al., 2014.)

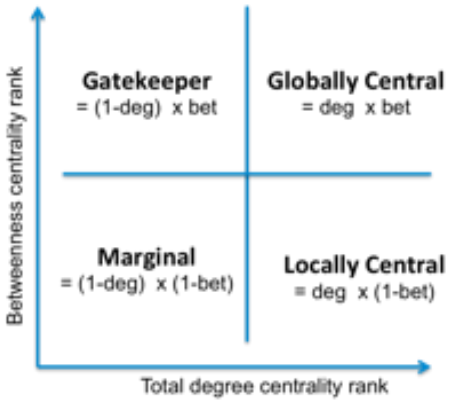


Figure 3. The four quadrants of the structural space.

We use the structural-space method to evaluate and track the dynamics of the eight shared metaphors (used by all three newspapers) of the *toxic* metaphor family.

Results

This section of will start by outlining the results we found for *Sun*, followed by those for *NYT*, and last by those for *FT*. The second part of this section compares the three newspapers, and the last part discusses the structural shifts in metaphor use detected with the structural-space method for each newspaper.

***The Sun*.** The articles published by *Sun* are relatively short and are designed to catch readers' attention at a glance. In the 168 articles published between 2007 and 2011, we identified 25 unique metaphors from the *toxic* metaphor family. Out of the 25 unique metaphors, only one was used in the precrisis period, in an article published on June 6, 2007. In this article, *Sun* metaphorizes the word *income* (i.e., *toxic income*). This demonstrates that *Sun* did not use metaphors with the source domain *toxic* in the years preceding the financial crisis to characterize the emerging events of the financial markets for its readers.

During the crisis period (between 2008 and 2009), *Sun* used 15 metaphors of the *toxic* metaphor family. The most frequently used metaphor was *toxic debt*, which occurred 35 times in the articles published in this period.

In the postcrisis period (between 2010 and 2011), *Sun* used 17 metaphors of the *toxic* metaphor family. The most frequently used metaphor was *toxic loan,* which occurred 23 times.

***The New York Times*.** In the 437 articles published between 2006 and 2011, we identified 60 unique metaphors from the *toxic* metaphor family. Although our analysis includes articles published only between 2006 and 2011, it is important to mention that the first metaphorical use of the word *toxic* in relation to financial issues by *NYT* dates back to February 13, 2004, and discusses the debt created by the building of the Eurotunnel (quoted above in the Data Collection section).

In the precrisis period, *NYT* used 10 of the 60 metaphors identified. The first such metaphor is used in an article published on October 6, 2006, and includes the word *stock* (i.e., *toxic stock*). The most frequently used metaphors during this period are *toxic market* and *toxic waste*, both being used twice. In the crisis period, *NYT* used 45 of the 60 metaphors identified. The most frequent metaphor was *toxic asset*, used 271 times.

During the postcrisis period, *NYT* used 23 of the 60 metaphors identified, with the most frequent being *toxic asset*, used 24 times.

The Financial Times. *FT* publishes slightly longer and more elaborated articles. In addition, its readers are expected to be particularly interested in financial issues. It is important to mention here that our LexisNexis search revealed that *FT* first used the term *toxic* in relation to financial issues in an

article published on January 27, 2004. This article talks about "toxic levels of debt" (Roberts, 2004, p. 24).

In the 2,212 articles published by *FT* between 2006 and 2011 and collected for this study, we identified 171 unique metaphors, the first metaphor identified being *toxic combination*, used in an article published on March 17, 2006.

During the precrisis period, *FT* used 26 of the 171 metaphors identified, the most frequently used metaphor being *toxic waste*, with nine uses. In the crisis period, 113 metaphors were used, with *toxic asset* the most frequent, with 1,820 uses.

In the postcrisis period, 87 metaphors of the 171 identified were used. Just as in the crisis period, the most frequently used metaphor in the postcrisis period was *toxic asset*, with 216 uses.

To summarize, the crisis period was most prolific in expanding the *toxic* metaphor family, both with novel metaphors and in the frequency with which the most popular metaphors were used (Figure 4) in *NYT* and *FT*. The number of unique metaphors used by *Sun* increased slightly between the crisis and the postcrisis period.

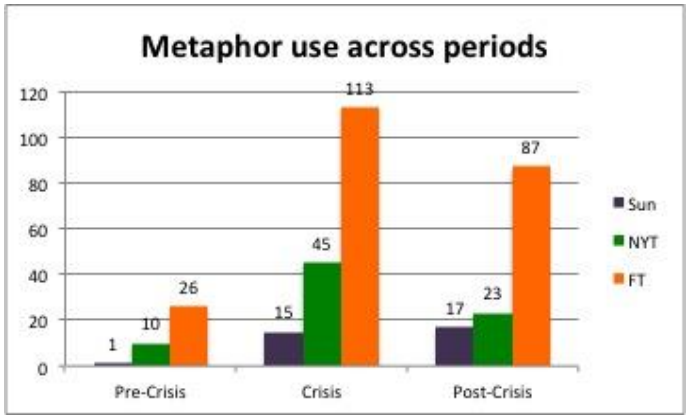


Figure 4. Number of metaphors used by each newspaper across periods.

Comparing newspapers. In terms of the number of distinct metaphors, the discourse of *FT* is the richest, having used 171 unique metaphors of the *toxic* metaphor family. This can be partially explained by the higher number of articles published by *FT* between 2006 and 2011. The high number of metaphors and the high number of articles published can be linked to the fact that *FT* is a highly specialized newspaper on financial issues. However, in terms of frequency of metaphors, *Sun*'s discourse suggests more variety. As shown in Table 2, *toxic asset* is by far the most frequent metaphor in both *NYT* and *FT*, with the second most used metaphor appearing comparatively many fewer times. The top most frequent metaphors used by *Sun*, on the other hand, are much closer in frequency, suggesting more discursive diversity. Therefore, we posit that *Sun* engages a more diverse audience.

Table 2. Top Five Most Frequent Metaphors per Newspaper.

SUN		***NYT***		***FT***	
Metaphor	Freq.	Metaphor	Freq.	Metaphor	Freq.
Toxic loan	52	Toxic asset	295	Toxic asset	2,036
Toxic debt	47	Toxic mortgage T	72	Toxic mortgage	117
Toxic asset	25	security	40	Toxic security	106
Toxic bank	19	Toxic waste	20	Toxic loan	101
Toxic mortgage	6	Toxic loan	18	Toxic debt	96

Structural Roles. While the structural-space method can be used to look at, for instance, top-ranking concepts in each of the structural roles, we focus on the eight shared metaphors (Figure 5). In the next section, we analyze the dynamics of these shared metaphors across periods and newspapers. For each of the structural roles plotted in this section, the background colors are a rough estimation of the four structural roles, the highlighted nodes are colored by frequency (**red** being the highest and **blue** being the lowest frequency), and *n* represents the number of nodes in the network plotted.

As mentioned before, in the precrisis period, *Sun* published only one article on financial topics using a *toxic* metaphor (i.e., *toxic income*). This metaphor is not one of the eight shared metaphors we have analyzed with the structural-space method because it was not used by all three newspapers.

During the crisis period (Figure 6a), *toxic debt*, *toxic loan*, *toxic bank*, and *toxic asset* rank highly on the globally central (GC) structural role. This means that these four metaphors, which were not present in the precrisis period, rapidly became popular in the crisis period while also becoming bridges between the topics *Sun* debated. *Toxic mortgage* was a more popular concept than a connective one, whereas *toxic waste* was a marginal and potentially emerging concept. The discourse of *Sun* shifted quickly from the precrisis state in which none of the eight metaphors were used to a crisis discourse that included six of those metaphors.

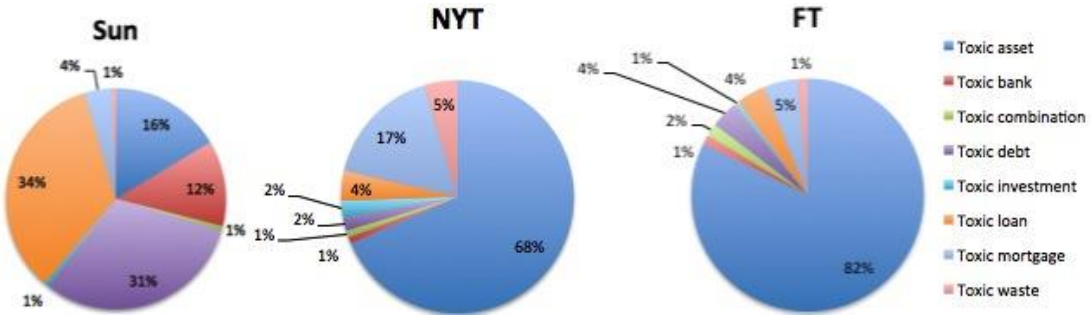
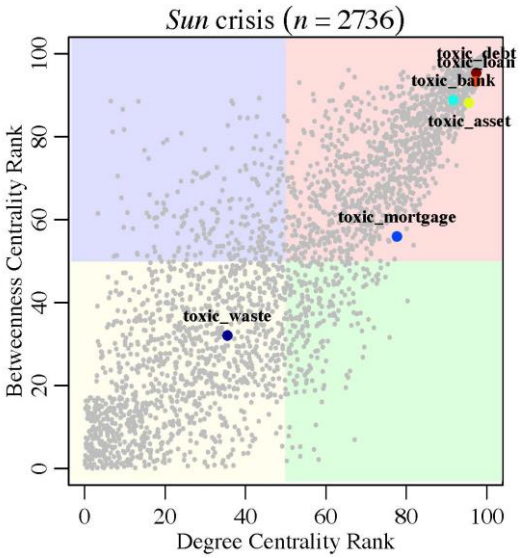


Figure 5. Use of selected metaphors across newspapers.

In the postcrisis period, *Sun* used seven of the eight common metaphors (see Figure 6b). Interestingly, *toxic loan*, *toxic bank*, *toxic debt*, and *toxic asset* maintained their GC position: they were popular in *Sun*'s discourse and used to connect various topics. In the crisis period, *toxic debt* was the highest ranking GC metaphor, but in the postcrisis period, *toxic loan* became the highest ranking. This shows that the focus of *Sun* subtly changed. *Toxic mortgage* also maintained its position as a more popular than a connective metaphor. While *toxic waste* was no longer present in *Sun*'s discourse, *toxic combination* held a borderline position between the G role and the M role. At the same time, *toxic investment* entered the discourse as an M metaphor, ranking low on both total degree centrality and betweenness centrality.

(a)



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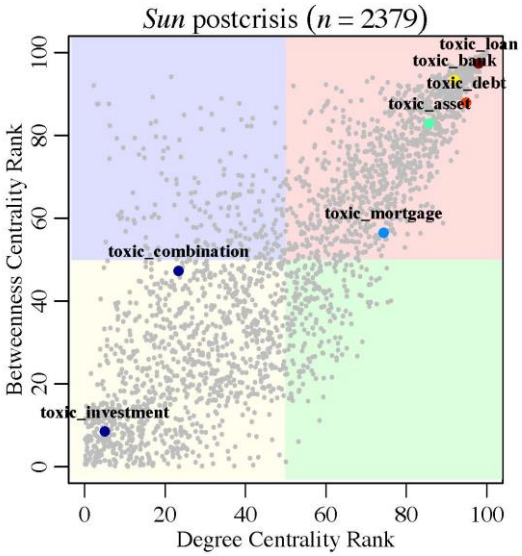
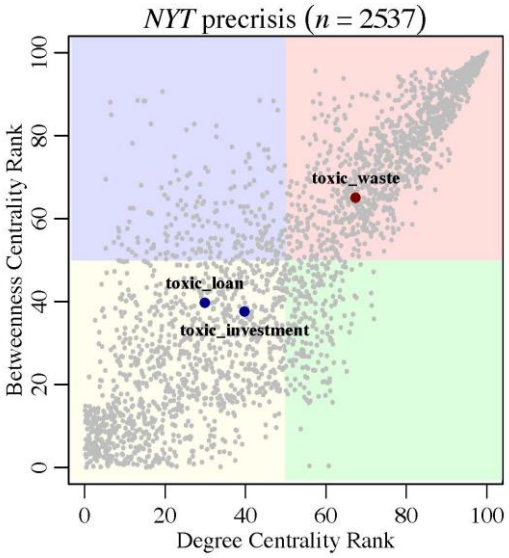


***Figure 6a, b. Structural-space plots for the semantic networks of the* Sun.**

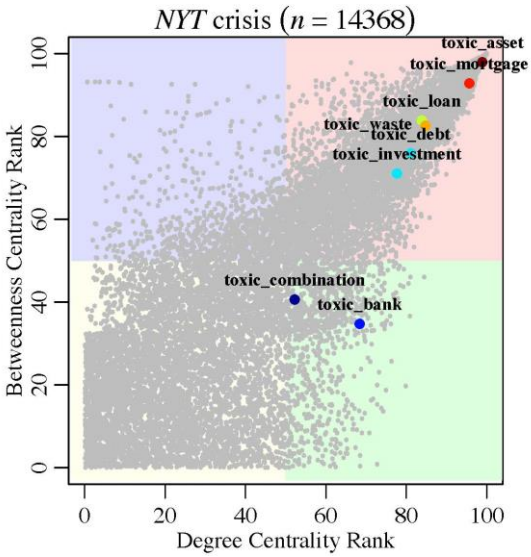
For *NYT*, the structural roles of the precrisis period reveal that only three of the eight common metaphors were used: *toxic waste*, *toxic loan*, and *toxic investment* (see Figure7a). While *toxic loan* and *toxic investment* were emerging marginal metaphors, *toxic waste* ranked higher in both total degree centrality and betweenness centrality. Thus, in the precrisis period, *toxic waste* was a popular metaphor that was also used to connect various topics under discussion in *NYT*'s discourse. Based on these results,

we can conclude that in the precrisis period, *NYT* was mostly focused on one of the eight common metaphors (*toxic waste*), which is arguably a generic metaphor meant perhaps to offer a broad characterization of the emerging crisis rather than a specific characterization of particular financial instruments, as *toxic asset* does. The metaphors generally used to characterize specific financial instruments were marginal and possibly emerging in *NYT*'s precrisis discourse.

(a)



(b)



(c)

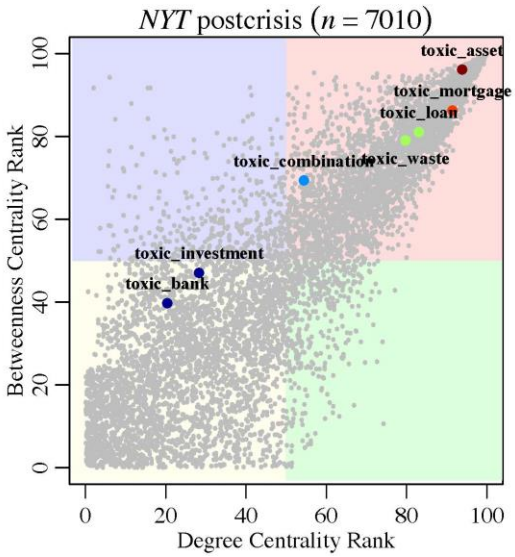


***Figure 7a, b, c. Structural space plots for the semantic networks of* NYT.**

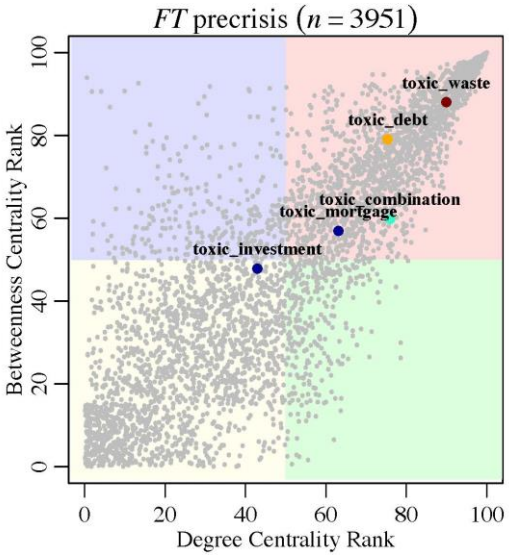
During the crisis period, *NYT* used all eight common metaphors, with six of these ranking as globally central (GC) metaphors (see Figure7b). *Toxic waste* was still a GC metaphor, but the fact that the top-ranked GC metaphor was *toxic asset*, followed by *toxic mortgage*, suggests a subtle shift in *NYT*'s discourse toward characterizations of particular financial instruments. This is also established by the GC positions of *toxic loan*, *toxic debt*, and *toxic investment.* Remarkably, while *toxic investment* was a marginal metaphor entering the discourse in the precrisis period, in the crisis period, this metaphor became GC. The positions of *toxic combination* and *toxic bank* in the structural-space plot (Figure 7b) indicate that these metaphors are not highly ranked on any of the four structural roles.

In the postcrisis period, *NYT* used seven of the eight common metaphors (see Figure 7c). *Toxic debt* was no longer part of the discourse, but *toxic combination* increased in betweenness centrality to become a more connective concept than it had been in the crisis period. At the same time, *toxic investment* was no longer a GC metaphor, now fulfilling a more connective role. *Toxic bank* also decreased in degree centrality during this period.

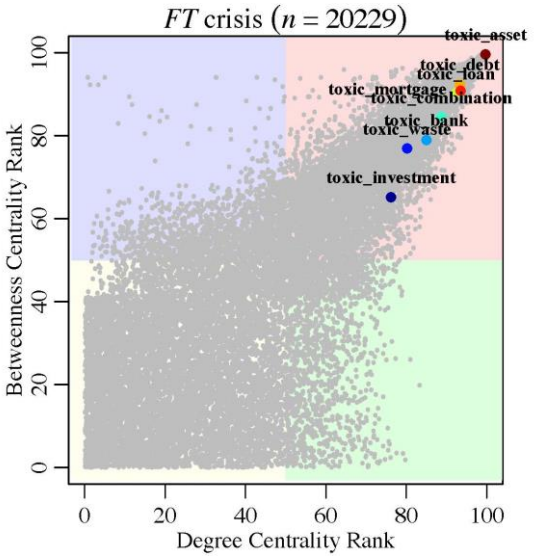
The precrisis period exposed that *FT* used only five of the eight common metaphors in its discourse, with *toxic waste* and *toxic loan* being the highest ranked GC metaphors (see Figure 8a). Unlike in the case of the precrisis period of *NYT*, the structural position of these two metaphors suggests that *FT*'s focus was twofold: on a more generic portrayal of the events, and on a characterization of specific financial instruments. During the precrisis period, *toxic combination* and *toxic mortgage* were marginally popular metaphors, but these metaphors were not highly connective ones. *Toxic investment* was a marginal metaphor in this period.

In the crisis period, *FT* used all eight common metaphors, with *toxic asset* ranking the highest on the GC scale (see Figure 8b). Two of the three metaphors that entered the *FT* discourse in the crisis period are related to financial instruments (i.e., *toxic asset*, *toxic loan*), and the third refers to banks (*toxic bank*). Although all eight metaphors can be considered GC during this period, the metaphors ranking highest in this role (*toxic assets*, *toxic debt*, *toxic loan*, *toxic mortgage*) suggest a clear shift toward portrayals of financial instrument

(a)



(b)



(c)

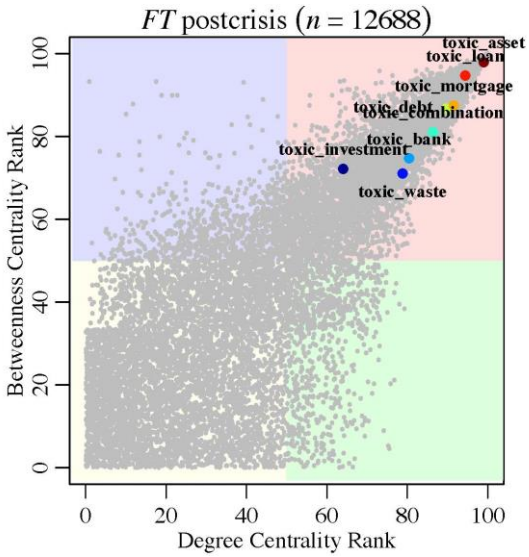


***Figure 8a, b, c. Structural space plots for the semantic networks of* FT.**

In contrast to the postcrisis period for *Sun* and *NYT*, the postcrisis period for *FT* does not reveal significant differences to the crisis period for *FT* (see Figure 8c). This finding suggests that while *NYT* and *Sun* adapted their discourse to a new stage (period), *FT* used the same discourse as it had in the crisis period.

None of the three newspapers used *toxic asset* in the precrisis period, but this metaphor became the top-ranked GC metaphor in the crisis period in all the newspapers. This metaphor also retained a high GC ranking in the postcrisis period in the three newspapers.

To summarize, the structural-space method revealed that in the precrisis period, *NYT* and *FT* used mostly generic portrayals of the emerging events by primarily using *toxic waste*, which we identified as the most GC *toxic* metaphor. The position of the *toxic waste* metaphor in the precrisis period suggests that the translation role of this metaphor is initiated through a generic, familiar association of it to financial issues, which potentially elicited a familiar negative image for audiences. Conversely, the structural-space analysis of the period has shown that all three newspapers focused more on metaphors characterizing financial instruments than they did on the generic characterization metaphors seen in the precrisis period. The translation initiated in the precrisis period with generic metaphors evolved into the use of a richer variety of *toxic* metaphors.

With the exception of *FT*, the newspapers showed significant changes in metaphor use in the

postcrisis period, implying a discursive shift toward a different and perhaps new state.

To further explore this particular finding, we looked beyond metaphor use to the general discourse of each newspaper and the differences that arose across periods. We treated the correlation coefficients among the semantic networks of each newspaper and each period as distances and used multidimensional scaling (MDS) to plot these values. MDS offers a way to visualize the (dis)similarities among a set of points (Gower, 1966). Figure 9 confirms that our findings regarding metaphor use remained valid for the general discourse of *FT* between the crisis and the postcrisis periods. Figure 9 also shows that although *Sun* and *NYT* discourses moved further away after the crisis period, *FT*'s postcrisis discourse remained very close to its crisis discourse. Interestingly, the MDS plot also shows significant similarities between the crisis discourse of *NYT* and *FT*, and the postcrisis discourse of *FT*.

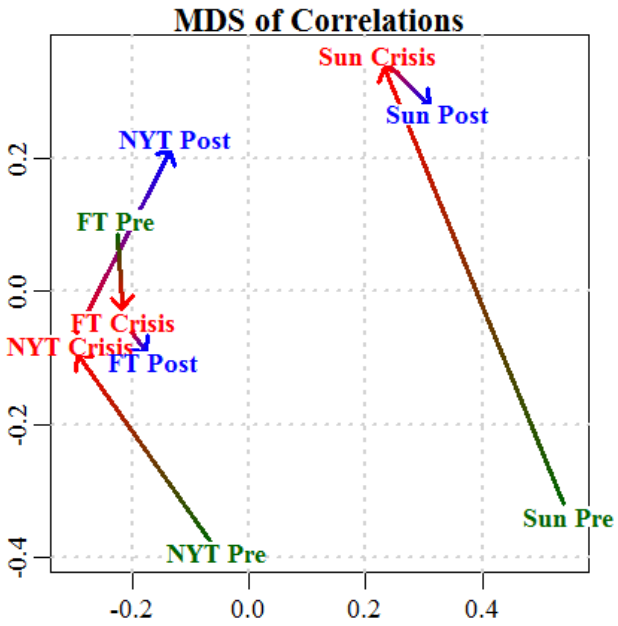


Figure 9. MDS representation of correlations across periods and newspapers. The periods are precrisis, crisis, and postcrisis.

Conclusion

We have analyzed financial crisis reporting in three newspapers with the aim of understanding the ways in which metaphor families fulfill a translator role for emerging new terminology in financial discourses. We have also contributed to research on the expansion and evolution of metaphor families. To map the changes as different ways of framing, we used the structural-space method to reveal subtle discursive changes of metaphor use in the three newspapers over time. Although metaphors using source domains such as *toxic* are common to discourses of all kinds, the way in which mass media, for instance, use such metaphor families to communicate financial issues and debates to their audiences plays a potentially important role in the way the public understands these issues and debates.

Our analysis showed that most of the *toxic* metaphor family variations were created in the actual crisis period, not in the pre- and postcrisis periods. It seems that the communication needs of the crisis period led to the creation of new metaphors, suggesting that translating the crisis to the readers of these newspapers required a larger set of metaphors (i.e., a metaphor family) than the one used in the precrisis period. Our metaphor-identification method revealed *FT*'s *toxic* metaphor family to be the richest, containing 171 unique metaphors. This can be partially explained by the high number of articles published by *FT*, but it can also be linked to the highly specialized or professional nature of this newspaper. Because *FT* specializes in reporting financial issues, it can be argued that a larger, more diversified metaphor family is required to translate these many issues to its audience. While *FT* used the largest *toxic* metaphor family, its focus was clearly on *toxic asset*, the metaphor with the highest frequency in its published articles. This also applies to *NYT*. In contrast, *Sun's* articles showed more variety in metaphor use. The top most frequent metaphors used by *Sun* were much closer in frequency, suggesting more discursive diversity.

In the second part of our analysis, we employed the structural-space method, which combines popularity and connectivity potential of concepts in semantic networks for a more comprehensive understanding of subtle dynamic discursive shifts within the investigated newspapers. Selecting the eight metaphors common to all three newspapers, we exposed shifts in the focus of individual newspapers across the three periods and differences and similarities between the newspapers. During the precrisis period, *NYT* and *FT* mostly used generic portrayals of the emerging events by using *toxic waste* as the most globally central metaphor.

In contrast, during the crisis period, all three newspapers focused more on metaphors characterizing financial instruments than they had on generic characterization metaphors in the precrisis period. In the precrisis period, the translation function of these metaphors was initiated with the use of *toxic waste* as the most popular and connective metaphor in both *NYT* and *FT*. This catchy, novel metaphor set the stage for the crisis period by eliciting negative, familiar images for the readers of these newspapers and thus strengthening the variety of *toxic* metaphors that emerged in this period.

These findings propose that during the full-blown financial crisis, the focus of the newspapers shifted to translating the many emerging flawed financial instruments. Translating such issues to audiences with a metaphor family created a bucket into which all these instruments could be thrown, and

thus they were labeled as poisonous or even deadly. This kind of translation (labeling) leaves little room for any neutral or positive associations, strengthening the negative impact of such metaphor families even further. The *toxic* metaphor family suggests a wider view on toxic capitalism (Smith, 2009), and this may have wider implications for which actions are taken to solve the crisis. *NYT* and *Sun* showed significant changes in their discourse in the postcrisis period, implying a discursive shift to a different and perhaps new state. The discourse of *FT* did not show significant changes between the crisis and the postcrisis periods, suggesting that by the end of 2011, *FT*'s discourse had not transitioned into the postcrisis stage.

Because of the highly specialized character of *FT*, this particular finding raises some interesting questions regarding the messages such discourse stability sends to its audience. If the discourse of *FT* remains unchanged, should we not talk about a postcrisis period? Is the financial crisis not yet over?

Discussion

Rich metaphor families provide a new field of research in metaphor theory. We provide an approach through which a vast array of metaphors can be identified and analyzed in a timely manner. Our approach offers the possibility of longitudinal analysis of metaphors in semantic networks over any time frame and thus opens new possibilities for theoretical and empirical advances in metaphor-evolution research. In this sense, our analysis adapted the notion of conceptual metaphors as proposed by Lakoff and Johnson (1980) to a more focused and effective approach to the study of source domains, their use in discourse, and their evolution. The results show that the source domain *toxic* was applied to increasing numbers of target domains, and at the same time, the idea of financial crisis seemed to become more conventional by the increased use of metaphors such as *toxic asset,* which was introduced into Oxford Dictionaries in 2010 (Toxic, 2012). Our findings show how such metaphors evolve from a stage in which they are used as general descriptive devices, such as "*toxic waste* of the debt markets" (Davies, 2006, p. 4, emphasis added), to the stage in which they become translating devices for unfamiliar terminology, such as "*toxic mortgage backed securities*" (Schwartz, 2010, emphasis added). While Thelwall and Price (2006) focused on extracting data about the rich family of metaphors related to the source domain of Frankenstein's monster, we have taken a step further and applied the structural-space method to the analysis of the rich family of *toxic* metaphors.

We performed automated extraction of metaphors and showed how the *toxic* metaphor family has been used differently in three news sources (*Sun*, *NYT*, and *FT*) in three time periods. Different from most other approaches (e.g., Birke & Sarkar, 2006; Fass, 1991; Gedigian et al., 2006; Goatly, 1997; Krishnakumaran & Zhu, 2007; Mason, 2004; Miller et al., 1990; Peters & Peters, 2000; Thelwall & Price, 2006; Ureña Gómez-Moreno & Faber, 2010; Wilks, 1978), the metaphor-identification method we used proved efficient in identifying large numbers of metaphors sharing the same source domain from large volumes of text with minimal data pre-processing and no manual coding. Based on the preferences of the analyst, the method can be adapted to extract metaphors of different lengths (e.g., by increasing the number of co-occurring concepts to include) and can also be applied to identify metaphors based on their target domain.

This type of metaphor identification has benefits, but some limitations must also be mentioned. This approach does not identify metaphors in which the target domain precedes the source domain, such as "securities that turned *toxic*" (Cox, Beales, & Dixon, 2009, p. B2, emphasis added). While a substantial number of metaphors are identified through this method, structurally more complex metaphors in which the target domain precedes the source domain, in which the target domain consists of multiple words, or both are not identified with this method.

Although the structural-space method employed in this study revealed important findings regarding the use of the *toxic* metaphor family, this method is in its incipient stages, being developed and tested. For further use and testing, an interesting approach could combine the structural roles with the composition of the concepts directly connected to the leading metaphor (i.e., egocentric networks).

While our method of classifying semantic network nodes into one of the four structural roles was used to highlight only eight common metaphors, the classification may easily be broadened to the potential roles of any number of metaphors (e.g., top 10) or variations in semantic networks.

If metaphors are the lenses through which we make sense of our daily lives, then scientists from all domains must acknowledge the importance of studies that elucidate their roles and dynamics in various discourses. In the financial crisis debate, the use of metaphors is important in terms of the images they create, the meanings readers associate to the issue reported, and the potential subsequent behavior changes in the decision-making processes of these readers. Large metaphor families using source domains such as *toxic* may produce overly negative portrayals of the events through their persuasive character (Sopory & Dillard, 2002), which in turn can have consequences for the magnitude of the crisis on the financial markets by creating, for example, panic among consumers of financial products (Kleinnijenhuis et al., 2013). The growing use of *toxic* metaphors can also potentially strengthen this metaphor family across news sources by conventionalizing them—by making them part of our everyday conventional language—and by influencing the ways in which we understand text (Allbritton, 1995).

References

Alejo, R. (2010). Where does the money go? An analysis of the container metaphor in economics: The market and the economy. *Journal of Pragmatics*, *42*(4), 1137–1150. doi:10.1016/j.pragma.2009.08.013

Allbritton, D. W. (1995). When metaphors function as schemas: Some cognitive effects of conceptual metaphors. *Metaphor and Symbolic Activity, 10*(1), 33–46. doi:10.1207/s15327868ms1001_4

Berdayes, L. C., & Berdayes, V. (1998). The information highway in contemporary magazine narrative. *Journal of Communication*, *48*(2), 109–124. doi:10.1111/j.1460-2466.1998.tb02750.x

Birke, J., & Sarkar, A. (2006). A clustering approach for the nearly unsupervised recognition of nonliteral

language. In *Proceedings of the EACL Conference* (pp. 329–336). Torento, Italy: The Association for Computer Linguistics. Retrieved from http://acl.ldc.upenn.edu/E/E06/E06-1042.pdf

Black, M. (1962). *Models and metaphors: Studies in language and philosophy*. Ithaca, NY: Cornell University Press.

Bounegru, L., & Forceville, C. (2011). Metaphors in editorial cartoons representing the global financial crisis. *Visual Communication*, *10*(2), 209–229. doi:10.1177/1470357211398446

Brandes, U., & Corman, S. R. (2003). Visual unrolling of network evolution and the analysis of dynamic discourse. *Information Visualization*, *2*(1), 40–50. doi:10.1057/palgrave.ivs.9500037

Bucchi, M. (1998). *Science and the media: Alternative routes in scientific communication*. New York, NY: Routledge.

Carley, K. M. (1997a). Extracting team mental models through textual analysis: Summary. *Journal of Organizational Behavior*, *18*, 533–558.

Carley, K. M. (1997b). Network text analysis: The network position of concepts. In C. W. Roberts (Ed.), *Text analysis for the social sciences: Methods for drawing statistical inferences from texts and transcripts* (pp. 79–102). Mahwah, NJ: Lawrence Erlbaum.

Carley, K. M., Columbus, D., Bigrigg, M., & Kunkel, F. (2011). *Automap user's guide 2011* (Technical Report CMU-ISR-10-121). Pittsburgh, PA: ISR, School of Computer Science, Carnegie Mellon University.

Charteris-Black, J., & Musolff, A. (2003). "Battered hero" or "innocent victim"? A comparative study of metaphors for euro trading in British and German financial reporting. *English for Specific Purposes*, *22*(2), 153–176. doi:10.1016/S0889-4906(02)00012-1

Chilton, P., & Ilyin, M. (1993). Metaphor in political discourse: The case of the "common European house." *Discourse & Society*, *4*(1), 7–31. doi:10.1177/0957926593004001002

Cox, R., Beales, R., & Dixon, H. (2009, April 9). Moody's mirrors Wall St. salaries. *The New York Times*. Retrieved from http://www.nytimes.com/2009/04/08/business/08views.html?_r=0

Danowski, J. (1993). Network analysis of message content. In W. Richards & G. Barnett (Eds.), *Progress in communication science* (pp. 197–222). Norwood, NJ: Ablex.

Davies, P. J. (2006, March 13). Axa IM: Debt markets are in the blood of derivatives specialist*. The Financial Times.* Retrieved from http://www.ft.com/intl/cms/s/1/b253b854-b236-11da-96ad-0000779e2340.html#axzz3LL2wFCiw

Diesner, J. (2012). *Uncovering and managing the impact of methodological choices for the computational construction of socio-technical networks from texts* (Doctoral dissertation). Retrieved from http://repository.cmu.edu/dissertations/

Fass, D. (1991). met*: A method for discriminating metonymy and metaphor by computer. *Computational Linguistics*, *17*(1), 49–90.

Freeman, L. (1979). Centrality in social networks: Conceptual clarification. *Social Networks*, *1*(3), 215–239. doi:10.1016/0378-8733(78)90021-7

Gamson, W. A. & Modigliani, A. (1989). Media discourse and public opinion on nuclear power: A constructionist approach. *American Journal of Sociology*, *95*(1), 1–37. doi:10.1086/229213

Gedigian, M., Bryant, J., Narayanan, S., & Ciric, B. (2006). Catching metaphors. In *Proceedings of the 3rd Workshop on Scalable Natural Language Understanding* (pp. 41–48). New York, NY: Association for Computational Linguistics.

Gloor, P., & Krauss, J. (2009). Web science 2.0: Identifying trends through semantic social network analysis. *In Proceedings of the CSE* (pp. 215–222). Institute of Electrical and Electronics Engineers. doi:10.1109/CSE.2009.186

Goatly, A. (1997). *The language of metaphors*. London, UK: Routledge.

Goldman, A. (2008). Consultant and critics on the couch. *Journal of Management Inquiry*, *17*(3), 243–249. doi:10.1177/1056492608318160

Gower, J. (1966). Some distance properties of latent root and vector methods used in multivariate analysis. *Biometrika*, *53*(3), 325–338.

Grebitus, C., & Bruhn, M. (2008). Analyzing semantic networks of pork quality by means of concept mapping. *Food Quality and Preference*, *19*(1), 86–96. doi:10.1016/j.foodqual.2007.07.007

Hayes, M. (1997). The use of metaphor in reporting financial market transactions. *Cuadernos de Filología Inglesa*, *6*(2), 233–245.

Henderson, G., Iacobucci, D., & Calder, B. (1998). Brand diagnostics: Mapping branding effects using consumer associative networks. *European Journal of Operational Research*, *111*(2), 306–327. doi:10.1016/S0377-2217(98)00151-9

Hill, V., & Carley, K. M. (1999). An approach to identifying consensus in a subfield: The case of organizational culture. *Poetics*, *27*(1), 1–30. doi:10.1016/S0304-422X(99)00004-2

Hellsten, I. (2000). Dolly: Scientific breakthrough or Frankenstein's monster?: Journalistic and scientific metaphors of cloning. *Metaphor and Symbol*, *15*(4), 213–221. doi:10.1207/S15327868MS1504_3

Hellsten, I. (2002). *The politics of metaphor: Biotechnology and biodiversity in the media.* (Doctoral thesis, University of Tampere, Tampere, Finland). Retrieved from http://tampub.uta.fi/handle/10024/67206

Hooper, C. J., Marie, N., & Kalampokis, E. (2012). Dissecting the butterfly: Representation of disciplines publishing. In *Proceedings of the ACM Web Science Conference* (pp. 137–140). Evanston, IL: ACM. doi:10.1145/2380718.2380737

Hulst, R. C. (2008). Introduction to social network analysis (SNA) as an investigative tool. *Trends in Organized Crime*, *12*(2), 101–121. doi:10.1007/s12117-008-9057-6

Johnson, M. (1981). *Philosophical perspectives on metaphor*. Minneapolis, MN: University of Minnesota Press.

Kennedy, V. (2000a). Intended tropes and unintended metatropes in reporting on the war in Kosovo. *Metaphor and Symbol*, *15*(4), 253–265. doi:10.1207/S15327868MS1504_6

Kennedy, V. (2000b). Metaphors in the news: Introduction. *Metaphor and Symbol*, *15*(4), 209–211. doi:10.1207/S15327868MS1504_2

Kitis, E., & Milapides, M. (1997). Read it and believe it: How metaphor constructs ideology in news discourse: A case study. *Journal of Pragmatics*, *28*(5), 557–590. doi:10.1016/S0378-2166(97)00075-1

Kleinnijenhuis, J., Schultz, F., Oegema, D., & van Atteveldt, W. (2013). Financial news and market panics in the age of high-frequency sentiment trading algorithms. *Journalism*, *14*(2), 271–291. doi:10.1177/1464884912468375

Krishnakumaran, S., & Zhu, X. (2007). Hunting elusive metaphors using lexical resources. In *Proceedings of the Workshop on Computational Approaches to Figurative Language* (pp. 13–20). Rochester, NY: The Association for Computational Linguistics.

Lakoff, G., & Johnson, M. (1980). The metaphorical structure of the human conceptual system. *Cognitive Science*, *4*(2), 195–208. doi:10.1016/S0364-0213(80)80017-6

Lakoff, G., & Johnson, M. (2003). *Metaphors we live by* (2nd ed., Vol. 111). Chicago, IL: University of Chicago Press.

Lehmann, F. (1992). Semantic networks. *Computers & Mathematics with Applications*, *23*(2), 1–50. doi:10.1016/0898-1221(92)90135-5

López, A. M., & Llopis, M. A. (2010). Metaphorical pattern analysis in financial texts: Framing the crisis in positive or negative metaphorical terms. *Journal of Pragmatics*, *42*(12), 3300–3313. doi:10.1016/j.pragma.2010.06.001

Mason, Z. J. (2004). CorMet: A computational, corpus-based conventional metaphor extraction system. *Computational Linguistics*, *30*(1), 23–44. doi:10.1162/089120104773633376

Miller, G., Beckwith, R., Fellbaum, C., Gross, D., & Miller, K. (1990). Introduction to WordNet: An online lexical database. *International Journal of Lexicography*, *3*(4), 235–244. doi:10.1093/ijl/3.4.235

Monge, P. R., & Contractor, N. S. (2001). Emergence of communication networks. In F. M. Jablin & L. Putnam (Eds.), *The new handbook of organizational communication: Advances in theory, research, and methods* (pp. 440–502). Thousand Oaks, CA: SAGE Publications.

Nerghes, A., Lee, J., Groenewegen, P., & Hellsten, I. (2014). The shifting discourse of the European Central Bank: Exploring structural space in semantic networks. In *Proceedings of SITIS* (pp. 447–455). Marrakesh, Morocco: IEEE Computer Society. doi:10.1109/SITIS.2014.13

Nerlich, B., Clarke, D., & Dingwall, R. (2000). Clones and crops: The use of stock characters and word play in two debates about bioengineering. *Metaphor and Symbol*, *15*(4), 223–239. doi:10.1207/S15327868MS1504_4

Norris, F. (2004, February 13). Speculating in worthless stock while the trains speed to London. *The New York Times*. Retrieved from http://www.nytimes.com/2004/02/13/business/speculating-in-worthless-stock-while-the-trains-speed-to-london.html

Ortony, A. (1993). Metaphor, language, and thought. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., p. 696). Cambridge, UK: Cambridge University Press.

Paris, R. (2002). Kosovo and the metaphor war. *Political Science Quarterly*, *117*(3), 423–450. doi:10.2307/798263

Peckham, R. (2013). Economies of contagion: Financial crisis and pandemic. *Economy and Society*, *42*(2), 226–248. doi:10.1080/03085147.2012.718626

Peters, W., & Peters, I. (2000). Lexicalised systematic polysemy in WordNet. In *Proceedings of LREC.* Athens, Greece: European Language Resources Association.

Petersen, A. (2005). The metaphors of risk: Biotechnology in the news. *Health, Risk & Society*, *7*(3), 203–208. doi:10.1080/13698570500229572

Popping, R. (2000). *Computer-assisted text analysis*. Thousand Oaks, CA: SAGE Publications.

Popping, R. (2003). Knowledge graphs and network text analysis. *Social Science Information*, *42*(1), 91–

106. doi:10.1177/0539018403042001798

Rhodes, C., & Garrick, J. (2002). Economic metaphors and working knowledge: Enter the "cogito-economic" subject. *Human Resource Development International*, *5*(1), 87–97. doi:10.1080/13678860110018803

Roberts, A. (2004, January 27). Relieving the debt hangover by giving a fine tune to the accounts. *The Financial Times*. Retrieved from http://www.ft.com [Specific link to article no longer available]

Schwartz, N. D. (2010, October 19). Bank of America reports $7.3 billion loss, citing charges. *The New York Times*. Retrieved from http://www.nytimes.com/2010/10/20/business/20bank.html

Shutova, E. (2010). Models of metaphor in NLP. In *Proceedings of the 48th Annual Meeting of the Association for Computational Linguistics* (pp. 688–697). Uppsala, Sweden: Association for Computational Linguistics.

Smith, N. (2009). Toxic capitalism. *New Political Economy*, *14*(3), 407–412. doi:10.1080/13563460903087623

Snow, D. A., & Benford, R. D. (1992). Master frames and cycles of protest. In A. D. Morris & C. M. C. Mueller (Eds.), *Frontiers in social movement theory* (pp. 133–155). New Haven, CT: Yale University Press.

Sopory, P., & Dillard, J. P. (2002). The persuasive effects of metaphor: A metaanalysis. *Human Communication Research*, *28*(3), 382–419. doi:10.1111/j.1468-2958.2002.tb00813.x

Sowa, J. (1984). *Conceptual structures: Information processing in mind and machine*. Boston, MA: Addison-Wesley Longman.

Star, S. L., & Griesemer, J. R. (1989). Institutional ecology, "translations" and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39. *Social Studies of Science*, *19*(3), 387–420. doi:10.1177/030631289019003001

Thelwall, M., & Price, L. (2006). Language evolution and the spread of ideas on the Web: A procedure for identifying emergent hybrid word family members. *Journal of the American Society for Information Science and Technology*, *57*(10), 1–20. doi:10.1002/asi.20437

Tourish, D., & Hargie, O. (2012). Metaphors of failure and the failures of metaphor: A critical study of root metaphors used by bankers in explaining the banking crisis. *Organization Studies*, *33*(8), 1045–1069. doi:10.1177/0170840612453528

Toxic. (2012). In *Oxford Dictionaries.* Retrieved from http://oxforddictionaries.com

Ureña Gómez-Moreno, J. M., & Faber, P. (2010). Strategies for the semiautomatic retrieval of metaphorical terms. *Metaphor and Symbol*, *26*(1), 23–52. doi:10.1080/10926488.2011.535415

Wilks, Y. (1978). Making preferences more active. *Artificial Intelligence*, *11*(3), 197–223. doi:10.1016/0004-3702(78)90001-2

Williams, A. E. (2013). Metaphor, media, and the market. *International Journal of Communication*, *7*, 1404–1417. Retrieved from http://ijoc.org/index.php/ijoc/article/view/1149/935

Williams, A. E., Davidson, R., & Yochim, E. C. (2011). Who's to blame when a business fails?: How journalistic death metaphors influence responsibility attributions. *Journalism & Mass Communication Quarterly*, *88*(3), 541–561. doi:10.1177/107769901108800305

Wyatt, S. (2004, April). Danger! Metaphors at work in economics, geophysiology, and the Internet. *Science, Technology, & Human Values*, *29*(2), 242–261. doi:10.1177/0162243903261947

Zeiss, R., & Groenewegen, P. (2009). Engaging boundary objects in OMS and STS? Exploring the subtleties of layered engagement. *Organization*, *16*(1), 81–100. doi:10.1177/1350508408098923