Democracy's Fourth Wave?
Information Technologies and the Fuzzy Causes of the Arab Spring

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Abstract

It has been 15 years since the last wave of democratization. In the "third wave" between 1989 and 1995, many remnants of the Soviet Union and failed authoritarian regimes in other parts of the world turned themselves into variously functional electoral democracies. Around the world, roughly three in every five states held a democratic form by 2010. But as a region, North Africa and the Middle East were noticeably devoid of popular democracy movements—until the early months of 2011. Between January and April 2011 public demand for political and economic reform cascaded from Tunis to Cairo, Sana'a, Amman and Manama. Democratization movements had existed long before technologies like mobile phones and the Internet came to these countries. But with these technologies, people sharing an interest in democracy built extensive networks and activated collective action movements for political change. What might have made regimes more susceptible than others to popular uprisings, and what might explain the relative successes of some movements more than others? What role does information technology have in the modern recipe for democratization? Weighing multiple political, economic, and cultural conditions, we find that information infrastructure—especially mobile phone use—consistently appears as one of the key ingredients in parsimonious models for the conjoined combinations of causes behind regime fragility and social movement success. Internet use is relevant in some solution sets, but by causal logic it is actually the absence of internet use that explains low levels of success.

INTRODUCTION

There may be several reasons to consider the Arab Spring a fourth wave of democratization. Over the course of a year, popular movements for democracy cascaded across the Middle East and North Africa. These were not Marxist or Islamist movements, and while there was great diversity in the expectations for what democracy could look like, there was a shared fatigue with authoritarian rule. In the early days of protest in each country, the participants were unusual:

they were not the urban poor, unionized labor, existing opposition party members, radical Islamists or minorities with grievances. They were middle class, educated, and underemployed, relatively leaderless, and technology savvy youth. The gender balance also surprised many Western observers. Four dictators were successfully deposed, a dozen other regimes made major political and economic concessions, and political turmoil devolved into civil war in several others.

By 2012, Egypt and Tunisia had run elections and were drafting fresh constitutions, there were new Parliaments and Cabinets in Morocco and Jordon, with significant commitments to extend franchise. Even in Constitutional Monarchies where ruling families remained in control, a greatly expanded welfare state was the cost of the stability. Several countries are now governed by transitional governments with imperfect constitutions and predatory militaries. It will be years before we can judge the democratic practices of the new governments. But even in countries where Islamism is on the rise, the most viable Islamist leaders are competing in elections and advocating different brands of Islamic Constitutionalism. And what is surprisingly important is the powerful role of digital media in both socializing young people into the existing tropes of political dominance or revolution and in allowing young people to create new rhetorical tools—and often logistical tools—for perpetuating or challenging ideological control (Singh This Issue Under Review).

For many observers, digital media appeared to have an important role in the ignition of social protest, the cascade of inspiring images and stories of success across the countries of the region, and the peculiar organizational form that Arab Spring uprisings had (Tufekci and Wilson 2012). For scholars of comparative politics, the distribution of outcomes suggest a need to take information technology seriously as a potentially causal factor: the two Arab Spring countries in

which dictators were deposed relatively quickly, Tunisia and Egypt, had the most tech-savvy civil society and largest internet-using population in the region; the two Arab spring countries in which dictators were deposed only after months of protracted civil war, Libya and Yemen, had no such character.

We build on a 6-stage framework for political change observed during the early aftermath of the Arab Spring to understand the contextual variables that were in-play *before* the Arab Spring (Howard and Hussain 2011). The most successful cases of sustained and peaceful protest, with deposed despots were Tunisia and Egypt. Both cases exemplified a pattern that can be seen, with different degrees of strength, across the region: a *preparation* phase, involving activists' use of digital media across time to build solidarity networks and identification of collective identities and goals; an *ignition* phase involving symbolically powerful moments which ruling elites and regimes intentionally or lazily ignored, but galvanized the public; a *protest* phase, where, by employing offline networks and digital technologies, small groups strategically organized on large numbers; an *international buy-in* phase, where digital media networks extended the range of local coverage to international broadcast networks; a *climax* phase where the regime maneuvered strategically or carelessly to appease public discontent through welfare packages or harsh repressive actions; and finally, a *follow-on information warfare* phase where various actors, state-based and from international civic advocacy networks, compete to shape the future of civil society and information infrastructure that made it possible. But this narrative of political change, though generalizable to many Arab Spring cases, does not account for some important technology related factors that were in play as well.

Moreover, it is tempting to follow this chronology of phases and begin anticipating what is next to come, it is important to recognize that successful uses of digital media across many

cases of the Arab world are potentially counter-balanced by important instances where digital media, even when available, may not have been very useful. For example, the United Arab Emirates boasts some of the highest levels of connectivity and e-government development in the Arab world, but this country experienced hardly any successful offline mobilization. Some regimes, including Saudi Arabia, were very masterful in designing information censorship and management protocols nearing the sophistication of China and Iran.

Citizen journalism videos and blogs were important vehicles for the spreading of news about self-immolations in Tunisia, Egypt, Saudi Arabia, and Algeria (Lim 2012). More formally organized networks of citizens and civic organizations have also led to the entrenchment of civil society, albeit in some cases, mostly online. These civil society groups, like the April 6 Youth Movement in Egypt, and banned but preeminent political parties, like the Muslim Brotherhood, have all successfully used information infrastructure to do political organizing and capacity building *over time*, not simply during the phase of street protests. The April 6 Youth Movement has been active since at least 2008, and the Muslim Brotherhood has built a massive online blogging and news production ecology outweighing any other Egyptian party or movement. Lastly, especially in the case of women in the Middle East, many, including but not limited to, feminist movements, have expanded the range of political inclusion from suffrage rights to driving, particularly in Saudi Arabia – and they have done so through online advocacy movements and awareness campaigns. Media has been particular important to "pink hijabis", who integrate their faith with the pursuit of women's rights by circulating films about female genital mutilation to friends and family, organizing workshops about technology strategies, and learning about successful digital strategies from like-minded groups in other countries (Wright 2011).

There has been no global study of the contribution of different kinds of information technology towards democratization movements. In one of the largest of public opinion analyses, Nesbit et al. find that internet drives democratic expectations, epecially in countries that already have a few democratic habits (Nisbet, Stoycheff, and Pearce 2012). Ever since the Zapatista rebels used the World Wide Web to promote their struggle for indigenous land rights in 1994, international analysts have been engaged in explaining the uses of digital technology by grassroots activists and social movements and determining the technologies' effects on political outcomes (Garrido 2003; Meikle 2002; Russell 2001; Russell 2005). In years since, many distinguished scholars have contributed valuable insights on this phenomena in specific geographic and temporal contexts, sometimes focused on moments of heightened contention, such as national elections or social justice campaigns (Earl and Kimport 2011; Howard 2010b; Margolis, Resnick, and Tu 1997; Pedersen and Saglie 2005; Sreberny and Khiabany 2010). Others have taken a thematic approach, viewing a specific phenomenon, such as digital authoritarianism, across a group of representative countries (Kalathil and Boas 2003b). These scholars have drawn on qualitative and quantitative data and have written from a variety of subject perspectives, including sociology, communications, political science, computer science and area-studies. Yet all have been limited to a specific country or region, and have a fairly limited time horizon.

Yet major protest movements around the world, most recently the Arab Spring, have demonstrated that the phenomena of digital activism is of great (and increasing) importance. In 1998, Suharto's rule over Indonesia was broken by a student movement that successfully used mobile phone infrastructure to organize their protests (Barendregt 2008; Hill 2003; Hill and Sen 2005). During Kyrgyzstan's Tulip Revolution of 2005, democratic leaders used mobile phones to

organize at key moments to throw out a dictator (Beissinger 2007; Chen 2011). When the authoritarian government of Kazakhstan shut down opposition websites, democratic organizations moved their content to servers in other countries. Threatened political elites in authoritarian regimes and emerging democracies often try to strip social movements of communications tools: Iran and Albania have blocked internet gateways and mobile phone networks during politically tumultuous periods. In Iran, Saudi Arabia, and Syria, blogs and YouTube submissions are nascent deliberative democratic practices and reflect the real opposition there (al-Saggaf 2004; Deibert et al. 2010; Deibert et al. 2008). In many Arab Spring countries, the internet is the primary place for open dialogues about race, gender, and the interpretation of Islamic texts (Howard 2010b; King 2011; Wolcott and Goodman 2000).

Studies suggest that along with wealth, telecommunications and information policy can contribute to democratization (Howard and Mazaheri 2009; Milner 2006; Norris 2001). Many have hypothesized that increased internet usage supports the growth of democratic institutions (Abbott 2001; George 2006; Hogan 1999). Yet both democracies and dictatorships have fast growing numbers of internet users, internet hosts, mobile phones, and personal computers. Authoritarian regimes may develop their digital communication infrastructure specifically to extend state power (Kalathil and Boas 2003a). There is significant research on the censorship strategies of the most authoritarian of Islamic states, but also evidence that a significant amount of digital content is beyond the reach of state censors (Diebert 2008). In democracies, there is some evidence that effective state services online breeds trust and confidence among citizens in their government (Tolbert and Mossberger 2006; Welch, Hinnant, and Moon 2005; Hasan 2003). As the experience of Iran suggests, it may be the social media that is most immune to censorship.

Indeed, there are lessons about civic action from Iran that may well be consistent with Arab Spring and #Occupy Movement: digital technologies provide the entry points for young activists to explore democratic alternatives, an action landscape such as cyberspace that allows for political discourse and even direct interventions with state policy, and coordinating mechanisms that support synchronized social movements through marches, protests, and other forms of collective action (Warschauer, Said, and Zohry 2002; Shapiro 2009; Abdulla 2007; Abdulla 2005; Kirsh 2001). Perhaps the clearest signs that digital media has changed the dynamics of political communication comes from the awkward ways authoritarian regimes have responded to its own tech-savvy activists. In pre-revolutionary Egypt, when Muhammad Khaled Said posted an online video incriminating the police in a drug deal, he was beaten to death outside of his internet café, an event which precipitated a Facebook group that was critical in mobilizing elites during the revolution (York 2011).

While "terror on the internet" and transnational Islamic identity has been well explored in the security studies literature, relatively little research has been done on the specific mechanisms of technology use and repurposing by civil society actors. Understanding such mechanisms would help us answer broader questions about the nature of contemporary regime change, online participation, and the security implications of information policy (Weimann 2006; Bunt 2000; Bunt 2003; Bunt 2009). Some area-studies and Islamist scholars have studied information technology diffusion and political practices in particular countries, or investigated the impact of al Jazeera on news cycles and sourcing (Wheeler 2006; George 2006; Alavi 2005; Rugh 2004). Information technologies are also the infrastructure for anti-democratic movements and the site of what some have called "cyberconflict" (Karatzogianni 2006). However, rigorous social science can build more transportable theories about the role of social computing during political

crisis, and the role of social computing in civic life in the Muslim world. Cyberwar and cyber-terror are not the only form of social computing in the service of political discourse (Stohl and Stohl 2007).

FUZZY LOGIC FOR COMPARATIVE PROBLEMS

It would be wrong-headed to debate how many bloggers it takes to make a democracy. In the analytical discourse so far, there are two ways of describing the causes and consequences of the Arab Spring. The first analytical frame is to identify the things that make a country susceptible to protests, or fragile enough for a popular uprising to ignite in the streets. The second is to identify the things that might explain a successful uprising. Rather than looking for simple or singular causal explanations for what made a country susceptible to popular uprisings or what allowed a popular uprising to achieve its goals, we should expect that there would be complex causal patterns, or even several causal recipes that would provide analytical purchase over several sets of cases. Moreover, knowing what we know about social movements and regime change, it makes most sense to look for "conjoined causal conditions," the set of multiple indicators that together provide a fulfilling narrative for understanding political outcomes.

There have been a significant number of single-country case studies in which information technologies have been part of the contemporary narrative of both democratic entrenchment and persistent authoritarianism. The comparative perspective taken in this investigation will not be limited to the standard cases, or even to situations that stand out as incidents of technology driven, enhanced, or enabled regime change. Instead this comparative perspective embraces cases in which information technologies had little to no role in democratic promotion, as well as situations in which information technologies were carefully used by authoritarian elites to

become better bullies, and situations in which information technologies played a critical role in sudden democratic transitions. Thus, the comparative approach is anathema to those who would generalize from singular studies in which information technologies had a central role in a grand democratization project, and those who would generalize by only relying on statistical models of international data on government effectiveness in terms of internet penetration.

Methodologically, the comparative approach is powerful and productive in that it confronts theory with data. Sometimes this approach is called "set-theoretic" in that attention is given to consistent similarities or differences across a set of cases, especially the causally relevant commonalities uniformly present in a given set of cases (Ragin 2009). The set of cases at hand is the population of Arab countries with large Muslim communities, and there are 22 of these. The argument of this investigation is that in recent years, information technologies have opened up new paths to democratization and the entrenchment of civil society in many Arab countries. Large-N quantitative researchers often turn "democratization" into an indicator for which the Western democracies are the standard. In our set-theoretic approach, we assume that democratization among these 22 countries is best calibrated according to a more regionally relevant standard, set at the high end by countries such as Lebanon, and Saudi Arabia at the low end. This calibration does not preclude the theoretical possibility of an Islamic democratic ideal type. But a grounded approach does assume that healthy, functional Muslim democracies may not look like Western democracies. Set-theoretic reasoning allows for fine gradations in the degree of membership in the set of successful democratic outcomes, and it requires evidence about each country's degree of membership in the set of countries that have experienced democratic transition or entrenchment during or since the Arab Spring.

Moreover, a set-theoretic explanation of the role of information technology in

contemporary democratization requires that we identify a consistent set of causal relations between technology diffusion and democratic outcomes. To construct this explanation requires fuzzy set logic, which does not explain variation in a sample through reductive correlational statistics. Instead, fuzzy set logic produces general knowledge about the role of information technology in contemporary democratic transitions through the accumulated experience of particular countries where rapid technology diffusion among political actors such as the state, parties, journalists, and civic groups had an observed impact on the domestic balance of power, the opportunity structure for social mobilization, or the "cognitive liberation" of citizenry. Fuzzy set logic offers general knowledge through the strategy of looking for shared causal conditions across multiple instances of the same outcome-sometimes called "selecting on the dependent variable." For large-N, quantitative, and variable oriented researchers, this strategy is unacceptable because neither the outcome nor the shared causal conditions vary across the cases. However, the strategy of selecting on the dependent variable is useful if researchers are interested in studying necessary conditions. Perhaps most important, this strategy is most useful when developing theory grounded in the observed, real-world experience of democratization in the Arab-Muslim communities of the developing world, rather than deploying theory privileging null, hypothetical, and unobserved cases.

The qualitative, empirical evidence reviewed lends itself to a set-theoretic argument, because the evidence revealed that many of the countries experiencing protests have high levels of technology diffusion diffusion, and almost all experienced significant changes in their political systems and/or economic welfare policies. The claim is based on the parsimoniously summarized relations between properties and cases, rather than modest correlations between technology diffusion and democratization. Examining cases with the same causal conditions to

see if they also share the democratization outcome is appropriate for identifying sufficient conditions, and sufficient conditions often appear as combinations of conditions. Identifying the causal conditions shared by cases that have democratized is appropriate for identifying the necessary conditions of democratization. It other words, if information technologies and infrastructure are a sufficient cause of democratization, then the presence of information technologies implies the presence of democratization (though democratization does not imply the presence of information technologies). On the other hand, if a sophisticated information management and censorship infrastructure is a necessary cause of no political change, then the presence of no democratic outcome implies the presence of a strong censorship regime.

It is possible that there are several recipes for contemporary democratization, and many possible ingredients and combinations of ingredients. One way to assemble the accumulated country experience is by comparing the recent histories of countries that share the common outcome of a significant period of democratic transition or entrenchment, such as in the Arab Spring. Analyzing the relationships in this set-theoretic manner exposes the key ingredients for democratization. Moreover, treating the institutional outcomes as fuzzy sets avoids selecting cases on the outcome because countries will actually vary in their degree of membership in the set displaying democratic transition or entrenchment. Set theory allows us to examine cases with the same causal conditions to see if they also share the same outcome. More important, if we assume that there is not just one recipe for contemporary democratization, but several, we can use fuzzy set analysis to identify combinations of causal conditions that share the same outcome.

Fuzzy Causal Variables

Several contextual factors might exacerbate or mitigate the causal role of particular aspects of

technology diffusion, and reducing the set of causal attributes to a few important ones must also respect the significant diversity among these countries. The cases involved in the Arab Spring differ in important ways, yet there may still be causal patterns and shared attributes that explain membership in the set of countries that have democratized or not. Along with the impact of technology diffusion on the system of political communication involving states, journalists, political parties, civil society groups, and cultural elites, additional contextual conditions should also be evaluated on a case-by-case basis:

- *Average incomes within country*. Measured as GDP per capita (adjusted for purchasing power parity), this factor accounts for the large diversity in the economic productivity across the region. The high end of this scale includes rich countries like Qatar, the UAE, Kuwait, and Bahrain (average range of $7,000-20,000); the low end includes countries like Mauritania, Iraq, Comoros and Somalia (average range of $200-800).
- *Wealth distribution*. Measured as Gini coefficients for income distribution, this indicator reveals the relative deprivation of the poor in society. It captures the distinctions between countries like Lebanon and Qatar, where wealth is comparatively well distributed, and Egypt and the UAE, where wealth is highly concentrated.
- *Levels of unemployment*. Access to jobs may have been a primary source of discontent in Arab Spring countries, particularly in countries like Tunisia and Yemen where the formal unemployment rates topped 15 percent. Employment may also be a comparatively important variable because some of the countries with weak protest turnout had low unemployment rates. In Saudi Arabia formal employment was hovering around 5 percent, and it was even lower in Kuwait. Youth unemployment is also a useful variable

to include because of anecdotal evidence that the political uprisings were led by disaffected youth.

- *Demographic variables*. The causes of political unrest during the Arab Spring could be plausibly related to having large groups of youth in densely packed urban settlements, so it is important to include measures of the size of the country in terms of population, the degree of urbanization, and youth bulge. Almost the entire population of Qatar and Kuwait lives in urban centers, while less than 40 percent of Yemen and Somalia's population does so. Yemen and Somalia also have the largest proportion of population under 25 years old—some 45 percent of the total population—while less than 25 percent of the population of Qatar and Kuwait is under 25 years old. Overall, the Arab Spring countries include both small island states with a few million inhabitants and countries like Egypt, with large populations.
- *Digital connectivity*. We measure digital connectivity in the diffusion of mobile telephone and internet use. Interestingly, more than half of Arab countries have mobile penetration well over 100 percent, including several of the countries where Arab Spring protests were most successful. Internet penetration rates do not always mirror mobile phone penetration rates, however. While 54 percent of the population of Bahriain has internet access, it is a country where the popular uprising was quickly crushed. Only 15 percent of Egyptians have access to the internet, but in that country the dictator was quickly removed.
- *Censorship sophistication*. To counterbalance digital access and shared connectivity, many regimes in the Arab world have instituted censorship mechanisms that range widely in levels of sophistication. As noted earlier, a few countries have very sophisticated

monitoring and management systems, and include Saudi Arabia, Bahrain, and the UAE. On the other hand, some regimes were either sloppy or unable to do so, and include: Algeria, Egypt, and Libya. To examine these cases comparatively we created an index combining the OpenNet Initiative's monitoring of countries that had instituted no filtering, or a range of selective, substantial, and pervasive filtering on content for political, social, security reasons or used automated tools to do so. Our index combines these multiple dimensions of censorship and sophistication in filtering to assess the overall censorship regime's capacity for managing new information infrastructure.

- *Fuel dependent economy*. Having access to the wealth generated by a fuel-dependent economy can allow ruling elites to maintain social control. Not having this wealth means authoritarian rules may not have the resources to maintain internal security services and coopt political opponents. To account for this significant variable, we included countries' level of oil production and its share in the global oil resources available. Saudi Arabia, the UAE, and Kuwait ranked most highly.

Fuzzy Outcome Variables

Because our key research questions deal with the contextual factors and variables at play during the Arab Spring, many of our predictive variables listed above come from the latest data points available at or just before the protest periods. However, our overall objective is to find a parsimonious set of causes, or conjoined causes that explains what made some Arab Spring regimes fragile to popular uprisings, and then what made some popular uprisings successful.

- *Regime fragility*. This was evaluated by the relative numbers and impact of protest

mobilizations in each of the countries of the Arab Spring. Full membership in the set of fragile Arab Spring countries was given to the countries where street turnout was surprisingly large, attendance was consistently high over several days, domestic media attention unusually interested, and protests took place in an unexpected number of diverse locations. Lower scores went to cases where protest turnout was small, concentrated in only a few locations, or protesters themselves were quickly dissuaded.

- *Social movement success*. Outcomes were graded on a straightforward, comparative Guttman score for how successful protest organizers were at achieving the immediate goals of regime change. The highest scores went to cases that are fully in the set of countries where the titular head of government was deposed with minimal violence—these were the ideal cases of peaceful democratic regime change (Egypt and Tunisia). Below this are the countries where major political and economic concessions were made (Oman and Saudi Arabia), followed by major political concessions only (Kuwait and Jordan), followed by economic concessions only (Lebanon and Bahrain), and lastly countries that reached bloody civil wars and/or violent stalemates with ruling elites (Libya and Syria). Long term success in achieving economic, employment, or constitution writing goals were not evaluated. The fuzzy ranks for this variable took into account the detailed qualitative information for each case, including the longevity of protest, numbers of killed and injured citizens, types of meaningful political concessions, and levels of economic redistributions of wealth.

We used data from 2011 or the best available year. When the data taken from large datasets were incomplete, supplementary data from secondary sources. Patching these gaps by hand

significantly reduced the number of missing cases and provided for a more robust and meaningful ranking system.

Preparing data for treatment as a fuzzy set required several steps. First, we computed indices for the plausible causal factors. Then we calibrated the indices, a process that evens out the distribution of cases between the thresholds for full inclusion in each set, full exclusion from the set, and the crossover point at which cases go from being partially in the set to being partially out of the set.

The variable of population size provides a useful example of how the calibration process works. Among the 22 countries there are a few very populated countries and many countries with a small population. Egypt, Iraq, and Saudi Arabia are at the top of this set, and obviously helps define the category of "populated Arab Spring country." In fact, Egypt has such a large population that if the set were left uncalibrated, Tunisia and Syria would be barely in the set, and most of the countries would be fully out of the set. Yet the important attribute is that some countries are comparatively more populated than others, so calibration makes the differences between the populous countries more intuitively comparable to those between smaller countries. The very populated countries still define the set by being almost full members, while the rest of the cases get graded by their degrees of membership in the set. In this example, the threshold value for full membership in the set of populated countries is established just below the actual population of Iraq. Bahrain, Qatar, and Oman are definitely not populated Arab Spring countries. So the threshold for full exclusion is set at 3 million people because these countries have even smaller populations than that. The crossover threshold for set membership was set at 10 million people, which roughly splits countries into two groups. Since Somalia and Tunisia have barely 10 million citizens, these two countries are just barely in the category of "populated country."

The recalibration around these thresholds allows for fuzzy set values that more meaningfully reveal the degree to which each country can be included in the theoretical set of populated countries.

As another example, for membership in the category of countries with a strong censorship regime, the threshold for full membership is defined as regimes that pervasively or substantially filter at least two categories measured by the OpenNet Initiative (political, social, security, or tool censorship). Saudi Arabia, Bahrain, and the UAE all fall comfortably into full inclusion into this category. Countries that had a very unsophisticated political information management regime had no functional ability to monitor and filter online content. Algeria, Egypt, and Lebanon all fall comfortably into the fully excluded category. Syria, Kuwait, and Oman are barely included because they do all, some, or no filtering, and none were pervasively or substantially filtering on two or more of the four filtering categories.

Fuzzy calibrations also allow comparativists to complete incomplete datasets. In this study, there were four hand calibrations. There were no censorship scores for Djibouti, Mauritania, and Somalia, but secondary sources suggest that the level of censorship in Djibouti was much like that of Kuwait, that the level of censorship in Mauritania was higher than Lebanon's but not as a high as Jordan's, and that the level of censorship in Somalia was almost as high as that in Saudi Arabia. The final hand calibration involved designating a Polity score for Somalia. Polity IV identifies Somalia as a failed state in 2010. This case is not likely to teach us much about a theoretical relationship between political institutions, technology diffusion, and popular movements for democracy, so it was given a fuzzy score of 0.50. This is a special score designating a case that is neither in nor out of the theoretical set of democracies. A score of 0.51 would mean that a country is very slightly in the theoretical set of democracies, and a score of

0.49 would mean that a country is just out of such a set. But the transition score signals that if regime type is important, Somalia is not a good instance of either a democracy or an autocracy.

The full dataset of all variables in the causal recipes described in this investigation is available at www.pITPI.org, as are the technical scripts for secondary solution sets not described here and the calibration points for specific membership sets. For more on fuzzy set calibrations see the codebook for the fs/QCA 2.0 software and Ragin (2000). The fuzzy scores used in this analysis appear in the Appendix.

FUZZY RECIPES FOR FRAGILITY AND SUCCESS

Each Arab Spring country could be described with its unique combination of causal factors. Certainly, there are more complex formulations of conditions that would also explain the susceptibility of a regime to a popular uprising, or the chances such an uprising would be successful. The combinations reported here are not the only plausible ones, but they plausibly explain multiple cases with good coverage and consistency. Coverage refers to the percentage of cases explained by that recipe. Consistency refers to the degree to which cases adhere to a particular causal recipe. Since the goal of comparative work is sensible, parsimonious explanations, Table 1 presents two of the parsimonious models with the best balance of case coverage and solution consistency.

As in many statistical procedures, the research proceeds by examining a variety of models. In testing out all of the plausible causal variables, urbanization and youth unemployment rarely appeared in parsimonious explanations. These variables were dropped in the analysis of regime fragility. Having high levels of income, but poor internet diffusion and low Gini scores made regimes vulnerable to public demonstrations, and Libya, Algeria and Saudi Arabia are the

best examples of how this causal combination resulted in regime sensitivity. A second parsimonious explanation is that regimes with high levels of unemployment, significant mobile phone use, and low levels of internet censorship also made regimes sensitive—Libya and Oman are best instances of this causal relationship.

Table 1: Two Parsimonious Models Explaining Regime Fragility

Variables Included	Causal Recipe	Raw Coverage	Unique Coverage	Consistency	Best Instances
gdppc, unemp, internet, mobile, censor, youth, gini, fuel, pol	gdppc*~internet*~gini	0.44	0.00	0.97	Libya (0.58,0.95), Algeria (0.58,0.53), Saudi (0.53,0.63)
gdppc, unemp, internet, mobile, censor, youth, gini, fuel, pol	unemp*mobile*~censor	0.50	0.00	0.98	Libya (0.81,0.95), Oman (0.58,0.74)

Note: The consistency cutoff for the first causal recipe was set at 1.00, and the cutoff for the second recipe was set at 0.96.

Whereas there were multiple conjoined causal recipes for regime fragility, and the two with highest levels of consistency were presented in Table 1, there was a relatively short and complete parsimonious solution for the analysis of social movement success. This analysis, presented in Table 2, yielded three causal recipes, which altogether covered two thirds of the cases with four-fifths consistency. Here mobile phones, not internet use, appeared in several solution sets, and Jordan, Tunisia, and Morocco were the best instances of the conjoined causal relationships.

Altogether, these three parsimonious recipes form a solution set with good coverage (0.64) and good consistency (0.79).

Table 2: Parsimonious Causal Solution Explaining Social Movement Success

Variables Included	Causal Recipe	Raw Coverage	Unique Coverage	Consistency	Best Instances
gdppc, unemp, yunemp, internet, mobile, censor, urban, youth, gini, fuel, pol	mobile*~fuel	0.53	0.08	0.83	Jordan (0.63,0.58), Tunisia (0.58,0.95), Morocco (0.53,0.58)
	mobile*~urban	0.52	0.02	0.88	Jordan (0.63,0.58), Morocco (0.53,0.58)
	~unemp*~urban*gini	0.44	0.03	0.86	Morocco (0.63,0.58), Jordan (0.53,0.58)

Note: The consistency cutoff for the solution set was 0.94.

DISCUSSION

Digital media were very important during the short-term cascade of street protests across the region. For example, we know that online conversations spiked before major events on the ground in both cases, as well as many others, across many of the Arab Spring cases (Howard et al. 2011). This was possible because social media helped democratic ideas spread across borders, through informal networks of families, friends, and interested onlookers. The intensity of political conversations that took place preceding major street protests support the idea that virtual networks materialized before street protest networks. For example, detailed maps and guides were widely available before protests began, and provided would-be participants with strategies

and nonviolence goals to sustain periods of dissent that disabled authoritarian regimes' past coercion and suppression techniques. Indeed, Facebook pages and Twitter conversations were essential for designing and trying out new strategies as events took place on the ground. Political blogospheres, many based nationally, but others also based more regionally, brought together political diaspora communities from France, the UK, and other Western democratic countries (Etling et al. 2010). The ability to produce and consume political content was important because it created a sense of shared grievances, and strong political efficacy that had not led to such sizable, diverse, and quick mobilization before the Arab Spring.

Despite the ample evidence of the role of digital media in the Arab Spring, it would be a mistake to suggest the democratic potential of information technology without considering the important roles that regimes play in managing or limiting their applications. Indeed, there are several regimes that have very sophisticated strategies to effectively co-opt or coerce technology providers. One of the key threats to authoritarian regimes is elite defection. Therefore, some regimes, like Saudi Arabia and the UAE, followed a closely-guarded and systematic strategy to monitor and punish a variety of autonomous attempts at online political engagement. Others, like Egypt and Jordan, tolerated such incidents by assuming that some venting of political dissatisfaction could be ventilated online, and therefore not materialize substantively offline. When this dissatisfaction did eventually spill over, unfriendly regimes took a range of measures to suppress the political application of digital media. During extreme circumstances, entire global information networks were taken offline. This strategy caused street protests to increase in numbers, especially in Egypt, where individuals turned to traditional institutions to find each other, such after Friday prayer services in Cairo. Disconnecting large information networks also caused regimes to lose millions of dollars on global financial transactions taking place in the

world economy, also the case in Egypt, which lost $18 million USD per day after turning off mobile and digital networks. Are digital media simply a new "tool" for social protest, or is there more that needs to be said about the modern character of social protest, the contemporary organizational form of civic unrest, or the changing opportunity structure for public dissent?

To answer these questions, we can examine the narrative arc of how digital media changed the tactics for democratization movements *during* the Arab Spring, and how new information and communication technologies played a major role in the organization of street protests. First, many of the countries that experienced long and sustained movements of protest had preexisting political publics that had long been wired, and developed tech-savvy civil society groups. In these moments of political crisis, technology firms also played a critical role, where some were constructive in providing activists the tools to create action opportunities. Others, when pressured from dictators and authoritarian regimes, sometimes were played into the hands of political suppression. It is difficult to say whether or not the revolutions would or would not have happened without digital media. Indeed, other sociological factors, such as widespread poverty and governmental ineptitude, had created the conditions for extensive public anger. However, the networks of people who did mobilize, did so with the direct application, initiation, and coordination, of digital media tools. Counter-factual scenarios are important, but the overwhelming evidence of what did happen concretely illustrates that the patterns of political change in these protests were digitally enabled.

For scholars of social movements and collective action, there are several interesting aspects of the Arab Spring: the distributed leadership of protest organizers, the core groups of elite publics (literate, middle-class, youth, women, and technocrats) that were relatively quick in joining them, and the important role that international news organizations played in giving them

the critical voice and global exposure which helped stave-off overtly violent reactions from their repressive regimes. We can say more than that the internet changed the way political actors communicated—social movements and collective action networks shared strategies for direct political action, created regional and international news events that drew attention and sympathy from neighboring countries, and inspired others to join and celebrate their causes. One of the key reasons why we must now turn our attention to the role of information technology is that citizens themselves have expressed its role, and now consider access to digital media a core nation-building resource.

We must also consider the years leading up to the Arab Spring, and the diffusion of digital media, in the form of mobile phones, personal computers, and software applications over time. These technologies and their applications have significantly impacted the political communication systems and their relationships to civil society organizations. First, mobile telephony, in the form of small consumer-based communication devices, have allowed regular citizens to bear witness, record, and disseminate acts of injustice and repression by their ruling elites and their security agencies. In important ways, authoritarian regimes to hold phony elections also gained widespread infamy, particularly in the Egyptian elections of 2005, where Mubarak's party won 89 percent of the vote. Mobile videos uploaded to YouTube and other video sharing cites disseminated actual footage of vote counting and rigging. Second, over the last five years, Al Jazeera became a functionally independent *regional* news organization, and with the addition of the English-language network in 2006, an international powerhouse that illuminated the accusations, criticisms, and failures of autocrats. Third, widespread internet access, though limited to middle-class urban-dwellers, offered everyday citizens to synthesize social networks with broadcast networks to communicate and engage with political issues.

Together, these long-term trends mean that information infrastructure helped decentralize state power, especially regimes that were not quick enough to adapt their management strategies to regulate these new political information spaces.

Digital media had a causal role in the Arab Spring in that they provided the fundamental infrastructure of a social movement unlike the others that have emerged in recent years in these countries. In the first few weeks of protest in each country, the generation of people in the streets—and its leadership—was clearly not interested in the three major models of political Islam. These social movements were not seeking to replace secular dictatorships with Al Qaeda's Salafi Jihadism, Iran's Shiite theocracy, or Saudi's rigid Wahhabism (Wright 2011). Instead, these mostly cosmopolitan and younger generations of mobilizers felt disenfranchised by their political systems, saw vast loses in the poor management of national economies and development, and most importantly, a consistent and widely shared narrative of common grievances – a narrative which they learned about from each other and co-wrote on the digital spaces of political writing and venting on blogs, videos shared on Facebook and Twitter, and comment board discussions on international news sites like Al Jazeera and the BBC.

The causes of revolution are always complex, and the conditions under which revolts succeed rare. As Goldstone observes, for a revolution to succeed, the government must seem so unjust and inept that it is viewed as a threat to the country's future. A country's social, economic, and military elites must be alienated from the state and no longer willing to defend it, which was true with Egypt and Tunisia in the deposition of their dictators, but less so with Libya and Syria, and not so with Bahrain and Saudi Arabia. The regime's opponents must also build consensus across a broad swath of the population, crossing ethnic, religious, and class groups, which has

been varied across the Arab Spring cases, but certainly bolstered with the diffusion of mobile and digital media networks. Finally international powers must either refuse to step in and defend the government, or they must constrain the government from defending itself too ruthlessly – both roles which have been played by American and European powers (Goldstone 2011). The Arab Spring, then, is historically unique because it is the first set of political upheavals in which all of these things were digitally mediated. Digital media allowed local citizens access to international broadcast networks, networks which were then used by online civil society organizations to lobby advocacy campaigns regionally by Arab CSOs and Western support groups like AccessNow and the Electronic Frontier Foundation in securing information infrastructure and combatting regimes' attempts at committing overt violence and censoring coverage of human rights atrocities. When the internet went down in Egypt, Mubarak also revoked satellite broadcast licenses. As a response, Google began streaming Al Jazeera English directly to YouTube.

Many of the dictators who have held on to power in the Middle East and North Africa have done so by telling their population, their neighbors, and the international community that they were the guardians against Islamist revolution. Some Islamist parties may have benefitted from the Arab Spring, like in the aftermath of Tunisia and Egypt, but they did not inspire the uprisings. In fact, they have categorically hesitated to joining them till victory and political change was close to a real possibility. Among the countries in the region, those with high rates of technology diffusion and a significant, tech-savvy and young civil society were the ones where the Arab Spring was most successful, along with regimes that had not mastered the art of managing information infrastructure. The countries with the lowest rates of technology diffusion, or a fragmented civil society with few technology resources, had less successful uprisings. Some

of these later countries, including Libya, Syria and Yemen, did experience extended civil war, but the inciting incidents of political strife, again, were digitally mediated. But on the whole the role of digital media in the political unrest of these countries was not as pronounced as it was in Tunisia, Egypt, and Morocco, all of which experienced major political concessions ranging from democratic regime changes or the uplifting of political sanctions and replacement of ruling elites.

The argument devaluing the complex causal role of digital media in the Arab Spring is often made through the simple claim that it is people, and their grievances, that constitute political revolution. Pundits have made this claim in different ways. Several pundits, including Gladwell, Rosenberg, and Friedman, argue that while Facebook and Twitter may have their place in social change, but that real revolutions take place in the street. Rosenberg wrote that the biggest obstacle in using social media for political change is that "people need those personal connections in order to get them to take action—especially if action is risky and difficult" (Rosenberg). For Friedman, "what brought Hosni Mubarak down was not Facebook and it was not Twitter. It was a million people in the streets, ready to die for what they believed in" (NEED CITATION). It is true that Facebook and Twitter did not *cause* revolutions, but it is silly to ignore the fact that the careful and strategic uses of digital media to network regional publics, along with international support networks, have empowered activists in new ways that have led to some of the largest protests this decade in Iran, the temporary lifting of the Egyptian blockade on Gaza, and the popular movements that ended the decades long rule of Mubarak and Ben Ali. Digital media had a causal *role* in the Arab Spring in the sense that it provided the very infrastructure there created deep communication ties and organizational capacity in groups of activists before the major protests took place, and while street protests were being formalized.

Indeed, it was because of those well-developed, digital networks, that civic leaders so successfully activated such large numbers of people to protest.

Social media is also the reason we have such good documentation of events. More important, it is the reason that Egyptians had such live coverage of what was going on in Tunisia, and also the reason that Moroccans, Jordanians, and Yemenis had coverage of what was going on in Egypt, just as Libyans and Syrians had coverage of what was going on in those countries, and so on. In other words, it was social media that brought the narrative of successful social protest across multiple, previously closed, media regimes. When things did not go well, as in the case of Bahrain and Libya, activists in the continuing cascade took note and applied these lessons – just as authoritarian regimes, like Syria and Bahrain, have made interesting moves like opening up previously embargoed digital networks to better monitor the strategies and activities of protestors. The Syrian government also very quickly developed a digital counter-insurgency strategy, effectively intimidating that country's activists form using social media in a systematic way for organizing. For the most part, it was physical intimidation that discouraged activists from communicating about their political activity on Facebook. But the authoritarian regime also invested in its social media strategy, by actively employing people to create pro-government content to distribute over social media networks.

Perhaps the most compelling reason for not dismissing the important causal role of digital media in the Arab Spring is that the traditional analysis, privileging other factors, yields uncompelling explanations (Gause, III 2011). For example, *The Economist* magazine built an index of how press freedom, corruption, democratic institutions, income, the youth bulge, and years of authoritarian rule might predict the vulnerabilities of particular regimes. But indexes like these—using many of the variables that traditional social media theorists also consider

important—suggested that Yemen, Libya, Syria, and Iraq were the most vulnerable. Yet they are neither the inciting nor defining cases of the Arab Spring. Yemen, Libya and Syria had a small elite of technology activists who helped spread the word of successful rebellion in other countries, but the tough authoritarian regimes responded quickly and forcefully and with their own digital media strategy. These countries descended into months of civil strife, and did not see a rapid regime transition. The countries that experienced rapid regime collapse, or where regimes made major concessions did not appear particularly vulnerable, for example Egypt and Tunisia, and Saudi Arabia and Morocco, respectively.

Social media and information infrastructure make useful contributions towards social movement organizing and the mobilization of popular protest. A peripheral look at counts of media use and digital diffusion reveals that the countries experiencing the most dramatic changes had low overall percentages of social media use (Mourtada and Salem 2011). But limiting the analysis to aggregate indicators precludes the possibility of telling a more complex, causal story. Moreover, if there is anything to the analytical frame of networks, the use of important media by a few important nodes of users could be exceptionally consequential. This is why, to unpack the complexities of the Arab Spring, we must employ analytic approaches that make possible the examination of complex social systems that constitute the overall aggregate of state-based cases. Street protests were the most challenging manifestations of political opposition for each regime's security forces, and they were certainly bolstered by decades long economic and political disenfranchisement of their citizens. Yet the millions of individuals on the streets of capital cities around the region were not disconnected individuals, and they also shared some generalizable similarities like large young populations that were less inclined to the political Islamist frameworks of previous generations.

In fact the opposite is true—these protesters were very connected, in groups and networks. Not every Tunisian and Egyptian had access to a computer. But mobile phones were the key mediating instrument bridging the communication gaps: they could be easily carried and concealed, could often be used to shoot and upload photos and videos, and could be recharged in the street. Given the high rates of mobile phone use, especially in the dense urban centers, it is safe to say that each person at the protests either had a mobile phone, or was part of a group in which there were several mobile civic journalists and bloggers. Before the Arab Spring, most social movement theorists had landed on a straightforward way of describing the importance of digital media. Digital media affected the costs and benefits of action, the opportunities and constraints on actor commitment, and was one of many resources available to activist leaders (Earl and Kimport 2011). In Bimber's account "socio-technological devices do not determine political outcomes, but simply alter the matrix of opportunities and costs associated with intermediation, mobilization and the organization of politics" (Bimber 2003, pp. 231). But the Arab Spring has demonstrated that digital tool for through which activist leaders evaluate costs and benefits, but a fundament infrastructure that varied political actors make use of.

CONCLUSON: THE DIGITAL SCAFFOLDING FOR SOCIAL MOVEMENTS

What might have made regimes more susceptible than others to popular uprisings, and what might explain the relative successes of some movements more than others? What role does information technology have in the modern recipe for democratization? Weighing multiple political, economic, and cultural conditions, we find that information infrastructure—especially mobile phone use—consistently appears as one of the key ingredients in parsimonious models for the conjoined combinations of causes behind regime fragility and social movement success.

Internet use is relevant in some solution sets, but it causal logic it is actually the absence of internet use that explains low levels of success by Arab Spring movements.

Fung et al arguer that there are two distinct models for how information technologies might have a role in democratic politics (Fung, Gilman, and Shkabatur This Issue). Rapid transitions towards democracy might come from a newly emboldened public sphere, the displacement of traditional organizations by new digitally self-organized groups, or digitally direct democracy. Long term, democratic entrenchment might come from truth-based, online advocacy, constituent mobilization, and crowd-sourced social monitoring. They find more intellectual promise in the second suite of possibilities, and until the Arab Spring much of the scholarly research on the political impact of digital media over the last decade supported this perspective (Howard 2010a). But this comparative analysis demonstrates that digital media may also have a role in rapid political transitions.

In every single case, the inciting incidents of the Arab Spring were digitally mediated in some way. Information infrastructure, in the form of mobile phones, personal computers, and social media were part of the causal story we must tell about the Arab Spring. People were inspired to protest for many different, and always personal reasons. Information technologies mediated that inspiration, such that the revolutions followed each other by a few weeks and had notably similar patterns. Certainly there were different political outcomes, but that does not diminish the important role of digital media in the Arab Spring. But even more importantly, this investigation has illustrated that countries that don't have a civil society equipped with digital scaffolding are much less likely to experience popular movements for democracy – an observation we are able to make only by accounting for the constellation of causal variables that

existed *before* the street protests began, not simply the short-term uses of digital technologies during the short period of political upheaval.

Since the Arab Spring, perhaps some of the best evidence that digital media altered the system of political communication in several countries is in the way political candidates have campaigned for office, emboldened by successful digital tactics, and continued to use information technologies in running for office. In both Egypt and Tunisia, the initial rounds of elections were notable for the way candidates wooed voters with social media strategies. Interacting with voters face to face was most important for reaching the many new voters who were not online and had little experience with campaign politics (Saleh). But competitive candidates also took to the internet and independent candidates not allied with Islamist parties, such as Mohammed El Baradei in Egypt, but also relied heavily on Facebook to activate networks of supporters. Digital media have had a crucial causal role in the formation, enunciation, and activation of coordinated opposition in several countries in North Arica and the Middle East. Now there is more evidence to suggest that this information infrastructure continues to be important after the dictators fell – further supporting the need to develop our theory to go beyond seeking linear relationships, and towards parsimonious recipes grounded in limited but real case-contexts.

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APPENDIX: Comparative Statistical Scores for Set Membership

Country	GDPPC	UNEMP	YUNEMP	INTERNET	MOBILE	CENSOR	URBAN	YOUTH	GINI	FUEL	POL	FRAGILE	SUCCESS
Algeria	0.58	0.42	0.95	0.32	0.47	0	0.47	0.32	0.37	1	0.83	0.53	0.47
Bahrain	0.84	0.58	0.26	0.89	0.68	0.75	0.89	0.26	0.42	0.58	0.11	0.32	0.05
Djibouti	0.16	1	0.68	0.16	0.05	0.36	0.63	0.74	0.74	0	0.83	0.11	0.11
Egypt	0.32	0.26	0.42	0.37	0.37	0	0.26	0.58	0.21	0.42	0.56	0.74	0.95
Iraq	0.05	0.74	0.95	0.79	0.42	1	0.42	0.89	0.11	0.37	0.94	0.84	0.58
Jordan	0.53	0.47	0.68	0.47	0.63	0.19	0	0.63	0.58	0.05	0.56	0.42	0.58
Kuwait	0.89	0.05	0.37	0.74	0.84	0.38	1	0.16	0	0.89	0.28	0.21	0.58
Lebanon	0.63	0.32	0.32	0.58	0.26	0	0.84	0.21	0.95	0.11	1	0.32	0.47
Libya	0.68	0.84	0.53	0.11	0.95	0.19	0.68	0.42	0.42	0.95	0.28	0.95	0.11
Mauritania	0.11	0.84	0.89	0.05	0.32	0.16	0.21	0.84	0.68	0.26	0.67	0.63	0.11
Morocco	0.42	0.37	0.05	0.68	0.53	0.31	0.37	0.37	0.79	0.21	0.44	0.42	0.58
Oman	0.79	0.58	0.16	0.84	0.89	0.38	0.58	0.47	0.21	0.68	0.11	0.74	0.84
Qatar	1	0	0.11	0.95	0.74	0.38	0.95	0	0.79	0.63	0	0.16	0.32
Saudi	0.74	0.16	0.42	0.47	1	0.75	0.74	0.53	0.21	0.79	0	0.63	0.84
Somalia	0	0.95	0.84	0	0	0.74	0.11	1	0	0.16	0.5	0	0
Sudan	0.26	0.79	0.79	0.21	0.11	0.63	0.16	0.79	1	0.74	0.67	0	0.58
Syria	0.37	0.21	0.16	0.42	0.21	0.38	0.32	0.68	0.42	0.47	0.28	0.84	0.11
Tunisia	0.47	0.53	0.53	0.63	0.58	0.63	0.53	0.11	0.79	0.32	0.5	0.53	0.95
UAE	0.95	0.11	0	1	0.79	0.75	0.79	0.05	0.11	0.53	0.11	0.21	0.32
Yemen	0.21	0.58	0.63	0.26	0.16	0.75	0.05	0.95	0.58	0.84	0.67	0.95	0.32

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