Transfer Document:

The Internet as a Catalyst for Social Movements:

An Analysis and Simulation of Social Media

Mechanisms in the Context of the Arab Spring,

Indignados and Occupy Movements

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1   Introduction

Over the last few years protest movements such as the Arab Spring, the Spanish Indig-

nados movement, and the Occupy protests, have cascaded through the Middle East and

the rest of the world.[1] All of these were portrayed as 'Internet Revolutions', or at least

as having been accelerated by the communicative capabilities of the Internet (Hamdy

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[1] The Arab Spring is also named 'Arab Uprisings' by some to indicate it is a continuing movement. Here
we will use the term 'Arab Spring', both because the focus here is on the early phases of movements
(their 'spring'), and because it is the more widely used term in the English academic literature.

et al. 2012; Farrell 2012). Did the Internet and social media actually have anything to do with them, and can we expect more Internet-enabled protests soon? Opinions are divided in the scholarly literature; mostly along the lines of the ongoing debate between so-called Internet-optimists and pessimists.

Notable scholars in the pessimist camp are Bart Cammaerts, Matthew Hindman and Evgeny Morozov. Cammaerts argues that commodification and appropriation by elites makes the Internet less deliberative than it is thought to be. Hindman argues that the Internet is barely used for politics and agrees with Cammaerts that it leads to more centralisation; for example into large — larger than any mortar and brick — companies, such as Amazon and Google (Cammaerts 2012; Hindman 2010). In the case of Google this led to censorship under pressure of the Chinese state (Dann et al. 2008). Morozov proposes that on-line activism is really slacktivism; a convenient distraction from actual street protests. Gladwell argues in addition that slacktivism can only foster ties that are too weak to sustain the sacrifices that protests require in the real world (Morozov 2012; Gladwell 2010). On the other hand, optimists such as Yochai Benkler and Howard Rheingold argue that the cheap many-to-many communication afforded by the Internet fundamentally changes how easily people can express and organize themselves, leading to greater empowerment and a more egalitarian cultural sphere (Rheingold 2003; Benkler 2006). More specific to recent protests, Philip Howard and Lee Rainie noted that on-line activity preceded protests on the ground, and that more active social media users were much more likely to show up at protests than others (Howard et al. 2011a, 2012; Rainie et al. 2012).

While the explanations and findings offered by both optimists and pessimists sound plausible, they do not come close to answering the question of what the impact of the Internet likely has been, or is. This is simply because the social processes they describe (if any), need not be mutually exclusive. They could work both ways, and do not warrant

blanket predictions. The thesis will attempt to improve upon this both by explicating and disentangling these, and other social processes relevant to the formation of protest movements, and then by carefully evaluating how various Internet platforms may have changed the media-landscape to affect each of them. Dissecting the Internet into different communication platforms, and 'impact' into a set of counter-acting social processes that each may play out differently, should move insight beyond blanket predictions, and help clarify how anomalous it would be if something as multifaceted as the Internet were *not* to have any impact on collective action initiation (Farrell 2012).

While it is unlikely that Internet platforms were a sufficient cause for recent protests, they are expected to be a contributory cause at least, because collective action is fundamentally communicative: for it to come about at the very least a common interest has to be identified and communicated, and contributions then have to be coordinated between many people (Flanagin et al. 2006). Besides, the initiation of social movements often crucially involves private, potentially high-risk communication to identify other possible initiators. Other central processes heavily relying on communication are: opening up hidden transcripts (people communicating discontent among similarly oppressed friends), overcoming falsified preferences (people adjusting preferences to what seems possible), and communicating new identities and framings of the situation (Scott 1990; McAdam et al. 2003; Kuran 1989).

In what will be a theoretical thesis, the most important social mechanisms involved in mobilisation and collective action initiation will be identified and analysed. Social mechanisms are central to the Analytic tradition in sociology, allowing for abstract, micro-scale, action-based explanations of recurring social interactions and their outcomes (Granovetter 1978). New communicative mechanisms introduced by specific social media platforms will be analysed as well, such as for example the Facebook feature that allows people to signal 'I'm going', for (protest) events, which could help people

gauge support in relative safety, even under serious (off-line) political oppression (such as existed in many Arab countries) (Aouragh et al. 2011; Gerbaudo 2012).[2]

For each of these mechanisms an illustrative model will then be created, and these models will be extended with the affordances provided by various media and Internet platforms (*media platforms*). Several models of collective action have already been produced in sociology, the foremost of which is Granovetter's threshold model. According to this model, individuals won't join a protest until their threshold (k) is met, for the number of others that need to be protesting before they dare to join. People's thresholds vary. Whether a protest happens then depends on whether enough people with low enough ks are nearby: leading to a riot if a hundred people with ks 0 to 99 are present, and only two rabble-rousers ($k = 0$ & 1) amidst 99 solid citizens, if the next k is missing (if $k = 2$ is missing, then $k = 3$ and further won't be joining in, breaking the chain) (Granovetter 1978; Granovetter et al. 1988; Gonzalez-Bailon et al. 2011; Watts et al. 2009).

Agent based modelling (ABM) is well-suited as a method for illustrating social mechanisms, and for maintaining the micro-macro link that constitutes emergent behaviour; which is a crucial phenomenon here. Even though changes in the affordances offered by media platforms only affect individuals' communicative environments in various small ways, communication is repeated, recursively, with every 'round' of interactions building upon earlier differences. Thus small, individual-level changes may cascade into large, emergent shifts in macro outcomes over time (Bond et al. 2012; Choi et al. 2010; Biggs 2005; Opp et al. 2010; Gould 1993, 2003; Thaler et al. 2008; Watts 2002, 2011; Blee 2012). Being able to trace such change — even if only in a model — allows for a clarification of how historically momentous outcomes, such as the ignition

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[2]Every individual 'I'm going' is naturally somewhat uncertain and thus needs discounting with the ratio of people who at similar protests indicated they were going versus those that showed up.

of social movements could arise, even in absence of large or spectacular causes.

The remainder of this document consists of the following: First the stage will be set by discussing previous work and the traditions the thesis flows from, followed by the research-questions. Then more will be said about ABM as a method, and an initial sketch of the agent-based model will be given. Next, social mechanisms that were already tentatively identified will be described. After which a note on research ethics, a time-table for completion, and a tentative list of chapters are included. The document will then conclude with an exposition of the many ways in which this research may contribute to the debate on the impact of the Internet as a catalyst for protest movements. Finally it should be noted that this work acknowledges that every collective action (also) has roots in complex historical and regional factors, and that individual agency, bravery, and sacrifice are often a *sine qua non*. In no way does this paper wish to detract from that. Its aim is merely to tease out the possible impact of communicative affordances.

2   Previous work and theoretical background

The thesis sprouts from three broad scholarly traditions: the social movements literature in sociology and political science, the Analytical school within sociology, and the tradition of formal modelling. In this section the core literature and ideas of each are going to be introduced, as well as how the thesis is derived from them.

2.1   Social movements

In the thesis social movement initiation will be studied. Where a social movement is something such as the Kefaya movement that was at the core of the protests against Mubarak, or the 15 May movement that became the Indignados movement. Social movements are defined by Charles Tilly as "a series of contentious performances, dis-

plays and campaigns by which ordinary people make collective claims on others", while Sidney Tarrow adheres to "collective challenges [to elites, authorities, other groups or cultural codes] by people with common purposes and solidarity in sustained interactions with elites, opponents and authorities" (Tilly 2005; Tarrow et al. 1994). Because initiation is examined here, and not so much growth or sustained existence, a simpler definition will be used: *"a set of ordinary people acting for the same politically contentious purpose"*. In addition, only social movements that oppose the government will be considered, rather than astroturf protests, or protests condoned by the government. Similarly, only attendance of real-world protests will be considered sufficient to define a budding movement, as such acts with non-trivial costs (even if only a few hours of one's time) are said to be unable to be fostered by the Internet (Gladwell 2010).

The broader sociological social movements literature is relied on as a source of core concepts and factors that are considered to affect social movement formation. In Tilly's basic model social change depends on mobilizing structures (organisations and ties), opportunities or threats, framing processes (how things are portrayed), and contentious interactions in which repertoires of contention (forms of protest such as sit-ins) are played out (Tilly 2008). Other factors that are important in the literature, and especially useful in a communicative context, are Timur Kuran's idea of falsified preferences, Scott's notion of hidden transcripts, and the level of actual and perceived grievances (Baldassarri 2009; McAdam et al. 2003, 2005; Kuran 1989, 1995; Scott 1990; Glaeser 2011; Meyer 2004). Unexpectedly, media platforms do not play a significant role in these established works.

In fact, very few papers from before the Arab Spring address the impact of media platforms on social movement formation and growth. There are five that look at media before the Internet. The first looks at the impact of mass media on the spread of protests during the civil rights movement, and finds that mass media were the main long-distance

diffusion channel (Andrews et al. 2006). Another paper finds no effect of Western TV broadcasts on protest participation in East Germany during the 1989 revolution (Kern 2011). Then there is a paper on the effect of the postal system on the size of organisations, though it focusses on commercial ventures, not social movements (Haveman et al. 2011). A fourth argues that cassette-tapes were used to circumvent state media in the run-up to the Iranian revolution of 1979 (Sreberny et al. 1994). The final paper explicates how radio broadcasts in the early 1930's could have shaped textile workers' sense of collective identity and political opportunity, fostering strikes among them (Roscigno et al. 2001). With this handful of papers, the literature has thus been quite sparse.

Since the Arab Spring, however, several papers have come out that directly address the impact of social media on the protests, where social media are defined as on-line platforms that enable "the creation and exchange of user-generated content" (Kaplan et al. 2010). A few papers even propose specific mechanisms such as the mass-media relaying information captured/sent out through social media, the Internet providing a secluded public sphere to prepare protests, or that the shutdown of the Internet and mobile coverage in Egypt on January 28 — instead of tempering protests — may in fact have drawn more people into the streets because they wanted to check up on family (Hassanpour 2011; Lim 2012; Howard et al. 2011a; Tufekci et al. 2012). Other works address the media question in a general manner. Paulo Gerbaudo provides a valuable comprehensive thick description of the three movements, while Castells' latest book expounds on generic network theory, but doesn't teach us much with regard to specific social mechanisms or actual media platforms (Gerbaudo 2012; Castells 2012; Howard et al. 2011a). By untangling each social mechanism and analysing the effects of affordances offered by actual media platforms, the thesis will address this (theory-shaped) gap in the literature.

In addition to concepts, the thesis will also borrow several formalized models from

the social movements tradition. Besides Granovetter's threshold model mentioned earlier, Olson's economic model of collective action (an analysis of the free-rider problem in large groups), and several papers following on from this, will inform the research, but will not be central to it, due to it's limited rationalist homo economicus model, which does not mesh well with attention for structural factors (Olson et al. 2009; Marwell et al. 1993; Baldassarri 2009; Finkel et al. 1998; Lupia et al. 2003). A model that will be drawn from, is that of Bikhchandani's cascades. It stipulates that if people decide on something in a row, and are influenced positively by previous actors' behaviour, then once sufficient people have acted in the same way, everyone else will follow suit (Bikhchandani et al. 1992, 1998; Banos et al. 2013).

Finally, the thesis will also draw from *Dynamics of Contention*, and *Contentious Performances*, by McAdam, Tarrow and Tilly, in which a dynamic view of social movements is presented; analysing social mechanisms observed across social movements throughout history. Its approach and narrative style are very close to what the thesis is aiming for (McAdam et al. 2003; Tilly 2008). The types of mechanisms studied include brokerage (individuals bridging previously unaffiliated communities or interests) and scale-shifts (a movements goals shifting to become more or less global). For example, both were at work in the American revolution, in which unrest over local taxes turned into a war of independence when Paul Revere's nocturnal ride bridged the diverse communities he had ties with (Han 2009). The scale-shift mechanism would nevertheless not qualify as a mechanism under the methodologically individualist definition that will be used here (movements are not individuals). More on this and social mechanisms now.

2.2   Structural individualism and social mechanisms

Analytical Sociology, and the structural individualism inherent to its social mechanisms based approach, forms the school which the thesis may be placed under. Even though already observed in Weber's writings, social mechanisms were initially explicitly theorized about by Jon Elster, and then further developed and redefined by Coleman and especially Peter Hedstrom (Elster 1989; Coleman 1994; Hedstrom et al. 2009e,c). Following Hedstrom we define social mechanisms as the 'cogs and wheels' of interactions between individuals that bring about macro-effects. They may be more abstractly described as: "a constellation of entities and their activities that are organized in such a way that they regularly bring about a certain outcome" (Hedstrom 2005). The crux is that macro-effects should be understood as (sometimes very intricate) aggregates of individual actions, which can only have an impact through the results of individuals' actions (supervenience) (Hedstrom 2005; Hedstrom et al. 2009a; Coleman 1994; Hedstrom et al. 2010).

By focusing on social mechanisms one can avoid the two sociological pitfalls of both inexact grand theorizing, and having to stop at merely pointing out correlations between macro-variables, as is common in some empirical work. A model called Coleman's boat can clarify this further (see figure 1): Arrow one is the individual being influenced by macro processes, for example by perceiving a change in opportunities due to global trends. Arrow two represents the (inter)actions of individuals on the micro-scale, and arrow three their alterations to the environment. The fourth arrow then shows the macro-level associations that arise from $1 - 3$, which have no causal effect of their own, and thus should not be used in sociological explanations (except perhaps as a shorthand) (Coleman 1994). This is especially so because different processes at $1 - 3$ may not predictably lead to the same outcomes across arrow four (again especially if recursion and emergence occur).
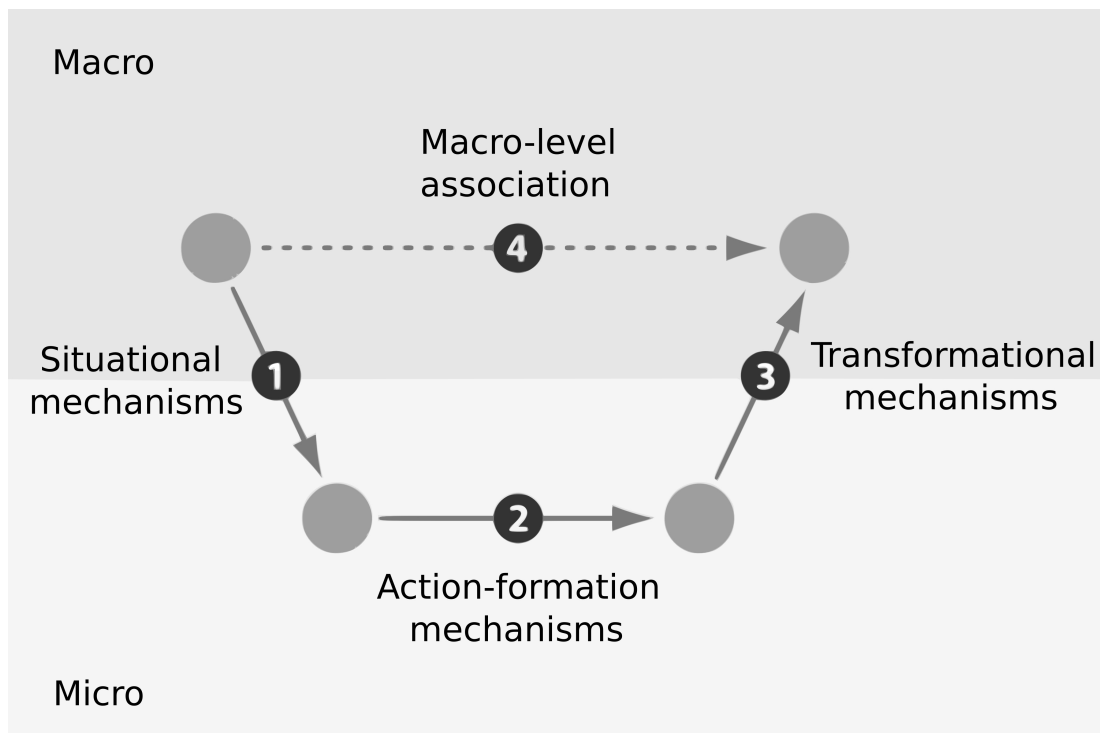
Figure 1: *Coleman's boat: Model of the interactions between micro and macro processes. Regularities along arrow 4 are not to be used as explanation when this can be avoided, as they merely arise from arrows 1 to 3.*

The social mechanisms approach allows for the dissection of social phenomena into abstract, realistic, and action-based explanations; opening the door to clarity, precision, and fine-grained distinctions. Because mechanisms are regularities in interactions between actual entities such as people or information sources, their descriptions can be made relatively abstract without loss of grounding. This allows for the same- or similar social mechanisms to be observed and analysed across many different settings. This is also done in *Dynamics of Contention* throughout history, and will be done across the different protest areas and media platforms in the thesis.

It is also important to note that the mechanism metaphor should not be taken too literally; it does not imply that social interactions are machine-like, but merely that they have regularities that can be examined, understood, and described in an abstract way: that they are — in principle — open to the project of science. A practicality that needs to be taken into account is that even though in some cases social mechanisms can be studied empirically, or even — on very small scales — experimentally, precise data about all individual interactions is rarely available, leading to more theoretical, rather than empirical work. In this thesis a theoretical approach is chosen as well; where the model is not predictive but primarily explicative (as detailed below).

Apart from data-sparsity, another potential downside of focusing on concrete actions and interactions is that more high-level influencers may easily be overlooked. Examples include slight shifts in peoples identities and Luhmanns *leitdifferenzen*; core distinctions (profit/loss, or legal/illegal) that guide the perception of information and its value within 'social systems' (domains), such as the economy or the legal system (Luhmann et al. 1995). If the impact of these influencers could only be observed on a macro scale, the risk of missing them would be especially great. This weakness, however, is one shared with all experimental, and most (small-scale) empirical sociological research. ABM, which will now be introduced, may alleviate this weakness to some extent by

maintaining the link between micro-processes and macro-outcomes.

2.3   Formal modelling

An agent-based model is a computer simulation of social interactions between autonomous agents, where agents usually represent people, and act according to relatively simple decision rules. ABMs are generally used to assess emergent, aggregate effects of many individual interactions on a social system as a whole. Here they will be used to assess the impact of changes to the media-landscape on the communicative opportunities of individuals, and of individuals' communication on collective action initiation (down below deck, and back up on Coleman's boat, see figure 1). A famous ABM from sociology is Thomas Schelling's segregation model. He found that even a small preference for neighbours of the same 'race', led to a large rise in segregation at the macro-level, when over a few iterations, 'unhappy' agents (those surrounded by too many of a different 'race') relocated to random empty spots on the model's map (Schelling 1971; Schelling 2006).

ABM was developed after, and is different from two other kinds of modelling. The first type is analytic modelling, which is equation-based, and is most commonly practised in economics. It approaches sociological processes as unified systems, and specifies relationships between (mostly) macro-variables, such as supply and demand, in exact opposition to Coleman's boat. Apart from this, formal modelling also does not (easily) allow for heterogeneous agents (agents with varying properties), or for the inclusion of social networks or other spatial and structural features (Axtell 2000; McElreath et al. 2008; Bonabeau 2002). Secondly, ABM also differs from game-theory, in that it relaxes the rationality requirements on the part of agents (and here too allows for the inclusion of structural factors). A consequence of ABM's increased richness is that there are no easily calculable outcomes or optima, as in game-theory: one has to run the

model on a computer to see what happens (Macy et al. 2009; Bonabeau 2002; Centola et al. 2005).

Agent-based models have attained considerable popularity over the last decade in economics and anthropology, and they have been used in sociology as well (Biggs 2005; Flanagin et al. 2006; Hamill 2010; Mas et al. 2013; McElreath et al. 2008; Baldassarri 2009). Apart from Schelling's model mentioned earlier, there is the modelling of pedestrian's movements, which has already saved many lives by improving the positioning of safety fencing, at festivals, and even around the Masjid al-Haram mosque in Mecca. Then there is Nigel Gilbert's pioneering work on simulating primitive societies, and innovation-networks (Gilbert et al. 2001; Helbing et al. 1995). Joshua Epstein created a simple model of civic protest that will be extended in this thesis. It models a central authority that tries to suppress a rebellion, and takes government forces, expressed and hidden grievances, and risk-aversion into account (see also section 4.2) (Epstein 2002). Still relevant, but slightly more remote, is Elkink's paper on (and model of) the diffusion of democracy as a system of government (Elkink 2011).

These models may seem simple, and they are. Even more so, this thesis will only significantly go beyond them, in that the communicative affordances and mechanisms introduced by the Internet, will be added. Parsimony is a virtue. For as is true for any model or theory, without parsimony one will just replace a reality that can not be understood with a model that can not be either (Hermann 1967; Conte et al. 2012). Complicated, opaque models may be very useful for prediction (if calibrated and tested), but they are not for the explication, clarification, and illustration of social mechanisms to human readers (Prietula et al. 1998; Boero et al. 2005; Centola et al. 2005). Keeping models abstract and simple ensures that they can be effectively communicated, will be remembered, and can easily form the basis for further research, both as starting models, and through generating new, unexpected hypotheses about possible social mechanisms

and their impact (Macy et al. 2009; Epstein 1996; Conte et al. 2012; Whitehouse et al. 2012). In this thesis all models will thus be parsimonious, informed by theory, held together by consistency, and their behaviour and output will only be considered as good as the model is intuitive and plausible to readers that are analysing the relationships defining their behaviour, not just their output curves (Macy et al. 2009; Miller et al. 2009). Interviews with scholars will be used to test whether the models perform well in this regard.

Another important thing to consider is that ABM will only be capable of illustrating generative sufficiency of the proposed social mechanisms (that they *could* have caused it), not proof of the specified mechanism actually having had a causal impact; other mechanisms may have been at work to produce the same exact outcomes instead (a situation known as generative plurality) (Boero et al. 2005). Though this is not as problematic as it seems, because, as Hume already noted, empirical hypothesis-testing suffers from generative plurality as well; even if confounding factors are ruled out perfectly, a plurality of explanations (or models) can always be given for the same sequence of B happening after A (Hume 2000; Epstein 2006; Centola et al. 2005; Macy et al. 2009). Empirical studies address this by showing that (macro) variable B correlates with A and then proposing or contrasting plausible theories about possible causal relationships in a relatively tentative way. Instead, the social mechanisms modelling approach focusses on illustrating and mapping out plausible micro-level (inter)actions and their exact causal relationship to hypothetical macro-outcomes, at the (not insignificant, but modest) cost of having to postpone proof that each modelled mechanism was historically responsible.

3   Research questions

While the Arab Spring, Indignados, and Occupy movements did undoubtedly broadcast their message using the Internet and social media in particular, it remains disputed whether their initiation and early growth was in any way caused, or furthered by the Internet. More precisely; while grievances over bad governance, police violence, the economic crisis, or high food prices, might have been sufficient causes (especially in the longer run), it remains disputed — but seems highly anomalous — that the Internet could *not* have been a contributory cause, especially given the communicative nature of the process of social movement formation. This leads to the following primary research question:

Could the Internet and the advent of social media have changed the media landscape in such a way as to make the initiation of social movements more likely?

In order to tease this out, the social mechanisms most relevant to protest movement formation will be identified, and for each it will be analysed what impact the Internet could have had on it. These social mechanisms will then be illustrated and checked by creating a simple ABM for each of them. The modelling and analysis will be theoretical in nature. It will also be limited to effects on the initiation and early spread of protest movements, rather than about whether they end in a successful revolution. In brief the thesis will thus provide a theoretical analysis of whether aggrieved people and local groups can communicate interest, find each other, reach their thresholds (k), form a small movement, and initiate a viable contentious gathering (Booij et al. 2011).

This results in the following sub-question:

Sub-question A) What relevant social mechanisms can be identified that were potentially affected or introduced by the Internet?

1. Could each of these mechanisms, when modelled, increase (or perhaps reduce)

the potential for collective action initiation?

For each social mechanism, a very simple, abstract, and illustrative ABM will be constructed, and its behaviour will be analysed for a variety of input settings. Of greatest interest here will be the number of protesters over time, relative to what it is for other models/mechanisms. No attempt will be made at simulating every aspect of reality in these or later models, as they serve to illustrate and formalize, not to replicate every aspect of reality. For social mechanisms that were already tentatively identified, such as the earlier mentioned usage of the Internet as a secluded public sphere, more detailed descriptions of how they are going to be modelled, will be provided in section 4.5.

However identifying and illustrating social mechanisms is not enough, because they may play out differently across various traditional, and on-line media platforms; which each after all have different structural properties. A comparison must thus be made across media platforms; leading to sub-question B:

Sub-question B) What impact could media platforms, and their generic structural properties, have on collective action initiation?

1. How does each specific social mechanism (where relevant) interact with the media platform it is played out on?

Traditional media platforms that will be modelled are: face-to-face communication, newspapers, broadcast TV, and stationary (and later mobile) telephones. On-line platforms taken into account will be: e-mail, passive web pages, usenet/bulletin-board style forums, blogs, Facebook, and Twitter. These media were chosen because they are widely used, and the latter three Internet platforms for their alleged relevance to the recent protest movements. Parsimonious agent-based models will be created and analysed for each of these media platforms. As a next step, most of the social mechanisms from question 'A' will then be run through these models (where they are relevant for

the medium), and their behaviour will be analysed and contrasted with earlier runs, and between media.

Looking at the interactions of the mechanisms with each of these concrete modelled media platforms, means the thesis can go beyond blanket-statements about the Internet as a whole. Nevertheless, only examining media platforms in isolation would not be enough to settle the primary question, because in practice communication is multimodal (Schroeder 2010); it happens through multiple platforms that together make up the media landscape. Hence the following sub-question:

Sub-question C) How does protest movement initiation differ for each social mechanism across the following three media landscapes:

1. The situation before the advent of the Internet (say in the 1970s)

2. The Internet as it was in the early 1990s, with e-mail, passive pages and silo-style on-line forums featuring primarily on-line-only contacts

3. The media landscape as it became in the 2000s, with mobile phones, blogs, social media and social-networks integrating on-line and off-line ties

These three media landscapes will again be modelled in a stylized and simplified fashion, not just by 'adding up' the various platforms from question 'B'. The first landscape consists of just the traditional, pre-Internet media, while the latter two each successively add the affordances provided by three new Internet media (see table 2 for the exact media). The transition between the last two landscapes (the Internet landscapes) is included in order to cover what several scholars see as substantial changes introduced by the arrival of social media (also known as the transition from Web 1.0 to Web 2.0) (Beer et al. 2007; Cormode et al. 2008; o'Reilly 2009). These three media landscapes should behave quite differently, and thus provide different emergent effects for the social mechanisms.

Besides the three landscapes, a second axis of comparison will be that between the three cases of the Arab Spring, Indignados, and Occupy movements. No new models will be created for these cases, instead they will provide contrasting values for variables such as Internet-penetration rates, and where relevant (for the social mechanism) other variables such as levels of censorship and government control. For example, Internet-penetration-rates were low in Arab countries, while it was moderate in Spain, and high in most Occupy countries. Censorship has exercised in the Arab world (especially offline), while there was virtually none in the other two cases (Gerbaudo 2012). The dimensions along which the three cases differ are listed in table 1 (Freedomhouse 2014a,b).

Case	Exemplar	Government	Censorship	Internet use	Protests
Arab Spring	Egypt	dictatorship	yes	36%	capital city
Indignados	Spain	democracy	no	67%	capital city
Occupy	US	democracy	no	81%	global/dispersed

Table 1: *Cases and their important variables*

Besides for being well-known, these case studies were also chosen because they are similar in many ways, such as in their horizontal organisation, their protests taking place on central squares, and the use of social media for their dissemination (Gerbaudo 2012). In addition, they happened shortly after one-another, and may even have been triggered by each other (Gerbaudo 2012). Finally, a growing body of literature exists for them, which not only forms a valuable source of examples of social mechanisms, but also provides grounding and richness of detail for the thesis (Hamdy et al. 2012; Hassanpour 2011; Howard et al. 2011a, 2012; Papacharissi et al. 2012; Wolfsfeld et al. 2013; Lotan et al. 2011; Penney et al. 2013; Tufekci et al. 2012; Lim 2012). Though these three

will be the main cases, where relevant, examples from other social movements may be brought up as well, such as the current protests in the Ukraine, or the Eastern European revolutions of 1989.

Because the thesis focusses on structural aspects, the modelling of all mechanisms, media, and landscapes will be illustrative, and be based on artificial scenarios. For the three landscapes no historical accuracy needs to be strived for. Thus historical changes in population size (number of agents), or changes in literacy levels, will not be modelled. In fact, when models are compared, all variables but the media-related one under scrutiny, will be kept constant. This is done in order to exclude them as confounding factors and to allow for more precision in elucidating the effects of structural changes to the communicative environment. Structural effects are brought to the centre of the stage because they are exactly the sort of effects through which media could affect collective action initiation. By mapping out and clarifying the impact of these effects, the debate on the impact of the Internet can not only be made more substantive, but new, interesting hypotheses for further research may be arrived at during the analysis as well.

Even though the thesis is theoretical, in order to provide some empirical grounding the models will be tested in two ways, culminating in the final sub-question:

Sub-question D) How do some of the models hold up against intuition, and to empirical reality.

1. For the models of on-line fora and twitter; how does the parsimonious version compare to a more detailed model that is calibrated by data?

2. How plausible do researchers with experience in the field find the models of the mechanisms and media landscapes?

A risk in ABM is that models may become too parsimonious, ommitting aspects or features that can drastically change, or even invert the behaviour of the model. In

order to evaluate whether such discrepancy would affect the models of media used in the thesis, two more realistic models will be constructed and calibrated with data. One will be built for on-line forums (typical for Web 1.0) and one for Twitter. Their impact on how (relevant) social mechanisms play out will then be evaluated against the more parsimonious versions. These two media are picked because both Twitter, and especially web-forums tend to be used more to communicate with strangers than, say Facebook or e-mail, which reduces the odds of missing communication that happened through other channels, and ensures that the models will be more complete. Access has been obtained to the Boards.ie and the SNAP Twitter data-sets, allowing for such models to be built.

Finally, because the models are primarily illustrative, the models and the analysis behind them need to be validated by testing their intuitive face value as well. This will be done through about a dozen interviews with scholars who did (qualitative) research on the Arab Spring, Indignados, or Occupy movements. These interviews will be held at conferences, and will consist of two parts: 1) Asking the scholar what social processes or mechanisms they think led to the early growth of the respective protest movement. 2) After walking them through the model of a mechanism, asking them whether the demonstrated mechanism appear relevant to them, and whether they consider the model a good illustration of it (repeated for a few mechanisms).

Through the testing of both the plausibility of the analysis, and the extent of the models discrepancy with precise data, the thesis will receive the evaluation that is required to be able to say something about its value and how well ABM as a method worked. More will be said about methods now.

4   Methods and approach

Before introducing the basic model of collective action, and the illustrative extensions to it for a number of social mechanisms, a few more things need to be explained about ABM as a method.

4.1   Agent-based modelling as a method

As discussed before (in section 2.3), ABMs are only capable of demonstrating generative plurality, and keeping models parsimonious is crucial for their communicative value. Earlier studies have nevertheless not always kept these limits in mind, leading to great variation in the quality of papers, and bringing a measure of disrepute to the method (Epstein 2006). Claiming too much is the most common mistake; such as historical proof, instead of generative sufficiency; another is trying to include too many theories and/or factors, leading to opaque and convoluted models. Some papers, on the other hand, are too reserved, and present ABMs as no more than toys or tools for teaching. Finally; because emergent effects may often seem obvious in hindsight, papers that demonstrate them are sometimes not given due credit.

While conceding these associated risks, the fundamental issue is whether the method can be applied properly, while taking its limits into account: and it can; by using it as a device for examining social mechanisms, and for developing and illustrating theories about them (Baldassarri 2009; Macy et al. 2009). As for unforeseeable emergent effects, though by definition they cannot be foreseen, it is likely that some will surface, given the complexity of media landscapes and the fact that several social mechanisms will be analysed. Though even if only the expected can be (generatively) demonstrated, its explication may provide a level of clarity beyond what has been achieved narratively. ABM is as much about clarification of what we know, as it is about discovery (Miller

et al. 2009).

The explicitness and clarity that comes with agent-based modelling has a downside as well, however, and that is that it pushes every assumption that is made out into the open. In ABMs, every latent ambiguity that surfaces but is not resolved, will leave a gap in the model that grinds it to a halt. This forces one to introduce a (well-informed) assumption for each ambiguity, creating the exact opposite situation from that of narrative accounts. If there are things one doesn't know or agree on in writing, they can be left open or implied (if not actively downplayed), while ABM's combination of explicitness and forced ambiguity resolution, makes each assumption stand out like a sore thumb. This can make ABMs look comparatively bad.

A small part of the answer to this issue is that making explicit what is not known may be as valuable as conclusively proving something new. Then there are measures to minimise the problem. Foremostly, assumptions must be well-informed: by grounding them in theory, by drawing on careful analysis of earlier studies, by basing them on precise observation and analysis of media platforms, and finally, by deduction from each of these; for example by avoiding inconsistencies with what is known (Prietula et al. 1998; Macy et al. 2009; Bonabeau 2002; Miller et al. 2009). Another good response is exploring the whole parameter space, possibly using a Monte Carlo technique (efficiently trying every reasonable value, so results can be qualified) (Hermann 1967). Being explicit about all assumptions, followed by parsimonious solutions, coupled with good presentation and an appeal to common-sense, can go a long way as well (as it does in narrative theoretical work). Finally, the best test of an illustrative ABM is whether it elucidates the modelled process to colleagues, and whether they think it make sense (Miller et al. 2009).

4.2   Epstein's basic model

In ABM, at minimum, agents are entities that act according to decision-rules. Normally their opportunity space and subsequent decisions therein, are also shaped and informed by: memory, computations, and by observations from their environment; including observations of the actions of other agents (Bonabeau 2002; Macy et al. 2009; Epstein 2006). In this thesis, Epstein's model of collective action will be used as a foundation. It has all of the aforementioned basic components of an ABM. It does not, and will not, include more complicated cognitive processes of individuals such as learning, or automatic processes such as evolution. Focus will be on the communicative environment provided by various media, and their most important objects/structures.

In Epstein's model, which slightly expands upon Granovetter's, there are two basic types of actors; citizens, and state actors. Citizens can either be part of the opposition or not, and do not join the opposition unless they are experiencing grievances at a certain level. State actors try to apprehend those who are in the opposition when they see them riot (signalling that they are in the opposition). Risk-averse citizens won't join the opposition based on their own private grievances alone, unless they see others around them join as well. The threat of detection and arrest by nearby state-actors is sufficient to make such citizens hide their private grievances and falsify their preferences in public.

The elements in Epstein's basic model are:

- *agents*: citizens and state-actors/cops (in the order of $200 - 300$ agents)

- *environment*: physical space, a grid that wraps around the edges (a torus, 40 x 40)

The agent-variables are as follows:

- r: Risk-aversion (floating point number between 0 an 1, normally distributed)

- g: Grievance level (floating point number between 0 and 1, normally distributed)

The model's relationships are specified in these formulas:

- C: Cops/state actors within sight of the agent (integer)

- A: Active opposition-members within sight (integer)

- P: Probability of arrest = C/A (actual formula $1 - exp(k * C/A)$ to always keep P between 0 and 1, with arrest-probability constant k set to 2.3 to ensure a plausible estimate of $P = 0.9$ when $C \& A$ are both 1)

- R: Net experienced risk = $r * P$

- a: Active in opposition = $g - R > 0.1$

These formulas are tied together as follows. Every actor has a level of risk-aversion r, and a grievance level g. These are set randomly from a normal distribution. Agents move randomly across a grid, and have a vision of 2 fields, leading to a total field of vision encompassing (2 + 1 + 2) x 5 = 25 agents (including the one watching). Any state actor inside this field counts towards C. While for A, besides all active agents, the agent also counts himself as active when calculating his probability P of being arrested (as in 'what would happen if I were to join the riot'). Agents that are arrested will be taken off the map for a number of rounds. The agent's net experienced risk R is calculated by weighting P against his risk-aversiveness r. The agent's experienced grievance g then determines whether the agent will go active (a) after evaluation against this R.

Epstein's model is simple, yet models the core communicative factors that play a role in riots. For one, it combines Granovetter's threshold model with Bikhchandani's cascades model. The former is included by having a (here local) threshold similar to

Granovetter's k, in that the relative number of rioters C/A is weighted against r (risk-aversion). While a cascade-mechanism is included when making the decision to go active, because private information (g) is combined with public information on others' previous decisions (on becoming active, A). Finally, in order to properly explore the models' behaviour and test for sensitivity, constants such as the field of vision, and the arrest-probability, will be varied. Naturally, communication-media are still missing as well, but that is why the model will be extended for various media platforms.

4.3   Extensions and implementation

In Epstein's basic model support for the opposition is expressed only through the act of rioting itself. In the extended version (the basic media model), opposition can be communicated through one (or more) media as well. As noted in the section on research questions (section 3, questions B and C), models for social mechanisms will be evaluated with communication occurring through different media-platforms. The media-plaforms are, first of all, the old one-to-many media, such as the oft censored newspapers and radio / TV. Telephones, both stationary, and (later on) mobile, will be analysed as well. Then with the early Internet comes e-mail; a push-medium popular among early adopters. Web pages and forums also arrived; two media which are especially good at involving the already involved over long distances. Finally, there are blogs and then social media, which knit off-line and on-line communities together, while still allowing for occasional long-range ties.

A mini-model will be created for each of these media, in such a way that it can be attached to the basic media model (in software-terms a plugin). Plugins will encode the basic features of the medium: such as its directionality (whether it is one-to-one, one-to-many), whether it is push- (primarily channel-based or intruding), pull- (request-based),

or both, and some of its basic structural properties.[3] The full list of media is provided in table 2. Simple estimates will be made for their average level of use, and the likeliness of messages being received/seen. Nevertheless, not every detail can be included, and the models will not go beyond illustrative isomorphic representations. In a more practical sense, it will be possible to plug different media, and media landscapes, into the models of each social mechanism, so that the impact of media can be tested. The effects of multiple media working in concert will be tested as well, both during the composition of the media-landscapes, and (where relevant to the mechanism) to explore the effects of multimodal communication directly (Schroeder 2010).

On-line media platforms taken into account will be: e-mail, passive web pages, usenet/bulletin-board style forums, blogs, Facebook, and Twitter. These were chosen because they are widely used, and the latter three for their alleged relevance to the recent protest movements. Parsimonious agent-based models will be created and analysed for each of these media. As a next step, most of the social mechanisms from question 'A' will be run through these models (where they are relevant for the medium), and their behaviour will be analysed and contrasted to the earlier outcomes. By looking at the interactions of the mechanisms with each of these concrete modelled Internet platforms, the thesis can go beyond blanket-statements about the Internet as a whole.

Besides plugins for media, the basic media model will also have two other extensions. The first is that agents differentiate between strong ties/friends and strangers. Agents will start out with a random list of friends (capped at Dunbar's number of 150)

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[3]What constitutes a push- or a pull-medium can be ambiguous for Internet-media, and is often nested because the Internet 'carries' multiple media-platforms. Visiting Facebook in the browser is a pull-act (just like visiting a static web page), but Facebook then pushes a stream of friends' wall-posts to the screen. Pulling up one of these posts can lead to further messages being pushed. Equating web-platforms to media such as TV or radio, and their pages to channels can help clarify some (but not all) of this ambiguity.

Medium	Landscape	Push/pull	Directionality	Temporality	Misc
Newspapers	Before	pull/push	one-to-many	asynchronous	half-day delay
Radio/TV		push	one-to-many	real-time	some delay
Telephones		push	one-to-one	real-time	private
E-mail	1990s	push	one-to-one	asynchronous	private
Websites		pull	one-to-many	asynchronous	static
Forums		pull/push	many-to-many	asynchronous	interactive
Blogs	Web 2.0	pull/push	one-to-many	asynchronous	interactive
Facebook		push	many-to-many	real-time	local/global
Twitter		push	many-to-many	real-time	global

Table 2: *Media and their basic properties*

that are mostly picked from among nearby agents (using a gravity function). Agents will have a lower threshold for showing their true colours to friends, and when evaluating whether to join the opposition, the stance of friends will weight more heavily (double) than if they were strangers. New relationships can be built with nearby agents, and when using personal media (such as telephones or e-mail), agents will be much more likely to contact friends, than strangers. Though certain media will have their own contact-lists. The second extension aims to model the effectiveness of protesting on centrally located squares. In it, instead of moving across the grid randomly, agents (when not rioting) will commute between two randomly chosen fixed points on the map.

No other major extensions will be added to the basic media model. Thus, for example, factions and shifts therein, or shifts in framing-strategies, will not be modelled. The effects of international politics and foreign pressure will also not be included. Even though these could all be important factors, and ABM allows one to combine multiple

aspects and theories, the focus is going to be on media and their possible impact (Gilbert 2008; Beissinger 2009; Beissinger et al. 2007; Kim et al. 1997). Apart from providing parsimony, this will also help isolate the impact of the structural properties of each medium. Allowing one to, for example — with total media usage time held constant — increase the time spent on a medium (*vis-a-vis* face-to-face time for example), and then to see whether it reduces or increases movement formation. Similarly, the proportion of political messages sent through each individual medium could be increased by exactly the same amount over successive runs, allowing one to tease out how outcomes of politicalisation differ per medium.

While the media have been decided upon, not all of the social mechanisms that will be analysed and modelled, have been identified yet, as this is an iterative, interactive and ongoing process. In addition, the model cannot be fully specified in advance, without this further research. For example the exact decision-mechanism for when to join the opposition may be extended (or replaced) with other things beyond the risk of arrest, such as costs (time or resources), or social pressure (Young 1993; Liebrand 1983; Centola 2013a). Finally; in software development, everything rarely can be specified in advance. More agile methods of iterating the feature-set, while keeping time more or less fixed, work much better than the so called waterfall model (popular in the 1980s); in which virtually all specification happened before anything was built (Benington 1983; Royce 1970).

Nevertheless, the basic implementation-decisions have been made; the programming-language is going to be CoffeeScript, a scripting-language with a very clean syntax that compiles into JavaScript (which the author also worked with professionally in Sillicon Valley). JavaScript runs in every browser, making the demonstration and sharing of models a breeze. Another reason for using CoffeeScript is that the AgentScript toolset was written in it. AgentScript attemts to, and is already well on its way, to re-create the

NetLogo toolset in the browser (the mainstream desktop ABM toolset) (Standish 2008; Wilensky 1999; Densmore 2014; Allan 2010). The model will be built in such a way as to make the addition of new media platforms easy. It will be visualized using HTML canvas, and the Three.js WebGL library (supported by all modern browsers).

4.4   A detailed example of a medium

To provide an example, the tentative plugin model of on-line forums will be sketched out here. Bulletin board style forums are mostly a pull-medium that has to be visited explicitly, though there is pushing as well, namely of popular threads to the front-page, once it is loaded in the visitor's browser. Forums are many-to-many, asynchronous, and continuous, because posting and reading can happen throughout the day (Kaltenbrunner et al. 2009). Comments allow for the expression of support, though they require more time-investment than 'like' buttons on Facebook. Forums are also generally non-local and topic-based (such as being about automobiles or anarchism); as opposed to based around local friendship ties, such as Facebook.

In the model there will be seven recent, popular threads that the agent can see. Threads can be political or not. Comments within political threads will reflect whether the poster is active in, or sympathises with the opposition. When agents visit a thread they evaluate the extent to which it is oppositional, and count this signal as that of one nearby agent. After visiting, the agent may also post a comment expressing his own political stance. Finally, both on political and non-political threads, trust building between agents can happen through repeated interactions, as it happens with nearby friends, but with a lower likelihood.

Thus a forum will consist of threads having the following variables, elements and formulas:

- t: Topic, political or not

- C: A set of comments, each with oppositional or inactive content, posted and read by users

- Ct: Comments in the thread conforming to government views

- At: Active/opposition comments in the thread

- O: Opinion in the thread $= Ct/At$ (actual formula $1 - exp(-2.3 * Ct/At)$)

- a: Count thread as supportive of the opposition $= g - R > 0.1$

Forums will allow for the following interactions (one per tick, stochastic):

- $visiting$: gauging public opinion, counts as one active agent

- $posting$: done after visiting, post a comment showing the in-tread active status

- $creating a thread$: will push an older thread out of sight (chance of 1 / 5 it will be political)

- $interacting$: when coming across authors frequently, trust may be built

The forum and its formulas work as follows. As the agent visits the forum, he will view one of seven threads. If the thread is not political, the actor may post and build trust, but will not be changing or showing his active status in any way. If the thread visited by the actor is political, the agent gauges public opinion O by calculating At/Ct, and then weights that against his grievance g (from section 4.2), and takes this into account as if it were one additional neighbour. Having the forum's status replacing that of one neighbouring agent will also be tried, in order to exclude the possibility that any effect would merely be due to agents having an extra neighbour. Then the actor may, with low odds (1:30), post this status to the forum as well, adding to public opinion (Wiersma 2011). If the forum is censored by state actors (and actors are not

anonymous), risk of arrest along the lines of P from the basic model, will be considered during the act of posting as well.

4.5 Tentative mechanisms

For five tentatively analysed social mechanisms a more in-depth description and a simple tentative way of modelling them will be provided now. Four of these are well-grounded in existing literature, while one (grievance exposure) is more innovative and based on observation. To re-iterate; these social mechanisms are modelled in a very parsimonious way, as the models serve to illustrate the mechanisms.

4.5.1 Communicative acceleration: Faster and cheaper communication

The most primary feature of the Internet and its media-platforms, is that it offers cheaper and faster communication, leading to more communicative opportunities at lower costs. This *ceteris paribus* should accelerate things such as the spread of information about protest events, and the coordination of contributions (Faris et al. 2008; Earl et al. 2011; Rheingold 2003; Shirky 2011). Emotions were found to spread through social networks (Kramer 2012). Additionally people see more messages now than before (about five thousand per day as opposed to two thousand in the 1970's) (Story 2007). Even though, to paraphrase McLuhan, the Internet carries, or mimics many other media, it most fundamentally is a cheap, asynchronous medium (McLuhan 1994). Benkler has argued that this reduction in transaction and coordination costs led to the rise of peer-to-peer production in the cultural realm, as exemplified by remixes and Open Source software. More recently, he has argued that the same thing may be happening in the public sphere and in political organizing (Benkler et al. 2013).

This *communicative acceleration* mechanism is different from the later ones, in that it is strictly speaking a generic acceleration of communication, rather than any specific

mechanism that plays out across communication media. It is also going to be modelled as such, by running the basic media model with the various pre-Internet & Internet media, and for the three media landscapes. The media will be modelled in such a way, as to make the off-line and the on-line situations as similar as possible. For example the risk of arrest will be kept the same as off-line (no anonymous users in case of on-line forums). What will be varied, are the field of vision (it including non-local actors on the media), as well as the total number of agents/active-signals within vision.

Though the description of this mechanism is very brief, its results will be a substantial part of the thesis. This because it will introduce the basic structural impact for each medium, which will then be used as a benchmark for all of the other mechanisms. The other mechanisms will be tweaking or adding certain dynamics, such as having non-binary active signals, or having homogeneous agents use certain media.

4.5.2   Secluded spheres: Enclaves for the progressive

A well-established social mechanism is that there is homophilous sorting in social settings, and in media-usage as well (McPherson et al. 2001). This homogeneity in media-usage could affect social movement formation through the reinforcement of beliefs, such as when conservatively minded people watch one TV channel, and progressives another, reinforcing their pre-existing beliefs (McPherson et al. 2006; Sunstein 2009). It is also helpful for recruitment, as messages can be better targeted. Additionally, TV broadcasts are out of reach for budding social movements, while social media are many-to-many and posting is free. Thus to the extent that birds of a feather flock together on Facebook and in other on-line communities — even if just a little bit more —, the effect is stronger there, and tapping into such communities may make it much easier for budding movements to reach likely protesters (Farrell 2012; Centola 2013b). If social incentives are added for joining, and if censors have reduced access to these spaces, the

effect may be even more pronounced (Siegel 2009; Snow et al. 1980).

The *secluded spheres* mechanism may also be applicable to the Internet as a whole, because Internet-users tend to be younger. Young people are generally less risk-averse, and are more involved with social movements, due to biographical availability (i.e. having no commitments to children, a job, or elderly parents) (McAdam et al. 2003; Earl 2010). During the baby-boom (from 1945 until about 1960) year over year, about 20 to 30% more children were born in the US than during the war-years. This led to a greater proportion of the population being young in the 1960's. Besides other factors, this in itself promoted social movements and helped new ideas gain critical mass among the young, especially as many of them gathered at concerts and at universities (Caren et al. 2011). A similar gathering-place for the young is the Internet (Howard et al. 2011a). Even though the entire population of Egypt was relatively young (because of high birth-rates), Internet-users were still younger, less risk-averse, and more Westernised than the off-line population (Gerbaudo 2012; Howard et al. 2011b; Nisbet et al. 2012).

The basic version of the mechanism will be modelled by having agents with similar risk-aversion thresholds interact with similar channels/groups. The basic media model will be extended by adding channels/groups to it, and then comparing outcomes with, and without sorting across them. For some runs there will be less censorship on more progressive channels. The Internet-wide mechanism will be modelled by having less risk-averse agents use media slightly more frequently. Besides being able to show the effect of secluded social spheres for Internet-media, modelling will also reveal to us whether the same could have happened if the progressive and young had called each other more, or had watched more TV. This allows us to tease apart the impact of structural aspects of each medium, from that of the secluded sphere mechanism itself.

4.5.3   Grievance exposure: Increased unintentional exposure of hidden transcripts

Under repressive regimes people often only discuss their grievances with very close personal friends from the same oppressed group, often through jokes ridiculing the powerful (Scott 1990). These so called hidden transcripts may be exposed to a wider than intended audience if such conversations took place on the Internet, especially because people often do not fully realize how public conversations on the Internet can be. From observation it seems that this applies even more if it is done from the cosiness of ones living-room (termed *the living-room effect* here). On forums, and especially on Facebook, things will be seen and read, or even spread further, by weak ties and others who are lurking (listening in), including acquaintances, distant family, and perhaps senior co-workers. If the conversation is political and oppositional, this might make them accidentally aware of how wide-spread grievances with the regime really are (Preece et al. 2004).

Facebook networks may thus have helped hidden transcripts reach across communicative boundaries (Lim 2012): undermining the apparent consensus that everybody preferred the regime, and showing it for what it really was; a falsified preference (Kuran 1989, 1995). This is a process that can get started easily if there is little or no censorship that would nip it in the bud through arrests, or indirectly, by making people very aware of how public their conversations are (Tufekci et al. 2012). Before the revolution in Egypt, many Internet-users were quite inexperienced with social media, and censorship on-line was relatively lax; on-line activists were not taken seriously, and literally called 'kids of comment and like' by the Egypt state-media (Morozov 2012; Gerbaudo 2012). All this makes *grievance exposure* a likely social mechanism (Aouragh et al. 2011).

The mechanism will be modelled by making agents expose the more truthful active-status normally only viewable by friends (one of the 150), to all readers on media such as Facebook, and Twitter. This mechanism will be modelled both naively, by increasing the

total summed up exposure (simply by setting it all to the level viewable by friends), and by keeping the total grievance exposure in the model equal to what it would have been in the basic media model under the same circumstances (by setting it to the summed divided average for friends and strangers, arrived at using the calculations from the basic media model). This mechanism will be briefly explored for communication in physical space, and across old media as well (by considering everyone friends), to explore the scenario where the old media had been used differently.

4.5.4   Micro-contributions: Small incremental contributions

Gladwell argued that high-risk, real-world activism requires strong ties and a lot of trust between participants, which is reasonable assessment, and is not going to be contested here (Gladwell 2010). His next claim is that the Internet and especially social media do not lead to more participation in real-world activism, because it only increases participation in low-risk, low-effort activism (such as changing profile-pictures, or liking & reposting protest-pages), but that does not have to follow (Gladwell 2010). Even if the Internet only furthers low-effort activism, this does not mean that low-effort activism will not in turn help people to progress into more serious forms of activism. Social media might very well offer small, gradual steps to becoming an activist, where the first step can be as small as a 'like' on Facebook, and the last, dying for the cause (Tufekci 2010).

According to McAdam, socialisation and self-projection theory can explain how: Budding activists start with small contributions, which bring them into contact with other activists, through whom they will hear more about activist viewpoints. Also, they might hang out with them, make friends among them, and then be further socialized into full-fledged activism (Opp et al. 2010). Similarly, by perceiving their own activist actions, even if small, people can come to see themselves as activists, and thus

become more willing to be involved next time (McAdam 1986). A similar effect allowed Wikipedia to gain an edge over an earlier project in which contributions were limited to whole articles; by making the first step to contribution as easy as correcting a spelling-mistake, people got used to the process, and began seeing themselves as editors. (Prasarnphanich et al. 2008; Prasarnphanich et al. 2011; Howard et al. 2012).

The *micro-contributions* mechanism will be modelled by making agents active-state on media non-binary. This will be done by still allowing some level of commitment to be expressed, even if the threshold for full activism is not reached. For agents that are partially active, the active-fraction will be used directly in equation P's A/C. Also, even though *ceteris paribus* the mechanism itself would lead to an increase in the total amount of private grievances expressed, it will be tested as well with expression adjusted in such a way, as to keep the total expressed grievance equal to what it would be in the basic media model. Self-perception will be modelled by adding an identity factor that slightly lowers the risk-aversion of agents that are partially active, or that have developed friendship relations with many activists. Besides directly, this effect will also be analysed with risk-aversion levels normalized against the levels that would be reached in the basic media model.

4.5.5   Slacktivism: On-line activism as a distraction

While micro-contributions on the Internet might socialize people into activism, such relatively meaningless contributions could just as well distract them. According to the so called slacktivism hypothesis, activism of any size makes people feel good about themselves; even low-risk, low-impact on-line activism such as clicking a like-button, or making a half-critical post (Morozov 2012). Such self-satisfaction may then make them less likely to engage in activism when and where it matters most; in high-risk situations on the streets. A survey among two thousand randomly selected participants speaks

against the slacktivism hypothesis, as it found that on-line activists were about twice as likely to donate, volunteer, or protest, than others. Though causality could naturally not be established by the survey; the type of people that became on-line activists might have been activists already, or maybe could have been even greater activists if the Internet did not exist to distract them (Oglivy 2011; Rainie et al. 2012).

There is theoretical support for the slacktivism mechanism, however, through so called moral balancing theory: It sees morality analogous to a balance sheet that is kept in the plus by occasional good deeds, but allows one's conscience to slack off a bit if it is (Lee et al. 2013). In this scenario slacktivism would provide good deeds that do not really matter, making people feel like quite the activist, even if they bail on essential, but high-risk actions that need their effort later. Besides moral balancing, there is also the counter-acting foot-in-the-door effect of moral consistency (which aligns in its effect with self-perception theory, mentioned earlier), in that moral acts for a certain charitable issue beget later similar moral acts for the same issue (Lee et al. 2013). In addition to these subtle effects, usage of the Internet (and other media) might cut into face to face time, negatively affecting peoples ability to connect locally, and distracting them (also through entertainment) from protest in the streets (Wolfsfeld et al. 2013). It may be summarised as: TV/Internet being 'the opium for the people'.

The *slacktivism* mechanism will be modelled by introducing a moral balance factor to represent the agent's worry about his moral status/urge to do good. It is positive towards action x (= 0.2 or so) once every 4 times, and negative $x/3$ the other 3 times. This moral balance factor is added to equation a to work along-side grievance to increase, or respectively, decrease the odds of the agent acting. The moral balance factor will be triggered both for expressions on media, and for decisions on whether to become active on the street. In a slightly more realistic version, agents will only have only one moral high to spend every 4 turns, even if their moral consciousness is addressed more often

than that during that time. The second, distraction aspect of media, will be modelled by making actors skip a round on the physical map when they are involved with media during it; except when the modelled medium is the mobile phone.

4.5.6   Other mechanisms

Examples of other possible mechanisms that have already been identified, are:

- Grievance reminders: The continuous stream of communication offered by platforms such as Twitter might keep grievances fresh on peoples minds, and incite them like an arousing speech on a public square can.[4] This may be modelled by introducing an attention/excitement-level which is stimulated by new/fresh political messages.

- Signalling intended attendance: For announced protest-events it is often unclear how many people will attend. Features such as the 'I'm' going button on Facebook allow one to assess risks of arrest before actually taking them. This could be modelled by introducing protests as events, and communication through media about intended attendance at events.

- Easier group formation: The Internet allows for the easy creation and maintenance of group pages, providing things such as member-maintained membership lists, and free communication channels with, and among members; making group-initiation and coordination a lot cheaper (Bimber et al. 2005; Bimber et al. 2009). This could be modelled by allowing opposition-members to invite sympathetic friends to group-forums/pages.

- Focussing attention: Traditional broadcast media such as TV can focus everybody's attention on the same thing at the same time. The Internet, on the other

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[4]Idea suggested by Bernie Hogan

hand, might scatter attention through interest-filtering (the 'Daily Me'), unless something else focusses it (such as a central square or a martyr) (Gerbaudo 2012; Sunstein 2009). This could be modelled by injecting waves of exogenous active-status messages into broadcast- vs Internet media.

- Sharing evidence: Pictures/videos taken with mobiles offer hard proof of state/police violence (as opposed to rumours before), that can be instantly shared and multiplied through social media. Moreover, once the genie is out of the bottle, it is also harder to put back due to the distributed nature of the Internet (Ellis et al. 2011; Thorson et al. 2013). This mechanism could be modelled by adding an evidence-message type (in addition to the two earlier types; political & non-political), and then giving them different credibility-strengths.

- Relay to media: TV and other broadcast media can be fed by social media and play a relay-function (especially Al Jazeera did this as an externally controlled TV station). Thus even with low Internet penetration rates, messages originating online, can still reach broad audiences (Aouragh et al. 2011; Gerbaudo 2012; Hamdy et al. 2012; Howard et al. 2011a; Papacharissi et al. 2012). This could be modelled by extending the previous, evidence-messages model with relay capabilities to other media.

- Multi-stage recruitment: Activists connected through mobile technology can go into the streets to inform and recruit people with no access (again making low Internet penetration rates less of an obstacle) (Gerbaudo 2012; Howard et al. 2011a; Thorson et al. 2013). Making agents that are activated through media, move around to recruit others, would be a way of modelling this.

5   Ethics

There are no pressing issues. CUREC approval has been sought for the collection and use of (anonymised) public on-line data. New CUREC approval will need to be sought for interviewing scholars before the summer, but no problems are expected with that.

6   Conclusion

The thesis will contribute to the debate on whether the Internet has had an impact on the waves of protest movements that we are currently observing. First of all, by mapping and analysing the most likely social mechanisms involved, it will provide a clear overview for scholars and activists alike. New media introduce changes to peoples communicative environment, and as has been argued, these changes may *ceteris paribus* have great consequences, such as the ignition of protest movements where previously nothing would have happened. Whether new media could possibly make such a difference, is something that can best be teased out by modelling these processes.

Therefore, after theoretical analysis, all the relevant social mechanisms will be formalized and modelled in a set of ABMs. Though these models will be built iteratively, their construction should be straightforward. The models will then be used to (generatively) test how various media-platforms might have augmented the effects of these mechanisms on social movement initiation. A comparison will then be made between three media-landscapes: before the Internet, the Internet as it was in the 1990s, and the situation today with social media and mobile connectivity.

Through the untangling of social mechanisms, and their analysis across media, a detailed picture will be generated of which exact aspects of the Internet, if any, could have been most responsible for the Arab Spring, Indignados and Occupy movements. This will allow the debate to move beyond blanket statements, and make it much harder

to simply deny that the Internet or other media could affect social movement initiation.

In addition, useful hypotheses for further research may be arrived at; not only about possible new mechanisms, but also about the exact workings of mechanisms, and their relationship to different emergent phenomena. If nothing else, the mechanisms that show most generative potential may be prioritized for follow-up research; either traditional sociological research, or research by large social media companies or governments who have access to most of the relevant data. Moreover, the model itself might be of interest to future social movement scholars as well, as its extensibility should make follow-up studies easy to produce when new on-line platforms change the media-landscape further.

Finally, if small changes in the communicative environment can indeed make a difference to social movement formation, then this will not only be of interest to social movement scholars and sociologists studying emergent effects, but it will also help demonstrate the importance of changes to the media-landscape for sociology in general. It may even be of interest to scholars in other fields, such as to historians, who only too often assume that the primary causes behind great revolutions must be great (men and/or grievances) themselves.

7 Timetable

Task	Start	Completion
Modelling groundwork	June 2013	January 2014
Transfer	June 2013	February 2014
Mechanism identification	December 2013	April 2014
Data analysis	February 2014	May 2014
Mechanism analysis	February 2014	June 2014
Modelling	February 2013	September 2014
Lit review and theory	December 2013	June 2014
Results analysis	June 2014	October 2014
Confirmation		February 2015
Write-up	December 2014	July 2015
Submission		July 2015

Table 3: *Timeline for completion*

8 Chapters (tentative)

The following is a tentative chapter layout:

- Introduction

- Literature review: (theoretical background)

    – Social movement initiation (from sociology and political science)

        * Factors

* Models

    – Social mechanisms (about methodological individualism and its merits)

    – Small causes (about nudge effects)

* Methods:

    – Mechanism identification

    – Property analysis

    – Modelling (about the pros and cons of modelling)

    – Model

        * Basic architecture

        * Main entities and variables

* Media

    – Formalizations (of the old + six new media, independently)

    – Media landscapes

        * Before the Internet

        * The 1990's: Cyberspace silos

        * Web 2.0: Reuniting on-line and off-line ties

* Social mechanisms (bulk of the thesis)

    – Secluded spheres: Enclaves for the progressive

        * Mechanism

        * Model results

- – Communicative acceleration: Faster and cheaper communication

  * Mechanism

  * Model results

- – etc...

- • Analysis (brings results together)

- • Conclusion

- • Bibliography

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