

Impact of Digitization on Smart Living: A Case of Dubai

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Abstract

Digitization has changed traditional urban living into Smart Living. The objective of this study is to find impact of Digitization, E-governance and Self-driven economy on smart living in Dubai. This empirical investigation is done through a survey of top and middle level management personnel of Dubai government having clear understanding of the pattern and growth of smart living in Dubai. The primary data was collected from 337 personnel through purposive and quota sampling from 15 different government departments and analyzed through correlation and structural equation modeling. The finding highlights the point that Digitization of infrastructure has a significant contribution in transforming urbanization into smart living. The results also highlighted presence of significant relationship between self-driven economy and smart living in smart cities, as the smart cities manage and operationalize their resources in a way that they are self-dependent and sustainable in all aspects.

Keywords: Sustainable, E-Governance, Self-Driven Economy, Smart Living, Digitization

Introduction

As the paradigm has shifted toward Service Industry from Agricultural base, an increase in urban population combined with urban societal challenges like; unemployment, increasing crime rates, and the need for energy efficiency, have made the Governments to think about developing Smart Cities, perceived to be built on the pillars of Digitization & Disruptive Technologies. To meet criticism on global construction (Bonilla, 2015), and ways of development (Edwards, 2013), the smart cities concept appeared as an idea for the innovative avenues of leading businesses and smart city life. As Gupta et. al. (2013) find that when global warming and environmental exploitation have become issues at global level and countries have committed to control the situations at international forums, the concepts of SCM are being transformed to GrSCM, which means conducting business to meet human needs without rapidly depleting resources, degrading the environment, or compromising nature conservation efforts.

(Manville et. al., 2014) defined the smart city as “a city looking for public issues through ICT based clarifications, on the root of several investor and community-based corporation”. The smart city ideology emphasized production, construction and consumption globally (global and local) (Herrschel, 2013, Graaf et al., 2014). A city is considered smart when it uses technology for better individual living standard. An extremely modified urban area that practices manpower as well as ICT for progressions in key zones like economy, flexibility, atmosphere, individuals, and administration (MOUD, Smart City - mission statements & guidelines, 2015; MOUD, 2015 June).

The First Pillar in building smart cities is availability of data, the lifeblood of smart solutions. The challenge is to use the power of data to create Big Data, wherein not only Predictive Analytics but Decision Support Systems are built using both structured and unstructured data to provide planned & efficient services to resolve urban issues. The usage of Disruptive Technologies as a second pillar is to provide Intelligence, Cost Efficiency, Security and Sustainability (Gigliardi, 2018). Payment technologies such as Contactless payments and digital wallets have transformed the way user transacts securely.

According to Government of UAE, Emirates Blockchain Strategy 2021, predicts to save 398 million printed documents and 77 million man-hours annually (UAE Government, 2018). Aero farming & Smart Irrigation has the potential to develop sustainable cities wherein the food required can be grown in Warehouses and Vertical farms instead of tradition fields with farmers. Price Water Coopers (PwC, 2018) predicted that Artificial Intelligence riding on the wave of Big Data will contribute US\$320 billion by 2030 to the Middle East economy. So, the adoption of Disruptive technologies not only provides smart and efficient governance but also decreases the cost of operations, and provides intelligent jobs. Finally, the third cornerstone of smart cities is smart people. Focus on employability and winning the ‘war on talent’ and provisioning ‘disruptive skills’ amongst its citizens in order to achieve sustainable economic growth.

The shifting of focus towards e-governance and regional security opens investment opportunities for global investors that will result in mobilizing the foreign direct investment (FDI). Katz and Bradley (2013) specified that early stages of a “Metropolitan Revolt” upturns the “common pressure” from different investors and institutes (like; civic authorities, assemblies, public forms etc.) towards companies to generate more supportive results. Dubai, commercial hub of the United Arab Emirates, has long been considered as a progressive city. Dubai, a true global city housing more than 200 diverse nationalities (Ahmed & Rafiuddin, 2018) and sometimes called as Mini Europe offers a progressive uplift which make it an attractive tourist place. Khan et. al. (2017) claimed the tourists' count would touch 20 million by the end of year 2020. The key factor of smart living depends upon the implementation of the smart city dream; driving force that incorporates the stakeholders' welfare (security, happiness & comfort) and Government's strategic plan. Therefore, smart way such as online renewal of trade licenses, e-gate facilities at airports, integrated transportation schemes (provide by RTA) & M-parking deploying Mobile Commerce; all are associated with an objective of providing smart services. The flow of resources in mission-aligned direction motivated the technology developers and technical personnel to design and create the best smart processes, applications and tools which can be utilized, tracked and implanted in smart cities for sophisticated living.

Many Governments perceive that Smart City means Digitization and usage of Disruptive Technologies. Partially true, but they forget the most important stakeholder, their People. Smart Cities should not be a burden on the Country, wherein other states or cities are using their natural and knowledge resources to serve the burgeoning city, but

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instead, should be built upon the pillars of sustainability and high rate of talented employment. The Digital expansion allows smart cities to carry on their services through 3D printing and enlarged their density for sustainable purposes, whereas on the other node it focuses towards improving smart living of individuals. Based on the arguments of smart city given by Katz et.al (2013) it increase the societal density from multiple investors to generate more supportable and employable values. Smart cities and smart living has shifted focus towards the smart strategy and the current societal issues (Angelidou, 2014, Ben et.al, 2015). As Gupta V. et al. (2013), found that all the organizations in the ICT sector face the same challenge to remain competitive, deliver customer value, make profit, and ultimately survive and grow. And the answer lies in their capabilities to manage the innovations. These innovations are broadly categorized in product and process innovations. The product innovation can be associated with new product and or significant changes in the existing product features to address use, quality, environmental and social issues, while process innovation deals with components of value chain i.e. procurement, production, distribution and sales. Yadav Shiv Shankar Kumar et al. (2017) find that organizations either have no understanding on how to implement sustainability issues or they consider that it will involve unnecessary expenditure, whereas now it has become imperative to examine performance of every organization on the parameters of sustainability. Since the ITeS organizations are not traditional business units, they need to be viewed as human-machine interaction system. But they also need to be examined on the parameters (economic, environment and social) of sustainability. Abbas (2018), in his article published by Khaleej Times, Dubai has been selected amongst the top three smart cities worldwide, pioneer of various public facilities for services improvement of citizens.

Research Objectives

This research is an empirical investigation of Smart City, namely Dubai, and aims to find the impact of Digitization (lifeline of Smart City) on Smart Living, and e-Governance. The study further tries to find the strength of relationship between Self-driven economy on smart living, and causal relationship between e-governance and smart living. The relationship between these parameters are extremely important to understand, whether exponential growth of computing power and technological innovations are rightly mixed with strong governance and improves the quality of life, needs to be established.

Development of Hypotheses

MarketsandMarkets in its Market Research Report of 2019, forecasted that market size of smart cities is projected to grow from US\$ 308.0 billion in 2018 to US\$ 717.2 billion by 2023. The reason of growth cited by the report are increasing demand of public security & safety, urbanization, adoption of latest technological practices, and better government initiatives. The concept of smart living remarked by

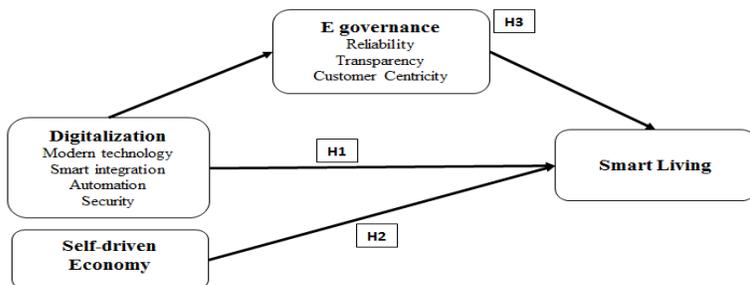


Figure 1. Hypothesized Model

Gerlitz (2015) is that “Smart Living” uplifts values in numerous parts of life ranging from offices and the way citizens commute inside the cities. Novel and modern technologies have reduced operational costs, improved life style, provided better living infrastructure through smart buildings systems having upgraded and smart attributes, Teufel et. al. (2015) concluded that ICT and digital operations have a significant influence towards a normal life. At present, our sphere is evolving from a digital land to a smart ecosphere Earl & Forbes, (2012). Technology is considered as a key driver for smart living in a smart state as it focused to facilitate people by raising the quality of life and creation of sustainable economy. Technological advancement directed towards masses have significantly modified demand and their behavior (Grewal, Roggeveena & Nordfal, 2017), (ICRTC, 2015), (Dassani, Nirwan & Hariharan, 2015).

Global advancement trends, leadership and strategic vision is progressing Dubai towards a leading smart state worldwide (Efthymiopoulos, 2016). Amponsah & Ahmed, (2017a, b) rated Dubai as the innovative city in the Middle East, wherein according to McKinsey Dubai is the top city in the Middle East and Africa in terms of deployment of greatest number of applications. Dr Aisha, director-general, Smart Dubai Office, in her interview to Khaleej Times (Aug 2018) stated that Dubai is a technologically advanced city, wherein most of the knowledge and assets to make the emirate smartest city on Earth already existed within government and private sector entities.

Digitization and technological advancement is changing conventional economies into smart economies. Kumar, Ananda and Song (2017) in their study of loyalty schemes in trade and services highlighted that the digitization has an integrated role with satisfaction level of people. Another study revealed significant role of technologies such as radio frequency (RFID), self-scanning system, self-payment for buying items and mobile apps are leading to the competitive development of a city (Gil, Ruiz & Berenguer, 2014). According to Terziowski (2010), a creative state thinks more for a short time duration, but possibly deeper. They are more intended towards innovations that appreciate better-quality performance. Therefore, the literature emphasizes that digitization is one of the drivers that making Dubai a smart city which leads to:

Hypothesis 1: Digitization of technology, automation, security and integration has significant positive impact on smart living in Dubai.

Dubai as a visible Islamic Economy is a self-driven leading economic hub and provides a Launchpad to new business and investments due to its orientations of innovation, technology, and happiness thus provisioning capital and labor efficiency with a business-friendly environment. According to Dubai Plan (2021), diversified value-added economic activities are not only enhancing Dubai’s economic resilience, but positioning it as a leading business hub especially in trade, logistics, Fintech, Tourism & Hospitality sectors. The introduction of Dubai Strategy 2021 adds a new story that is supported through the teamwork of Dubai’s people, society and government. According to Hvidt (2007), Dubai highlighted its position through Digitization, innovation, strategic investment, and its openness to globalization. Salem (2016) commented on Dubai Plan (2021), the UAE’s government attention and entrepreneurial attitude allowed it to create the culture of openness, in addition to promotion of a cooperative governance smartness.

This approach of governance brought change in collective thinking about the government. In particular, its focus is more intended towards people’s wellbeing or “happiness”. The Dubai Plan, 2021 targets, core

areas for improving, overall smartness that comprises of: happiness of people, a wide-ranging society, preferred place for new or memorable experiences, sustainable smart city, center of global economy and it displays UAE government and authorities as an efficient service provider. Emphasis that self-driven nature has positive and significant impact on smart living leads towards:

Hypothesis 2: Self-driven economy of Dubai has significant positive impact on smart living.

A Digital economy is weaved around a “PULL” approach wherein people centric decisions are taken based on the needs of its citizens. In this new approach, organizations, both public and private, organize themselves in such a way they are able to put the right people and assets in right place with shorter lead times. They tap into flows of assets provided by other companies and usually replacing manpower by digital power. Kumari and Singh (2016) specified that e-governance is concerned with the correct delivery of services and information through electronic means and is helpful in creating an accountable, responsible and a transparent government for the people of any state. Information and Communication Technology (ICT) is recognized as an imperative factor for the development of an efficient system in knowledge mining, public administration and intelligent decision making. ICT provides support to government institutions, ministries and authorities to operate infrastructure electronically and dynamically by using intellectual resources and central control and secured system provisioning as per state regulations Rai, Patnayakuni, and Patnayakuni (1997). Working in tandem with ICT through e-governance, government’s role is central in eliminating corruption. Dubai has a land of emerging opportunities, diversified infrastructure, upgraded services, and variety of goods to cope with multiple nationalities living in the city (Ahmed, Amponsah & Desai (2018); Alzubi & Ahmed, 2019). Dubai Plan (2021), presents the vision under which the government of Dubai took many initiatives to encourage e-user’s participation through functional integrations. This article studies e-governance as an interface between the government of Dubai and its citizens. The interface transacts through electronic and digital applications which can be operated easily and are accessible 24/7 using smart phones by the users. The transformation of knowledge and information from Government towards its citizens are carried through electronic means and covers a range of processes including the political processes. Michel (2001) in his article presented the fact that e-governance depends upon electronic interaction between, government and citizens, internal government processes and control, with an objective of developing a strong integration in order to run a smooth self-governing system adhering to government regulations, limitations and provisions. The theme behind the proposed idea of smart living dialogues with an objective improve government efficiency and transparency in all phases. Sheikh Mohammed bin Rashid Al Maktoum, Vice-President of UAE and the Ruler of Dubai, continuously stressed that government is a power for people and not over them. The Government looks after resident’s happiness and satisfaction by offering efficient public services defined on transparent policies are key to ensure government’s success, and thus leads towards:

Hypothesis 3: E-governance processes have enhanced the trust of people on digital systems and thus has positive impact on smart living in Dubai.

Methodology

The focus of this study was limited towards the Emirates of Dubai. Purposive sampling techniques were used as it was important to have the respondents from top and middle management positions who had a clear understanding of processes and services being deployed in Dubai smart cities. After deciding level of executive's quota sampling technique was used to select 20-30 executives working in fifteen key Dubai governmental organizations for this primary survey. Finally, 337 acceptable responses due to its completeness were considered for the analysis. The questionnaire was divided into five key sections, namely Digitization, Self-Driven Economy, e-Governance & Smart-Living, each having 4 statement along with section for demographic information. Each question was measured on 5 Point Likert Scale (strongly disagree “1” to strongly agree “5”). Questionnaire also captured the level of employee in the organization. Data was analyzed using SPSS 23 version and AMOS to test reliability, correlation and model testing by applying structural equation modeling technique.

Results

The Analysis elucidates that Digitization catalysis self-driven economy, and ($p < .05$, $r = .673$) leads to much efficient and transparent e-Governance practices ($p < .05$, $r = .572$), and enhances the quality of life by improving living standards ($p < .05$, $r = .457$).

Table 1. Pearson Correlation Analysis (PCA)

Variables	Digitization	Self-driven Economy	E-Governance	Smart Living
Digitization	1			
Self-driven Economy	.673**	1		
e-Governance	.572**	.751**	1	
Smart Living	.457**	.480**	.440**	1

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Additionally, e-Governance Boosts Self-driven economy ($p < .05$, $r = .751$), by providing digital barometers for its growth by adopting innovative services deliveries to its citizens. These satisfied citizens enable additional FDI within the Smart City. Smart Living is the end-result of all these initiatives, and it can be concluded that Digitization ($p < .05$, $r = .457$), e-Governance ($p < .05$, $r = .480$), and Self-driven economy ($p < .05$, $r = .440$), are significant contributors to enable Smart Living, though stronger correlation results defies Conviction. Figure-2 shows the results on AMOS by using Structural Equation Modeling (SEM). The impact of various variables on each other, the regression weights and model fitness values are specified below.

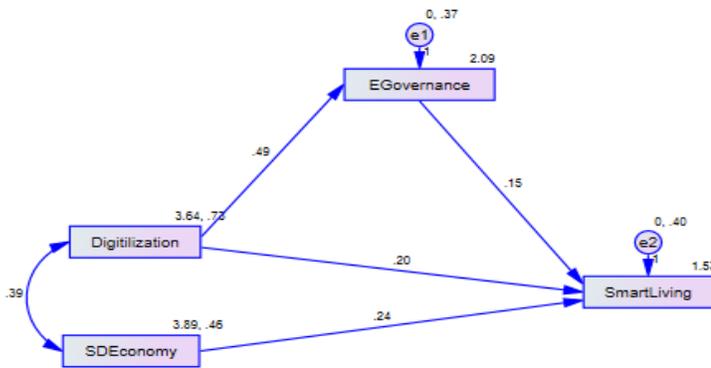


Figure 2. Structural Equational Modeling

Table 2. Regression Weights

	Path	Estimate	S.E.	C.R.	P
Smart Living	<--- Digitization	.196	.061	3.201	.001
Smart Living	<--- SD-Economy	.238	.069	3.461	.005
E-Governance	<--- Digitization	.494	.039	12.769	.028
Smart Living	<--- E-Governance	.147	.071	2.061	.039

The results of Structural equational modeling highlighted that digitization has significant ($p < .05$) and positive ($b = .20$) impact on smart living which means that by use of digital technology improves the living standards of Dubai’s citizens.

The digitization has 19.6% impact on smart living on people of smart cities. The government authorities should launch new apps and electronic services with user friendly interface but should ensure secured automation and integration with smart services. 1% change in digital advancement there will be 19% upsurge positive change to improve the living standard in Dubai, hence, H1 of the study is supported by our data. The self-driven economy integrated with ICT has 23.8% impact on smart living. 1% change in tools of self-driven economy will result in 24% positive change in smart living. Therefore, H2 of the study is also supported by the data. The Table 3 further shows the mediation of e-governance with digitalization and smart living. The direct impact of digitization on smart living is positively significant and after placing mediator e-governance has 49% impact on digital operations, concerns, automation, integration and security. This can be read as moderate impact of e-governance in Dubai smart cities and transparency of information and data handling as per UAE government regulations. The Table further indicates that 15% impact of e-governance on smart living in Dubai smart cities. It shows that through digitization the Dubai government can gauge smart living, regulated and operated by e-governance. If there is 1% change in digitization operations, it will deteriorate the transparency and trust of people on digital systems. The positive change in attributes will bring the

strongly positive impacts on smart living. Therefore, H3 of the study is also supported by data.

Table 4. Model Fitness Indices

	χ^2	CFI	TLI	NFI	RMSEA
Four factor Model	774.280	.920	.948	.931	.064
Three factor Model	1882.242	.743	.722	.692	.123
Two factor Model	1953.342	.730	.710	.680	.126
One factor Model	2567.383	.621	.593	.580	.149

Note: $n = 337$; Values are differences of each of the alternative measurement models with the hypothesized model. $**p < .001$, 4 factor (“D”, “SDE”, “EG”, “SL”), 3 Factor (“D, SDE”, “EG”, “SL”), 2 Factor (“D, SDE” and “EG, SL”), 1 Factor (“D, SDE, EG, SL”).

The above table shows model fitness indices of all four variables including digitization, self-driven economy, e-governance and smart living. CFA was performed to check the model fitness of hypothesis before testing, directing, and mediating relation. Table representing that the 4 factor model was fit with ($\chi^2 = 774.2$, $p < .000$; CFI = .920, TLI = .948, NFI = .931, RMSEA = .064). Alternately, 3 factor model by combining "D", "SDE" and "EG" and "SL" was lesser fit ($\chi^2 = 1882.242$, $p < .000$; CFI = .743, TLI = .722, NFI = .692, RMSEA = .123) with respect to 4 factor model.

Therefore, four factor measurement model give us the strong values as compared to all other measurement models. The values of fitness indices closer to 1 are more fit and acceptable. Henceforth, the values of Four Factor Model show close to 1, as compared to chi square which is a weak test for fitness of model.

Conclusion

Dubai has established itself in global space as one of the leading smart cities in the world. A city is smart not only because of its latest technological implementations, but also through stable and matured governance and the services that it offers to its citizens. The overall sum result is provisioning smart living wherein a citizen can interact with its government directly and ignore intermediaries. Digitization of technology, automation, security and integration has significant and positive impact on smart living in Dubai, holds partially true as Digitization might bring predictive analytics and decision automation on the fingertips of government, but only partially guarantee’s an improvement in standard of living. Self-driven economy of Dubai

doesn't have a strong impact on smart living, but has a partial impact, but Digitization has a strong impact on creating a self-driven economy. This means that Digitization is the source of creating a self-driven economic system, and partially enhances smart living culture wherein the citizens are able to interact smartly using the government apps and are able to enjoy the cost and time benefits due to direct and 24x7 interactions. This raises the quality of life and standard of living. e-governance processes have enhanced the transparency and trust of people on digital systems and thus has a positive impact on smart living in Dubai. Results show that digitization, e-governance and self-driven economy, all of them significantly contribute to the smart living in Dubai. The implications of this study is that the currency of the new economy is trust and digitization. Social media and online rating sites give each individual consumer a voice that should be heard by Government. Protecting trust and reputation in the digital world has become a vital activity for government organizations. Digitization and smart living disintermediated/eliminated the intermediaries from the value chain and brings user in direct contact with the service provider thus reducing the cost and time. The power of data and analytics should be actively harnessed by governments to make evidence based decision making. The government that is best enabled to create insight from its data has a competitive advantage, resulting in smarter and happier people, better FDI and improved GDP.

Implication to theory and practice

The theoretical paradigms on smart city speaks about innovative technological evolutions and smart products to capture data at source using Internet of Things, and analyze it using various machine learning algorithms, such as classifications, regressions, statistical learning theories, clustering and recommender systems to create intelligence so that decisions can be automated. In practice the cycle stops here, the source of e-governance is correctly interpreted by many governments, i.e. digitization, but its soul is never touched, i.e. the purpose that needs to be achieved. The core purpose of e-governance, build upon digitization, is to improve standard of living by providing quality life to its citizens. Once the quality of life improves, the efficiency of economy can be improved, and country's growth can be sustainably achieved. These intelligent inputs if timely interpreted and acted by governments of the day, true governance can be delivered by the incumbent governments. The governments should think about technology as a source of digitization not as a source of demonstration, e-governance as a pathway to deliver smart living, then only smart governance can be achieved.

Limitation of study

This study was focused to Dubai only and due to resource constraints, it was limited to middle and top management personnel of key governmental authorities. The sample size may be increased and the study may be extended to citizens and private sector to check its adequacy. This study directs the future research from user and investors perspectives, and can be extended to other smart cities also.

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