Twitter as a tool for public engagement with emergent technologies?

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Project Overview

Twitter and other social media offer the potential to engage science enthusiasts and connect interested publics. This potential for engagement with science information on social media leads to the question of whether or not Twitter is actually being used to connect and explain complex science to interested publics. In this study, our two main research questions ask:

- Is Twitter being used as a tool of interactive engagement between the public and nanotechnology experts?
- What proportion of tweets about nanoscience are attempting to explain nanotechnology or engage interested publics?
- Does a breakthrough in a nanotechnology related field lead to attempts to explain it to interested publics on social media?

Introduction

Science communication online affords several new possibilities for reaching interested publics. As coverage of science and emergent technology in traditional media has decreased, there has been limited coverage of nanotechnology. Instead, nanotechnology often receives greater and more diverse coverage online (Cacciatore, et al., 2012). Additionally, the interested publics who are looking for science news online tend to avoid traditional news media (NSF, 2012).

Twitter and other social media offer the opportunity for the science community to engage with the public (Brossard, 2013), which some argue may be important in restoring public trust in science (Wynne, 2006). Previous research has examined expressions of pessimism/optimism and uncertainty related to nanotechnology and social media (Brossard, 2012; Runge et al., 2013), but there has been less investigation on what type of information about nanotechnology is shared in social media. This research sets out to explore what types of science information are shared are shared in social media and examine what portion of science information in understandable to a general audience.

This research is the first in a new project investigating social media and science communication. By exploring how and under what context information about nanotechnology is shared, we demonstrate how the public could be exposed to explanations of emerging technology in social media. This fits into CNS's interest in public understanding of science policy and risk perception of emergent technologies.

Methods

The researchers collected all Tweets from from January 2010 through September 2014 that contained keywords in a nanotech search string based on Arora et al. (2012); this string includes words such as nano, nanotech, graphene, and quantum dots, among others. The tweets were accessed through a "firehose" dataset that included all publicly available Tweets provided by Crimson Hexagon, coupled with Crimson Hexagon's automated sentiment analysis tools. Crimson Hexagon's sentiment analysis tools based on a variant of ReadMe (Hopkins, King, Knowles, & Menendez, 2010), a suite of supervised computer learning tools for sentiment analysis developed for the social sciences. Crimson Hexagon is well-known data gathering and descriptive tool in political communication research, used by many, including Runge (2013).

The tweets were then categorized based on the type of discussion (basic research or product) and the language of the discussion (scientific, non-scientific).To determine relationships between categories, the researchers used vector autoregression and Granger Causality.

Category	Criteria	Examples
Research Description	uses primarily scientific language about basic research in nanotechnology	"Dimension dependence of negative differential thermal resistance in graphene nanoribbons is.gd/Uih7hp"
Product Description	uses primarily scientific language about a product made with nanotechnology	"TCL has announced an Ultra HD "4K" LED LCD TV that uses quantum dots to create light. Onforb.es/1pJL1cD"
Research Explanation	attempts to explain basic research in nanotechnology or explain how nanotechnology works	"A fascinating new use of nanotechnology: Tracking insects with Quantum Dots buff.ly/18f98CN"
Product Explanation	attempts to explain how a product made with nanotechnology works	"Quantum Dots Can Charge Your Smartphone in 30 seconds!!! Po.st/xwA4wB via @IFLScience"
Irrelevant	not related to nanotechnology or general discussion about nano	"Nanotechnology: Pakistan lags behind - The News International http://t.co/08iOWIY2"

Results

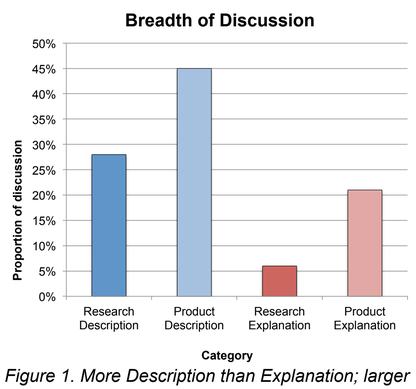

Figure 1. More Description than Explanation; larger focus on Products

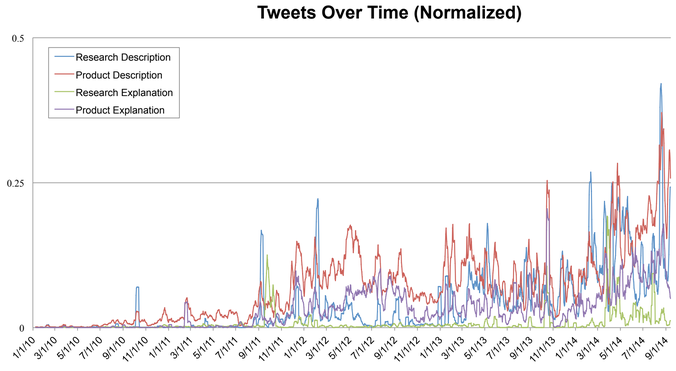

Figure 2. Normalized timeline of Tweets per category; 7 day weighted moving average. No easy way to untangle results

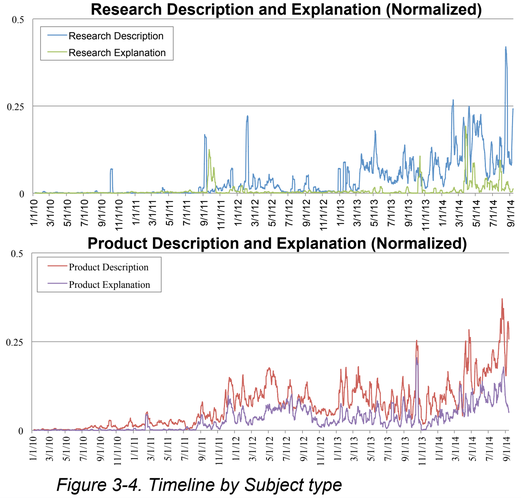

Figure 3-4. Timeline by Subject type

Direction	Granger Results
Research Description --> Research Explanation	Research Description Granger Causes Research Explanation (p=0.00)*
Research Explanation --> Research Description	Research Description Granger Causes Research Explanation (p=0.00)*
Product Description --> Product Explanation	Product Description Granger Causes Product Explanation (p=0.00)
Product Explanation --> Product Description	Product Explanation *does not* Granger Cause Product Description (p=0.983)

Figure 5. Relationship between timelines

Conclusions & Continuing Work

- Most Tweets related to nanoscience are descriptions of nano-products
- In recent years, there has been an increase in Tweets that describe nanoscience and nanoproducts
- However, there is less content that attempts to explain nanoscience in language suited to general audience
- Tweets that do attempt to explain, tend to focus on nano-based products
- Interaction between volume of Research Description Tweets and Research Explanation Tweets, meaning that at times, increase in Description Tweets leads to an increase in Explanation Tweets, while at other times, the opposite occurs.
- Explanations of nano-based Products are more likely to appear after Descriptions of nano-based Products, suggesting that when there is a specific product to sell, there is more motivation to explain nanoscience in language suited to a general audience.
- Lack of Research Explanation Tweets, especially when compared to Research Description Tweets, suggests that Twitter is becoming a forum for announcements, and possibly engagement, with other scientists, but not with the public.

Literature cited

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