

# **A Case Study for Evaluating Facebook Pages with respect to Arab Mainstream News Media**

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## **Abstract**

In this paper we propose a framework to analyze and evaluate social networking pages based on their usage data and apply it to a number of Arab mainstream news media Facebook pages. Two well-known metrics are used, these are namely: Internet Penetration and Facebook Penetration. The paper also introduces new metrics such as: Page Penetration and Ranking Index, as well as new evaluation methods. The framework is applied to a set of countries, these are specifically the Arab-World countries which count to twenty two countries in addition to seven Facebook pages that belong to seven prominent Arab satellite channels. The proposed framework is used to evaluate countries for their Internet and Facebook penetration rates. Countries' consumption of news through those pages is also explored and evaluated. Results are verified using the Member Participation metric which is also proposed in this framework. Results reveal that Arabs highly credit natively-Arabic news media rather than those news media who only disseminate in Arabic. Furthermore, 70% of the Arab countries have more than 50% of their Facebook users use it for news consumption. We also conclude that those Arab countries that suffered unrest, civil war, or political crises in the recent years show higher page penetration rates such as Yemen, Syria, Egypt, and Libya.

**Keywords:** Internet, Facebook, Social Networking Sites, Social Media, Social Network Analysis

## **1. INTRODUCTION**

Social Networking Sites (SNS) are playing an important role in our lives. They are web-based services that enable their users to: (1) create accounts (profiles), (2) connect to their friends, relatives, colleagues, fans, etc. and following these connections and others' connections [1], and (3) exchange messages [2]. Facebook, Twitter, LinkedIn, Google+, Pinterest, YouTube, and Instagram are examples of SNS. Along with social networking Social Media (SM) is always present. SM is defined as a set of Internet-based applications that exploits Web technologies and aims to exchange user-generated content (UGC) between participating entities [2]. SM leveraged the widespread of SNS and became a valuable, ubiquitous Internet service [3, 4].

More than a billion users worldwide use SNS which forms nearly 82% of Internet users aged 15 and older [5]. Those use SNS to: (1) establish connections, (2) exchange messages [6], and (3) share content of different types [7] such as: video, audio, UGC [5], personal or private information [8], and blogs [2]. Recently, SNS moved to the mobile computing arena introducing Mobile Social Networks [9]. The ubiquity of mobile devices helped accelerating the diffusion of social networking [10]. SNS became essential for almost everybody; not only individuals, but also businesses, educational institutions, mainstream news media, governments, etc. Those access SNS to interact with their customers (clients). However,

Facebook is ranked the first amongst SNS in terms of number of user [6, 11].

Nowadays, SM has become a trend in the field of news media technologies which started to penetrate newsrooms in the 1990s using websites, e-mails, and mobile technologies [12]. Almost all mainstream news media today utilize SM in order to leverage their marketing and content distribution [13], in addition to gaining a foothold in the competition [14]. Actually, mainstream media use SM to increase their audience, reach, and influence [15, 16]. Mainstream news media can reach more audience using SNS features, such as friend recommendation, i.e. profiles of mainstream media may appear to mutual friends suggesting to like them [17], which in turn contributes to increasing the number of fans of those pages.

News consumers are highly affected by SM; their way of perceiving news has changed; now, they can interact with the news that are shared using SM within a few minutes [18, 19]. Consequently, users are not only receiving the news, they additionally can choose what to read, and they can comment and enter discussions with other audience or media.

In this paper, we collect usage data for a number of prominent satellite channels that are Arab mainstream news media and have Facebook pages to share news. Seven pages are selected, these are namely: (1) Al Jazeera

Channel, (2) Al Arabiyya, (3) Sky News Arabia, (4) BBC Arabic, (5) CNN Arabic, (6) France 24 Arabic, and (7) Russia Today Arabic. Those pages share Arabic content in different formats and are oriented to Arab countries, i.e. the 22 Arab countries of the Middle East and North Africa (MENA). The study focuses on page penetration rates and countries' news consumption via Facebook. Netvizz is the tool used to: (1) collect data about pages and groups on Facebook [20], (2) retrieve page posts, likes, shares, and comments [21, 22], and (3) export the collected data in standard formats [23].

The importance of this research is that we are proposing a framework that can be applied to extract usage data of Facebook pages that disseminate and share any content type which pertains to different fields like: universities, celebrities, bloggers, SM activists, etc.

The remainder of this paper is organized as follows: in section 2, we review some of the related work. The methodology is described in section 3. Then the problem is formulated in section 4. In section 5, we present our experimental results. Finally, conclusion and future work are highlighted in section 6.

## 2. RELATED WORK

G. LOTAN et al. [15] tackled sharing news about Tunisian and Egyptian revolutions using Twitter. Their main interest was to classify users who share content related to the revolution into categories. They affirmed that Twitter is an important tool for spreading information. In this research we are widening the domain of the study to include more Arab countries some of them had revolutions during the last few years and others had not. We are different from G. LOTAN et al. in that we are not interested in analyzing what users share. Rather, we are interested in how much users of Facebook from our selected set of countries use Facebook to consume news, and what pages they prefer.

A second paper by S. Hille and P. Bakker [24] discussed Facebook usage and participation of Dutch media. It discussed and studied the use of Facebook by media, the interaction of users with the posts, and whether the journalists interact with the users. They concluded that Dutch media on Facebook had very few friends compared to traditional media and the popularity of their websites. On the other hand, in terms of Facebook page likes, media was growing with a very low number of likes and comments on posts. In our paper, we studied how much audience trust news shared through SM in Arab countries, and which pages have much credibility. We focus on the penetration rates of some Arabic mainstream news media Facebook pages.

A. Hermida et al. [13] studied the impact of SM on news consumption by means of an online survey of 1600 Canadians. Their results show that social networks are important sources of news for Canadians. We followed a

different approach, instead of depending on user opinions that are collected by surveys, we collected real usage data by means of well-known tools. Using real usage data is more accurate than surveys, since surveys may not reflect actual attitudes because participant could be biased. Also, the sample size used may not reflect the whole society. It is noticeable in the work of A. Hermida et al. that the sample size is small to make a decision. In our work we used actual figures which are obtained from credible sources and represent all the society of users of the Internet, Facebook, and the pages selected in the study.

## 3. METHODOLOGY

The problem is first formulated and the analysis and evaluation metrics are defined. We setup our study on Arab countries only; these are only 22 countries that speak the Arabic language and are located in the Middle East and North Africa (MENA). We select the targeted Facebook pages based on the following criteria: the Facebook pages are for Arab mainstream media and they have a high level of credibility between Arabs. Netvizz App is used to collect usage data for these pages. Internet and Facebook statistics are collected from well-known worldwide sources. Datasets are created by importing the collected data into a database. Finally, calculations and analysis are made to get the desired results.

## 4. PROBLEM FORMULATION

Assuming we have  $n$  countries and  $m$  pages, then both definitions 1 and 2 hold.

**Definition 1: Country Set (C):** Let  $C$  be a closed set of countries, such that  $C = \{c_1, c_2, \dots, c_n\}$ . A country  $c_i \in C$  is a tuple  $c_i < Id, L, I, FB >$  such that  $L, I, FB \in \mathbb{N}$ ,  $Id$  is the country code,  $L$  is the population,  $I$  is the number of Internet users, and  $FB$  is the number of Facebook users.

**Definition 2: Page Set (P):** Let  $P$  be a closed set of Facebook pages, such that  $P = \{p_1, p_2, \dots, p_m\}$ . A page  $p_i \in P$  is a tuple  $p_i < Id, F >$  such that  $Id, F \in \mathbb{N}$ ,  $Id$  is the page identifier and  $F$  is the number of Fans for that page.

Internet and Facebook penetration rates are two important metrics that should be calculated as defined in definitions 3 and 4 respectively.

**Definition 3: Internet Penetration Rate (IPen):** is defined as the ratio of Internet users in a specific country to its population [25]. Let  $I_{c_i}$  be the number of Internet users in country  $c_i$  and  $L_{c_i}$  the population of the same country  $c_i$ , then:

$$IPen(c_i) = \frac{I_{c_i}}{L_{c_i}} \quad (1)$$

**Definition 4: Facebook Penetration Rate (FBPen):** is defined as the ratio of Facebook users in a specific country to its population [25]. Let  $FB_{c_i}$  be the number of Facebook users in country  $c_i$  and  $L_{c_i}$  the population of the same country  $c_i$ , then:

$$FBPen(c_i) = \frac{FB_{c_i}}{L_{c_i}} \quad (2)$$

The page penetration rate is another important metric that is proposed by this paper and is defined in definition 5. This metric is used to rank the pages.

**Definition 5: Page Penetration Rate (PgPen):** the ratio of number of page fans per country to the number of Facebook users in that country. Let  $f(c_i, p_j)$  be the number of page fans per country, and  $FB_{c_i}$  the number of Facebook users in country  $c_i$ , then

$$PgPen(c_i, p_j) = \frac{f(c_i, p_j)}{FB_{c_i}} \quad (3)$$

We need to group the set of countries with similar properties into groups; for example the geographical location. This is necessary because the number of participating countries could be large. This grouping can be excluded for smaller number of countries.

**Definition 6: Groups:** a group  $G_i$  is a subset of the country set  $C$ ; that is  $G_i \subset C$  such that  $i > 1$ .

Results of page penetration rates need to be organized in a matrix that we propose called the ranking matrix. It gives weight to the positions that countries achieved in page penetration rates.

**Definition 7: The Ranking Matrix (R):** an  $n \times n$  matrix  $R(n, n)$ , such that for a given group  $G_x$ ,  $n = |G_x|$ . Rows in  $R$  represent the group's countries, and columns are the page penetration rates ranks ( $r$ ), such that  $0 < r_i \leq n$ . Each rank there is given a weight  $w_i = n - i + 1$ . A cell  $R_{ij}$  represents the number of times a country  $c_i \in G_x$  achieves the rank  $j$  in page penetration.

After the results are organized in the ranking matrix, we proposed a metric to order the countries in order of PgPen. The proposed metric is called the ranking index (Rx) and is defined in definition 8.

**Definition 8: Ranking Index (Rx):** a measure to sort countries in order of PgPen. It is calculated for each row in the ranking matrix (R) by summing the product of each cell in a single row and its corresponding weight then dividing the sum by  $n^2$ , such that  $n$  is the number of countries in the group.

$$Rx = \frac{\sum_{j=1}^m m_{ij} \times w_j}{n^2} \quad (4)$$

The objective is to sort countries in order of Internet, Facebook, and page penetration rates.

## 5. EXPERIMENTAL RESULTS

Population, Internet and Facebook users, and page fans have a rapidly changing nature. Accordingly, this research is based on the first three quarters of the year 2016, i.e. starting from Jan 1<sup>st</sup> to Sep 30<sup>th</sup>.

At the beginning, we set up the testing environment on the 22 Arab countries that are listed in Table 1 according to Definition 1. Country codes in are represented in ISO Alpha-2 codes [25]; these are international standard codes that comprises two letters and used as a general-purpose code [26]. Internet and Facebook users are collected from Internet World Stats website [27], and population data is collected from the World-Bank datasets [28].

Table 1: List of Arab countries

Id	Country	Population (L)	Internet Users (I)	Facebook Users (FB)
AE	United Arab Emirates	9156963	8515420	7700000
BH	Bahrain	1377237	1278752	800000
DJ	Djibouti	887861	150000	150000
DZ	Algeria	39666519	15000000	15000000
EG	Egypt	91508084	34800000	32000000
IQ	Iraq	36423395	14000000	14000000
JO	Jordan	7594547	5700000	4800000
KM	Comoros	788474	60000	60000
KW	Kuwait	3892115	3202110	2300000
LB	Lebanon	5850743	4545007	3100000
LY	Libya	6278438	2800000	2800000
MA	Morocco	34377511	20207154	12000000
MR	Mauritania	4067564	714132	370000
OM	Oman	4490541	3310260	1500000
PS	Palestine	4422143	3007869	1700000
QA	Qatar	2235355	2200000	2200000
SA	Saudi Arabia	31540372	20813695	14000000
SD	Sudan	40234882	10886813	10886813
SO	Somalia	10787104	660000	660000
SY	Syria	18502413	5502250	5502250
TN	Tunisia	11107800	5800000	5800000
YE	Yemen	26832215	6773228	1800000

Netvizz v1.41 is used to collect Facebook usage data for the specified pages from different Facebook sections and supports different formats [29].

### 5.1 Internet and Facebook Penetration

Internet and Facebook penetration rates are calculated as defined in Definitions 3 and 4 and shown in Fig. 1 and Fig. 2 respectively.

Both results of IPen and FBPen converge with each other; according to IPen the first four countries were QA AE, BH, and KW, while FBPen shows QA, AE, JO, and KW in the first four places.

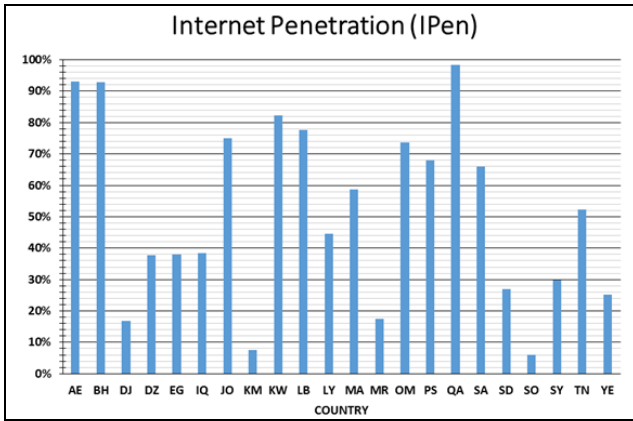


Fig. 1: Internet Penetration (IPen)

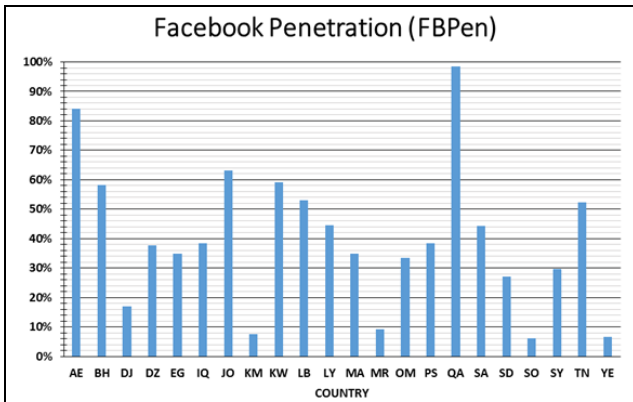


Fig. 2: Facebook Penetration (FBPen)

## 5.2 Page Penetration and Ranking

The page set defined in Definition 2 contains the 7 Arab mainstream news media pages listed in Table 2.

Table 2: Selected pages with number of fans for each page

Id	Page	Fans (F)
JSC	Al Jazeera	17360261
ARB	Arabia	16358487
SKY	Sky News Arabia	8996886
BBC	BBC Arabic	7248563
F24	France 24 Arabic	5960249
CNN	CNN Arabic	1798623
RTA	RTA Arabic	9669311

JSC comes in the first place terms of number of fans, followed by ARB, RTA, SKY, BBC, F24, and finally CNN.

To calculate the page penetration rate (PgPen), we divide the set of countries into four groups according to their geographical location. Table 3 lists the four groups and members of each group.

Table 3: Countries divided into four groups

Group	Member Countries
Arab Peninsula	AE, BH, KW, OM, QA, SA, YE
Levant	IQ, JO, LB, PS, SY
North-East Africa	EG, SD, SO
Arab Maghreb	DZ, LY, MA, MR, TN

It is noteworthy that both DJ and KM are not grouped because page statistics for both countries are not available by Facebook. Thus, they will not appear in the statistics that follow. As per, we only have 20 countries.

Figure 3 shows the page penetration rates (PgPen) introduced in Definition 6 for the Arab Peninsula group.

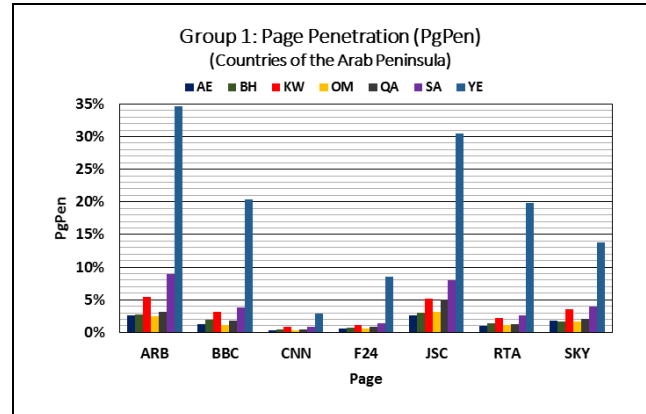


Fig. 3: Page Penetration (PgPen) for the first group.

In order to rank the pages in the first group, we construct the ranking matrix defined in Definition 7 as follows: we have 7 countries and 7 relevant ranks, each is given a weight that is shown between parentheses in Table 4. We then multiply the number of times a country achieves a rank by the relevant weight, and divide the total by the square of the number of countries in the group, i.e. 49 in the case of Group 1, to calculate the ranking index (Rx) defined in Definition 8.

Table 4: Ranking matrix of Group 1

Country	Rank (Weight)							Total	Rx (%)
	1 (7)	2 (6)	3 (5)	4 (4)	5 (3)	6 (2)	7 (1)		
AE	0	0	0	0	1	4	2	10	20.41
BH	0	0	0	2	3	2	0	21	42.86
KW	0	1	6	0	0	0	0	36	73.47
OM	0	0	0	0	1	1	5	10	20.41
QA	0	0	0	5	2	0	0	26	53.06
SA	0	6	1	0	0	0	0	41	83.67
YE	7	0	0	0	0	0	0	49	100

According to the ranking index (Rx), YE comes in the first place, followed by SA, KW, QA, BH, then both AE and OM are in the last place.

Figure 4 shows page penetration rates for the second group, Arab countries of Levant. Table 5 shows the ranking matrix of group 2.

Based on the values of the ranking index (Rx), SY comes in the first place, followed by PS, both IQ and JO come in the third place, and finally LB comes in the last place.

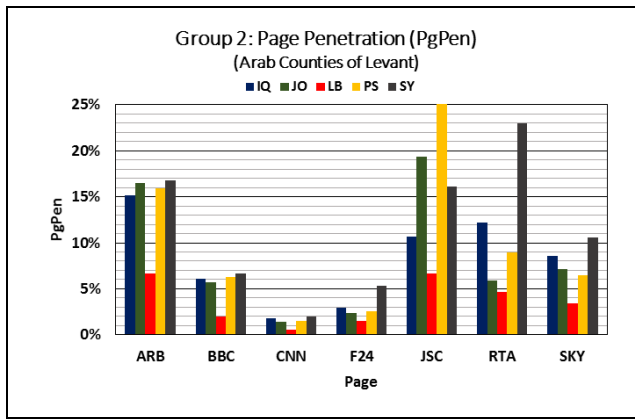


Fig. 4: Page Penetration (PgPen) of group 2.

Table 5: Ranking matrix of Group 2

Country	Rank (Weight)					Total	Rx (%)
	1 (5)	2 (4)	3 (3)	4 (2)	5 (1)		
IQ	0	4	1	2	0	19	54.29
JO	0	2	1	4	0	19	54.29
LB	0	0	0	0	7	7	20
PS	1	1	4	1	0	23	65.71
SY	6	0	1	0	0	33	94.29

Page penetration rates of countries of North-East Africa are shown in Fig. 5.

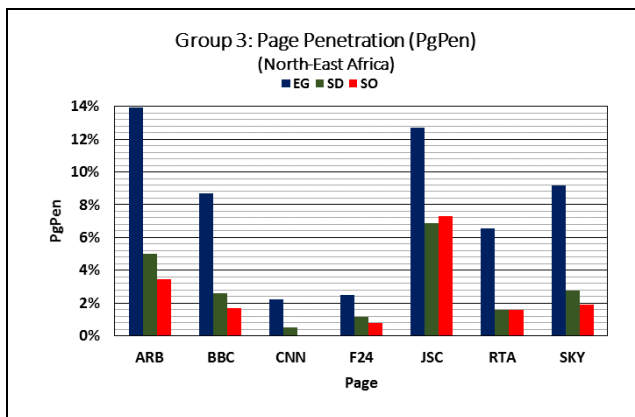


Fig. 5: Page Penetration (PgPen) of group 3.

Table 6 is the ranking matrix of the countries of Group 3, North-East African countries that comprises only 3 countries.

Table 6: Ranking matrix of Group 2

Country	Rank (Weight)			Total	Rx (%)
	1 (3)	2 (2)	3 (1)		
EG	7	0	0	21	100
SD	0	5	2	12	57.14
SO	0	2	5	9	42.86

According to the ranking index shown in Table 6, EG is ranked first, followed by SD, and then SO.

Results of the last group, Arab Maghreb countries, which comprises 5 countries are shown in Fig. 6.

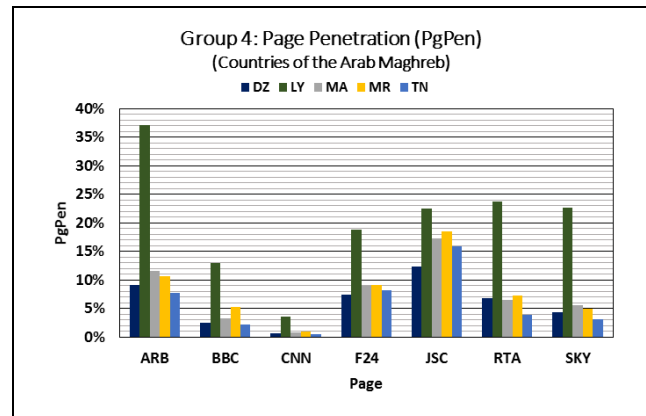


Fig. 6: Page Penetration (PgPen) of group 4.

Table 7 shows the ranking matrix for this group and calculates the ranking index for each country.

Table 7: Ranking matrix of Group 4

Country	Rank (Weight)					Total	Rx (%)
	1 (5)	2 (4)	3 (3)	4 (2)	5 (1)		
DZ	0	0	1	5	1	18	51.43
LY	7	0	0	0	0	35	100
MA	0	2	4	1	0	22	62.86
MR	0	5	2	0	0	26	74.29
TN	0	0	0	1	6	8	22.86

According to Table 7, LY comes in the first place, followed by MR, then MA, DZ, and finally TN.

### 5.3 Discussion

Results of Internet and Facebook penetration rates shown in Fig. 1 and Fig. 2 respectively, show that 50% of the Arab countries achieved more than 50% Internet penetration rate, and nearly 32% achieved Facebook penetration rates higher than 50%. This shows a relatively high demand on Internet and its resources as suggested by A. Al-Shaikh et al [30].

Regarding the number of fans listed in Table 2, both JSC and ARB came in the first two places. Our interpretation to these results pertains to history. JSC and ARB were the first two Arabic news satellite channels that made a debut. This gives an intuition that users believe in the maturity of these two channels, this in turns reflected to the number of fans of their Facebook pages. Another interpretation we can make is about the nationality of the channel; except JSC and ARB, the other channels are not originally Arabs, they are either British, American, French, or Russian, but they disseminate in Arabic. In conclusion, Arabs prefer to get their news from pages that are natively Arabic not only Arabic-speaking.

Table 8 sorts all the 20 countries in order of page penetration rates (PgPen) and the ranking index (Rx).

Table 8: Sorting countries based on their Rx's

Rank	Country	Rx (%)	Rank	Country	Rx (%)
1	YE	100	9	IQ	54.29
	LY			JO	
	EG		10	QA	53.06
2	SY	94.29	11	DZ	51.43
3	SA	83.67	12	BH	42.86
4	MR	74.29		SO	
5	KW	73.47	13	TN	22.86
6	PS	65.71	14	AE	20.41
7	MA	62.86		OM	
8	SD	57.14	15	LB	20

It is clear that results of Table 8 conform to those we obtained by each group individually. YE, LY, EG, and SY came in the first 2 ranks; the first three are equally ranked the first, and the last one (SY) is ranked the second. In group 1, countries of the Arab Peninsula, YE was ranked first. SY is the top amongst group 2, Arab countries of the Levant. For North-East African countries that are members in group 3, EG is ranked first. Finally, LY is ranked the first in the fourth group, countries of the Arab Maghreb. This leads us to conclude that citizens of Arab countries that suffered political crises, coups, or civil wars during the Arab uprising that is known by the Arab Spring are the top news consumers via Facebook.

The country that comes in the 3<sup>rd</sup> place is SA which despite of never witnessing any political crises, SA is an important player in the Yemeni war; it is leading a military coalition named the Firmness Storm against militants in YE. This is a good explanation of being in the first ranks of news consumption.

Obviously, 14 of the 20 Arab countries recorded a ranking index (Rx) higher than 50%. In other words, 70% of the Arab countries have more than half of their Facebook users follow mainstream news media on Facebook and consume their news from those pages. However, there are still a number of Arabic news media that have accounts on Facebook, and those were not included in this study. This opens a new research area to investigate either more news media pages on Facebook, or different SNS such as Twitter, especially if we know that Tunisia was the country that ignited the spark of the Arab Spring. Nevertheless, Tunisia was of the least countries that use Facebook for news consumption with a ranking index (Rx) 22.86%. This leads us to hypothesize that Tunisians might be using different SNS such as Twitter. Actually, this conforms to the results of G. LOTAN et al. [15] which argued that Twitter was an important tool in spreading information in Egypt and Tunisia during their revolutions.

The same situation applies to Lebanon. Although it did not witness any unrest during the last years, but the country is affected by the Syrian revolution which is only few kilometers away from its borders. Furthermore, Lebanon is a country known by its high levels of democracy and freedom of expression. However, being ranked in the last place in our study hypothesizes that

either Lebanese are convinced by their local news agencies, or they might be using different SNS, which in turn opens the door for a new research area.

It is worthwhile to mention that our findings contradicts to those of S. Hille and P. Bakker [24]. We found that a relatively high percentage of Facebook users from the Arab world consume news through Facebook. This could be also due to the current situations and circumstances some Arab countries are facing which stimulate Arabs to follow news on SM which constitutes a faster medium for spreading news, especially during those accelerating events.

## 6. CONCLUSION AND FUTURE WORK

In this paper, we proposed a framework to evaluate SNS. We used Internet and Facebook penetration rates, and proposed some other metrics such as: page penetration (PgPen) and ranking index (Rx). We also introduced techniques for ranking the pages and countries. We applied the proposed framework to Facebook pages of some Arab mainstream news media. We concluded that the credibility of natively Arabic news media is higher than others that are non-natively Arabic from Arabs perspective. Also, our findings revealed that users from countries that faced civil war, unrest, political crises, etc. are the top news consumers via Facebook. Moreover, 70% of the Arab countries have more than 50% of their Facebook users use it for news consumption. The importance of this study is that we established a framework that could be used for evaluating Facebook or any SNS pages from different domains. We can further analyze the contents of those pages or other pages to examine user trends. The same study can be applied to different SNS like: LinkedIn, Twitter, Google+, and others.

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