Web Network & Content Changes Associated with the 2011 Muslim Middle-East & North African Uprisings:

A Naturalistic Field Experiment

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***Abstract*—This research gathered web network top-level domain (tld) interlinkage among Muslim Middle East and North African Nations (MMENANs) in December 2010 and in April 2011, constituting before and after measures with respect to the 2011 Muslim Middle-East (MMENA) uprisings between these time points. This constitutes a naturalistic field experiment, with the uprisings occurring before April serving as the treatment condition. Evidence found that the MMENA uprisings are associated with increased presence of radical Islamist concepts on the MMENANs web domains, associating the terms: jihad, infidels, sharia, civil society, and democracy in a non-Western perspective. MMENANs that became more central in the network and therefore more powerful after the early uprisings may exert greater influence on other nations to increase presence of radical Islamist concepts in their web domains or to create hyperlinks to other nations' pages already having such content. Organizations increasing in network indegree after the uprisings are accumulating more web capital based on their domains being increasingly linked from other MMENANs. Increased indegree MMENANs are perhaps serving as more active incubators or breeders of the ideology concepts in their web domains. They have increased numbers of links from other MMENAs that increase the diffusion of these concepts. MMENANs that increased in network outdegree after the uprisings have societal members who are reaching out more to link with web content in other MMENANs. This may indicate they are seeking to more effectively develop their domestic religious/political constellation of concepts They would perhaps be most likely to have internal growth in popularity of the ideology and may reach critical mass to increase their own national anchoring of the ideology and associated practices.**

Keywords-Muslim; Middle East; North Africa; web mining; jihad; sharia; civil society; social network analysis;

I. INTRODUCTION

The fact that we had been gathering research data just prior to the beginning of the MMENAN uprisings enabled us to replicate the analysis after the initial phase of the uprisings to serve as a naturalistic field experiment to examine changes in the structures of networks among MMEMANs and in concepts associated with jihad, sharia, civil society, and democracy. This provides a unique opportunity to observe what effects the early uprisings period have had on these variables.

II. BACKGROUND AND LITERATURE REVIEW

Social networks in relation to MMENA uprisings have been of interest for at least nearly twenty years [1]. As does most social network (SNA) research, that early study analyzed networks among individuals as nodes. Nevertheless, network analysis using nations as nodes has also been useful, studying both the network of telephone call traffic, of internet development, and of web interlinks in relation to civil society development [2].

The recent wave of MMENA uprisings beginning earlier this year and continuing have been so recent that scholarly research has yet to catch up with them. Mainly news and opinion in the popular press are the sources available. As usual, these are not highly analytical treatments. Moreover, they have furthered a potentially misleading concept of "Arab Spring." Our research will show that this concept is associated with increases in the network power of radical Islamist concepts. So, for those opposing such perspectives, this period may be better conceptualized as the "Arab Storm."

The current study draws on a series of earlier studies on internet development and civil society in the MMENA and provides a scholarly platform on which to construct analysis of the internet and web networks in relation to some key religious and political concepts. These include: civil society, democracy, jihad, infidels, and sharia. That research began by empirically examining the premise of foreign policy in previous USA presidential administrations which asserted that the development of the internet in the MMENA is a necessary first step toward democracy. The rationale was that internet and web communication lead to civil society development, considered a necessary condition for the establishment of democracy [2]. The current USA administration has extended

this concept in a more basic way, not directly linking it to civil society, but asserting that access to the internet is a basic human right, particularly in the context of the MMENA uprisings, but not tying it as explicitly to democracy. As such it is a more politically neutral concept, in that the internet can be used as a tool by groups with a range of perhaps conflicting ideologies, including radical groups such as the Muslim Brotherhood, or Al Qaeda, as well as less ideological committed youth, or those with more Western values.

The current study gathered data from the top-level internet domains of the MMENA web in December 2010 and again in April 2011. Each nation of the world has a unique top-level domain name, such as .eg for Egypt or .dz for Algeria, and most web pages and other internet information is coded for that domain name. Table 1 shows the tlds for each MMENAN nation along with the total number of Google web pages. Exceptions are .com domains, although recent research has developed a method for retrieving web links among top-level domains based on their co-links to .com domains [3]. This is one way in which the science of Webometrics [4] represents domain interlinkage.

In December 2010 we gathered direct top-level to top-level domain interlinkage among the 47 nations with a majority Muslim population and were preparing to add to the design the web search terms of interest and some additional related religious/political terms. Shortly after this work had begun, the wave of uprisings in the MMENA began. Thinking we could capture some post-uprising data to analyze with respect to the December pre-uprising data we decided to wait as long as feasible while some of these movements had run their course. Although they continue in some MMENANs, to have time to prepare this paper by the deadline we replicated the 2010 data collection in April 2011. By comparing possible changes in the network structure and positions of MMENANs pre- and post- the early uprisings period we have a naturalistic field experiment. In addition to the before and after measures we have the early uprisings as the 'treatment' condition in the design. The analysis of these data is the focus of the current research, which enables analyzing the rate of change in the network variables, particularly centrality, indegree, and outdegree, in relation to the rate of change in the prevalence of the religious/political terms within each MMENAN. This provides evidence of the possible effects of, or producers of, the early uprisings associated with web networks and web content.

III. Research Design and Methodology

We will briefly describe the research design and methodology in this section and provide the details in a later section after presenting the results and discussion.

Our basic research design is considered in the quasi-experimental literature to be a naturalistic pre-/post- treatment field experiment with no control group. The pre-early uprising network measures were made in December 2010 and the initial post-early uprising measures made in April 2011. This research has two categories of pre- and post- measures. One category is the number of web pages in one MMENAN that have links to a web page in another MMENAN. These directional interlinkage data enable use of SNA methods to index such structural aspects as the relative network centrality of the MMENANs. Centrality is represented by the Freeman flow betweenness metric [5] because as has been previously pointed out [6] for communication data it is more fitting to the assumptions than is the commonly but incorrectly used basic betweenness centrality measure of Freeman [7]. Network indegree is measured at two levels: 1) the number of incoming web pages linked to those in a MMENAN domain from all other MMENANs domains and 2) the number of different MMENANs from which a particular MMENAN has links. Outdegree is the number of links that a MMENAN domain has to other MMENAN domains.

As is standard practice in the SNA research the actual link frequencies were used because network methods have no assumptions about normality of distributions, so log-normalization is not necessary. Just for the graphics, we dropped links below the median to enable more interpretable network images; otherwise almost all MMENANs are linked to all other MMENANs resulting in the proverbial "bowl of spaghetti" graph problem, reducing visual insights. In contrast the quantitative measures of graph properties used all of the data.

The second type of measures at both the pre- and post- time points is the frequencies of the following terms in each MMENANs web domain: 'civil society,' 'jihad,' 'sharia' and 'innovation.' Measured only at the post- period is 'infidels,' 'martyrs,' 'democracy,' and a combination of most of the terms on an individual web page: 'civil society,' 'democracy,' 'jihad,' 'infidels,' 'sharia.' Each of these frequency count variables for each MMENAN was log-normalized across the MMENAN distributions. Ratios were computed for amount of change by dividing the April 2011 values by the December 2010 values.

Another category of measures was about the internet size in each MMENAN domain: the number of users, the total number of web pages, and the number of internet hosts. Each of these was log-normalized. We controlled for all three of these measures in computing the partial correlations among the other variables of interest among the SNA and web term count measures.

IV. Results and Discussion

For 2010, the MMENAN top-level national domain interlink network for directional links above the median of 56 appears in Fig. 1. The 2011 network, having a higher median of 88 directional links, is shown in Fig. 2. Fig. 1 appears to have a slightly denser network than Fig. 2, which was born out from the numerical computations of network centrality using Ucinet [8]. This suggests that the uprisings may have had an effect of increasing the centralization of the network. The actual change was, however, small, increasing from 18% to 21% centralization.

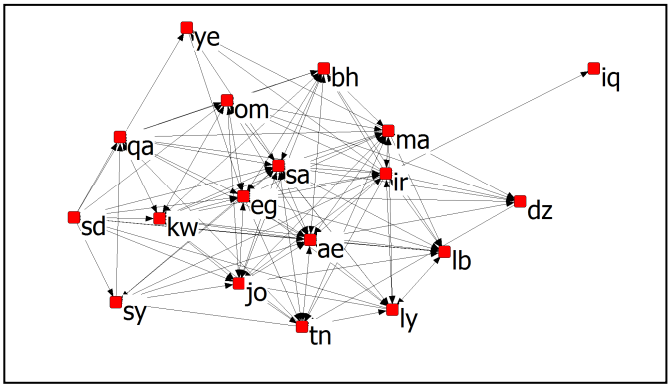

Figure 1. Web Interlink Network for June 2010

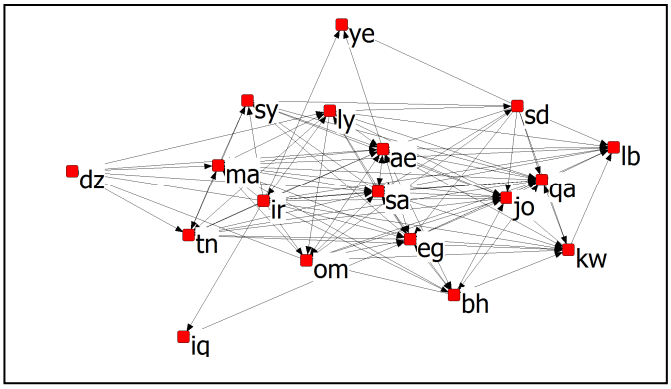

Figure 2. Web Interlink Network for April 2011

TABLE 1. KEY FOR TOP-LEVEL DOMAINS & TOTAL GOOGLE WEB PAGES

TLD	MMENAN	Google Pages
ae	UAE	25,600,000
bh	Bahrain	3,810,000
dz	Algeria	2,150,000
eg	Egypt	7,320,000
iq	Iraq	966,000
ir	Iran	116,000,000
jo	Jordan	9,120,000
kw	Kuwait	9,370,000
lb	Lebanon	6,030,000
ly	Libya	15,900,000
ma	Morocco	28,400,000
om	Oman	2,450,000
qa	Qatar	5,790,000
sa	Saudi Arabia	16,500,000
sd	Sudan	1,760,000
sy	Syria	6,600,000
tn	Tunisia	7,740,000
ye	Yemen	319,000

As Table 3 in the Appendix shows, the 2010 link distribution was non-normal, as is typical, with a mean of 62,056 and a standard deviation of 63,849 directed links. The range was from 0 to 1,040,000 links from Kuwait to Lebanon. Iraq had the fewest links at 572 with Lebanon had the most at 1,051,566.

The distribution of 2011 links, shown in Table 4 in the Appendix, was also non-normal with a mean of 5,861 directional links per pair of MMENANs and a standard deviation of 73,943 links with a range from 0 to 1290000, the high value also from Kuwait to Lebanon. Iraq had the lowest average number of directed links at 500 and Lebanon had the highest at 1,301,562 links.

The number of users, the number of internet hosts, and the number of web pages are positively associated. Partial correlations for all other pairs of variables were computed controlling for these three internet development variables.

A. Meanings Among Web Terms

In 2010 we were studying innovation among MMENANs and unexpectedly found that the term 'innovation' in Arabic (and in Persian for Iran) was significantly positively associated with the term 'jihad.' Consistent with this finding is the positive association between that term in 2010 and the term 'martyrs' in 2011. 'Innovation' was also positively associated with 'sharia' in 2011. As well, 'innovation' in 2010 was positively associated with the phrase 'civil society' in both 2010 and 2011. Increase in 'innovation' from 2010 to 2011 was negatively associated with increase in indegree ($r=-.53$, $p < .02$). In contrast, increase in 'innovation' from 2010 to 2011 was positively associated with an outdegree increase from 2010 to 2011 ($r=.45$, $p < .05$).

This finding means that If users in an MMENAN domain are increasing their focus on innovation, they are increasingly linking their web pages to those in other MMENANs. At the same time, as increases in innovation focus occur, fewer other MMENANs are increasing their links to them. Innovation increases, therefore, create an outward orientation in linking to web pages other MMENANs.

It is understandable from Western perspectives to observe that MMENANs would have an association of 'innovation' with 'civil society." Western societies generally see MMENANs as having underdeveloped civil societies, so from that from this perspective increasing its development would be an innovation. Less easy to understand on their face are the associations between 'innovation' and 'jihad' and 'martyrs' unless one considers that only six of the 18 MMENANs are fully Islamist states. These concepts in the other MMENANs would therefore be considered innovation-related. Although 'sharia' is already more diffused among MMENANs, it too is linked with 'innovation.'

A question for further research is whether these notions about jihad and sharia being innovative from an Islamist perspective carries into goals for effective jihad waged against Western nations which has as one of its goal the establishment of sharia jurisprudence. The political rhetoric in the USA of the Council on American Islamic Relations (CAIR), for example, includes the establishment of sharia there and also has included active attempts to block moves to outlaw sharia in several states [9].

The MMENA uprisings of 2011 through April are coincident with some noteworthy findings: Not surprisingly, an increase in 'jihad' from 2010 to 2011 is positively associated with an increase in 'sharia' from 2010 to 2011, and also with an increase in 'civil society' from 2010 to 2011. At the same time, an increase in 'civil society' is positively associated with an increase in 'sharia' from 2010 to 2011. These change associations among the variables further substantiate that civil society has become increasingly linked with religious concepts from before to after the early uprisings in the study. Western media observers have been concerned that the uprisings are motivated at least to some extent by Islamist strategy. The current study provides supporting empirical evidence at the level of web content patterns.

B. Network Variables and Web Terms

The ability of the research design to statistically examine changes in jihad and related religious and political concepts in concert with changes in MMENA network structures gives evidence for two of the three elements of causality, association and time-order. Regarding the directionality of associations in a causal sense, it appears reasonable to assume that changes in the network structures are leading to changes in the concept frequencies, rather than assuming the causal agency of concepts is changing the network structures. The evidence is that there are many more outdegree links than web pages with the concepts. So, the creation of such pages alone could not be expected to lead to the observed changes in outdegree, indegree, and centrality.

If changes in network variables are leading to changes in concepts. This would mean that MMENANs that are increasing in network power are causing change in other MMENANs that increase their focus on the religious/political concepts.

An increase in 'jihad' from 2010 to 2011 is positively associated with an increase in outdegree from 2010 to 2011 ($r=.66$, $p < .004$). As a MMENAN increases its focus on 'jihad' on the web from before to after the MMENA early uprisings, its outbound linkages to other MMENANs increase. The absolute amount of jihad focus in 2010, however, is negatively associated with an increase in outdegree from 2010 to 2011 ($r=-.57$, $p < .01$). In other words, those MMENANs in 2010 that were already higher in jihad focus did not increase in outdegree, while MMENANs in 2010 with a lower level that moved higher in 2011 did increase in outdegree. This change is associated with their establishing web links to more MMENANs during and immediately after the early uprising period.

As well, an increase in civil society from 2010 to 2011 is positively associated with an increase in outdegree from 2010 to 2011 ($r=.49$, $p < .03$). The combination search term of: 'jihad, infidels, sharia, civil society, democracy' all in the same web pages is positively correlated with 2011 flow betweenness centrality as well as an increase in flow betweenness centrality from 2010 to 2011. ($r=.48$, $p < .04$; $r=.44$, $p < .05$). This seemingly non-Western combination of religious/political concepts is perhaps unique to MMENANs, although for more informed security policy, future research may find it beneficial to examine this combination of concepts in the 30 other Muslim countries for which we gathered data but have not yet analyzed it. This combination of concepts suggests from a Western perspective what appears to be a radical Islamist orientation that is coupled with civil society and democracy concepts. This is indicative of an Islamist activist meaning for civil society and democracy in MMENANs that may also include jihad against infidels outside the MMENA. Although, whether this has increased as a result of the early uprisings needs further study.

The early uprising period is associated with MMENANs with this orientation becoming more central in the inter-MMENAN web network. Because network centrality is associated with power in the SNA literature [10] this reflects increasing agenic web capital and power for MMENANs with this combination of jihad-related concepts. To more effectively interpret MMENAN dynamics, this non-Western connection of concepts warrants further study. Whatever its meanings, it is growing in power.

An increase in indegree from 2010 to 2011 is negatively associated with an increase in outdegree from 2010 to 2011 ($r=-.52$, $p < .03$). This pattern when coupled with findings discussed earlier indicates that MMENANs with a higher degree of democracy focus are being linked to less frequently by other MMENANs. Taken together with the previous finding, this suggests that most MMENANs have not taken action during the early uprising period to link more to other MMENANs. Rather, it is a subset of MMENANs with the greatest increase in outdegree that are the most active agents. The MMENAN with the largest increase in outdegree is Oman with an increase of 248% over its 2010 level, followed by Iran with a 151% increase, as seen in Table 2. The listing of countries is sorted by the change in indegree and by the change in flow betweenness centrality. The country with the highest increase in indegree was Iraq. In contrast, fewer MMENANs are directing links into the Iranian domain after the uprisings. The countries showing the largest increase in flow betweenness centrality were UAE, Egypt, Libya, and Sudan. These were the new network power agents at the time of the study. Since that time, Libya has seen interventions that have no doubt changed its network position.

To further interpret these findings consider that a country with increasing indegree is accumulating more external web capital because more web sites outside it are linking to pages within it. This indicates that the value of this country on the Web to users in other countries is increasing.

On the other hand, a country that is increasing in outdegree is linking out to more web pages outside its domain, here to other MMENANs. This does not increase external web capital, instead increasing internal web capital for the user communities within the domain. They are gaining more information of interest from outside MMENANs. If this growing accumulation of information from other web domains reaches critical mass, internal changes may be expected in these higher outdegree MMENANs. Given that this research has found apparently unique meanings for the combination of religious/political concepts studied, it is reasonable to expect that such changes would be in the direction of increases in the prevalence of radical Islamist strategy.

A country with increasing flow betweenness centrality is becoming more powerful in its position in the network relative to other countries. This is higher agenic web capital than it previously had. To the extent these countries share the radical Islamist conceptual schema that was seen to increase after the early uprisings, then we can expect this network agency to promote these concepts to other MMENANs. Because of the privileged network positions of power, their actions may be more effective than those of other MMENANs.

TABLE 2. NETWORK OUTDEGREE, INDEGREE, AND FLOW BETWEENNESS INCREASES IN RATIOS OF 2011 BY 2010 VALUES

Country	Outdegree Increase
Oman	2.48
Iran	1.51
Bahrain	1.41
UAE	1.30
Tunisia	1.29
Kuwait	1.24
Egypt	1.21
Algeria	1.21
Jordan	1.10
Iraq	1.07
Lebanon	1.06
Yemen	0.99
Morocco	0.98
Qatar	0.96
Sudan	0.74
Syria	0.46
Libya	0.34
SArabia	0.31

	Indegree Increase
Iraq	1.70
Oman	1.48
Morocco	1.39
Sudan	1.29
Kuwait	1.25
Algeria	1.24
Jordan	1.22
Syria	1.21
SArabia	1.15
Libya	1.13
UAE	1.06
Bahrain	1.00
Yemen	0.90
Tunisia	0.85
Egypt	0.49
Lebanon	0.29
Iran	0.29
Qatar	0.20

	Flow Betweenness Centrality Increase
UAE	3.02
Egypt	2.34
Libya	2.29
Sudan	2.13
Qatar	1.44
Lebanon	1.33
Oman	1.31
Tunisia	0.40
Iraq	0.11
Kuwait	0.01
Yemen	-0.08
Iran	-0.16
Algeria	-0.27
SArabia	-0.82
Bahrain	-1.89
Syria	-2.00
Morocco	-2.01
Jordan	-2.65

IV. CONCLUSIONS

This research has found evidence that the MMENA early uprisings have been associated with increases in radical Islamist concepts on the web. Given the increasing importance of the web to offline social behaviors, this finding has security implications for Western societies. The network changes among the MMENANs associated with the early uprisings and the increases in radical Islamist concepts suggest a triple threat.

One, more central/powerful nations after the early uprisings can possibly exert more effective influence on other nations toward the radical Islamist perspectives in ongoing uprisings or afterward.

Two, organizations increasing in indegree links from other nations are accumulating more web capital of a sort that includes non-Western concepts of civil society. These nations may serve as more active incubators or breeding grounds of the ideology.

Three, nations that increased in outdegree after the early uprisings would appear to have societal members who are reaching out more to link to web content in other MMENANs, which may indicate they are seeking to more effectively develop the unique religious/political constellation of concepts this research identified. They would perhaps be most vulnerable to internal growth in popularity of the ideology and may reach critical mass that may affect their ideology and associated strategic practices.

In addition, Western societies are increasingly concerned about homegrown radical jihadist activities. For example, organizations in the USA such as CAIR are widely discussed on the web as agents of radical Islamist forces from within the MMENA with ties to the Muslim Brotherhood and other radical Islamist organizations.

V. METHODS

This section presents further details on the methods described in section III. Searches for web terms were conducted in Arabic (Farsi for Iran) using Google Translate. These translations were back-translated to assess reliability, which was found. There may be other linguistic variants that are relevant but hot captured within Google Translate. Their absence would mean that the current findings are less strong than would be expected with a wider translation array. The English word was translated to the MMENA phrase in UTF format so that the characters were exactly represented as in the

standard encoding of the languages. Searches using these translated terms were entered into Google in the form:

الأوسط الشرق النص بنت site:.tld

Where tld is the top-level domain for the MMENAN, for example, .ae is the code for United Arab Emirates, .dz is the code for Algeria. See Table 1 for all of the tlds. As a result of the search, Google displays an estimate of the total number of web pages in the tld that contain the search term(s). These totals were entered into an Excel spreadsheet as the data were built for eventual reading into SPSS version 19 for statistical analysis. If the search term was a phrase, such as 'civil society' the term was entered into the Google translator with quotes "around it" and the resulting MMENA language contained the quotes in the proper locations. This enables finding the number of web pages that contain the two terms directly next to each other in the text, rather than appearing anywhere in the page, such as when the quote marks do not surround more than one term.

The authors have previously conducted reliability testing on the Google results at different times of the day and night and there is consistently a correlation at .97 at higher number of pages returned over different times. Some of the presumed error is probably not error but the fact that the actual number of pages had changed based on the Google web crawling robot results. So, Google appears to provide a reliable tool for counting web page hits for search terms, regardless of the time of the day it is accessed on different days.

Each of the web term(s) search counts is non-normal as is characteristic of frequency counts of communication data. The natural log (ln) was performed on each Google count variable to rescale it to be more normal. Applying a constant transformation to the variables results in no introduction of error. The reason why log transformations are performed is because parametric statistical techniques were used that have assumptions of relatively normal distributions of variables. Here we used the parametric technique of partial correlation, controlling for the number of internet users in the tld, the number of total web pages in a tld, and the total number of host computers in the tld. Host data is robotically collected every six months by the Internet Systems Consortium (http://www.isc.org/solutions/survey) and indexes the host counts for tlds. The total number of web pages is obtained using Google by entering the term: site:.tld with no other search specification. The number of internet users per domain was obtained from International Telecommunications Union (ITU) (http://www.itu.int/ITU-D/ict/statistics/). The Webometric hyperlink interlinkage data were collected using the Yahoo Applications Programming Interface (API), which unfortunately was discontinued later in April after our data collection was finished. It was the only operating search engine that had functionality for measuring interlinkage among domains, which had previously only been available in the AltaVista search engine. When Yahoo acquired AltaVista several years ago it discontinued that functionality in AltaVista but later introduced an API in Yahoo that had the same domain interlinkage functionality. Hopefully, in the near future another search engine will enable such data collection, ideally Google. The Yahoo API allowed us to enter special commands to return counts of the total number of directional links between each pair of MMENANs. The API results were converted to a consistent matrix format by the LexiURL tool (http://lexiurlsearcher.blogspot.com/), rendered as Excel spreadsheets such as shown in Tables 2 and 3.

The spreadsheets were input to the SNA program Ucinet version 6.328 and converted to its system files. This enabled computation of statistics for indegree, outdegree, and flow betweenness centrality. As well, these system files were input to its associated network graphics drawing program, Netdraw [11]. The default symbol of a square was used to represent each MMENAN as a node in the network. It was resized for ease of viewing. Likewise labels for the tlds and the arrow heads indicating direction of links were made larger. Links below the median for each network graph were dropped to increase the clarity of structural differences visible. If such a procedure, which is standard, is not performed then every node is often connected to every other node and one is faced with the proverbial "bowl of spaghetti" looking graph that is quite useless for visual comparison purposes, as well as for revealing important structural differences across networks that can be subsequently validated through quantitative analysis of the full ranges of data in Ucinet or other social network analysis software. For the 2010 network the median was 56 directional links and for the 2011 network was 88 directional links, showing an increase in interlinkage associated with the early uprising period.

Netdraw creates for links a layout of nodes based on the standard "spring embedded" algorithm. This operates as if each link in the network is a spring which increases in strength in direct proportion to its relative link strength. Imagine that the collection of nodes was first uniformly distributed on the graph and locked into position, then the springs were attached, following this the nodes were subsequently released from the fixed positions so that the collective forces of all of the springs acting on each other would lay out the nodes in the optimal solution. Because of this functionality, different optimized graphs can be visually compared. Nevertheless, this eyeballing of the figures, while useful for seeing gross patterns, should be followed by statistical analysis of the full ranges of data to compute indices for each node. Such a quantitative statistical analysis including these network variables and all of the other variables used in this study was performed.

SPSS version 19 reads .xlsx files into it. The first analysis step was to perform the log transformations on the web and internet development variables. Ratios were then computed for all variables measured at both the December 2010 and April 2011 time points. The 2011 values were divided by the 2010 values to produce a ratio reflecting the amount of increase or decrease in the values. These are the most analytically powerful variables in that they enable correlating sets of change variables. This enables consideration of possible effects of, or producers of, social forces coincident with the MMENA uprisings between the two observation points. Because the number of web pages, users, and hosts are correlated with both the network variables and the web count variables, we controlled for them using partial correlations. This treated the three log-normalized internet variables as

controls, removing their effect from the correlations observed for the other variables examined.

Initially, because the three internet development variables had relatively high correlations, we tested whether it was appropriate to sum the variables into an index, by computing Chronbach's Alpha reliability coefficient. The score was .61, which some researchers consider sufficiently reliable to form a scale but it is more technically defensible if the scores approach .90 or higher. Given the value observed we did not compute an index but used each of the three variables together as controls in the partial biserial Pearson correlations. Because we expected relationships among variables based on previous research we computed one-tailed statistical significance tests. There were no missing data. The effective n for the significance tests was 13 because of the use of the two correlates plus the three controls, reducing the value from 18, the actual number of MMENANs. This made it more difficult to find statistically significant relationships than with regular correlation. The standard probability value cutoff of .05 was used so that all reported relationships were possibly due to chance alone only 5 times out of 100 or less as the p values were lower.

VI. Competing Interests

The authors declare that they have no competing interests.

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VIII. References

[1] G. Denoeux, Urban unrest in the Middle East: A comparative study of informal networks in Egypt, Iran, and Lebanon. Albany, NY: State University of New York Press, 1993.

[2] J, A. Danowski, "Arab countries' global telephone traffic networks and civil society discourse," in Civic discourse and digital age communications in the Middle East, H. Amin and L. Gher, L, Eds. Westport, Conn.: Ablex Publishing, 2000, pp. 93-108.

[3] G. A. Barnett, C. J. Chung, and H. W. Park, "Uncovering transnational hyperlink patterns and web-mediated contents: A new approach based on cracking .com domain," Social Science Computer Review, vol. 29, no. 3, August 2011.

[4] H. W. Park, "Mapping the e-science landscape in South Korea using the webometrics method ," Journal of Computer-Mediated Communication, vol. 15, no. 2, pp. 211-229, March 2010. .

[5] L. C. Freeman and S. P. Borgatti, "Centrality in valued graphs: A measure of betweenness based on network flow," Social Networks, vol. 13, no. 2, pp. 141-154, June 1991.

[6] S. P. Borgatti, "Centrality and network flow," Social Networks, vol. 27, no. 1, pp. 55-71, January 2005.

[7] L. C. Freeman, "Centrality iin social networks: Conceptual clarification," Social Networks, vol 1, no. 1978/1979, pps. 215-239, 1979.

[8] S. P. Borgatti, M. E. Everett, and L. C. Freeman, "Ucinet for Windows: Software for Social Network Analysis. Harvard, MA: Analytic Technologies, 2002.

[9] CIAR, "American Muslim News: Associated Press, 1/14/11 CHICAGO TRIBUNE: Muslim group urges rejection of anti-Sharia bill." Available from http://www.cair-ny.org/content/?content_id=502

[10] S. Wasserman and K. Faust. Social network analysis : methods and applications. Cambridge, N.Y. : Cambridge University Press, 1994.

[11] S. P. Borgatti, "NetDraw: Graph visualization software. Harvard, MA: Analytic Technologies, 2002.

IX. Appendix

TABLE 3. DECEMBER 2010 WEB INTERLINK MATRIX

	ae	bh	dz	eg	iq	ir	jo	kw	lb	ly	ma	om	qa	sa	sd	sy	tn	ye
ae		3220	192	2250	21	750	1620	4070	1620	737	9690	2570	2840	3570	39	1090	1290	887
bh	439		11	365	1	8	393	456	43	44	154	142	4230	215	2	50	24	6
dz	169	11		37	2	4	23	9	12	125	152	4	10	21	2	7	94	10
eg	13000	501	34		7	216	464	528	138	293	448	164	378	408	25	148	331	37
iq	30	13	12	102		11	20	7	22	5	10	10	6	20	27	17	10	10
ir	5180	499	161	1410	406		237	1160	981	599	2030	581	1290	1650	12	131	169	183
jo	366	68	55	235	8	16		88	692	23	106	46	47	717	37	136	82	10
kw	3160	375	15	736	3	221	4460		1290000	61	86	134	389	529	0	66	19	12
lb	326	49	14	87	5	77	1910	71		106	33	9	26	1910	6	31	33	10
ly	794	75	18	229	6	323	134	81	97		390	95	91	80	1530	77	185	1
ma	1200	86	535	253	3	82	350	69	96	2480		42	2970	246	11	101	547	46
om	7460	53	7300	114	3	13	7450	7380	29	31	7300		107	7530	5	41	21	12
qa	312	1110	18	704	1	43	51	682	64	23	21	66		105	3	17	20	5
sa	12300	49100	2880	1410	11	476	9730	50000	6200	450	283	49700	279		95	455	243	83
sd	4490	3	2	1470	17	5	2580	1450	1450	41	10	1450	1450	1470		1450	10	1450
sy	1020	10	11	35	5	28	114	21	40	7	18	19	322	59	1		13	5
tn	47500	8	68	64	0	9	27400	46900	54	37	1290	14	792	149	2	17700		10
ye	50	18	16	74	1	7	29	16	24	0	27	15	15	32	4	7	8	

TABLE 4. APRIL 2011 WEB INTERLINK MATRIX

	ae	bh	dz	eg	iq	ir	jo	kw	lb	ly	ma	om	qa	sa	sd	sy	tn	ye
ae		3220	192	2250	21	750	1620	4070	1620	737	9690	2570	2840	3570	39	1090	1290	887
bh	439		11	365	1	8	393	456	43	44	154	142	4230	215	2	50	24	6
dz	169	11		37	2	4	23	9	12	125	152	4	10	21	2	7	94	10
eg	13000	501	34		7	216	464	528	138	293	448	164	378	408	25	148	331	37
iq	30	13	12	102		11	20	7	22	5	10	10	6	20	27	17	10	10
ir	5180	499	161	1410	406		237	1160	981	599	2030	581	1290	1650	12	131	169	183
jo	366	68	55	235	8	16		88	692	23	106	46	47	717	37	136	82	10
kw	3160	375	15	736	3	221	4460		1290000	61	86	134	389	529	0	66	19	12
lb	326	49	14	87	5	77	1910	71		106	33	9	26	1910	6	31	33	10
ly	794	75	18	229	6	323	134	81	97		390	95	91	80	1530	77	185	1
ma	1200	86	535	253	3	82	350	69	96	2480		42	2970	246	11	101	547	46
om	7460	53	7300	114	3	13	7450	7380	29	31	7300		107	7530	5	41	21	12
qa	312	1110	18	704	1	43	51	682	64	23	21	66		105	3	17	20	5
sa	12300	49100	2880	1410	11	476	9730	50000	6200	450	283	49700	279		95	455	243	83
sd	4490	3	2	1470	17	5	2580	1450	1450	41	10	1450	1450	1470		1450	10	1450
sy	1020	10	11	35	5	28	114	21	40	7	18	19	322	59	1		13	5
tn	47500	8	68	64	0	9	27400	46900	54	37	1290	14	792	149	2	17700		10
ye	50	18	16	74	1	7	29	16	24	0	27	15	15	32	4	7	8	