

# *How Did Design Thinking Develop in the Arab World? Findings from Twitter Analysis*

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## **A**bstract

*Design Thinking is an approach to creativity, collaboration and innovation that has attracted much attention around the globe. While the history and spread of Design Thinking are relatively well documented with regard to the U.S. and Europe, very little is known about its acceptance, understanding, and application in Arabic-speaking countries. This paper reports findings about the early adoption of Design Thinking in Arabic-speaking countries, using an analysis of Twitter data. The results reported here are part of a large-scale study that uses an array of research methods to explain the development of Design Thinking in the Arab World. Design Thinking first entered the Arab World in 2006 and reached a peak in 2011. According to the collected data, there has been no agreed-upon term to designate Design Thinking in the Arabic language so far. Hence, one of the study's contributions is the aggregation of all available key terms and plotting these terms by frequency of use, revealing that 91% of people tweeting about Design Thinking in Arabic use the term التفكير التصميمي. Another finding is that the rank order of countries tweeting in Arabic differs from the rank order of countries tweeting in English. As for Arabic tweets, Saudi Arabia contributes most posts — 70% of all Design Thinking mentions. By contrast, the United Arab Emirates contribute most posts on Design Thinking in English — 42% of all Design Thinking mentions.*

## **K**eywords

*Design Thinking, Design Thinking Adoption, Social Media Analysis, Arab Countries, Arab World.*

# Introduction

Design Thinking (DT) is a framework for creativity and collaboration to advance desirable innovation. The approach has been used widely in business (Brown & Katz, 2009; Liedtka & Ogilvie, 2011; Kelley & Kelley, 2013; von Thienen et al., 2017), research (Plattner et al., 2011; 2012), education (Plattner et al., 2009; Roth, 2015), and other domains (e.g., Burnett & Evans, 2016; Lewis et al., 2020). Many organizations — both private and public sector— have begun to apply DT in their professional practices, as Design Thinking is intended for and used in all areas of life (Plattner et al., 2009; Meinel et al., 2015).

The development of Design Thinking has been a complex process with multiple lines of expertise and application concerns leading to current practices. One notable center of origin is Stanford University, where the term *Design Thinking* was already used in the 1950s and continuous developments have taken place ever since (von Thienen et al., 2016). Several strands of influence from the U.S. and beyond merged into a unique innovation culture and set of innovation methodologies. Design Thinking in this work environment focuses mainly on creativity education at academic facilities, and the advancement of desirable innovation in professional practice. Later, a partially independent strand of research emerged under the headline of Design Thinking, focusing on thought processes of design professionals e.g., Archer (1969), Buchanan (1992) and Cross (2011). These different notions of Design Thinking overlap partially, and the exchange between multiple communities concerned with *Design Thinking* has led to even richer theoretical bases as well as practices.

Lindberg (2013) provides an overview of how the concept of Design Thinking is used in several lines of academic discussions and how discourses have influenced each other. While in academic discussions authors typically clarify what they mean by terms such as Design Thinking, in the industry the approach is typically applied with less explicit definitions. Therefore, multiple institutions can claim to use Design Thinking, while practices could potentially differ drastically from one organization to the next. To answer the question of how Design Thinking is understood and applied in corporate contexts, researchers from the Hasso Plattner Institute (HPI) conducted the first large-sample survey of Design Thinking adoption in practice in 2015, entitled *The Current State of Design Thinking Practice in Organizations* (Schmiedgen et al., 2016). The study provided the first evidence on how Design Thinking is being perceived and applied by people worldwide. However, there was a striking lack of survey respondents from Arabic-speaking countries<sup>1</sup>, leaving it unclear whether the concept of Design Thinking was endorsed at all in this region, or how it would be understood and applied.

To fill this gap, we conducted a large-scale study to investigate the adoption of Design Thinking among individuals as well as organizations in Arabic-speaking countries. This overall study invokes multiple methodological approaches to clarify Design Thinking developments in the region, including online surveys, semi-structured interviews and literature reviews. A report of study outcomes is provided here, based on an analysis of social media data from Twitter in the period between May 2006 and May 2019. This study aims to answer two questions in particular:

1. What is the most frequently used term referring to Design Thinking in Arabic language? Insights in this regard are crucial and fundamental to track the development of Design Thinking in the region. Without knowledge of proper translations and relevant keywords, topical discussions in the region cannot be identified.
2. What are the commonalities and differences of Design Thinking adoption across various Arabic-speaking countries and what can be learned about Design Thinking in the Arab World?

<sup>1</sup> Arabic-speaking countries (also referred to as the Arab world) are countries that have Arabic as an official language. Complete list: [https://en.wikipedia.org/wiki/List\\_of\\_countries\\_where\\_Arabic\\_is\\_an\\_official\\_language](https://en.wikipedia.org/wiki/List_of_countries_where_Arabic_is_an_official_language)

## Methodology

The study follows an explorative approach fed by one Social Media data source, namely Twitter. Twitter is the second most influential platform after Facebook in the Arab world (Mourtada & Salem, 2011; Radcliffe & Abuhmaid, 2020), hence, it offers very good access to the targeted population. In addition, Twitter is considered a credible microblogging tool for news aggregation and dissemination along with knowledge sharing among other applications (O'Donovan et al., 2012; Broersma & Graham, 2013). Some studies have pointed to Twitter as the go-to channel for *elite* users, who generate about 50% of all tweets from the region (Mourtada & Salem, 2011). Another reason for focusing on Twitter is the feasibility of data harvesting. In order to generate reliable evidence on the status of Design Thinking in the Arab world via Twitter data, a two-phased research methodology was adopted, including data harvesting and cleaning followed by data analysis and visualization.

In Design Thinking as an approach to creativity, collaboration and innovation, a study showcasing that twitter as a data resource has not been reported before. Studies into the evolution and history of Design Thinking have looked into structured documents like published and unpublished course materials (Carleton & Leifer, 2009; von Thienen et al., 2016; 2017; 2019; 2021; Auernhammer & Roth, 2021) or questionnaires and interviews (Schmiedgen et al., 2015).

### Data Harvesting and Cleaning

The Twitter data was harvested through Twitter's API using a Python script designed specifically for this purpose. The team started by acquiring a Twitter User account, which was then used to register as a Twitter developer (Hill & Scout, 2017). Once registered as a developer, the team created a Twitter application at <https://apps.twitter.com/>, which contains all the required information to obtain the Twitter API secret keys (Bernábe Loranca et al., 2020). The Pandas library 0.24.1<sup>2</sup> (a software library written for the Python programming language for data manipulation and analysis) was then used in combination with the obtained secret keys to query the backend of Twitter API (cf. Beyer, 2012; Bhavsar & Manglani, 2020; Thorat et al., 2017). Having obtained the Twitter API access authorization, the following steps were taken (Figure 1);

**Step 1:** The authors scouted for potential keywords that could be associated with Design Thinking in Arabic language. Based on literature reviews and web searches, three Arabic translations that refer to the term *Design Thinking* were identified (التفكير التصميمي، الفكر التصميمي، التصميم التفكيري). Another two terms — Creative Thinking and Human-centered Design (التصميم المتمحور حول الإنسان، التفكير الإبداعي)— which sometimes appeared to refer to Design Thinking, were also included in the keyword search (Traifeh et al., 2021).

**Step 2:** All tweets were gathered, including the identified potential translations of *Design Thinking*.

**Step 3:** Via visual inspection of two independent raters, all tweets were screened for content-relevance to Design Thinking. This resulted in one term being excluded as potential translation of Design Thinking, as unrelated content was discussed under this headline. By contrast, three terms were confirmed as immediate translations of Design Thinking in Arabic language, and one term was confirmed to be associated with Design Thinking topics.

**Step 4:** Based on the confirmed translations and relevancy of keywords, an in-depth search was conducted to collect tweets data that specifically regard Design Thinking.

**Step 5:** The collected tweets were geotagged according to the countries from which they were published. This permits a distinction between tweets in Arab languages on Design Thinking that are geotagged originating from Arab countries versus tweets in Arab languages not geotagged in this region.

**Step 6:** All the non-geotagged users' biographies were manually checked to try and identify their base location. Some of the locations were identified and added to the geotagged group, while others remained unidentified. Their data is thus reported separately in the non-geotagged tweets group.

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<https://pandas.pydata.org/pandas-docs/version/0.24.1/>

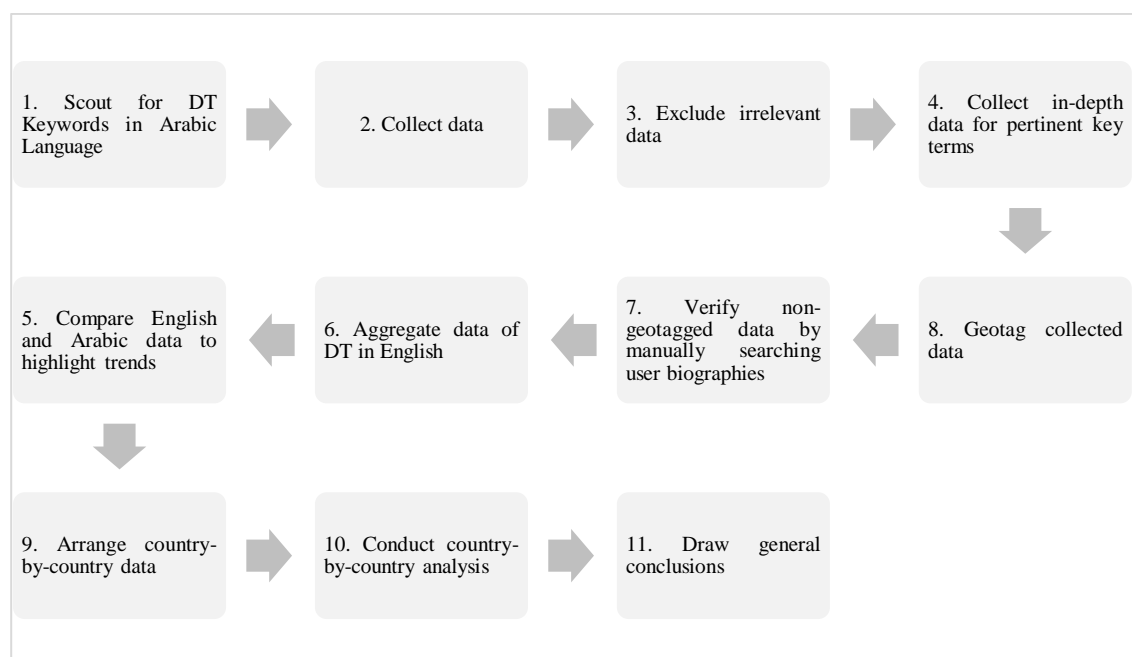
**Step 7:** The next step was to aggregate data, mentioning Design Thinking in English, posted from Arab countries. Tweets were grouped based on the tweet authors providing personal geotags or not.

**Step 8:** The Arabic and English data were compared to highlight trends, similarities and differences in volume and progression.

**Step 9:** The geotagged data was arranged by country to show the progression of Design Thinking over the period from 2009 — when the first mention of Design Thinking in Arabic was detected— to May 2019. Thus, the emergence of Design Thinking in Arab speaking countries is tracked along the first decade of Design Thinking adoption.

**Step 10:** The data was analyzed on a country-by-country basis to provide an in-depth profile for each Arab country.

**Step 11:** General conclusions were drawn from the data analysis.



**Figure 1:** Research Design Summary.

## Research Findings

This study provides a qualitative and quantitative account of how Design Thinking has been adopted in the Arab world, based on Twitter data. The study targets the years 2006 to 2019. From 2006 to 2009, posts including the English term *Design Thinking* have appeared on Twitter from Arab speaking countries. Tweets with Arabic translations of Design Thinking have been found from 2009 onwards.

Considering the novelty of Design Thinking research in this region, our study seeks to provide an introductory overview of developments; Who is involved, where did events take place and what can be learned about Design Thinking in the Arab World. The study will answer two research questions by describing the data harvested from Twitter, followed immediately by contextualizing, interpreting and concluding. The data is organized and visualized according to three main aspects: time of occurrence, language and location. These themes were used to gauge insights on the adoption of Design Thinking in the Arab world, both in Arabic and English language, as well as to highlight trends across different Arab countries.

## 1. What is Design Thinking in Arabic?

An initial mapping of all Arabic hashtags associated with Design Thinking shows that there is no single agreed upon term to designate Design Thinking in Arabic. However, aggregating all available key terms and plotting them by frequency of use shows that there is one predominantly used term in Arabic discussions of Design Thinking, which is التفكير التصميمي. This term is used in 91% of all tweets about Design Thinking in Arabic language (Figure 2). Establishing التفكير التصميمي as the regular translation of Design Thinking in Arabic can be an important first step both for Design Thinking research and development in the region.

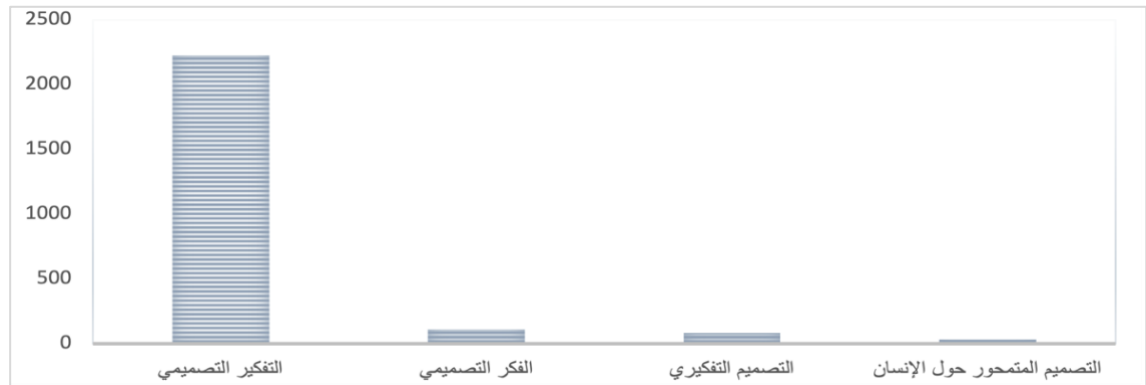


Figure 2: Terms referring to Design Thinking in Arabic, with التفكير التصميمي most frequently used.

## 2. When did Design Thinking Enter the Arab World and how is it Evolving?

According to the analyzed Twitter data, the Arabic term for Design Thinking first emerged in 2009. As shown in Figure 3, a high number of tweets on Design Thinking emerged in the two years preceding the Arab Spring uprising, and a peak is observed in 2011. This peak is followed by a sharp drop of post numbers in 2012. From 2013 onwards, there is a gradual increase of Design Thinking mentions again, and this dynamic accelerates from 2016 onwards.

In terms of contextualization, there seems to be an obvious connection between the Arab Spring uprising and great societal interest in Design Thinking, as reflected in high numbers of tweets by the time. This presumed linkage is also supported by means of content analyses. The blog post *Why Design Thinking is Important to the Arab world Now?* from 2011, written by Doreen Toutikian — President and Founding Director of the MENA Design Research Center in Beirut, Lebanon— can be a good example. She explains the connection between the rise of Design Thinking and the Arab Spring: *Designers can perhaps help the Arab communities redefine their systems by being the link between politics and the people* (Toutikian, 2011). Having established the MENA Center in 2011, she highlights the inherent topical connection between the Arab Spring’s grassroots movements calling for social, economic and political change in the region as well as Design Thinking’s participatory and bottom-up problem-solving strategies. This, however, does not explain the drop in 2012.

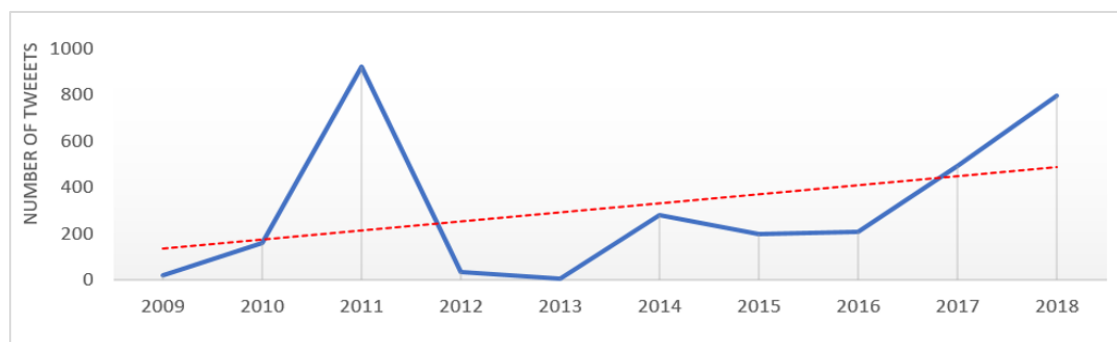
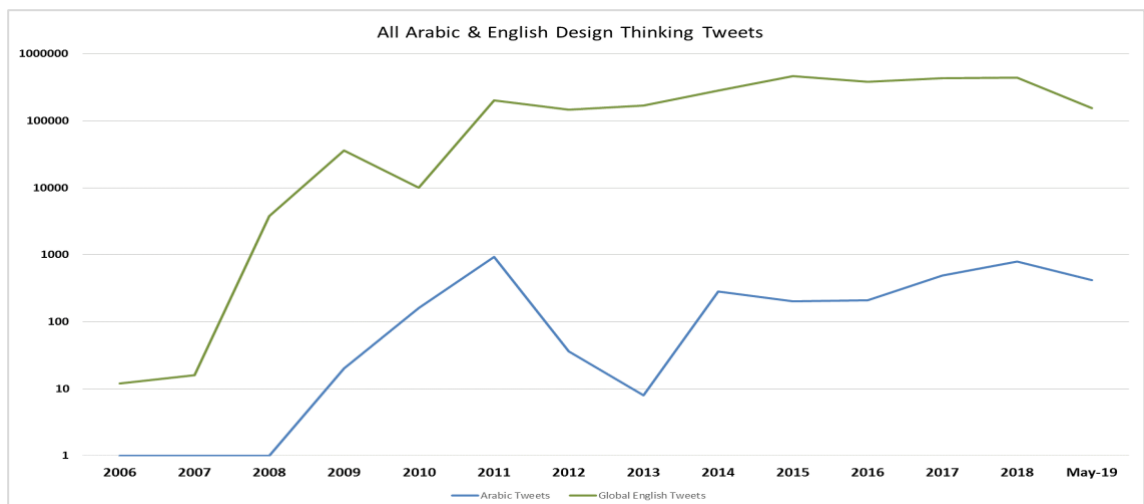


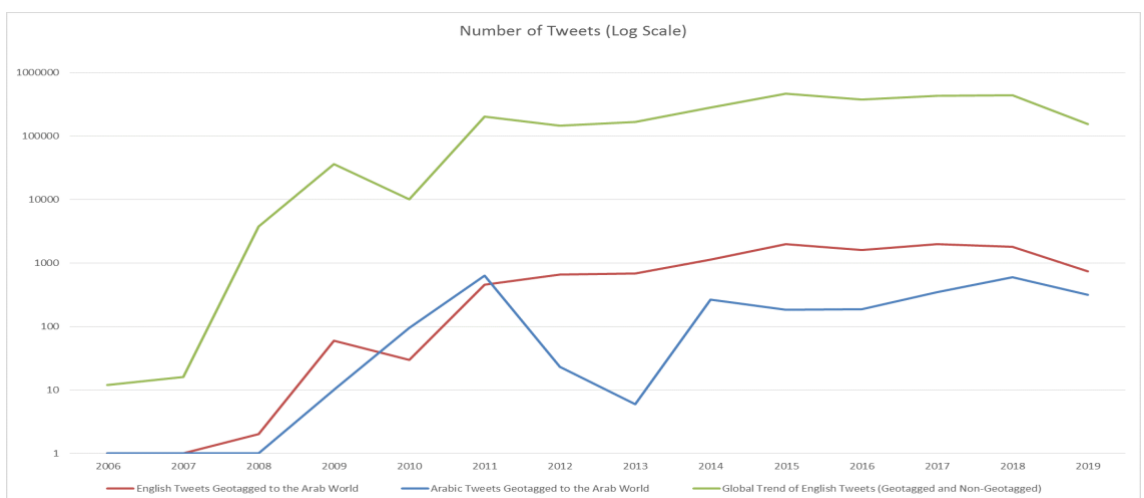
Figure 3: How often Design Thinking is mentioned in Arabic tweets over time.

Comparing usage frequencies of Design Thinking terms in English versus Arabic shows that the English term precedes Arabic terminology. As depicted in Figure 4, the English term *Design Thinking* first appears in 2006 in tweets from Arabic countries. That is three years before Arabic translations emerge. This is expected, as English is the original term, and it must have taken some years for Design Thinking practitioners to come up with an Arabic equivalent. Moreover, some similarities but also differences can be observed regarding Design Thinking posts in English versus Arabic. Tweets in English show a peak in 2009 and another one in 2011. Afterwards there is more or less a plateau. Diversly, tweets in Arabic also show a peak in 2011, but this is followed by a significant drop in tweet numbers afterwards. Only from 2013 onwards, there seems to be renewed interest, reflected by rising numbers of Arabic tweets.

Looking at all existing tweets across the world, the volume of tweets on Design Thinking in Arabic remains below 1000 posts. By comparison, there are considerably more than 100,000 posts in English during the same time frame. Figure 5 highlights a close similarity between the global trend of English tweets and the trend of English tweets from the Arab world. Thus, tweets in English — even when stemming from Arab regions — show no drop in the 2011-2013 timeframe, after the Arab Spring uprisings. This may indicate that Arab posts on Design Thinking were indeed associated with political and societal aspirations, whereas English conversations may have been more attuned to international strands of debate and concern. A content analysis of posts in English versus Arabic is needed to clarify this in further detail.



**Figure 4:** Comparison between English and Arabic Design Thinking Tweets on Twitter – looking at all Twitter data from across the globe, including geotagged and non-geotagged.



**Figure 5:** Comparison between English global trend and, English and Arabic, tweets geotagged to the Arab World.

### 3. Who is Tweeting about Design Thinking in Arabic?

While Design Thinking is relatively novel in the Arab world, there are large differences across countries. The study suggests that Saudi Arabia is most strongly engaged with Design Thinking so far. 70% of all Design Thinking mentions in Arabic originate from this country. Kuwait comes next with 13% of all mentions. Other countries with notable numbers of posts include the United Arab Emirates, Jordan and to a lesser extent Oman. Overall, the numbers imply that Design Thinking is gaining momentum in Arab countries, and this dynamic is especially visible in the Persian Gulf region. At the same time, the number of tweets on التفكير التصميمي suggest that the majority of the Arab world — including countries such as Iraq, Syria, Palestine, Libya, Sudan, Bahrain, Algeria and Morocco— is still rather unfamiliar with Design Thinking up to this point (Figure 6).

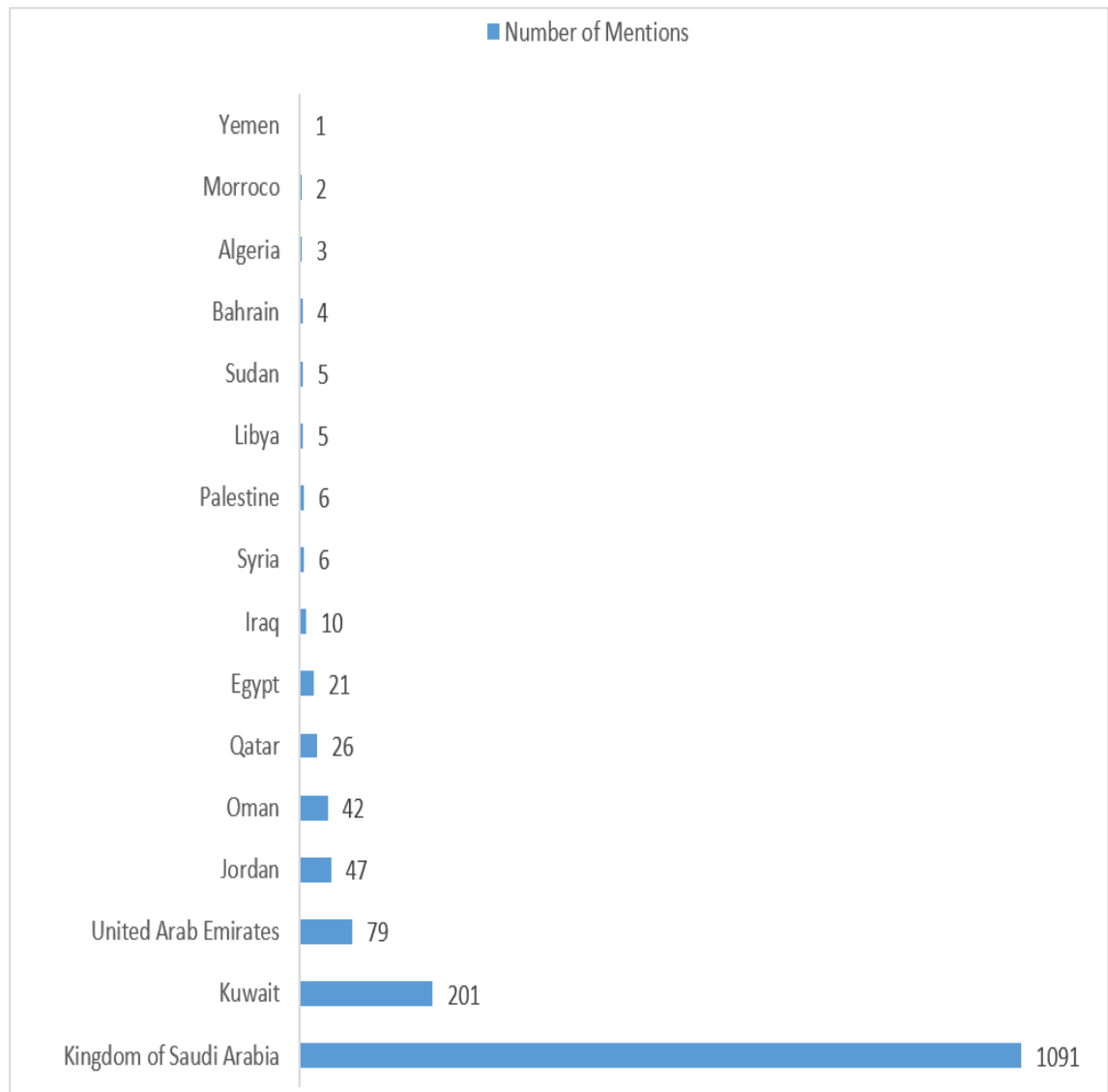


Figure 6: Number of Design Thinking mentions in Arabic (“التفكير التصميمي”) across Arab countries (2006-2019).

However, in the last three years (2017-2019), the data shows a trend of rapidly increasing posts from the UAE, outpacing Saudi Arabia in tweet numbers. Figure 7 indicates that Kuwait seems to have fallen behind Jordan, Egypt and Lebanon. It also shows some emerging engagement with Design Thinking in countries, where previously no tweets on the subject had been posted. This illustrates significant acceleration in the spread of Design Thinking, especially with regards to the influence of highly populated countries like Saudi Arabia and Egypt.

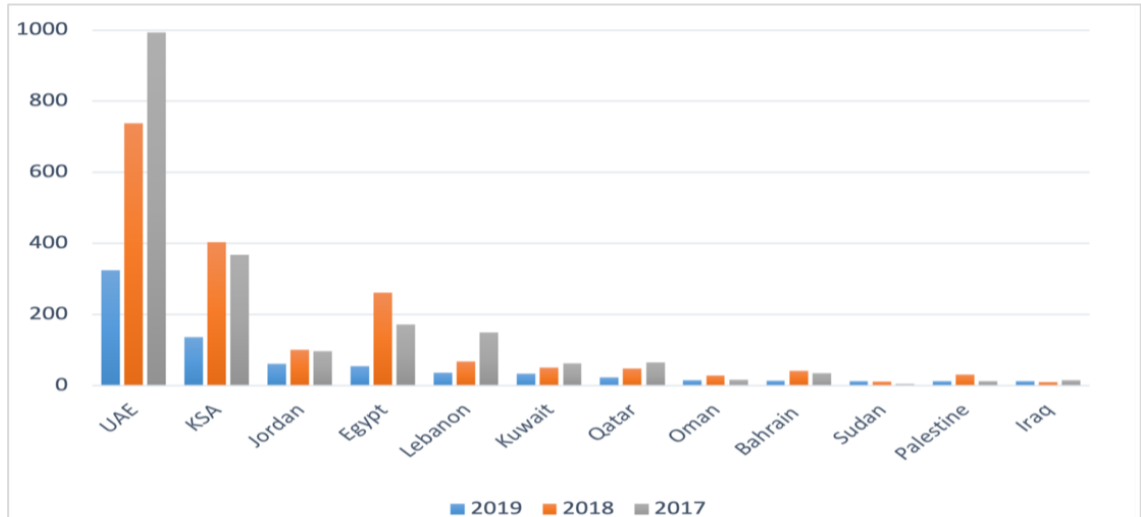


Figure 7: Number of Design Thinking posts geotagged to Arab countries during 2017-2019 (Arabic or English).

#### 4. Who is Tweeting about Design Thinking in English from Arab Countries?

As discussed above, this study finds general similarities in the patterns of Arabic and English tweets on Design Thinking in Arab countries. Yet, some details stand out. In particular, tweets in English geotagged to Arab Countries only start to surge in 2010 (Figure 8). Posts from the UAE are specifically notable in terms of high tweet numbers. The next high posting rates are associated with Saudi Arabia and Egypt. Overall, the data reflects a rapid emergence of interest around 2010.

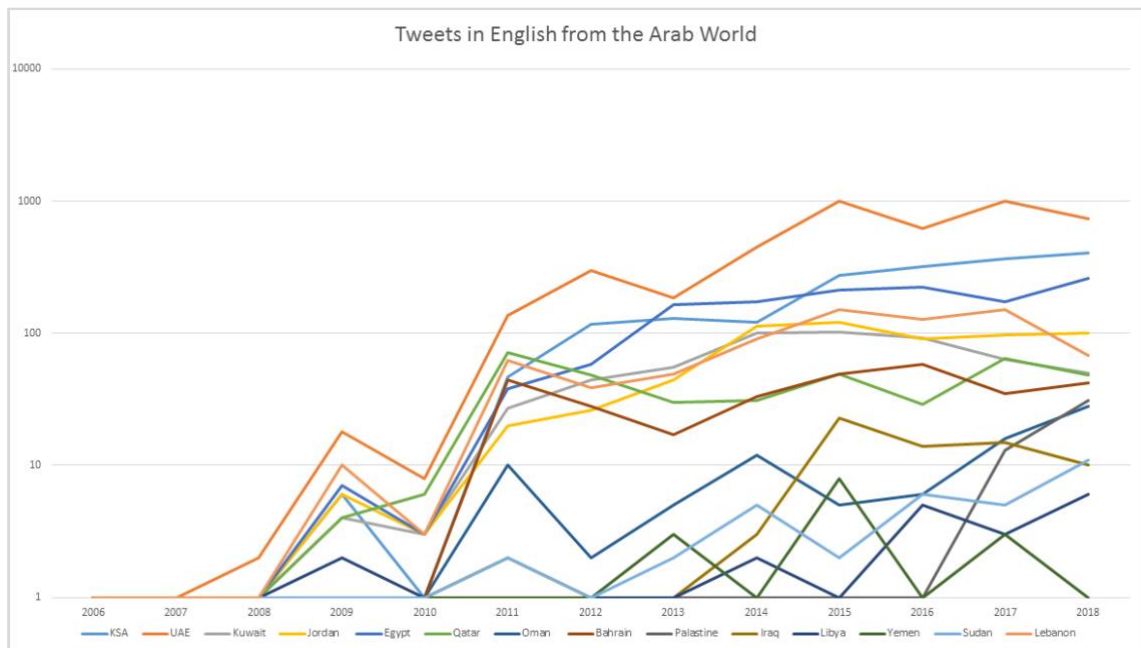


Figure 8: A Timeline of tweets in English from across the Arab World.

#### Country by Country Analysis

This section provides an in-depth review for the eight Arab countries that contribute most to Design Thinking traffic discussions on Twitter during the analyzed time period. In doing so, this study aims to highlight trends and major turning points. Countries are discussed in the order of their tweet numbers, turning to English Twitter posts on Design Thinking only. This analysis now excludes countries with less than 100 English Design Thinking posts on Twitter during 2006-2019. Nevertheless, findings from these countries had been included in the previous sections and will be revisited in the concluding remarks.



## 1. The United Arab Emirates (UAE)

With 4.6 million Twitter users (GMI Blogger, 2018), the UAE ranks 1st in its contribution to the English Design Thinking tweets, whereas it ranks 3rd in its contribution to Arabic Design Thinking tweets. This finding can be explained through the UAE's unique demography. Emirati Citizens represent 1.4 million out of UAE's 9.2 million population, and the rest are mainly English-speaking expatriates. Figure 9 shows that the UAE's introduction to Design Thinking started in 2008 and has been on steady increase since 2010.

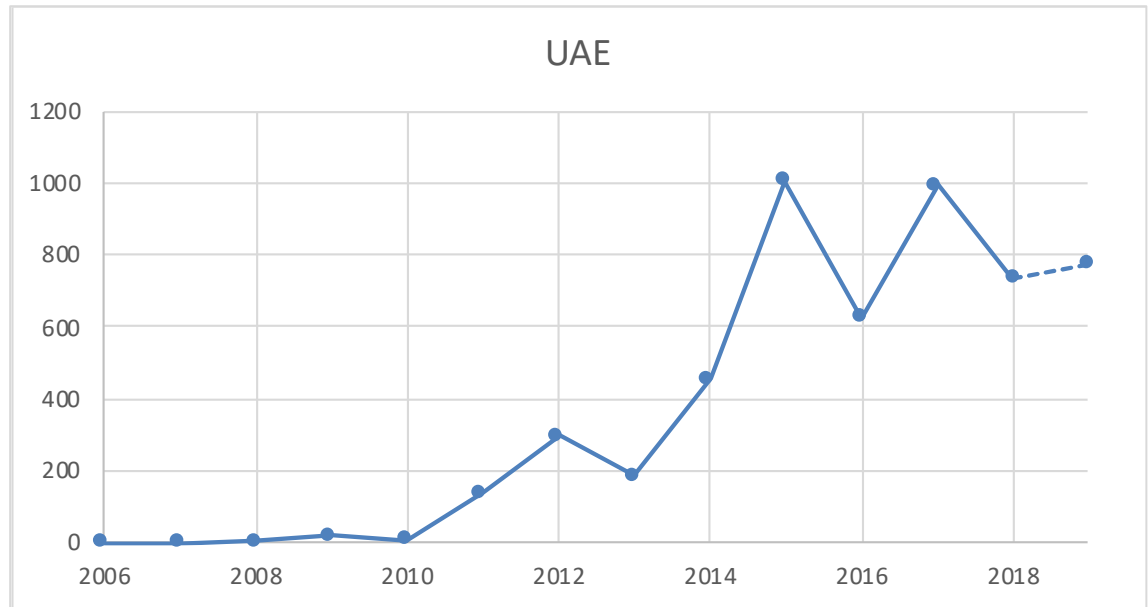


Figure 9: English Tweets about Design Thinking geotagged to the UAE.

## 2. Saudi Arabia

Ranking 2nd in English tweets on Design Thinking, KSA ranks 1st with regard to Arabic tweets. This indicates that a major part of circulating knowledge on Design Thinking in Arabic is likely generated and used in Saudi Arabia. Figure 10 shows that KSA experiences a surge in Design Thinking interest between 2014 and 2018.

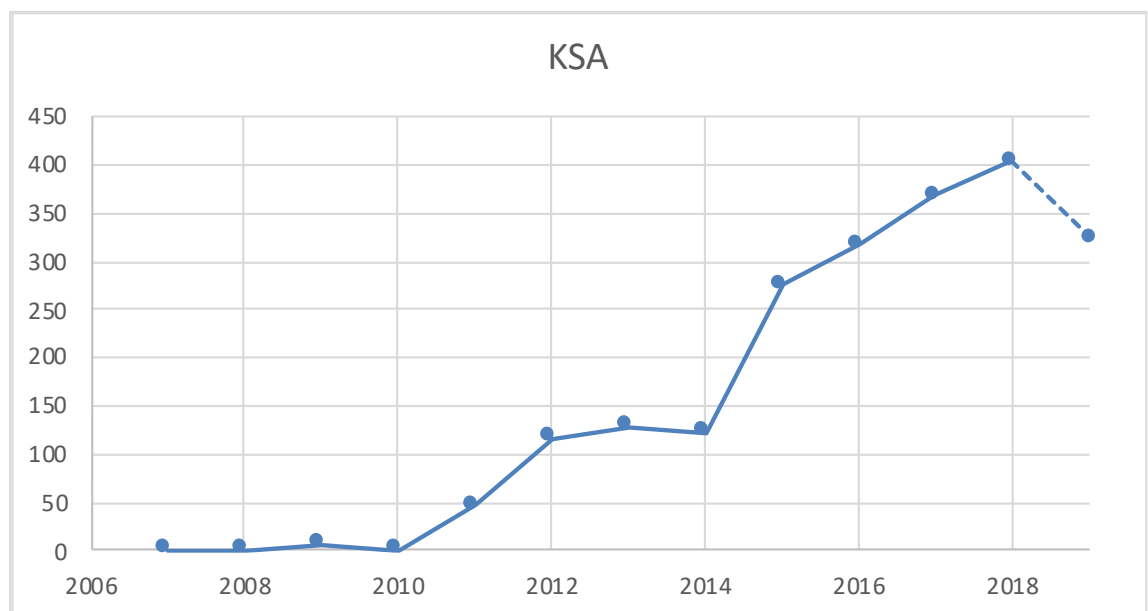


Figure 10: English Tweets about Design Thinking geotagged to KSA.

### 3. Egypt

Egypt ranks 3rd in English tweets about Design Thinking during the analyzed time frame. This contrasts starkly to minimalistic numbers of posts in Arabic from that region. In Egypt, increased interest in Design Thinking seems to build up from 2012 onwards (Figure 11). Whether the Egyptian population prefers to tweet in English irrespective of topics, or this preference is more uniquely associated with Design Thinking discussions, would have to be clarified by further analyses.



Figure 11: English Tweets about Design Thinking geotagged to Egypt.

### 4. Lebanon

Lebanon ranks 4th in its contribution to English Design Thinking tweets from Arab regions. Like Egypt and Saudi Arabia, Lebanon experiences a surge in Design Thinking posts from 2012 onward. Yet, a significant drop becomes visible later, especially from 2017 onward (Figure 12). As opposed to the previous countries, Lebanon did not have any representations among the aggregated data on Arabic tweets. It is likely that the majority of Lebanese prefer to tweet in languages such as English and French.

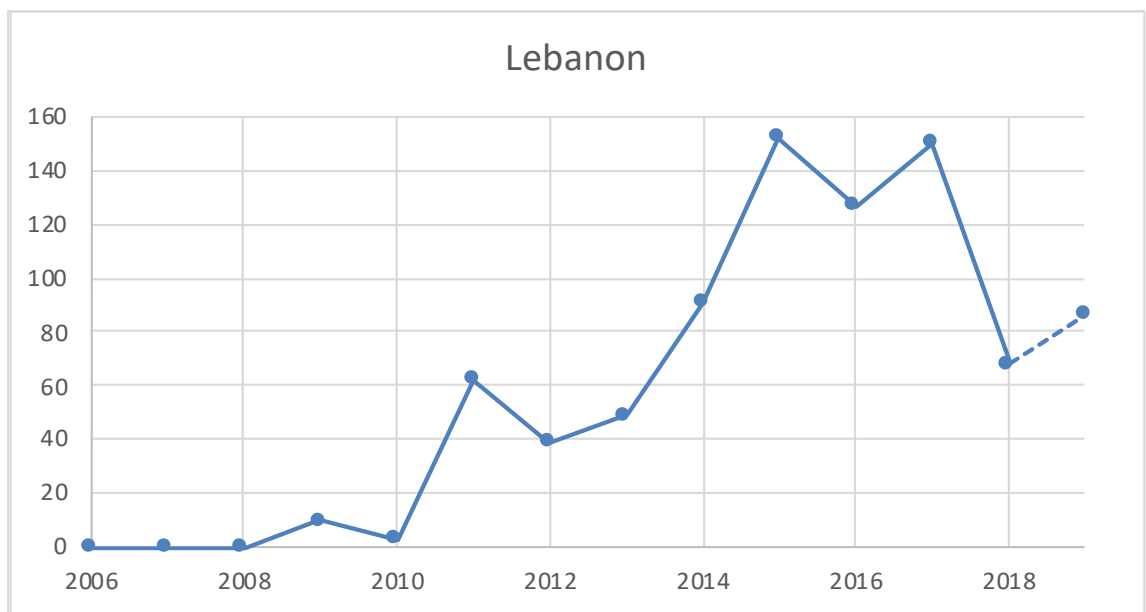


Figure 12: English Tweets about Design Thinking geotagged to Lebanon.

## 5. Jordan

Coming in the 5th place, Jordan seems to show an exponential increase in post numbers from 2008 to 2014, with first tweets emerging in 2009, followed by some dynamically changing post numbers after 2014. Jordan also contributes 3% of the overall Arabic Tweets about Design Thinking, so that this region might contribute to building connections between English and Arabic Design Thinking discussions (Figure 13).

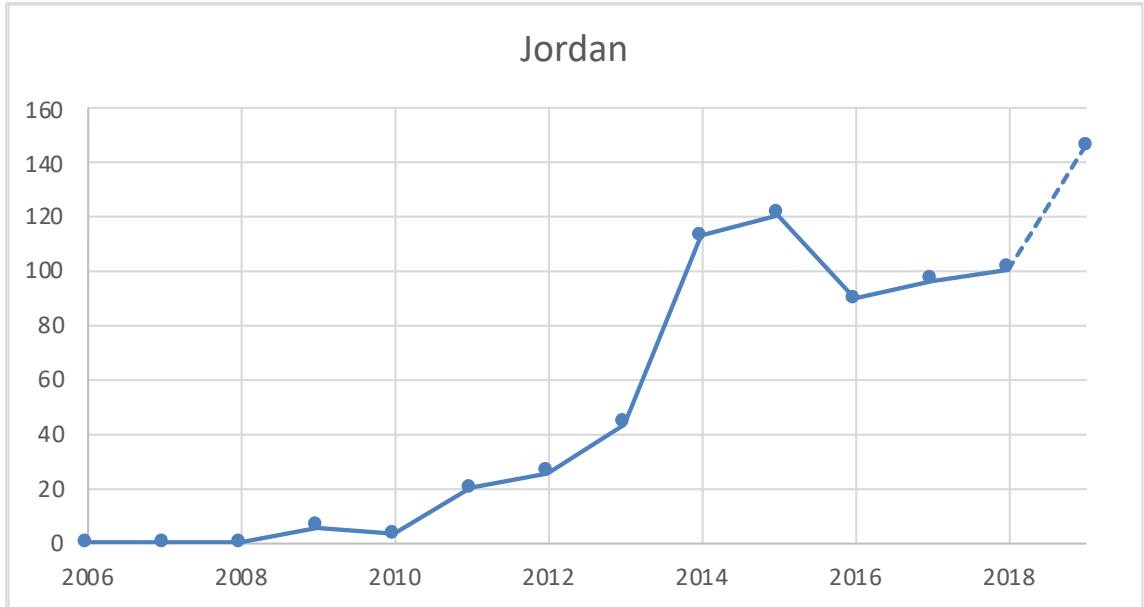


Figure 13: English Tweets about Design Thinking geotagged to Jordan.

## 6. Kuwait

Kuwait ranks 6th, with a total of 574 tweets on Design Thinking in English. The country ranks 2nd with regard to Design Thinking tweets in Arabic, here contributing 13% of all Arabic tweets. Therefore, Kuwait can be an important region for the development of Design Thinking knowledge in Arabic language. Moreover, Kuwait shows similar trends like countries discussed before, with sharply increasing post numbers from 2010 onwards (Figure 14).

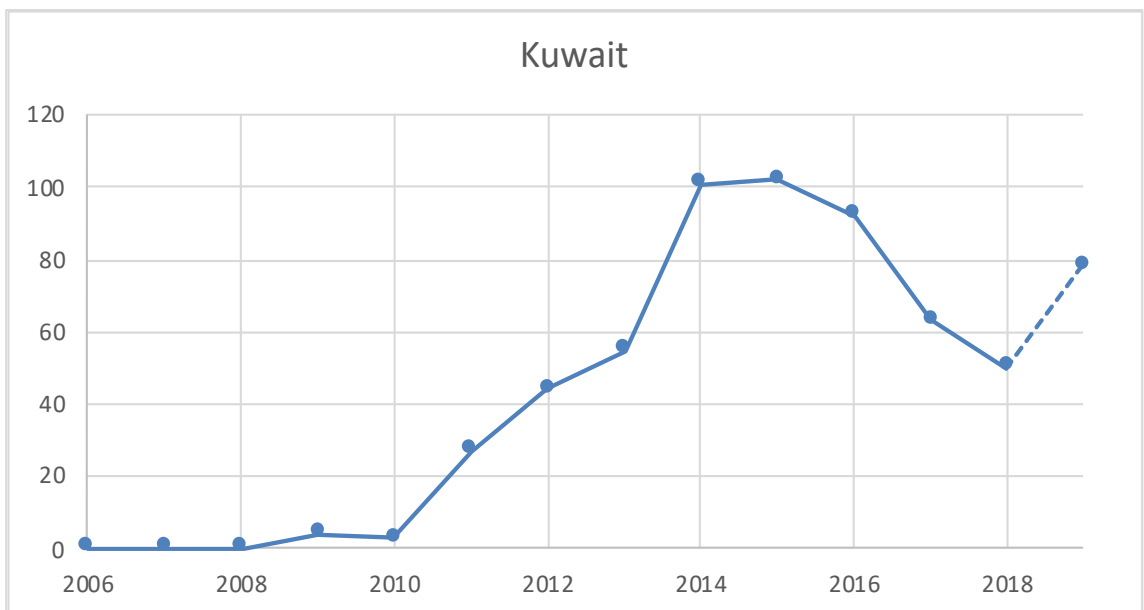


Figure 14: English Tweets about Design Thinking geotagged to Kuwait.

## 7. Qatar

With a total population of 2.6 million, it is remarkable that Qatar ranks 7th in its contribution to English Tweets on Design Thinking (Figure 15).

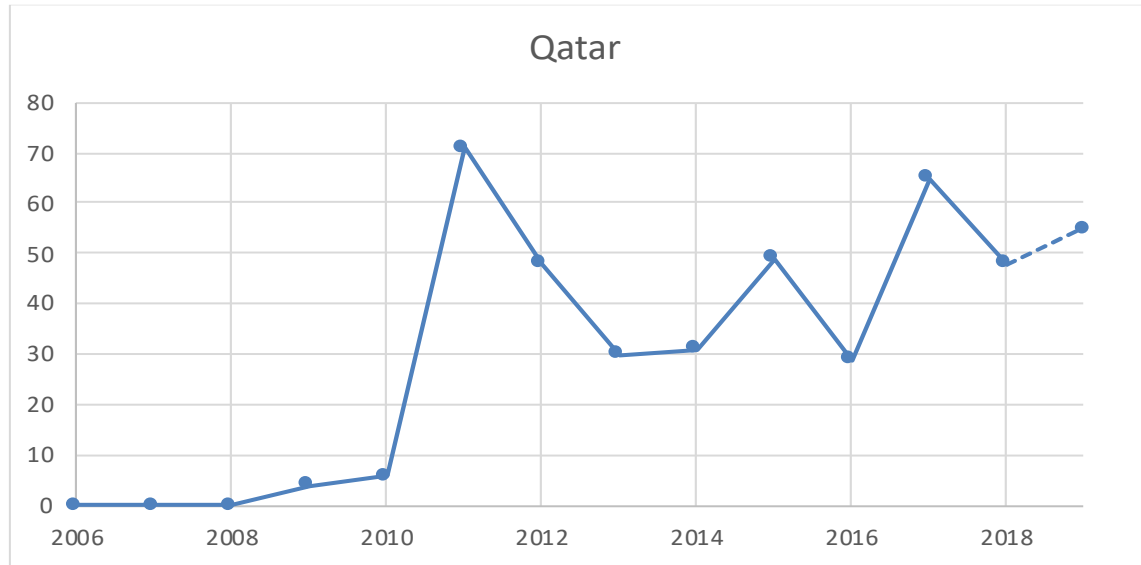


Figure 15: English Tweets about Design Thinking geotagged to Qatar.

## 8. Bahrain

Bahrain accounts for a total of 321 English tweets on Design Thinking in the Arab region during the observed time frame. While these post numbers may seem small overall, they appear significant considering Bahrain's population size of just around 1.7 million people (Figure 16).

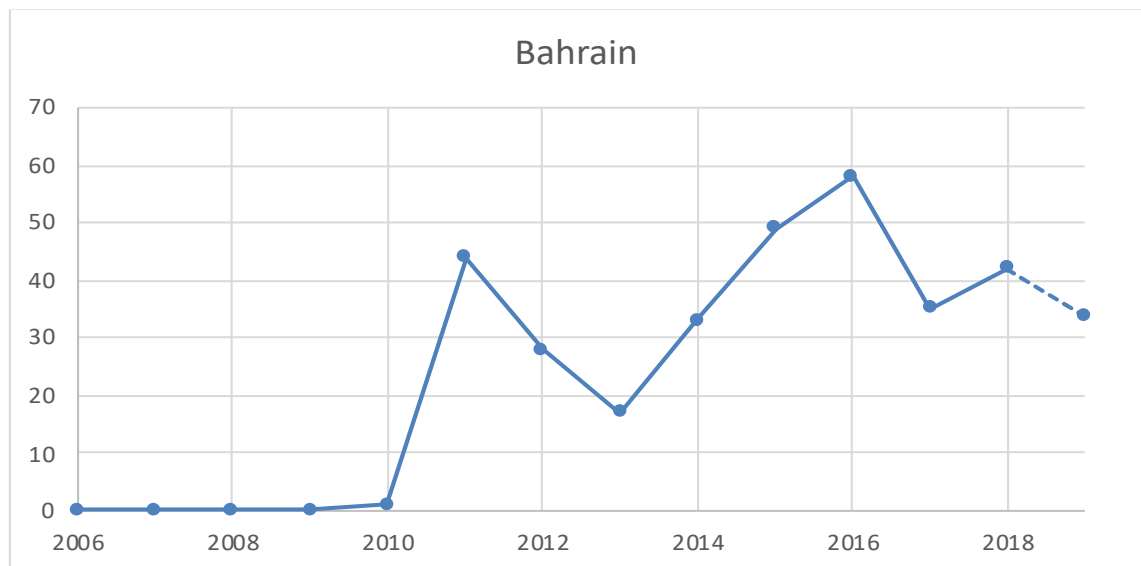


Figure 16: English Tweets about Design Thinking geotagged to Bahrain.

## Methodological Limitations

The research team encountered two methodological limitations that should be considered in the data interpretation; and subsequent studies may help to address these issues. First, in the data collection phase, it was difficult to identify the source location of about 24% of the harvested Arabic tweets. This arose from the fact that some of the tweets were posted without a geotagged location.

This limitation was mitigated by manually checking the users' profiles in order to identify their country of origin and/or their country of residence, which was successful for about 10% of the tweets without geotag information. The tweets for which geolocations could be identified were moved to the geolocated data set, and the remaining tweets were reported as non-geotagged.

Subsequently, this study did not cover tweets in French, as the focus of this first research initiative had been to compare English (the language in which Design Thinking concepts were first communicated) with emerging discussions in Arabic. However, not including French likely leads to an underrepresentation of Arab North African Twitter users, who predominantly tweet in French. Countries most likely affected by this are Tunisia, Algeria, Morocco and to a lesser extent Lebanon. There may have been Design Thinking tweets from these regions that were not recognized by this particular data harvesting approach, due to matters of language choice. More generally speaking, any tweets from Arab countries in languages other than English or Arabic are not represented in the data of this study, as they had not been focused on.

## Discussion and Conclusion

While the adoption of Design Thinking has been studied repeatedly before, this study is the first to explore adoption patterns in Arabic-speaking countries. As mentioned in the introduction, a previous study on Design Thinking adoption in organizations across the globe (Schmiedgen et al., 2015) found a striking lack of responses from the Arab region, leaving it an open question whether notable Design Thinking developments would exist at all in this area.

This study explored the early stages of Design Thinking adoption in the Arab world by using a methodology that extends beyond academic publications or questionnaires, as well as leverages existing Twitter data to detect patterns of Design Thinking adoption in Arab countries, tracing developments over time. One key finding is that — in spite of lacking questionnaire responses in Schmiedgen et al.'s study (2015)— Design Thinking has witnessed growing adoption in some Arab countries.

One advantage of the chosen methodology is that it not only provides a static image but also allows the tracing of developments over time. In terms of Twitter discussions, Design Thinking entered the Arab world in 2006 with 12 mentions only. The first posts all used the English term *Design Thinking*. Arabic translations emerged only three years later. This is not surprising since the English term is the original designation. In light of this data, the Arab world even seems to be an early adopter of Design Thinking, as the topic was pursued persistently, as well as Arabic translations were introduced within relatively short time frames.

While several Arabic translations for the English term Design Thinking have been identified in this study, one Arabic designation is used in the majority (91% of all Arabic tweets) of cases. This term is therefore recommended to be considered the official Arabic translation of Design Thinking: التفكير التصميمي.

Parallel dynamics become visible when comparing English and Arabic tweets on Design Thinking from across the globe. First there is a strong rise in tweet numbers (in English: beginning 2007; in Arabic: beginning 2008). Then, a drop in number occurs (in English: 2009-2010; in Arabic: 2011-2013). Afterwards, tweet numbers rise again.

Looking at tweets in Arabic language, geotagged to Arab regions, Design Thinking posts seem historically aligned to movements of the *Arab Spring Uprising*. Some content analyses suggest that this is not a coincidence. At least by some of the contributors, Design Thinking was invoked as a means to social engagement, to gauge participatory approaches and collaborative problem-solving. It was combined with a region-specific call for bottom-up movements and change.

When comparing tweet numbers geotagged to Arab countries, it is noteworthy that the rank order of countries tweeting in Arabic is not the same as the rank order of countries tweeting in English.

As for Arabic tweets, during the analyzed time period, Saudi Arabia contributes most posts accounting for 70% of all Design Thinking mentions. Kuwait comes next with 13%. Other countries with significant contributions include the United Arab Emirates, Jordan and to a lesser extent Oman. By contrast, with regard to English tweets geotagged to Arab countries, the United Arab Emirates contribute most posts on Design Thinking, accounting for 42% of all Design Thinking mentions.

Notably, some countries like Lebanon contribute significant numbers of Design Thinking tweets in English, while not making statistically relevant contributions in Arabic. This indicates some potential disconnect between Design Thinking discussions in English versus Arabic, even within Arab speaking countries. Subsequent research could look further into the content of Design Thinking debates, in order to see what might be the centers of interest in each line of discussion. There could be a potential risk of building up disjunctive knowledge sets in communities posting in English versus Arabic. On the other hand, there can be an opportunity to move communities ahead by exchanging points of views and sharing knowledge.

Subsequent studies can turn to further media beyond Twitter, to look for publications or institutional initiatives regarding Design Thinking. Data from this study might help advance the search process. Important contributions in English could most likely be expected in the United Arab Emirates, for example, while Saudi Arabia would seem to be a specifically promising search domain for Design Thinking publications in Arabic.

## References

- Auernhammer, J., & Roth, B. (2021). *The origin and evolution of Stanford University's design thinking: From product design to design thinking in innovation management*. Journal of Product Innovation Management.
- Archer, L. B. (1969). The structure of the design process. In G Boardbent and A Word (Eds). Design Methods in Architecture. Lund Humphrise, London. p. 76-102.
- Bernábe Loranca, M. B., Espinoza, E., González Velázquez, R., & Cerón Garnica, C. (2020). *Algorithm for collecting and sorting data from Twitter through the Use of Dictionaries in Python*. Computación y Sistemas. 24(2), p. 719-724.
- Beyer, Y. (2012). *Using discovertext for large scale Twitter harvesting*. Microform & Digitization Review. 41(3-4), p. 121-125.
- Bhasvar, H., & Manglani, R., (2020). *Sentiment classification system of Twitter data using Python*. International Journal of Recent Technology and Engineering. 8 (6), p. 1042–1044. DOI: [10.35940/ijrte.f7348.038620](https://doi.org/10.35940/ijrte.f7348.038620)
- Broersma, M., & Graham, T. (2013). *Twitter as a news source: How Dutch and British newspapers used tweets in their news coverage, 2007–2011*. Journalism Practice. 7(4), p. 446-464.
- Brown, T., & Katz, B. (2009). *Change by design: How Design Thinking transforms organizations and inspires innovation*. HarperBusiness, New York.
- Buchanan, R. (1992). *Wicked problems in Design Thinking*. Design Issues. 8(2), p. 5-21.
- Burnett, W., & Evans, D. J. (2016). *Designing your life: How to build a well-lived, joyful life*. Knopf, English.
- Carleton, T., & Leifer, L. (2009). *Stanford's ME310 course as an evolution of engineering design*. In Proceedings of the 19th CIRP design conference–Competitive design. Cranfield University Press. p. 547.
- Cross, N. (2011). *Design Thinking: Understanding how designers think and work*. Berg.

- GMI Blogger, (2018). *UAE Social Media Statistics*, 4 May 2018, Infographics, GMI Blog. <https://www.globalmediainsight.com/blog/uae-social-media-statistic>
- Hill, S., & Scott, R. A. (2017). *Developing an approach to harvesting, cleaning, and analyzing data from Twitter using R*. *Information Systems and Operations Management Journal*. 15(3), p. 42.
- Kelley, T., & Kelley, D. (2013). *Creative confidence: Unleashing the creative potential within us all*. Currency, English.
- Lewis, J. M., McGann, M., & Blomkamp, E. (2020). When design meets power: Design thinking, public sector innovation and the politics of policymaking. *Policy & Politics*. 48(1), p. 111-130.
- Liedtka, J., & Ogilvie, T. (2011). *Designing for growth: A Design Thinking tool kit for managers*. Columbia University Press.
- Lindberg, T. S. (2013). *Design-Thinking-Diskurse: Bestimmung, themen, entwicklungen*. Doctoral Dissertation. Universität Potsdam.
- Meinel, C., Weinberg, U., & Krohn, T. (Eds.). (2015). *Design Thinking live: 30 perspectives on making innovation happen*. Murmann.
- Mourtada, R., & Salem, F. (2011). *Civil movements: The impact of Facebook and Twitter*. Arab Social Media Report. 1(2), p. 1-30.
- O'Donovan, J., Kang, B., Meyer, G., & Höllerer, T. (2012). *Credibility in context: An analysis of feature distributions in Twitter*. In 2012 ASE/IEEE International Conference on Social Computing and 2012 ASE/IEEE International Conference on Privacy, Security, Risk and Trust. p. 293-301.
- Plattner, H., Meinel, C., & Weinberg, U. (2009). *Design Thinking: Innovation lernen; Ideenwelten öffnen*. München: Mi-Wirtschaftsbuch, Finanzbuch Verl.
- Plattner, H., Meinel, C. & Leifer, L. (2011). *Design Thinking: Understand – improve – apply*. Springer Heidelberg. <https://link.springer.com/book/10.1007/978-3-642-13757-0>
- Plattner, H., Meinel, C. & Leifer, L. (2012). *Design Thinking research: Measuring performance in context*. Springer Heidelberg.
- Radcliffe, D., & Abuhmaid, H. (2020). *Social media in the Middle East: 2019 in review*. SSRN 3517916.
- Roth, B. (2015). *The achievement habit*. HarperCollins.
- Schmiedgen, J., Rhinow, H., Köppen, E., & Meinel, C. (2015). *Parts without a whole?: The current state of Design Thinking practice in organizations*. Universität Potsdam. Technische Berichte. 97.
- Thorat, S., Deshpande, P., & Shaga, V. (2017). *Review of sentiment analysis on Twitter data using Python*. *International Journal of Advanced Research in Computer Science*. 8(9).
- Toutikian, D. (2011). *Why design research is important for the Arab World right now?* MENA Design Research Center Blog. 24 October 2011. <https://menadrc.wordpress.com/2011/10/24/why-design-research-is-important-for-the-arab-world-now/>
- Traifeh, H., Abou Refaei, R., von Thienen, J., von Schmieden, K., Mayer, L., Osman, S., & Meinel, C. (2021). *Mapping Design Thinking in the Arab World*. In *Design Thinking Research*. Springer, Cham. p. 41-60.
- von Thienen, J. P. A., Ford, C. & Meinel, C. (2016). *The emergence of Design Thinking in Californian engineering classes: Four historic concepts worth knowing*. Presentation at the MIC Conference 2016: From Creative Brains to Creative Societies, September 14-16, Bologna, Italy.

von Thienen, J. P. A., Clancey, W. J., Corazza, G. E. & Meinel, C. (2017). *Theoretical foundations of Design Thinking. Part I: John E. Arnold's creative thinking theories*. In Plattner, H., Meinel, C., & Leifer, L. (Eds.), *Design Thinking Research. Making Distinctions: Collaboration Versus Cooperation*. Cham: Springer. p. 13-40.

von Thienen, J. P. A., Royalty, A. & Meinel, C. (2017). *Design Thinking in higher education: How students become dedicated creative problem solvers*. In Zhou, C. (Ed.), *Handbook of Research on Creative Problem-Solving Skill Development in Higher Education*. Hershey: IGI Global. p. 306-328.

von Thienen, J. P. A., Clancey, W. J. & Meinel, C. (2019). *Theoretical foundations of Design Thinking. Part II: Robert H. McKim's need-based design theory*. In Plattner, H., Meinel, C., & Leifer, L. (Eds.), *Design Thinking Research. Looking Further: Design Thinking Beyond Solution-Fixation*. Cham: Springer. p. 13-38.

von Thienen, J. P. A., Clancey, W. J. & Meinel, C. (2021). *Theoretical foundations of Design Thinking. Part III: Robert H. McKim's visual thinking theories*. In Plattner, H., Meinel, C., & L. Leifer, (Eds.), *Design Thinking Research. Interrogating the Doing*. Cham: Springer. p. 9-72.



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