

Review of Research on Culture and ICT: Insights from the Arab World

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ABSTRACT

Most published research on information and communication technology (ICT) application has been in the context of advanced economies of the world, particularly western countries, viz. Europe and North America. Research on ICT impact on socio-economic development has been primarily focused on eastern Asia and sub-Saharan Africa. Relatively little research has been published on ICT in the Arab world. But better appreciation of the role of Arab culture on ICT use may help in providing guidance for more successful implementation of ICT in the future. To help ascertain this role we reviewed the literature between 2003 and 2016 focusing on ICT implementation in Arabic speaking countries.

Keywords: Arab culture, information technology, ICT

I. INTRODUCTION

Kuchinsky (1996) writes that all too often, new technologies fail in the marketplace because of flawed assumptions about considerations totally unrelated to technical merit. And, as Collins (2001) points out, a major factor impacting successful use and implementation of ICT is culture. Understanding those assumptions, whatever they may be, and the culture where ICT is implemented may increase the likelihood of success. Most published research on ICT application, however, has been in the context of advanced economies of the world, particularly Western countries, viz. Europe and North America (i.e. Cyr 2008; Fang et al. 2011; Lowry et al. 2010). Research on ICT impact on socio-economic development has been focused mainly on developing countries, particularly countries in eastern Asia and in sub-Saharan Africa (e.g. Avgerou 2008; Igira 2008; Lowry et al. 2011; Ramesh et al. 2017), or at a multi-national level (i.e. Ramesh et al. 2017; Reinecke and Bernstein 2013; Su 2015). Little research has been published on ICT implementation in countries of the Arab world. But better understanding of the role of Arab culture on ICT use may help in providing guidance for more successful implementation of ICT in that region in the future (e.g. Kappos and Rivard 2008; Reinecke and Bernstein 2013; Straub 1994). To help determine this role we reviewed 44 papers published in academic journals and conferences between 2003 and 2016.

The specific research question we are focusing on is: What are the dynamics of the interrelationships between ICT use and implementation and the prevalent culture in the Arab world? The expectation is that a better understanding of the cultural impact on ICT use and implementation will allow making adjustments that may increase the likelihood of successful ICT implementations.

II. BACKGROUND

2.1 Culture

To research and understand the role of “Arab culture”, we first need to have an awareness of what is meant by “culture”, and more specifically, “Arab culture”. Examining the historic conceptualization of “culture” makes one quickly realize that the term has been used in various ways and many definitions have been put forward (e.g. Srite et al. 2003; Straub et al. 2002). This is true in the ICT context as well as independently of ICT. Culture has played various significant roles in ICT (Leidner and Kayworth 2006) in general and at a specific stage of ICT systems development (e.g. planning, analysis, etc.) (e.g. Iivari and Huisman 2007; Reinecke and Bernstein 2013; Straub et al. 2001).

The anthropologist Edward B. Tylor describes culture as "that complex whole which includes knowledge, belief, art, law, morals, custom, and any other capabilities and habits acquired by man as a member of society" (1871, p.5). Another anthropologist, Edward Hall states that “culture is communication and communication is culture” (1959, p.186). Hofstede describes culture as the “collective programming of the mind that distinguishes the members of one group of people from those of another” (1991, p.5). Srite et al. suggest that “culture is primarily a manifestation of core values” (2003, p.37). Leidner and Kayworth summarize their conception of culture with the belief that “culture is a critical variable in explaining how social groups interact with IT” (2006, p.360). Quoting Ibn Khaldun, the 14th century Arab sociologist, "man is the son of his customs and his habits, not of his nature and constitution" (Polk 2001, p.9).

The range of definitions for “culture” may be due to its complex nature as a concept that is challenging to measure (Leidner and Kayworth 2006; Reinecke and Bernstein 2013; Straub et al. 2002). It is ironic that our IS discipline praises itself on precision when it comes to definitions (appearing in published research), but the definition of theory, a key concept in our academic discipline of IS, has not reached consensus (Lee 2014). In the context of ICT, nevertheless, culture has been extensively researched within the context of Western countries (e.g. Cyr 2008; Fang et al. 2011; Lowry et al. 2010), Eastern countries (e.g. Lowry et al. 2011; Ramesh et al. 2017) or at a multi-national level (e.g. Ramesh et al. 2017; Reinecke and Bernstein 2013; Su 2015). Reinecke and Bernstein (2013) argue that culture “cannot be equated with a specific country, nor can its effects be confined by artificial country borders”. The authors cite Gupta and Ferguson (1997), Hofstede (1997), Hofstede (2001), Karahanna et al. (2015), among other research publications, arguing that many factors (i.e. nationality, migration, behavior and mode of interaction, political orientation, etc.) may influence in the construction of people’s culture.

2.2 Arab World

To specifically discuss Arab culture, it is useful to identify which countries make up the "Arab world". While the Arab people originated in the Arabian Peninsula, Arab language, together with Islam, has spread in much of Northern Africa and the Middle East. Generally, the Arab world is associated with the countries where Arabic is the official language, which includes mainly the 22 countries that make up the League of Arab States (informally known as the Arab League). However, not all people living in countries of the Arab League consider themselves Arabs, such as the Berbers of North Africa and the Kurds of Syria and Iraq. And some countries that are not part of the Arab League also have Arabic as one of their official languages such as Israel. Nevertheless, in this paper we consider the Arab World as the member countries of the Arab

League (see Fig. 1), as this seems most practical for our research. The members of the league are (in alphabetical order): Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Somalia, State of Palestine, Sudan, Syria, Tunisia, United Arab Emirates (UAE), and Yemen (Encyclopædia Britannica 2015).



Figure 1. Countries of the Arab League (in green) (Encyclopædia Britannica 2015)

While Arab culture is often associated with Islam, many predominantly Muslim countries do not consider themselves Arab, as for example Turkey, Iran, Pakistan and Bosnia. Also, not all Arabs are Muslims, as there are considerable Christian minorities in many Arab countries, as for example Palestine, Lebanon, and Iraq. Arab countries also differ considerably in their affluence. Some countries, such as the countries forming the Gulf Cooperation Council (GCC), viz. Bahrain, Saudi Arabia, Kuwait, Oman, Qatar, and the United Arab Emirates, differ from the other Arab countries with respect to oil production and the resulting prosperity. The other Arab countries are generally poor or with limited wealth. There are many problems affecting the countries of the Arab world in different ways and at different levels (Hamade 2009).

In spite of the variants in the definition of culture, the unclear borders of what is considered the Arab world, and the variation in affluence and religion in various countries within this Arab world, we feel that it is still useful to try to identify common cultural traits that may impact information technology implementation and use in this region.

2.3 Information Technology in Arab Countries

ICT includes a wide range of technologies, such as consumer-focused technologies like mobile phones, personal computers, the Internet, social networking technology, and satellite TV, but also e-business, e-commerce, e-government, and back-office technology.

The prevailing culture in some Arab countries has had a profound effect on ICT use. Living in a conservative society with Islamic values, many parents in UAE prevent their daughters from using electronic devices such as mobile phones, fearing they would be used inappropriately (Jewels et al. 2009). Similar attitudes, limiting women's usage of ICT also exist in Kuwaiti society (Rouibah and Abbas 2011). In some countries, for example Saudi Arabia, women are expected not to work outside of the home unless it is an exclusive all women environment (Baker et al. 2007). Though attitudes are progressing and limitations in the use of ICT and expectations for women in the workplace may have improved, women still lag men in ICT related professions (Metcalf 2011). Thus understanding cultural values and attitudes is very important in that they constitute a "...key component in a successful transfer of information technology into an organizational and business environment" (Loch et al. 2003, p.53).

III. LITERATURE REVIEW

3.1 Selection of Articles

We aimed for publications that included ICT as well as culture as significant themes in the context of the Arab world, published between 2003 and 2016. We searched in ABI/inform, the AIS electronic library, Google Scholar, Web of Science, and also directly accessed the websites of the “basket of 8” information systems (IS) journals suggested by the AIS College of Senior Scholars. We also searched proceedings of major IS conferences for relevant articles. Our search in the “basket of 8” IS journals, however, did not yield any research papers in the context of Arab speaking countries.

Our search for literature on ICT and Arabic-speaking countries included words such as “Arab culture,” “Arab,” and “Middle-East,” (along with their variations, i.e. plural, singular, and combination of words), proceeded with “ICT,” “IT,” or “IS.” We determined the relevancy of the resulting research works based on titles, author supplied keywords, and abstracts. For some papers we read the introduction and conclusion sections if the relevancy wasn't clear from the abstract, to determine their relevance to our research.

Our initial search yielded 104 articles, which after closer examination was reduced to 44. Table 1 contains the distribution of paper publications across conferences, and Table 2 contains the distribution of paper publications across journals. The 44 papers are detailed in Table 3.

Table 1. Distribution of Papers Across Conferences	
Conference Name	# of Articles
<i>American Society for Engineering Education</i>	1
<i>Americas Conference on Information Systems</i>	16
<i>Annual International Conference of the UK Academy for Information Systems</i>	1
<i>Australasian Conference on Information Systems Proceedings</i>	2
<i>European Conference on Information Systems</i>	2
<i>IEEE International Conference on Developments in e-Systems Engineering</i>	2
<i>IEEE Engineering Technology and Technopreneurship</i>	1
<i>IEEE International Conference on e-Business Engineering</i>	1
<i>IEEE International Conference on ICT and Knowledge Engineering</i>	1
<i>International Conference on Innovation Management and Technology Research</i>	1
<i>IEEE International Conference on Information Technology: New Generations</i>	1
<i>International Conference on Information Systems</i>	1
<i>Mediterranean Conference on Information Systems</i>	1
<i>Pacific Asia Conference on Information Systems</i>	5
<i>Proceedings of the Southern Association for Information Systems Conference</i>	1
Total	37

Journal Name	# of Articles
<i>Computers in Human Behavior</i>	1
<i>IEEE Transactions on Engineering Management</i>	1
<i>International Journal of Handheld Computing Research</i>	1
<i>Information and Management</i>	1
<i>Information Technology for Development</i>	1
<i>Information Technology & People</i>	1
<i>Journal of Enterprise Information Management</i>	1
Total	7

Authors	Region	Context	Findings
Agarwal et al. (2015)	Saudi Arabia and globally	Research on collective action (CA) through the analysis of blog and twitter postings.	(1) Novel methodology to model online CAs and computational approaches for social network analysis, sentiment analysis, text mining, and content analysis, (2) Established a framework to understand the emergence, evolution, development and trajectory of CAs in complex online environments, (3) Studied coalition formation, interorganizational communication, and transnational support of the two online CAs, "Women to Drive" and "Sexual Harassment".
Akhter (2007)	UAE	ICT adoption e-business. The extent of security and privacy factors impact adoption of e-commerce.	(1) The result shows that all of the independent variables played important roles in determining the adoption of e-commerce. Those variables are depicted in Figure 3, p. 386, in order of importance as security, trust, convenience, pricing, wider selection, and user interface. (2) Found that there are two significant factors, making an impact on the adoption of e-commerce, which are the user's educational background and their understanding of security features implemented by the vendors. (3) Vendors should enhance perceptions of security and trust by adopting clearly stated return policy, options for cancellation without penalty, special offers, and easy to use websites. (4) E-commerce websites needs endorsements for reliability from third parties such as Visa, MasterCard, etc.
Aladalah et al. (2014)	Saudi Arabia	Sustainability of e-marketplaces.	(1) Proposed a framework for the factors to sustain e-marketplaces. (2) Study found five of the eight independent factors of the framework, i.e. value co-creation, service systems, ICT readiness, individual firm strategy, and regulations, to influence sustainability of e-marketplaces in Saudi Arabia.
Alanazi and Chatfield (2012)	Arab countries	Cross-county analysis of open data practice in the Middle East.	(1) Examined e-gov website of 13 countries in the Middle-East, three of which had observable evidence (Bahrain, Saudi Arabia, and UAE). (2) Evaluated the three countries against the eight

Table 3. List of Reviewed Articles (arranged by author name)			
Authors	Region	Context	Findings
			principles for open government data implementation (proposed in 2007 Open Working Group) and found the UAE scoring the highest, although slightly. (3) The three countries tend to show higher level Internet penetration rate and higher number of social media users, particularly Facebook users, among their citizens than those of the rest of the Middle Eastern countries.
Al-Busaidy et al. (2009)	Oman	Factors influencing the progress of e-gov from an employee's perspective. A quantitative survey of 94 Omani government employees.	(1) When there are improvements in accessibility, efficiency and availability of e-government services, Omani citizens' confidence in e-government improves. (2) When there are improvements in e-government security and privacy issues, Omani citizens' trust improves. (3) When ICT specialists and controllers improve their experience, the integration between different government agencies continually improves and the manner of information exchange improves as well.
Aldraehim et al. (2013)	Saudi Arabia	Cultural impact on e-service.	(1) The tested hypothesis was rejected: the presence of Service Oriented Culture is not a positive predictor of Intention to Use e-services in Saudi Arabia. (2) It is evidenced that consideration of the impact of the cultural values will mainly contribute to the enhancement of ICTs implementation and use.
Al-Gahtani (2003)	Saudi Arabia	Computer technology adoption.	(1) Diffusion of innovations research is further supported in developing nations (Saudi Arabia). (2) Study confirms that innovation attributes (Rogers' five attributes of innovation namely, relative advantage, compatibility, complexity, trialability, and observability) are important determinants of innovation adoption. (3) The relative impacts of these attributes to computer adoption may differ among societies. For the current sample it came to be in the following order: observability, compatibility, complexity, relative advantage and trialability.
Al-Gahtani et al. (2007)	Saudi Arabia	Culture's acceptance and use of ICT.	(1) Validation of the unified theory of acceptance and use of technology (UTAUT), a synthesized model of the user acceptance of ICT, in Saudi culture. (2) Found that performance expectancy had a positive effect on intention, but no interacting effect with performance expectancy and either gender or age on intention. (3) Found that effort expectancy did not have a significant effect on intention in the presence of interactions with the moderating variables. The negative interaction between effort expectancy and experience on intention indicated that, with increased years of experience with computers, ease of use becomes less important in predicting Saudi's behavioral intentions. (4) In cultures characterized by a high power distance dimension, individuals would be more inclined to show

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			deference to authority and conform to the expectations of others in important or superior roles. (5) In higher power distance cultures would exhibit a stronger association between subjective norm and behavioral intention.
Al-Hinai et al. (2014)	Gulf region: KSA, Oman, UAE, Kuwait, Qatar, and Bahrain.	ICT-culture conflict: the case of Arab women: virtual relationships, and conservative cultures, influenced by social networking technologies.	(1) Found that all the female participants fear the conflict created by social networking and its consequences on their lives. (2) Found that some of the interviewees who are involved in open virtual relationships have actually started rebelling against their real life cultures. (3) Found that rebelling against one culture through the use of technology does not mean the total rejection of their culture. (4) Found variations of the intensity of each conflict type.
Al-Jabri and Roztocki (2010)	Saudi Arabia	Adoption and use of ICT in mandatory settings.	(1) The proposed framework is supported by several companies in Saudi Arabia that implemented a large ERP or Enterprise System. (2) The proposed framework may be used during the implementation phase of an ERP or other mandatory system. (3) Users who benefited from the increase in organizational transparency were more likely to voice their support for the new system.
Al-Mabrouk et al. (2009)	Arab world	Major issues for successful ICT transfer.	The ten major issues found in order, are: (1) Formulate flexible government policies, with assistance from private and public corporations, for the selection and introduction of technology. (2) Identify and utilize competitive and high quality suppliers. (3) Formulate and develop a strategic plan that focuses on the actual ICT transfer process and its implementation. (4) Develop open and effective relationships for information sharing between suppliers and acquirers of technology. (5) Measure attitudes towards R&D learning and commercialization capabilities. (6) Establish R&D centers to evaluate, promote, and encourage technological growth and development in the Arab countries. (7) Make use of the consultation services concerning ICT transfer and receive support for the quick and efficient realization of practical applications for best results. (8) Embrace information technology transfer to improve social lifestyles, without compromising local culture including values, attitudes, beliefs and traditions. (9) Formally evaluate suppliers' performance against organizational requirements. (10) Evaluate effectiveness and quality of candidate technology transfer.

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Al-Mayahi and Mansoor (2012)	UAE	Analysis of e-government.	(1) Evidence indicates that the UAE has successfully developed a strong e-government platform for everyday use by both citizens and businesses. (2) E-security and culture resistance are some weaknesses and threats to be addressed.
Alhajjar et al. (2012)	Jordan	Mobile commerce acceptance in collectivist cultures	Proposed a conceptual model based on TAM along with other constructs and proposed hypotheses for future research.
Al Omoush et al. (2012)	Arab culture	Impact of cultural values on online social networking, Facebook	(1) The results indicated a disparity in cultural impact on motivations and attitudes. (2) The results also revealed that individualism, masculinity, long-term orientation, and indulgence cultural dimensions have a significant effect on the attitudes of Facebook members. (3) The study found significant effect of members' motivations, attitudes, and usage on the continuity of Facebook membership value.
Alotaibi and Bach (2014)	Saudi Arabia	E-commerce challenges.	(1) Identified primary challenges in the successful implementation of e-commerce in Saudi Arabia, which are: lack of government involvement, weakness of the postal delivery system, insecure online payment infrastructure, and the absence of e-commerce law. (2) Proposed solutions to the issue of expediting and facilitating e-commerce in Saudi Arabia. The solutions proposed are: additional government support, establishing permanent home addresses, providing secure online payment, and introducing policy and regulation.
Baker et al. (2007)	Saudi Arabia	The effects of gender, age and education on new technology implementation using theory of planned behavior (TPB).	(1) The validation of TPB accounts for approximately 37 percent of the variance in intention to use computers among Saudi knowledge workers. (2) Demographic variables (e.g. gender and age) that have been reported to be significant moderators of the influences of attitude, subjective norm, and perceived behavioral control on behavioral intention in other cultural samples (M.G. Morris et al., 2005; Venkatesh et al., 2000) were found to be non-significant in TPB.
Binsawad et al. (2016)	Saudi Arabia	Technology Incubation.	Review of current growth in Saudi business incubation system and investigation reveals that while the system has successfully supported new enterprises, its performance can be enhanced by emphasis on creativity, innovation, and knowledge-sharing within incubation systems.
Chiravuri and Abdul (2016)	UAE	Determinants of e-gov quality.	Framework for examining the quality of e-gov services.
Choudrie (2016)	Saudi Arabia	Study of adoption, use, and diffusion between older adults and e-gov.	Proposal of a framework to study the gap between the elderly and ICT.
Eid and Al-Anazi (2008)	Saudi Arabia	Factors influencing consumer's loyalty towards e-	(1) The study found that amongst other factors (the user interface quality, product and service information quality, security perception, and privacy perception),

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		commerce.	customer trust and satisfaction influence consumer's loyalty towards B2C e-commerce in Saudi Arabia. (2) The lack of security as perceived by e-commerce consumers is another main obstacle to the development of B2C E-commerce in Saudi Arabia.
El Louadi and Everard (2004)	Arab culture	ICT in Arab countries.	(1) Highlight some Arab traits that are not currently grasped in existing cultural studies models. (2) Suggestions to update Hofstede (1991; 2001) work of models for studying culture in adding Arab dimensions.
Gergely et al. (2017)	UAE	Examined the role of social and individual factors to explain cross-country differences as reasons for software piracy.	Proposal of a plan to examine the role of social desirability bias as a possible explanatory factor for differences in reports of software piracy behavior in two countries: the United States and the UAE.
Hamade (2009)	Arab countries	Problem affecting the flourishing of ICT.	(1) The problem can be split into two kinds; problems related to basic infrastructure and economy; and problems related to governments' policies and regulations. (2) Infrastructure and economic problems include: interrupted electricity supply, inefficient and insufficient landlines, extreme poverty, and high prices of internet services. (3) Government policy and regulation problems include: social and legal constraints (i.e., censorship), and Shortage of ICT skills.
Harfouche and Robbin (2011)	Arab countries	Investigation of the factors that influence the digital divide at the macro level of developed and developing countries (including Arab nations)	(1) Results show that for the 86 countries political variables are the most important factor that influences the digital divide. (2) Cultural differences, specifically gender disparities in literacy, influence the digital divide in the 21 Arab countries.
Haynes et al. (2010)	Middle-East	e-Business in developing countries.	(1) Authors interested in building Case Studies of E Business Strategic Thinking and also exploring ideas for strategic thinking. (2) The presenters of this workshop with major research grant in Oman (the equivalent of just over US\$200,000).
Ilie et al. (2009)	Middle-East	Socio-cognitive assessment of physician's engagement with electronic medical records (EMR) in developing countries.	(1) Developed a model based on socio-cognitive theory and theory of planned behavior. (2) Found that in pre-EMR implementation stages, the critical predictors of intention to engage with complex technologies such as EMR are physicians' perceptions of computer self-efficacy, technology support, and effort expectations. (3) Performance expectations and social influences did not have a significant impact on intention to use EMR.
Jewels et al.	UAE	Lessons from e-	The investigation found four issues:

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(2009)		business use in the UAE.	(1) Cultural issues (i.e., conservative in nature, censorship). (2) Lack of understanding/education. (3) Mistrust in electronic medium (i.e., online shopping). (4) Language and regional factors.
Khan et al. (2014)	UAE	ICT adoption in the UAE, a case study of the challenges and framework proposal.	(1) Analysis results showed that complexity of the system and infrastructure are the main challenges faced by different organizations. (2) Resistance to change and lack of skilled labor are the dominants secondary challenges in these organizations.
Khushman and Amin (2011)	Tourists in Jordan	Adoption of e-business websites, a comparison between Arab and UK cultures.	(1) Both cultures differ in their preferences for website design features. UK tourists find usefulness a more discernible variable, while the Arabs find ease of use. (2) For the UK culture, acceptance is routed through preferences, usefulness and attitude of satisfaction. For the Arabs, it seems to move along the ease of use side of the model. Ease of use seems to influence behavior more strongly than attitude of satisfaction. (3) Arabs do not favor carrying out business via internet, compared to UK culture. (4) Simple websites that are designed with tangible cues: adding pictures, phone numbers, buildings, etc. will make them more tangible and then acceptable by Arab cultures. UK culture do not need such cues because they view the websites as something virtual, and this element of intangibility attracts them, not distracts them from the website.
Khushman et al. (2009)	Tourists in Jordan	Relationship between culture and e-business acceptance in Arab countries.	(1) The study is anchored on Davis (1989) technology acceptance model (TAM) and Hofstede's (1980) cultural dimensions. (2) Using Hofstede's cultural dimensions: low power distance, low uncertainty avoidance, high individualism, and high masculinity cultures (e.g. Western cultures) are not optimally suited to Arab cultures which involve high power distance, high collectivism, low masculinity and high uncertainty avoidance. These cultural characteristics do not support the use of a new technology. (3) Increasing the level of trust is a key to increasing user acceptance of e-business. (4) Arab respondents are less interested in using e-business websites for purchasing goods or services or providing personal information than their UK counterparts. (5) Arab tourists have a higher masculinity than UK tourists, contradicting the results of Hofstede's (1980). (6) Arab respondents are less interested in using e-business websites for purchasing goods or services or providing personal information than their UK counterparts. (7) Collectivist cultures shows less trust in e-business where these people are do not trust outside the boundaries of family or community.

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Klischewski and Elragal (2015)	Saudi Arabia and Egypt	Business and ICT alignment.	The “fast-track” of business-ICT alignment may be achieved with consultants’ interceptions. These efforts, however, may be obstructed by the personality and behavior of the CEO, the attitude of middle management, and the corporate culture.
Koshy (2013)	UAE	Factors effecting Facebook and Twitter as marketing tools.	(1) Fear of possible damage to reputation and fear of customer comments. (2) Firms were also not convinced about how engaging with social media could affect the bottom line. (3) Social media’s power to inform opinions may lead to revolutions (i.e., Arab Spring). (4) Cultural and religious reasons (i.e., censorship).
Loch et al. (2003)	Arab countries, mostly Egypt	Using the internet in the Arab world, a study of culture and social norms.	(1) Findings show strong support for both developed models, explaining, respectively, 47% and 37% of the variance. (2) The second method was a qualitative analysis, which supported the quantitative study and reveal how culture can both inhibit and encourage technological innovation and how Arab cultures can move their economies more quickly into the digital age. (3) There is a need to understand the peculiarities of the individual, as evidenced by micro-level cultural beliefs and behaviors of individuals in developing countries, and how they perceive their respective organization, as a key component in a successful transfer of information technology into an organizational and business environment. (4) Lack of awareness of the Internet and its restrictiveness of language (Arabic language) are barriers to adoption. (5) Participants were primarily from Arab countries and mostly Egyptians.
Lowry (2004)	UAE	Translation and validation of Davis (1989) TAM for use in the Arab world.	(1) TAM was validated as an instrument into Arabic language. Its content’s validity, quality, and robustness of translation were verified by three separate back-translations of Arabic to English of the TAM questionnaire. (2) Factor analysis results suggest that TAM may work differently in the UAE than in the West. (3) Three factors makeup the TAM in the UAE: (a) Intention to Use (dependent variable); (b) Perceived Usability (condensed Factors 2, 3, 4 from Davis (1989) TAM); (c) Perceived Difficulty to Use (Factors 5 & 6 from Davis (1989) TAM).
Lowry et al. (2012)	Middle-East	Cross-cultural model of online whistle-blowing.	Proposal of a model to consider, among other things, cross-culture, model will be tested with working professionals in the USA, Middle East, and China, when using whistle-blowing.
Maghrabi and Palvia (2012)	Saudi Arabia	Linkage between ICT and culture.	Study is currently in-progress. The study developed a research framework and developed the semi-structured interview protocol for individuals from Saudi Arabia.

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Maghrabi and Salam (2013)	Egypt	Social media and social movement for political change.	(1) Highlight the utility of the process analysis as a qualitative approach for studying social media in the context of political change. (2) Social media can have to extreme outcomes when it comes to political change. The first is to facilitate oppressions and create risks for repressive surveillance. The second is social development and political engagement leading to political change (i.e., revolution).
Ojo et al. (2014)	UAE and nine major cities (non-Arab)	Analysis of ten major Smart Cities (from Netherlands, Sweden, Malta, UAE, Portugal, Singapore, Brazil, South Korea, China and Japan) programs.	Present a Smart City Initiative Design (SCID) Framework design space for the objectives, implementation options, strategies, and the enabling institutional and governance mechanisms for Smart City initiatives.
Rouibah (2007)	Kuwait	Adoption of mobile payment technology (Mnet).	(1) Study draws on Davis (1989) TAM and found that gender and experience are two important factors on Mnet acceptance. (2) The intention to use is perceived usefulness and enjoyment driven for experienced and inexperienced male users, while it is enjoyment driven for female users. (3) Perceived trust affect intention to use Mnet, regardless of users' experience. (4) Perceived trust affects intention to use Mnet only of female users. (5) Social norm and privacy play the weakest effect on intention to use.
Rouibah and Abbas (2011)	Kuwait	Camera mobile phone (CMP) acceptance for social interaction.	(1) The study develops a model that is anchored on Davis (1989) TAM, the theory of reasoned action, the attachment motivation theory, innovation diffusion theory, and the theory of flow. (2) Results reveal the "social use" and "use before shopping" uses, explain 32.3% and 30% of the variance in CMP acceptance, respectively. (3) Most importantly, the study reveals that personal innovativeness, attachment motivation, and social norms have an important effect on CMP acceptance.
Rouibah (2012)	Kuwait	Customer trust in online payment system.	(1) Customer trust and perceived enjoyment mediate the effect of external variables (personal innovativeness, familiarity, propensity to trust, and presence of third party seal). (2) Perceived enjoyment emerges as an important factor toward intention to use online e-payment system. (3) Lack of direct effect between customer trust and intention to use as well as between customer trust and perceived security.
Stafford and Khasawneh	Jordan	ICT (mobile internet) adoption	(1) Findings are representative of Middle East and North Africa Region (MENA) users.

Authors	Region	Context	Findings
(2009)		behavior of technology users.	(2) Key differences between early, late and non-adopters among the Jordanian population. (3) Early adopters have relatively more homogeneity than of late adopters. The non-adopters were the most heterogeneous group. (4) Early and late adopters were a diverse group of people in terms of their demographic profile and their experience with other ICTs. Non-adopters were also found to be different in terms of demographic variables. Lack of prior experience with other ICTs and lack of Internet experience appeared to be predictive of non-adopter status.
Tassabehji et al. (2008)	UAE	Corporate acceptance of mobile-technology in tourism sector.	(1) Developed a novel model, based on TAM, with additional constructs. (2) Case study of a Destination Management Company based in the UAE. (3) One finding is that employees are more committed to engage with the new system when organizations present a reduction in privacy implicit in the mobile-technology as a benefit of flexible working to the employees.
Yuce et al. (2013)	Saudi Arabia and globally	Transnational nature of online collective action through the lens of inter-network cooperation.	Individual opinions gain traction in the interconnected networks, development of behavioral patterns, both of which were found through research methodology (social network analysis, sentiment analysis, text mining, and content analysis).

Reviewing the literature, we found that culture was only inferred as a factor that may impact ICT, but not directly addressed in many of the papers. Table 4 lists various themes of ICT and culture evident in the literature review. Table 5 lists ICT themes found in the literature in the context of Arab countries, without inferring cultural issues.

Theme	Authors
Culture and ICT Development	Baker et al. (2007)
Culture, ICT Adoption and Diffusion	Al-Ani and Redmiles (2004); Al-Gahtani (2003); Al-Gahtani et al. (2007); El Louadi & Everard (2004); Al-Mabrouk et al. (2009); Alnajjar et al. (2012); Elsheikh and Azzeh (2014); Harfouche and Robbin (2011); Jewels et al. (2009); Khushman and Amin (2011); Khushman et al. (2009); Loch et al. (2003); Miller (2013); Ottoum (2015); Rouibah (2007); Rouibah (2012); Rouibah & Abbas (2011); Rashed et al. (2013)
Culture, ICT Use and Outcomes	Aldraehim et al. (2013); Al-Gahtani et al. (2007); Alnajjar et al. (2012); Al Omoush et al. (2012); Kenan et al. (2013); Koshy (2013); Yasin and Yavas (2007)
Culture, ICT Management and Strategy	Al-Mabrouk et al. (2009); Al-Mayahi & Mansoor (2012); Harfouche and Robbin (2011); Klischewski and Elragal (2015); Ottoum (2015)
Influence between Culture and ICT	Al-Hinai et al. (2014); Lowry et al. (2012); Gergely et al. (2017); Maghrabi & Palvia (2012); Mourtada and Salem (2012)

Table 5. ICT Themes		
Theme		Authors
Social Media	Analysis of social media	Agarwal et al. (2017); Yuce et al. (2013)
	Social media for political change	Maghrabi and Salam (2013)
ICT Strategy	e-Gov adoption	Al-Busaidy et al. (2009); Eid & Al-Anazi (2008)
	ICT adoption in mandatory settings	Al-Jabri & Roztocki (2010)
	ICT Strategy	Binsawad et al. (2016); Haynes and Arockiasamy (2010)
	Open data (i.e., government. transparency)	Alanazi and Chatfield (2012)
	e-Gov quality	Chiravuri and Abdul (2016)
	Smartcity strategy	Ojo et al. (2014)
	ICT Development	Hamade (2009)
ICT Adoption	Adoption of complex ICT in medical practice	Ilie et al. (2009)
	e-Commerce adoption	Akhter (2007); Aladalah et al. (2014); Alotaibi and Bach (2014); Choudrie (2016)
	ICT acceptance	Lowry (2004)
	Mobile internet adoption	Stafford and Khasawneh (2009)
	Mobile technology acceptance in corporations	Tassabehji et al. (2008)
	Improving supply chain framework in the service industry	Khan et al. (2014)

3.2 Findings

In general, e-service (i.e., e-commerce, e-business, e-marketplace, etc.) and e-government appear to be a recurring area of investment for many of the Arab countries as covered in a great number of research papers we reviewed. The analysis from these papers indicates that the maturity of e-service and e-government is at the early stages, with potential for improvements. Table 4 contains more than half of the 44 reviewed papers, which explicitly discuss culture in Arab countries as a consideration for ICT. The remainder of the reviewed papers, shown in Table 5, implicate culture indirectly in their research of ICT in Arab countries (i.e., social norms in Rouibah and Abbas (2011); ICT adoption in Khan et al. (2014)).

In Table 3, Saudi Arabia appears as the country that was researched the most, with e-commerce the most prevalent theme. Authors call on governments to help with e-commerce related issues (i.e., policy) as well as trust as a factor hindering the adoption and further expansion of the e-marketplace. ICT in Saudi businesses (i.e., ERP) is another theme in the literature. Here the authors call for ICT and business alignment and an increased in organizational transparency.

UAE was the second most discussed country. e-Gov and e-business are the two most discussed themes. The UAE government has been investing heavily in various aspects of ICT from

infrastructure and supporting services, both in the public and private sector. Research papers analyzed the quality of e-government and e-services in the country and recommended specific steps for improvements. The recommendations include customer perceptions (i.e., security) among cultural issues (i.e., conservative in nature). Some of the challenges facing ICT adoption in UAE include fear of damage to reputation, another valuable perception in the culture of UAE and of other Arab countries.

As shown in Table 3, there was a strong presence of ICT adoption in Arab culture and Arab countries as a general theme in numerous research papers reviewed. The authors argued that in many cases governments in Arab countries hold the keys to improving adoption and use of ICT through policies and investments. Another argument was the impact of culture that was evident in the use of social media, as some customs are embedded in the core values of people.

Some of the reviewed research papers (reference Table 4) portrayed culture as a powerful determinant of ICT use and implementation, apart from of the obvious benefits of ICT. Thus, it seems important for researchers and professionals to better understand the influence of culture when considering ICT. In general, our literature review organized the papers into ICT themes that may be helpful for future research endeavors.

IV. LIMITATIONS AND FUTURE RESEARCH

The scope of the review was limited due to the scarcity of the published research available on this topic. Most of the research papers that were available are from conference proceedings, and often consisted of research-in-progress (i.e., Lowry et al., 2012; Maghrabi and Salam, 2013), methodically less rigorous, and lacked in theoretical bases (i.e., AlAnazi and Chatfield, 2012; Al-Mayahi and Mansoor, 2012) than journal publications. We searched for completed (or follow-up) research of the research-in-progress papers, but in most cases, we did not find any.

For future research endeavors, we would consider a theoretical framework for analyzing research on ICT and culture in the Arab world. Another consideration is interviews with experts who have lived and worked in Arabic-speaking countries.

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