

Computational Assessment of the Impact of Social Justice Documentaries

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Abstract

Documentaries are meant to tell a story, that is, to create memory, imagination and sharing (Rose, 2012). Moreover, documentaries aim to lead to change in people's knowledge and/ or behavior (Barrett & Leddy, 2008). How can we know if a documentary has achieved these goals? We report on a research project where we are developing, applying and evaluating a theoretically-grounded, computational solution for practical assessment of the impact of social justice documentaries in a scalable, empirical, robust and rigorous fashion. We leverage cutting-edge methods from socio-technical data analytics for this purpose and provide a publicly available technology that supports these routines. In this paper, we focus on the theoretical, methodological and technological foundations of this project, and provide an illustrative example of the proposed solution.

1 Introduction

The need for the rigorous and scientific evaluation of the impact of social justice documentaries has been repeatedly pointed out by funding agencies, practitioners and researchers who are active in the field of documentaries in particular and media productions in general. This problem is of high practical relevance: when a funding agency, e.g. the Sundance Documentary Fund, the Ford Foundation or BritDoc, award a grant to a film maker, they want reliable and comprehensive information on the return of investment, where the goal with these investments is to cause change in society. However, as explained in the background section, the amount and depth of prior reports and actual work on this topic is limited. In a nutshell, assessment in this domain has been typically done by using (a) traditional, scalable and quantitative methods and metrics, such as the number of visitors of a screening or webpage, and/ or (b) conventional, qualitative methods for studying the perception of a topic or media product by few people in depth, such as interviews with focus groups. Overall, the quantitative metrics are typically used on the community or societal level (macro-level), while the qualitative methods are applied on the individual or small-group level (micro-level). We argue that these two layers have to be integrated to gain a comprehensive understanding of the impact of films.

Another major shortcoming with prior work in this field is that while evaluation methods do consider the reaction of target audiences, they fail to take into account (a) relational information about audiences and other stakeholders as well as (b) the information produced and disseminated by these groups. We address this limitation by having developed a methodology that monitors, maps and analyzes (a) the social network of all stakeholders involved in the main topic of a movie – regardless of whether they have anything to do with a particular production or not - and the potential connections of film producers and audiences to these stakeholders, and (b) the content of the information produced and shared by these groups. We bring these types of behavioral information (social relationships and content) together by constructing and analyzing socio-semantic networks of stakeholders, audiences and information. We argue that this approach provides a more comprehensive window into the structure, functioning and dynamics

of the interplay of social agents and information (Diesner, 2013; Gloor & Zhao, 2006; Roth & Cointet, 2010).

This paper is structured as follows: Section two reviews prior work on documentary assessment and concludes with identifying missing pieces. Section three addresses these shortcomings by reporting on the development of a theoretically grounded, computational solution for mapping and assessing impact. We put this proposed solution into an application context by providing an illustrative example. Section four summarizes the outcomes of this work, open questions and next steps.

2 Background

In this section, we synthesize prior work on assessing the impact of documentaries. Basically, there are three families of prior studies: case studies on individual movies, proposed frameworks, and academic research.

2.1 Individual Case Studies

One main group of approaches for measuring the impact of documentaries are cases studies, i.e. collections of quantitative metrics and anecdotal reports on a single production. Two examples are the assessment of the documentary “Legacy” (by Applied Research & Consulting LLC), and Working Films’ evaluation of “Blue Vinyl”. Such evaluations approximate the influence of a documentary by considering (a combination of) the following indicators:

- Cumulative counts of the number of screenings, video distributions, or people reached through campaign activities.
- Comments from individual viewers , analyzed qualitatively on a case by case basis.
- Lists of key organizations participating in the documentary-related campaign. Connections between these organizations are not considered.
- A few instances of policy adoption.

Overall, case studies can be useful in highlighting the outcomes of a specific documentary. However they do not generalize to other productions. In other words, this approach fails to ensure that the same methodology is applicable across productions and genres such findings for multiple films can be compared.

2.2 Previously Proposed Frameworks

Various major media institutes and foundations, including the Center for Social Media, the Fledgling Fund, the Knight Foundation, and the Rockefeller Foundation, have proposed systematic frameworks for impact assessment (Barrett & Leddy, 2008; Clark & Abrash, 2011; Figueroa, 2002; KnightFoundation, 2011). Each of these organizations has released their own framework, which typically measures impact along five to seven dimensions entail the following: the aforementioned quantitative metrics plus influence on the individual, community, and societal level. The main limitation with solutions from this category is that these frameworks are of normative and theoretical nature such that testing them in real-world settings might require adaptations and changes in order to obtain accurate and actionable results. Furthermore, the indicators recommended in prior frameworks are highly similar to the anecdotal evidence mentioned above. In terms of methodology, these frameworks typically combine simple cumulative frequency counts (number of screenings, viewers, website visitors and supportive

organizations) with analyses of small samples of narrative descriptions from self-reports of participants.

Some framework proposals actually include indicators related to social networks: for example, “interorganizational collaboration” (Fledgling Fund), “network building” (Center for Social Media), and “network cohesion” (Rockefeller Foundation) are mentioned as key ingredients, but do not further elaborate on how to collect, analyze and interpret respective data. Even where core network metrics such as density and centrality are mentioned (Rockefeller Foundation), these terms are simply introduced as possible metrics without providing information or practical guidance for how to use and interpret them in an evaluation process.

2.3 Academic Research

The majority of scholarly work on this topic is confined to studying psychological effects of documentaries on individual viewers. Thus, most scholarly publications consider documentaries as a subcategory of mass media. A few exceptions to this exists: Whiteman (2004) uses a political science perspective to study several factors that affect a documentary’s impact. However, since his framework heavily depends on qualitative analysis such as observations and content analysis, it is highly similar to the first two groups of approaches.

In summary, although various types of approaches to documentary evaluation have been suggested and applied, most of them are similar in that they jointly consider traditional frequency counts on a large scale and qualitative indicators on a small scale. Several proposals have emphasized the importance of taking social networks and the content of information associated with network members into consideration. At least in the domain of assessing the impact of documentaries, these strategies are waiting to be put into action.

3 Method

The overall process for this research project is shown in Table 1, and further explained through this section.

Table 1: Research and Development Process

Step	Description	Result
1. Theory	Comprehensive review of prior literature on impact assessment of documentaries	Framework of relevant dimensions/indicators of media impact: CoMTI (shown in Table 2)
2. Operationalization	Translate relevant indicators into metrics and indices	
3. Methods, metrics and algorithms	Map indices to methods, metrics and algorithms suitable for analyzing large-scale, empirical data	Combination of social network analysis and text mining of social media data, news coverage data and ground truth data about the documentary
4. Technology	Comprehensive technology review to decide whether to reuse an existing tool or build a new one (shown in Appendix)	[name omitted for blind review] – we have been developing a publicly available technology for jointly analyzing text data and network data
5. Data Collection	Empirical: news coverage, social media data, focus groups data	

6. Analysis and Interpretation	Apply ConText to data on various movies	Use our technology and additional tools for evaluation of various social justice documentaries
7. Evaluation	Assess accuracy and performance of methodology and technology	Step not yet completed

Based on our literature review (step one and background section), we argue that measuring the impact of social justice documentaries requires the capturing, modeling and analyzing the map of the stakeholders and themes associated with a movie in a systemic, scalable and analytically rigorous fashion. Specifically, in order to understand the functioning and dynamics of the wider context surrounding a media production and its impact, we need to move beyond the level of individual and small-group studies by also identifying the connections between people, groups and information. Furthermore, we need to consider the content of the information related to some campaign and discourse. These requirements have also been suggested by media production organizations, but have not been put to test as explained in the previous section.

3.1 Theoretical Framework

We have synthesized the indicators of impact as suggested by prior work into a framework named CoMTI (**content, medium, target, and impact**). This model is organized along the main dimensions of impact assessment and respective methods:

- Dimension: a component or process through which a documentary can achieve impact.
- Level: a set of sub-categories of evaluation criteria per dimension.
- Index: a set of evaluation factors per level.
- Analytics: suitable methods for discovering meaningful results per index category.
- Item: a set of specific features to be measured per index.

The framework is grounded in a set of theories and allows for large-scale, multi-level analysis:

- *Theoretical Foundation*: framework based on empirically and rigorously tested theories from domains including diffusion, media effects, marketing, social and semantic network, and collective action.
- *Domain Expertise*: framework incorporates concepts specific to documentary evaluation that were suggested by experts from this domain.
- *Analytical Comprehensiveness*: considered analytical methods and metrics originate from statistics, network analysis and text analysis.
- *Multi-modal Units of Analysis*: includes entities types including people, organization, and information.
- *Integrated Approach*: combines traditional strategies for measuring documentary impact (frequency counts and qualitative analysis) with new methods (network analysis, text analysis).

This framework entails a variety of stimuli that have been associated with cognitive, attitudinal, and behavioral changes over time on the individual, communal, societal and global level. In this context, we consider a documentary as a special kind of a media product. When it comes to identifying the impact of media content on people, prior work can be divided into three categories (Laughey, 2007):

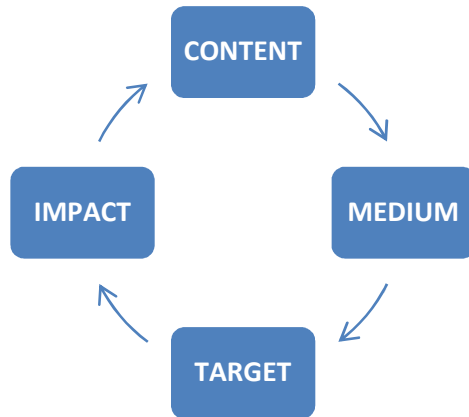
- Direct impact: media content can have powerful influence on the knowledge and behavior of the audience.
- Indirect impact: media content is one of several factors that affect peoples' behavior and cognition.
- Null impact: media content does not have a significant influence on peoples' cognitive and behavior.

Little research has conclusively confirmed or negated media impact (Sparks, 2012). Even with advanced research designs, evidence for a causal relationship between media and impact remains vague. Several lab experiments have successfully shown short-term impacts. However, the highly controlled settings are a limitation to the generalization of any findings from this work to real-world situations. More importantly, the small-scale and typically point-wise nature of such work prevents longitudinal insights. Despite many open questions about media impacts, scholars agree that media content affects our perception and behavior in certain, maybe latent, ways (Bryant, 2008; Laughey, 2007). The proposed framework assumes that the impact of a documentary can be measured; and that this impact can be direct, indirect or not evoked. Also, we conceptualize the entire process of making and distributing a documentary as a communication process, where participants exchange information and knowledge via behavioral signals, including natural language (Griffin & McClish, 2003).

A large common denominator of media effects research is the believe that humans can be affected by media stimuli. The holistic process of how stimuli influence people has been dissected into five categories; all of which were originally suggested by Laswell in his model of communication (Johnson & Klare, 1961; Lasswell, 1948). Most of theories on media effects fit into one or more of these categories (Laughey, 2007). We use the Laswell model as a backbone for the CoMTI framework by empirically identifying: *What has been said* (content) *In Which Channel* (medium) *To Whom* (target) and *With What Effects* (impact)? The *Who* dimension is partially entailed in the medium dimension, and will also be considered when we extract (groups of) stakeholders from network data and by bringing text mining methods to the *medium* dimension. In the Lasswell formula, communication happens in order to influence a target audience. Thus, communication is conceptualized as a persuasive process (McQuail, 2010). This aligns with the goal of documentaries to lead to change in people's knowledge and behavior.

Applying the provided definition of media use, we argue that a documentary is not some one-way communication where some agents (seeks to) transfer ideas or messages to others in order to achieve certain effects, but rather a two-way process in which senders and receivers interact with each other: receivers' responses and reactions to senders' input form dynamic feedback loops. This inherently reciprocal and iterative process is represented in our framework as shown in Figure 1, and is essential to overcome Lasswell's conceptualization which has been criticized for it's a linear, one-way direction of communication flow. Such feedback loops have high practical implications as the film producers and engagement workers can leverage them to model the landscape of stakeholders and discourse associated with the theme of a documentary prior to and during release in order to identify relevant social agents and themes that producers and engagement workers want to link up to. This helps to strategically allocate scarce resources.

Figure 1: CoMTI framework with a Feedback Loops



The CoMTI framework borrows elements from verified outcomes of media studies, but is also unique in the following three ways:

- While most studies of media effects focus on one or two phases of the Lasswell's formula, our framework models the whole communication processes around a documentary.
- The proposed framework overcomes the linear, sender-driven, one-way flow of communication.
- The proposed framework is tailored towards measuring the impact of documentaries by integrating dependent variables related to change measurable indices and methods.

Table 2: CoMTI Framework for Impact Assessment

<h1 style="text-align: center;">CoMTI MODEL</h1> <h2 style="text-align: center;">A Comprehensive Framework for Measuring the Impact of Documentaries</h2>							
DIMENSION	LEVEL		INDEX	ANALYTICS	ITEM		
CONTENT	MESSAGE		Guiding Factor	Description Ranking weighing	Report by producers or funding agencies		
	EXPECTED OUTCOME						
	EVALUATION PRIORITY						
	RESOURCE						
MEDIUM	RELEASE MEDIUM	OFFLINE	Outreach	Stats	Number of movies, CDs distributed Number of theatrical, Internet release Duration of release; Sales of product		
		ONLINE					
	RESPONSIVE MEDIUM	MASS MEDIA	Mass Media Attention	Text Mining Web Analytics Survey, Interview	Frequency of news coverage weighted by influence (article, opinion/editorial) Domestic, international broadcast		
		USER MEDIA	User Media Attention		Twitter, Facebook, Blogs, webpages Frequency of talking about, links included, user-created contents		
		PROFESSIONAL MEDIA	Prestige		Number of festival acceptance Number of awards Number of professional reviews		
		INTERPERSONAL INTERACTION	Intimate Attention		Conversation, talking on the phone or email, lectures, exchange of letters, etc.		
	TARGET	AUDIENCE SIZE		Reachability	Text Mining Web Analytics Archived Data Survey, Interview	Number of viewers or visitors	
		HOMOGENEITY		Diversity		Geography & demography: location, age, gender, education, income	
AUDIENCE TYPE		SINKER	Passiveness	Text Mining Web Analytics Network Analysis	Number of inactive viewers		
		TRANSMITTER	Leadership		Number of opinion leaders		
COLLECTIVE ENTITY		Advocacy	Text Mining Web Analytics Survey, Interview	Number of advocacy communities, colleges, schools, or NGOs			
IMPACT	INDIVIDUAL COMMUNAL SOCIETAL GLOBAL	COGNITIVE	Awareness	Stats, Text Mining Web Analytics, Network Analysis	Frequency of names, ideas, thoughts, or concepts appeared in corpus Report of increased awareness		
		ATTITUDINAL	Sentiment	Sentiment Analysis	Frequency of positive, negative, neutral sentiments of comments Personal, critics, mass media, and organizational responses Reaction to calls for action		
		BEHAVIORAL	Engagement Enactment Connectedness Capacity Expansiveness Centralization	Text Mining Web Analytics Network Analysis	How well connected How much & far disseminated How centralized is the impact The route of diffusion Number of action pledges alliance and allied action of organization Discussion or decision by organizational, governmental, international policy/legislation makers sponsorship of bills, adoption, donation, funding, implementation, social movement or intervention		
		TEMPORAL	Impact Dynamics	Longitudinal analysis	Comparison b/w multiple time points Duration of impact Increase vs. decrease Change vs. stability vs. reinforcement Introduction or shifts of topics Detection of social norm change		
							7

We now briefly elaborate on every dimension of the CoMTI framework in more detail.

3.1.1 Content

Studies of media impact start from the presence or absence of certain kinds of content before measuring impact (Sparks, 2012). Taking the explicit and implicit content of a film and the communication related to (the theme of) the movie into account is essential for impact assessment and related strategic communication and interventions. The *Content* dimension of the CoMTI framework consists of the following levels of measurement:

- **Message:** the main message that a film wants to convey. This can be elicited from filmmakers or in a more empirical fashion from the film transcripts.
- **Expected Outcome:** goals set by film makers for the scope of reach and intended changes.
- **Evaluation Priority:** a ranked list of priorities with respect to intended outcomes, which can be elicited from producers. These rankings can be used to weight impact categories.
- **Resource:** investment needed for a production, e.g. money, personnel, engagement work and follow-up activities. This information can be used to assess the effectiveness of a production – how much input is needed to move the needle how much?

The outlined levels of content are not limited to documentaries, but also applicable to other types of communication data, and are related to each other throughout the data collection and evaluation process.

3.1.2 Medium

Some scholars argue that the medium or channel, which nowadays are often information and communication technologies, determine the characteristics of media products, content, and their political, economic, social and cultural usage (Innis, 2007; McLuhan, 1994). Acknowledging the importance of the medium, previous assessments of documentary impact typically report media statistics, such as the frequency of screenings, theatrical release and broadcasts; considering higher numbers as (proxies for) greater impact (Barrett & Leddy, 2008; Clark & Abrash, 2011; John & James, 2011). One limitation with this strategy is that exposure does not have uniform impact cross recipients. Prior studies on the diffusion of innovation have shown that different types of adopters perceive information at different points in the life cycle of a production and with varying degrees of depth of impact (Rogers, 2003). Moreover, social networking effects, e.g. word of mouth, strongly impact this process (E. Katz & Lazarsfeld, 2006; M. Katz & Shapiro, 1986). Thus, the choice of media for a documentary is likely to shape the breadth and depth of potential impact on the public.

Another problem is that prior studies do not differentiate between first-hand (seeing the actual film) versus secondary ((social) media reactions, public discourse) media exposure. We argue that this distinction matters because a) first-hand exposure is easier to track for distributors and b) secondary exposure has the potential for greater networking effects. This separation goes hand in hand with the distinction between push versus pull models for media: mass media (push) implies that communicator transmit information to large and scattered audiences (Dominick, 2007; Luhmann & Cross, 2000), while social media (pull) is based on interactions between users, and has been found to be more influential than mass media in terms of credibility, speed of message transfer, and potential to change behavior (Bessièrè, Kiesler, Kraut, & Boneva, 2008; Jenkins, 2006; Keen, 2008). Corresponding data can be collected from news archives and the participatory web, respectively.

Finally, face-to-face interaction between individuals is another important channel. Interpersonal contact has been identified as the most powerful channel of cognitive, attitudinal and behavioral change (Bass, 2004; Rogers, 2003). These data are more difficult to collect than (social) media data; (partial) mappings are possible via surveys and interviews.

3.1.3 Target

In marketing, the size of the reachable target audience matters; it determines for instance the cost-per-person of an advertisement. However, for documentaries, this rationale does not apply, mainly because producers have no tangible metric for assessing effectiveness other than pairs of eyes having been observed to watch a film. Thus, the size of the audience can translate into impact, but needs to be complemented with additional factors (Barrett & Leddy, 2008; Clark & Abrash, 2011; Figueroa, 2002; John & James, 2011).

Another issue related to the target dimension is audience diversity: the more heterogeneous the audience, the broader the reach. Studies in risk communication, marketing, social influence and diffusion have shown that audiences who are homogeneous in terms of age, sex, income, education or physical proximity can limit the ripple effect of communication (R. Lundgren & McMakin, 2009; Page, 2007; Prell, 2012; Rogers, 2003).

A classical finding from media effect studies is that ideas flow from media to opinion leaders to the rest of the world (E. Katz & Lazarsfeld, 2006). In the CoMTI framework, formal opinion leaders, e.g. media editors and professional critics, are distinguished from informal opinion leaders, such as bloggers and grass-root organizations, who can be identified via social network analysis of social media data (Hansen, Shneiderman, & Smith, 2010; Watts, 2007).

One common feature of previous efforts to measure documentary impact is the focus on advocacy (Barrett & Leddy, 2008; Clark & Abrash, 2011; John & James, 2011). Established communities of practice can be a powerful change agents because members of tight knit groups are subject to group norms (Drazin & Schoonhoven, 1996; Rogers, 2003). The importance of communities as change agents justifies their inclusion as a separate indicator in CoMTI.

Data for measuring the indices for the *Target* dimension mainly come from statistical reports by documentary producers, web analytics, surveys and archival records. For identifying informal opinion leaders, social network analysis is used.

3.1.4 Impact

In the framework, impact is measured as a weighted function over four stimulus dimensions that are associated with cognitive, attitudinal and behavioral changes over time on the individual, communal, societal, and global level. Sometimes, a change might be clearly associated with a stimulus, e.g. the creation of a new legal regulation or adoption of a policy (Barrett & Leddy, 2008).

Studies in diffusion, risk communication and social contagion generally list four levels of the range of impact: individual, communal, societal and global (Kasperson et al., 1988; R. E. Lundgren & McMakin, 2011; Marsden, 1998; Rogers, 2003). In prior conceptualization of range, impact is assumed to start on the individual level and branch out to the next larger level; implying a linear diffusion mechanism from small to large. We do not make this assumption, but

acknowledge the fact that impact might diffuse between any of these layers, maybe in an iterative fashion.

Research on human perception and behavior has identified the following sequential process through which individuals experiences change: knowledge, persuasion, and decision (Rogers, 2003; Slovic, Finucane, Peters, & MacGregor, 2004). Knowledge is generated when an individual is exposed to new stimuli or information and develops an understanding of them. Persuasion means that an individual forms a positive or negative opinion towards stimuli or information. Decision follows if an individual is engaged in activities that lead to accepting or rejecting the given inputs. There is no common agreement on how to collect data corresponding to each these stages. KAP surveys have been used for several decades to provide information on the knowledge, attitudes and practices of health behavior and innovation adoption (Launiala, 2009).

The CoMTI framework conceptualizes the phase of potential documentary impact as consisting of cognitive, attitudinal and behavioral factors and suggests corresponding indices. We choose the term *cognitive* because the mental activities related to knowledge acquisition are mainly of cognitive nature. Persuasion denotes the intent of communicators to induce attitudinal change in a direction desired by the senders. *Attitudinal* is neutral in that it does not imply any directionality of change. *Behavior* can be distinguished from cognition and attitude in that it represents tangible changes expressed in words or activities. We do not assume a strictly sequential order of these stages, and allow for interaction effects.

In explaining changes in cognition, attitude and behavior, the network concept is vital. Numerous studies have shown that perceptions, feelings and behaviors initiated by one member of a network can influence other network participants (Christakis & Fowler, 2007; De Nooy, Mrvar, & Batagelj, 2011; Marsden & Friedkin, 1993; Scherer & Cho, 2003). As shown for the Medium dimension, social media and other forms of interpersonal interaction can be more influential for cognitive and behavioral changes than mass media exposure. Furthermore, empirical reports on measuring the impact of documentaries have listed the network of viewers or alliances of advocacy organizations as a sign of increased capacity (Barrett & Leddy, 2008; Clark & Abrash, 2011; John & James, 2011). For example, the degree of connectedness of the audience can be used to gauge the degree of cohesion of members for collective action. The sheer act of forming connections to other can be part of a behavioral change.

The temporal aspect of impact is an understudied issue. Many impact studies have relied on surveys and experiments from a single point in time, or use a survey – impact – after impact survey design (Bryant, 2008; Sparks, 2012). The CoMTI framework incorporates the temporal aspect of impact by measuring indices at multiple points in time. In summary, the CoMTI framework considers spatial, temporal and phase-related aspects of change.

Data for measuring the Impact indices can be obtained through intensive mining of unstructured and semi-structured natural language text data, e.g. from the social web. Text mining and network analysis technique will be used to extract entities (including people, organization, themes) and detect patterned relationship between them.

In summary, the CoMTI framework bridges the gap between theory and practice by offering a mapping from clearly defined, practically relevant and theoretically grounded indicators of

impact to (a) crucial dependent variables, i.e. relevant dimensions of impact and (b) cutting-edge method for capturing, representing and analyzing these signals based on real-world data.

3.2 From Theory to Practical Solutions: Analysis Techniques, Technology and Methodology

Based on the presented review of prior work and the proposed theoretical framework we conclude that enabling a reliable, efficient, broad and deep understanding of documentary impact requires the capturing and analysis of the web of stakeholders and content associated with (the theme of) a movie. This implies the combination of two types of techniques:

- Social network analysis, which helps to map and assess the structure, functioning and dynamics of the web of stakeholders (Wasserman & Faust, 1994).
- Natural Language Processing (NLP), which help to identify (the valence of) salient concepts and topics originating from or shared by stakeholders and public discourse (McCallum, 2005; Mihalcea & Radev, 2011).

Conducting such analysis in a scalable and robust fashion requires software tools. To avoid reinventing the wheel, two independent experts from our team evaluated existing tools along the dimensions of impact defined in the CoMTI framework and additional relevant features such as pricing (Table 3). The list of tools, though by no means exhaustive, contains products currently used for documentary assessment and alternative current solutions. The results (Table 3) show that each tool satisfies only a subset of the measurements laid out in CoMTI. Moreover, while some tools offer language analysis capabilities and other support network analysis, no single tool combines both methods. However, to measure impact the way we defined it, the integrated analysis of text mining and network analysis is indispensable. This justifies the need for a new computational technology that enables the usage of both of these techniques.

Based on the outlined assessment of capabilities needed we built a new, publicly available tool [name omitted for review] that covers the following routines:

- Data collection: social media data collection from Twitter and Facebook.
- Data preparation of unstructured and structured news wire data: routines for disambiguating and splitting up downloaded batches from LexisNexis into unique individual text files (news wire data) and organizing the respective meta-data in a database.
- Analyzing techniques for unstructured text data:
 - o General pre-processing techniques: stop word removal, stemming, parts of speech tagging
 - o Analysis techniques: entity detection, corpus statistics and topic modeling (summarization techniques), sentiment analysis (valence detection technique), and visualization of topic modeling in word clouds
- Relation Extraction techniques: construction of social networks, semantic networks, and other types of networks (any of the following types of entities can be combined into one-mode or multi-mode networks: people, organizations, locations, information):
 - o from structured data: using the meta-data database
 - o from unstructured text data: via the automated or computer-supported construction of codebooks that map text terms to entity classes. Once these nodes

have been identified, they are linked into edges based on user-defined parameter values for co-occurrence.

- Network Analysis and Visualization techniques: common routines such as graph visualization according to various layouts and computing network analytical metrics on the graph and node level.

The resulting software integrates a variety of open source libraries as well as routines that we built from scratch. The relation extraction part is particularly crucial for integrating text analysis and network analysis. The software has a graphical user interface so that non-technical people, in this case particularly funding agencies and impact producers (a new job title currently emerging in the documentaries business) can conduct analyses on their own. We have also released handbook to guide the user through the analysis process. Moreover, this technology is of general applicability: it can be used for conducting text mining and network analysis on data from other domains, even though the evaluation criteria from the CoMTI framework might not be applicable in such cases.

For using this tool for assessing the documentary impact, we have developed the following methodology:

1. Understand the problem space: (Where) is impact possible?
 - Mapping the public discourse and key players related to the main theme(s) of film prior to release; resulting in a baseline model. Main themes can be identified in a data driven way, e.g. by conducting topic modeling on the film transcript, or from but film makers or funders (based on our experience throughout this project, the outcomes from both strategies do not necessarily align).
 - Data and analysis: collect, analyze and combine text data and network data based on news coverage, social media, and focus groups; using the analysis techniques mentioned earlier in this section.
 - Outcomes:
 - i. Analytical: Baseline model
 - ii. Practical: Understanding of opportunity space for connecting campaign work to relevant stakeholders and themes, which helps to allocate scarce resource strategically and to mobilize social capital. Also, identify unpromising topics/ film projects early.
2. Understand the message of the documentary: Aiming to achieve impact with respect to what?
 - Applying the same text analysis techniques as used in step 1, but this time to the film transcript.
 - Outcome:
 - i. Analytical: ground truth model, i.e. the message that the actual film can communicate.
3. Understand the film's impact: Has the needle moved?
 - Reassess the public discourse and key players related to/ co-mentioned with the film during and after release.
 - Data and analysis: as in step 1.
 - Outcomes:

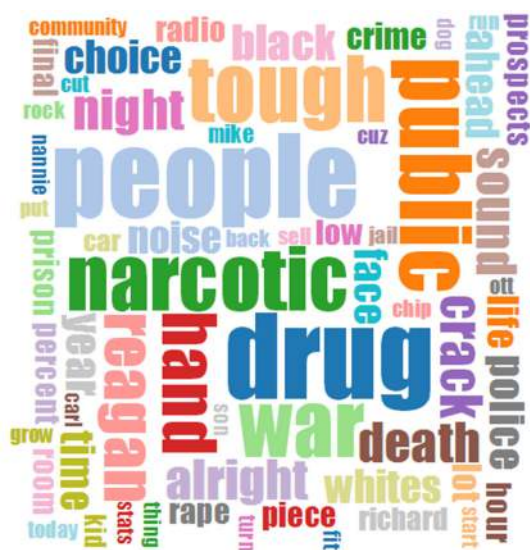
- i. Analytical: Model of reality. We compare this to the baseline model; looking for new links among and between stakeholders and themes that are also connected to the discourse around the movie.
- ii. Practical:
 - 1. Delta between the baseline model and model of reality: impact, along the dimensions laid out in CoMTI.
 - 2. Delta between ground truth and model of reality: difference in perception of movie between makers/ producers and audience. This helps makers, funders and producers understand additional opportunity space for impact.

3.3 Illustrative Example

We provide a brief illustrative example of the proposed methodology and technology. We recently presented our impact assessment of “The House I Live In”, a documentary by Eugene Jarecki first screened at Sundance in 2012, at the 2013 Sundance Creative Producing Summit, where we got plenty of valuable feedback on our work that we are currently incorporating into our framework and implementation (addressed in the limitations section).

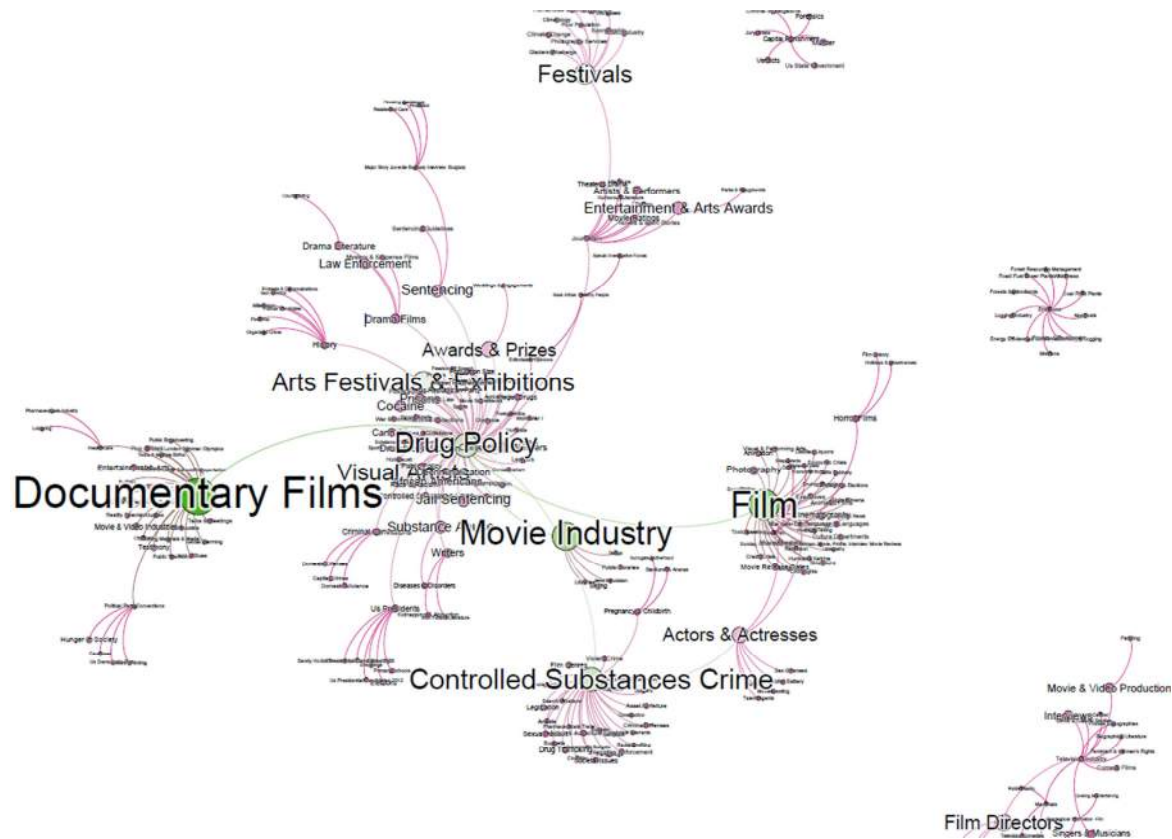
For this assessment, the funder of the film informed us that the main issue that the movie aims to have an impact on is "mandatory minimum sentence" (MMS). We collected the international press coverage on this topic from LexisNexis (downloading N=167 articles), and used the LexisNexis routines in our technology to parse, deduplicate and preprocess these data; transforming raw download data into to a curated corpus and metadata database. Figure 2 shows a semantic network of the media discourse on MMS, generated from meta-data that index the main themes addressed in the collected articles, and that get linked if they co-occur for a single article. Figure 3 provides a summarizing visualization of the main topics addressed in the actual text bodies. This was generated by applying topic modeling to the data and visualizing the main words for the main topics as a wordle. These outcomes suggest that the media frame MMS as (a) a social issue centered on people and (b) a legal issued centered on drug abuse and sentencing.

Figure 4: Message that the Documentary can convey (visualization of topic modeling of film transcript)



Assessing the media discourse on the actual movie after its release— again based on articles from LexisNexis (N = 167) that we converted into semantic networks based on the meta-data (Figure 5) and text bodies, shows that the press coverage is mainly about announcements of screenings and centered around the director, but hardly addresses MMS – the main issue that the movie aims to have an impact on. While we as academics might consider this as a limitations, we were informed at the Sundance summit that producers often aim to position a movie as a piece of art first and a communication vehicle for some issue second. This calls for a more long-term cycle of evaluation, which our methodology and technology support.

Figure 5: Media discourse on “House I Live In” after movie release (semantic networks of meta-data)



To capture the public reaction to the movie, we also conducted social media analysis using our methodology and data collection routines. We also used NodeXL for visualization since our tool was not yet ready for this part (Hansen et al., 2010). Mapping followers and followees of @DrugWarMovie – the handle for “The House I live in” - shows that even though the film is followed by a substantial number of people, many of them are not that important themselves on Twitter (small number of nodes, small node size), and their number is smaller than the number of potentially powerful people who the movie follows (

Figure 6). Looking at the intersection of followers and followees more closely shows that most of them are organizations involved with legalizing certain drugs, while only a few relevant stakeholders are present – more precisely one retired politician, two government workers, 12 small media companies and 33 NGOs.

A more successful impact of the movie was observed on Facebook: The semantic networks built from co-occurring and highly salient terms that appear on the posts of this page (salience defined as TFIDF) suggests that the person making posts to the film’s fanpage mainly addresses “watching the movie”, “release of the movie” and “war on drugs” (Figure 8). This represents classic campaign work. However, the user base (comments and replies to posts) not only picks up on these topics, but brings in new ones, mainly around the prison system and people of color. This finding suggests that it takes an engaged campaign worker to get a discussion started

(missing on Twitter for this particular movie), but then one possible form of impact is the public engaging with this topic and taking it into new directions. Note that looking at only one social media platform would not have allowed for gaining this differentiated view.

Figure 6: Twitter-sphere for @DrugWarMovie

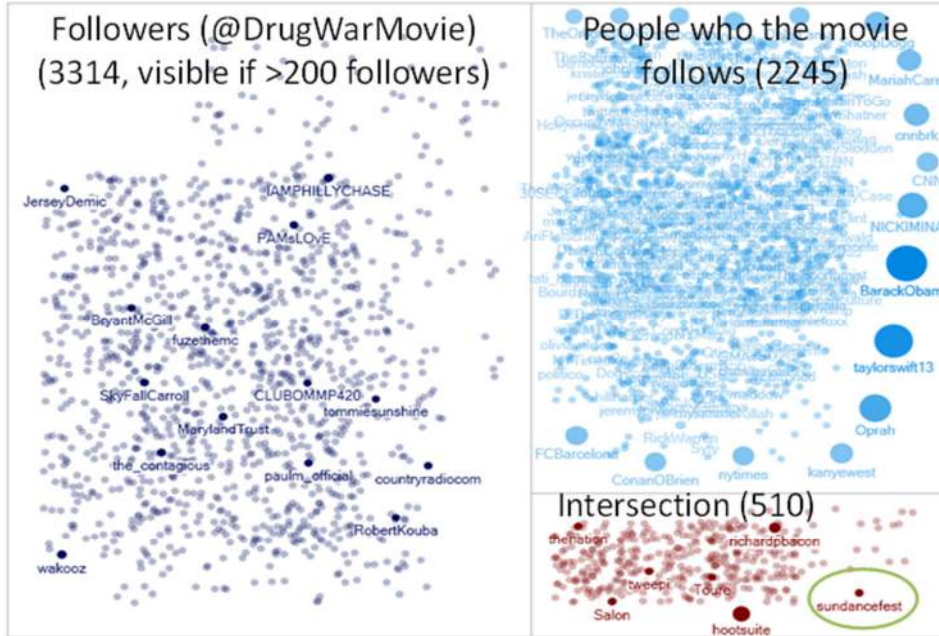


Figure 7: Intersection of followers and followees (red = relevant types of people, purple = anybody else)

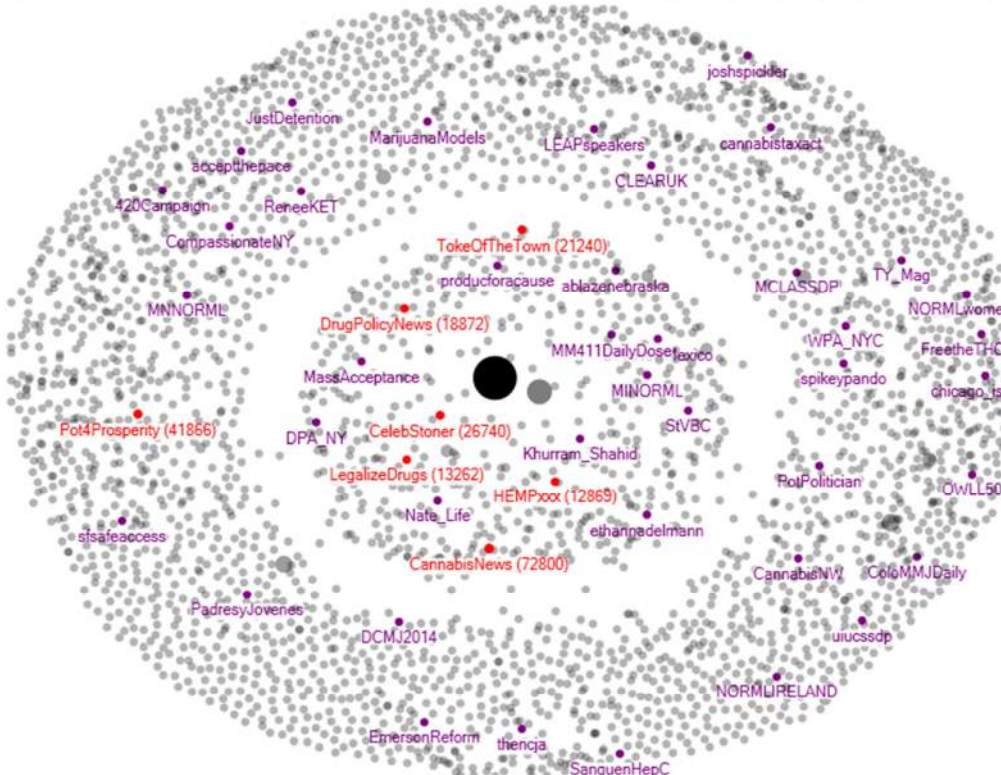


Figure 8: Co-occurrence of salient terms from posts on Facebook Fanpage for "House I Live in"

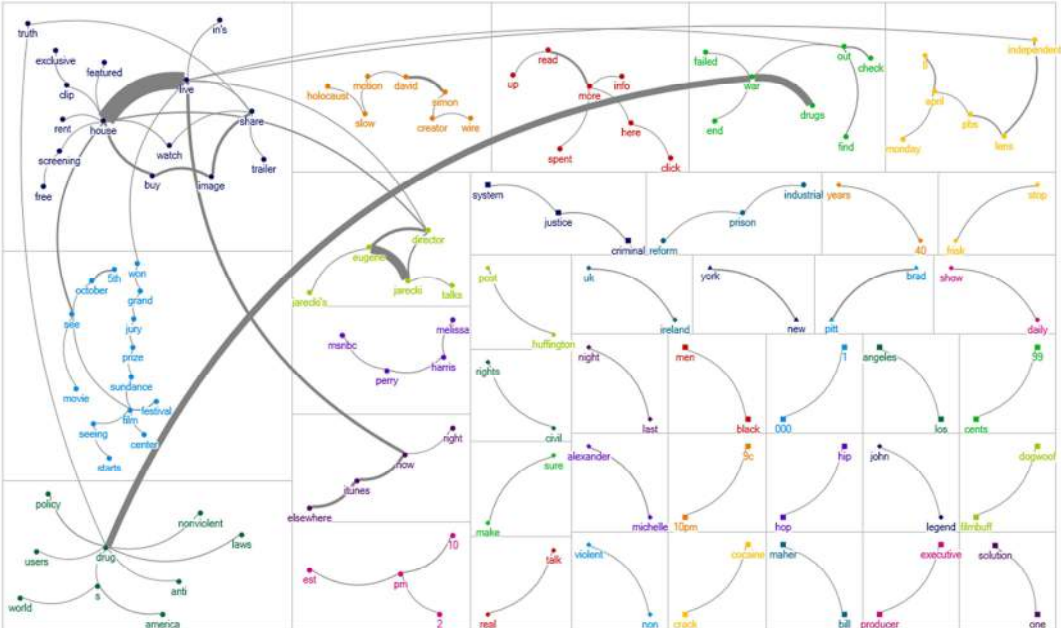
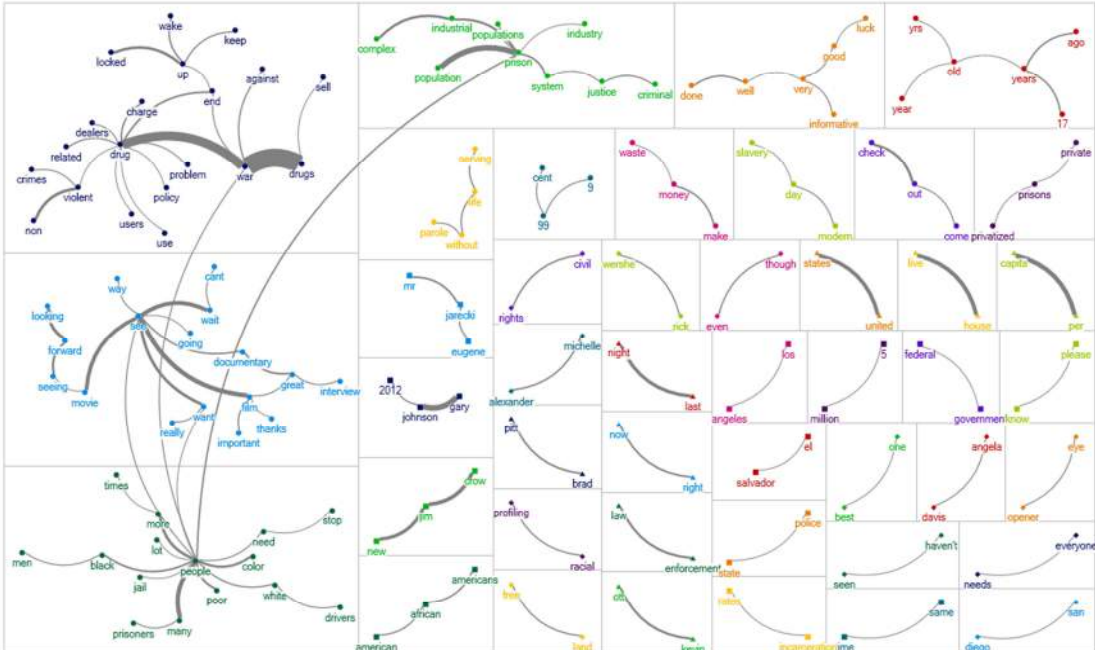


Figure 9: Co-occurrence of salient terms from comments on Facebook Fanpage for "House I Live in"



4 Conclusions, Discussion and Next Steps

Films are produced, screened and perceived as part of larger and continuously changing ecosystems that involves multiple stakeholders and themes. We have presented a novel, theoretically grounded and computational solution for mapping and assessing the impact of (social justice) documentaries by analyzing the web of stakeholders and information related to (the main topic of) a film in a systematic, empirical and scalable fashion. This solution overcomes the main shortcomings of prior approaches used or proposed for this purpose. Our evaluation methodology tracks the evolution of a movie, the issues addressed in a movie and the reactions on it from the earliest stages of a film production on; allowing for the strategic allocation of scarce resources for engagement work. The developed, publicly available technology is also applicable for conducting text mining and network analysis on data from other domains.

Several limitations apply to our current conceptualization and implementation: First, our ground truth model about a film considers only one dimension of a documentary, i.e. content as represented in the film script, while other key elements like visuals and sounds are neglected. While we do not incorporate these elements into the ground truth, reaction to it are being tracked. Second, we focus on public awareness as reflected in social media data, news coverage and data from focus groups. However, the target of impact might also be political and corporate change. In the near future, we plan to expand our framework and technology to cover these dimensions as well.

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Appendix

Table 3: Mapping of Existing Tools to CoMTI Categories (Legend: green = feature/ strength, yellow = limitation, red = serious issue, empty = no information available)

Tool	Main Functionalities supported	Access	Scalability	Cost	ComTI Category	Interface
SAS Social Media Analytics	Data, Sentiment, Demographics, Historic, and Influence	API integrated with web-analytics		\$5000 /month	Cognitive Direction Attitude Behavior	Graphical Interface
Social Mention	Data, Influence, Sentiment, “Passion”, and “Strength”	Stream API managed through GET request	1000 queries/day	Free	Cognitive Attitude Behavior	
Beevolve	Crawler, Data, Sentiment, Very basic analysis	Crawler API queries	10 terms	\$100/m	Cognitive Attitude	Graphical Interface
Trendrr	TV program assessment, Data, Historic, Sentiment, Geo-tagging, and Link Analysis	API, but not publicly viewable		\$500/m	Cognitive Direction Attitude	Nice Graphical Interface
Viral Heat	Data, Sentiment, Influence, and Stream based	HTTP Managed API		\$10/m	Cognitive Attitude Behavior	Graphical Widget
Hoot Suite	Data, Sentiment, Link Analysis, Geo-tagging, Influence, Historic, and Sentiment	HTTP managed API for streams	300 queries per hour.	\$10 /month	Cognitive Direction Attitude Behavior	Graphical Report Builder
Gnip	Data, Influence, URL Resolution, Geo-tagging, Historic, and Language Detection	APIs for stream management		\$2000/month	Cognitive Direction Behavior	Web based interface
Topsy	Data, Sentiment, Influence, URL Resolution, Geo-tagging, Historic, and Related Topic Discovery	API managed through GET request		\$60 /month?	Cognitive Direction Attitude Behavior	Web Viewer. API returns JSON
DataSift	Data and Sentiment	APIs for stream management	Limited by cost	Pay by use	Cognitive Attitude	Graphical Interface
Meltwater Buzz	Data, Sentiment, & Influence	No available APIs		\$10,000 /year	Cognitive Attitude Behavior	Graphical viewing platform
Sysomos	Data, Sentiment, Historic, Influence, Language Tagging, and Geo/Demo-tagging	API available, but not publicly posted			Cognitive Direction Attitude Behavior	Widgets for digesting data
Alexa	Basic Web Analytics. Noted for inaccuracies	Parse from Web		Free	Temporal	
Google Analytics	Basic Web Analytics. Decent Accuracy	API with docs		Free	Temporal	

