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Adoption and use of Smartphones by Casablanca's households and their impact on the project of Casablanca smart city?

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***Abstract*— Few years ago, Morocco started raising investment in the technologies of information and communication and heighten it to the rank of national priority. It has instituted a real project called "Digital Morocco 2013", one of its objectives is to make the Kingdom technological hub in the region, and by way of consequence, to stimulate the competitiveness of its territories. No one can, indeed, contest the observation that the economic development of territories is intimately correlated with their numeric development. This awareness of the strategic character of ICT has led the Moroccan public authorities to reconsider their policies towards a digital development of the territory, following the same trajectory as many developed countries.**

In this logic a whole reflection has been lunched around the metropolitan development of Casablanca. A very ambitious project baptized "Casablanca Smart city" is "imported" as the intelligent cities of developed countries such as Barcelona, Nice, Singapore and well of others. This project strives to transform the metropolis of Casablanca in an ecosystem called " smart city" thanks to numeric projects that will allow an optimal analyze of the informational wealth of data that is gathered and analyzed; and the restoration of harmony between the administration and the users by proposing them a suitable public service.

In spite of all these laudable efforts to make this metropolis a model in terms of numeric development, no one can ignore the major challenges that it must confront, among others, the resorption of the numeric fractures in terms of accessibility and use as well as the numeric literacy of the citizens. These last constituent the pillar of the Casablanca Smart City concept as users, consumers and producers of information and data.

These reports lead us to a questioning of the feasibility of the Casablanca Smart-City project. We will tempt to answer this question through an empiric survey of the adoption and the use of the smartphones by 1500 individuals residing in the metropolis of Casablanca. The idea is to appraise the numeric literacy of the citizens of Casablanca through how much they can use their technological tools, in this case their smartphones. Indeed, the success of the Casa Smart City project is based on the existence of a strong connected community in the city through their use of mobile ICT infrastructure such as smartphones and other mobile devices.

***Keywords*— Smartphone, smart city, smart citizen, Casablanca, adoption and use of smartphones.**

I. INTRODUCTION

The concept of the city has progressed much since its inception from the ideal town to the smart-city. Aiming to improve the citizens' life quality, public authorities are experimenting with new concepts of territorial, urban and local development. The cities then become laboratories of experimentation of new ideas and techniques of urban conversion before the labelling of the concept« urban labelling » [1]. The success of an idea makes it an exportable concept to other contexts. Experimenting with an idea about a city requires tangible and intangible investments as well as a favorable legal and political framework. This city-laboratory concept remains a luxury for some countries. Southern cities have neither the socio-economic conditions, nor the political and financial autonomy of western cities nor the time for the experimentation of new ideas. Urban sprawl is increasing, according to a UN estimate (2014), about 70% of the world's population will live in urbanized areas by 2050. Under the constraint of this massive urbanization, the cities of the South countries would then ask for turnkey models of urban development.

With this in mind, many smart cities that have proven themselves are looking to sell their concept. Smart cities ranking contests are organized all over the world in order to convey the concept. The best

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ranked cities in 2016 by the Juniper Research[1], namely: Singapore, Barcelona, London, San Francisco and Oslo, have built a brand image that will enable them to be well positioned on that global market. These cities are often classified according to indicators, covering technology, transport, energy, open data and the economy.

Adopting this smart city concept by countries around the Mediterranean includes both opportunities and risks. As the successful experiences of Mediterranean cities such as Barcelona, Nice, Marseille ..., cities such as Tunis, Cairo, Algiers and Casablanca have imported the concept of smart city and are trying to adopt it.

In Morocco, a reflection on the metropolitan development of Casablanca putting first the strengthening of its national and international competitiveness to make it a real technological hub has been started. A very ambitious project called "Casablanca Smart city" has begun. This project aims to transform the metropolis of Casablanca into a smart city thanks to digital projects enabling optimal analyze to the informational wealth of data collected and analyzed; with the aim of bringing the administration and users closer together by offering them an appropriate public service.

The approach of Smart City is based on the use of mobile and ubiquitous ICT infrastructure such as smartphones and other mobile devices to develop interconnected applications, services and pilot projects in order to gradually create an ecosystem of social, sustainable and collaborative innovation. Which promotes the creation of an interconnected smart city environment. Therefore, importing the Smart City project for the city of Casablanca would require a "Smart" citizen. In other words, he must show a dexterities and intellectual skills that would allow him to manipulate digital technology because he will be both producer and consumer of digital data.

However, some alarming figures show daunting obstacles to the adoption and use of technologies, especially the Internet and technological support. Major disparities characterize the metropolis in particular between rich neighborhoods and peripheral areas where the first degree digital divide is ubiquitous [2]. Moreover, the price of access to technology remains inaccessible for a large segment of the population: according to a report by the World Bank (2014) a representative household belonging to the 40% poorest Moroccan population should pay 32.11% of his income to access to mobile broadband. This same household should bear a financial burden of 29.03% of its disposable income to have access to the fixed broadband. Adding to these impediment the illiteracy which hinders a large proportion of citizens from manipulating the technology.

These findings lead us to rethink the adoption and use of smartphones and their involvement in the success of the Casa Smart City project. The contrasts observed challenge us in several ways:

1. Would Smartphones be adopted by all Casablancans?
2. What uses do they make of their Smartphone?
3. Are these uses enough to ensure the completion of the project aimed to make Casablanca a smart city?

We will attempt to answer these questions relying on an empirical study that we conducted with 1305 individuals residing in the metropolis of Casablanca in 2015. A model of qualitative econometrics will help to estimate the determinants of the adoption and use of Smartphone by Casablancans. To that end, we refer to the Davis [3] Technological Acceptance Model (TAM) and its extensions.

The first section of this article presents the conceptual framework retained through a review of the theoretical and empirical literature on the concept of smart city as well as the acceptance and adoption of new technologies. In the second section, we present the survey and the main results.

II. Review of the literature

A. Smart city: Concept and components

The Smart City concept has been around for twenty years. It was strongly linked in the beginning to the progress made by ICTs. Its diffusion has gone from the digital city to smart city ... This concept is based on the integration of ICT in the urban planning process.

Despite the abundance of names, the Smart City was associated by some authors with the concept of

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"smart growth" which recognizes the link between land use planning and quality of life [1]. This idea was developed by multinationals in the ICT sector such as IBM, which identified cities as potential customers with huge profits. In order to sell its services to the government, IBM built its project around three components: 1) a system for planning and managing the services; 2) ICT infrastructure services; and 3) Human services [4]. Amazed by the idea, public authorities have made it a real territorial marketing tool.

For city planners, the Smart City seems like a promising solution to face growing urbanization [5], climate change, scarcity of resources and competition between cities. Making a city a Smart City does not mean transforming or expanding its attributions or functions, but it aims to exploit the vast amount of data and information generated by the progress of ICT, and to use it in the goal of improving the well-being and everyday life of citizens.

Giving a single definition to this concept may limit its scope. The Smart City is the subject of multidisciplinary research such as economics, geography, urban planning, research and development in the field of hardware and software infrastructure, etc. Nevertheless, its central core remains the data [6].

The concept gives rise to two reflections. The first can be built around technologies and tools of communication that allow to collect and disseminate information that transforms the city into a "digital city", and the second privileges the involvement of the technologies user by making the city "smart". That leads us to the next question; is Smart City a set of smart platforms or it is the way of using these platforms to improve the living conditions of citizens and visitors of cities?

According to Attour and Rallet [7], a city is considered "smart" only if it has the capacity to develop itself while mitigating the negative effects of this growth on financial costs and well-being of its inhabitants. Similarly, Komninos [8] discusses the integrated use of many electronic and digital technologies by residents and visitors in order to raise the quality of life and employment in an area.

In fact, the approach of the intelligence of a city would be larger than a simple use of the new technologies. It includes diverse urban approaches such as the economy, education, democracy, infrastructure, transport, environment, security and quality of life [9].

The following figure groups together the aspects showed in a study made by Giffinger and al. in 2007 [10]. This study proposes a smart city model by identifying the following components:

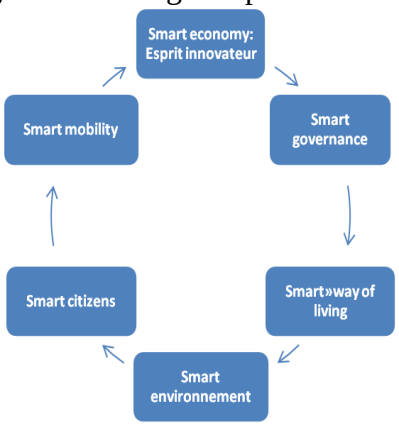

Fig. 1 Components of the intelligent city inspired by Giffinger, s.d

Smart mobility: Transport is a sector that affects both the economy, the environment and the well-being of citizens. In order for mobility to be smart, it must participate in improving logistics flows and facilitating the mobility of citizens. By developing applications that make it possible to provide and access information on road traffic, car parks, high-risk areas, transport delays ... This intelligent mobility aims to make it easy for citizens to access, quickly and in real time to information related to road traffic [11]. In this sense, technology has led to the development of alternative means of transport, which positively influences the fluidity of roads and therefore positively impact the environment.

Smart economy: aims to encourage the innovative spirit and entrepreneurship of citizens. This component cannot exist without the involvement of companies, universities, innovation and research centers, governments and citizens in order to value the data. Such a vision is largely inspired by the triple helix model of innovation systems in the urban economy. The interaction between these actors aims to create a climate of innovation in which smart initiatives of economic development emerge.

Smart governance: It is based on the digitization of public administration procedures and virtual

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access to official documents. The participation of citizens in decision-making and the development of city strategies through digital platforms dedicated to the exchange of ideas between the local government and the inhabitants of the city remains a goal for the Smart City. In short, to be qualified as smart, governance must be both participative and digital.

Smart way of living: transforming the city to improve the quality of life of its inhabitants requires, first and foremost, a health and safety education and housing system that meets the needs of citizens and then a cultural infrastructure and a social cohesion leading to the development of the inhabitants. This component remains vital for the attractiveness of the city.

Smart environment: the smart city must work to protect its environment, through good management of natural resources, pollution reduction, waste treatment, environmentally friendly housing, etc. The smart environment is based on the use of ICT to rationalize energy and water consumption in the city.

Smart citizen: It is the hard core of the concept, its participation is crucial because he is both user and producer of the smart services in the city. The smart city is created by the citizen and for the citizen. He must be able to appropriate all the uses of the smart city thanks to ICT mainly smartphones. It must have digital skills. These skills develop with learning through three levels: the instrumental skills that enable it to use technological support, the informational skills through which it can process digital information content and strategic skills that provide it with the ability to use it proactively, to contextualize in its own framework of life and to make decisions with a view to acting on its professional and personal environment , individual or collective [12]. This user of smart services must have the requisite skills to know an intellectual level enabling him to use ICTs, open-mindedness, creativity and involvement in the political life of his city.

In summary, The adoption of the concept is synonymous with the emergence of a new service based on the six components mentioned above. This service offer must make the citizen a priority. It must be built around citizens needs by placing them at the heart of urban development in a role of consumers and actors. The Smart City is a city that puts data at the service of its citizens through data projects covering all areas.

Given the complexity of the urban environment, setting up a Smart City project is more complicated than it may seem. Each of its components can be considered as a subsystem of a global system. The evaluation of the overall project requires a test of integration of the different components.

Zygiaris [13] has developed a performance measurement system that identifies the different layers of a city: 1) It begins with an elementary layer that responds to the basic components of the city; 2) Then the 'green city layer' which integrates the environmental and green component of the city; 3) The 'interconnection layer' which encourages innovation in ICT infrastructure to interconnect people, transport systems, local government and other devices; 4) The 'instrumentation layer' which, thanks to the interconnection layer, has the role of using data from the latter and making them available to the public; 5) The open integration layer, which ensures that all smart applications and services communicate with each other to produce accurate information; 6) The application layer where the city is observed and controlled in real time. The information is shared through interconnected and instantaneously instrumented operators; 7) The innovation layer allows the city to achieve territorial attractiveness based on an innovative ecosystem that allows the creation of value.

B. Casa Smart city : Context of the project

The awareness of the strategic character of ICTs in the economic development of the territories has led the Moroccan public authorities to rethink their policies towards a spatial planning based on digital, following the same trajectory as many developed countries.

The city of Casablanca has followed the smart cities movement by launching the "Casa Smart City" project. It aims to transform the metropolis of Casablanca into a smart city through projects related to urban toll management, intelligent parking, intelligent public lighting, video surveillance, waste management and treatment, decreasing the consumption of energy and water, facilitation of urban travel by focusing on the environmental component and improving the quality of life of the Casablancans.

Several initiatives have been launched with this vision, the "E-Madina" cluster was launched in 2015 with the aim of

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creating and developing a smart city ecosystem to bring out the city's transformation solutions using digital technologies.

In January 2016 an intelligent and optimized urban surveillance system comprising 760 CCTV cameras connected by 220 km of fiber optics was installed in Casablanca. In order to encourage smart governance, an interactive citizen communication application has just been launched. Entitled "MajlisKOM" which means " your council", it is intended as a platform dedicated to the management and dissemination of the activities of elected assemblies, town halls, municipalities and local authorities. The event "Smart City Expo" which is in its second edition in 2017 gather the professionals of the domain and the event "smart City Connect" aims to raise people awareness of the concept. Through these achievements, Casablanca seeks to position itself as an African leader in the area of smart city.

Despite all these achievements and laudable efforts to make this metropolis a model in terms of digital and economic development, no one can challenge the major difficulties facing the city. Casablanca remains a city of contrasts as summarized in the following table:

Strong points	Weak points
Area: 1 200 km² with 70 km of coastline	Density: 15.165 HBT/km² (exceeding 40,000 in certain borough)
Population: 4.2 million (12.6% of the Moroccan population)	10 million travel per day
10 Faculties, 7 large schools, more than 45 private higher schools	Education level: 34% have no instruction
Labour force: 46.4%	Unemployment rate from 15 to 24 years: 37.5%
Share of national GDP: 30%	23% of homes do not have access to drinking water
National VA share: 50%	The wastewater treatment rate is only 45%
Share of national investment: 48%	Human Development Index: 0.64
Share of productive units: 39%	The slums represent 15.8% of the dwellings
Industrial workforce: 60%	12% of the city's inhabitants live in a dwelling representing 0.6% of the total area

Fig. 2 Key figures of the city of Casablanca. Source: HCP-2014 census

As mentioned above, the city of Casablanca suffers from some social inequalities, 34% of the population has no education, 22.2% of the population is illiterate in urban areas, 15% of population is living in slums, etc.

Referring to the Zygiaris model [13], we must begin with the elementary 'city layer' where the basic functions of the city concept must be corrected such as : the fight against unsanitary housing, illiteracy, increasing unemployment of young people, the encouragement of entrepreneurship, the improvement of urban infrastructures as roads, car parks, public transport ..., and the setting up of a participative governance. The second step is to set up an intelligent infrastructure which allow the collection, processing and dissemination of information in a readable form by its citizen, and also a citizen intelligence offering them the opportunity to participate in the success of the project. Without these conditions, the Casa Smart City project may create additional inequities in the metropolis as well as another way of social exclusion of this population.

In summary, the success of the Smart City project is tantamount to involving the citizen in this process of change. Getting acceptance is also a challenge. The social acceptability of the project and the respect of privacy remain a social aspect that must be studied for the implementation of the concept because it remains an significant limit since the citizen are the heart of it.

C. The technology acceptance model

The initial model of technology acceptance (TAM) that was developed by Davis in 1986 [3] is an adaptation of both the theory of reasoned action [14] and the model of planned behaviour [15]. The TAM has undergone several revisions including those proposed by Davis and Venkatesh in 1996 [16], by Venkatesh in 2000 [17] and by Venkatesh and al. 2003[18].

The TAM provides a theoretical explanation to the behavior for new technologies adoption. Pointedly, it allows to define and predict the origin factors of the acceptance/rejection or of the use of new information technologies in various contexts. Davis [3] starts from two major questions. The first relates to the reasons why an individual could accept or reject information technology. The second concern the characteristics of the technological system and the effort that must be made by the potential user to accept the technology. Thus, the use of a system depends on two subjective perceptions: perceived usefulness and perceived ease of use.

Davis asserts that the attitude, belief, and intention to use a new technology, in this case, the computer, depends on two factors: perceived ease of use, and perceived usefulness. Davis defines perceived utility as "the degree to which a person believes that the use of a particular system could improve his performance" ([3], [14], [15], [16], [17], [18], [19], [20]). It is linked to the intensity of the belief, in terms of potential performance, that an individual may feel as a result of the use of a new technology.

The perceived using ease is defined as " the degree to which a person believes that using a particular system would be free of effort" ([3], [14], [15], [16], [17], [18], [19], [20]). Thus, an individual would easily accept new technology if the needed effort to use it is low.

The hypothesis made by Davis is that the adoption of an information system is determined by the intention of its use. This intention is itself influenced by the attitude of the individual towards the use of technology. The attitude ultimately depends on the two aforementioned beliefs: perceived usefulness and perceived ease of use. Similarly, external variables not included in the model, such as the user profile, training, design and system characteristics, documentation, etc., could influence the adoption of the technology ([3],[14], [15], [16], [17], [18], [21]).

TAM's strength in describing the adoption behavior of new technologies has been validated in various contexts and applications such as e-mail, voicemail, word processing, e-commerce, etc. ([22]; [23], [24], [25], [26], [27], [28], [29], [30], [31], [22] , [26]; [21], [17], [32], [33], [29], [34], [35]). In this context, a meta-analysis published by King and Hue 2006 [27], listing 88 empirical studies and involving more than

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12,000 observations using TAM, reveals that the model is robust and has strong predictive power, regardless of the context in which it served. This result is corroborated by the meta-analysis of Yousafzai's and al. [34], [35], which covered 145 articles published about TAM between 1989 and 2004. This study also recognizes the originality of the TAM and its strength in predicting the use of computer systems. Similarly, in another meta-analysis by Legris and al [28], of 22 empirical studies that tested the model, the authors go in the same direction as their predecessor by demonstrating that the TAM is a robust theoretical model that can explain the Use of information technologies in different contexts.

The technology acceptance model (TAM) have known several improvements and extensions to enhance its explanatory power, including those contributed by Davis and Venkatesh in 1996 [16], by Venkatesh in 2000 [17], Venkatesh et al. 2003[18] summarized the main work of technological acceptance and developed a "unified theory of technology acceptance and use" (UTAUT). The latter was formed from a vast review of the literature, including eight models: (1) Rational Action Theory (RAT), (2) the Technology Acceptance Model (TAM), (3) model of motivation (MM) ([36], [37]), (4) planned behavior theory (PBT), (5) The model combining the TAM and the planned behavior theory (6) PC using model (MPCU) [38], (7) the theory of diffusion of innovation (DOI) [39] and (8) social cognitive theory (SCT) [40].

In their integrator model, UTAUT, Venkatesh et al. [18] reveal:

i) Three major determinants of technology usage intention: "expected performance" of a system to boost user productivity, perception of "expected effort" to apprehend the system, "social influence" refers to the amount which an individual perceives that his important close people think that he should use a system ";

ii) Two direct determinants of the use of technology: "facilitating conditions" defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of technology" and "the intention to adopt a behavior ". Beyond the direct determinants, the model puts forward the significant impact of four moderating variables: gender, age, previous experience and usage context, which can be either voluntary or obligatory.

The unified theory of acceptance and use of technology (UTAUT) is considered by Venkatech and al [18] as the best explanatory model of the individual use of an information technology. It would explain 70% of the "intent of use" variance and 50% of the variance for usage.

This model, like its predecessors, has experienced different extensions and empirical validations applied to different types of technologies in different contexts [41] and across different cultures ([42], [43], [44], [45], [46], [47]).

III. Empirical study

Our study differs from the existing literature in that we scrutinize the individual decisions of adoption and use of Smartphones. We surveyed by questionnaire 1305 individuals located in the Greater Casablanca. The choice of this metropolis is motivated by the fact that the public authorities have launched a very ambitious project to make this city a "Smart city". As it was developed in the literature study, the pivotal pillar of a smart city is the "smart citizen" through its participation in the production of data and use of information provided by mobile terminals. Studying the adoption and use of smartphones by inhabitants of Casablanca will allow us to firstly evaluate their "Smart" level insofar as they are the main beneficiaries, and secondly to evaluate the success of the Casa smart city project.

It is important to note that the structure of the questionnaire enabled us to verify the quality and consistency of the collected answers. To ensure validity an coherence of collected information, the meaningful questions were asked several times in the questionnaire in different formulations. It should be also noted that the development of the questionnaire was based on a broad review of the theoretical and empirical literature.

The questionnaire is made-up of four blocks of qualitative information: "technological dependence of the respondent", "adoption of Smartphone", "use of Smartphone" and "socioeconomic variables of respondents". The materials collected are subjective responses in the form of qualitative information.

The first results show that 92% of respondents have access to Internet. Compared to other access ways, the connection to the Internet in a mobility situation remains by far the preferred means of our interviewees. The Smartphone is at the top of the connection brackets with a rate up to 71% against 33% for laptops and 11% only for fixed computers. The connection via tablet concerns only 6% of the respondents.

Also, 97% of respondents state that they have a mobile phone. 83% of them have Smartphones. The top five reasons for adopting the system by our respondents are "to remain constantly connected" with a rate of 62%, "to communicate with my friends" to 54%, "it helps me in my work" to 38%, "I love new technologies" to 36% and "to organize my life" with a rate of 20%. The imitation effect "do like the others" was mentioned by only 9% of the respondents. By contrast, the reasons of the non-adoption of Smartphones seem to be related to the two factors advanced in the literature by Davis namely "perceived utility" and "perceived ease of use". In fact, 54% of respondents reject the Smartphone because they do not see it as useful: a mobile phone is only used to make calls and send messages. Similarly, for 20%, the refusal of adoption would be linked to the complex characteristics of the technological system insofar as they consider that they do not have the cognitive necessary skills for the use of the Smartphones. It should be noted that the cost does not appear to be an

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important obstacle to the adoption because it was evoked by only 15% of the respondents.

A. Presentation of the econometric model, the explanatory variables and the hypotheses to be tested

We propose to analyze the determinants of individual choices of the adoption and use of smartphones by the inhabitants of the Casablanca metropolis through an econometrics qualitative modeling [48]. This choice is justified by the fact that the variables are qualitative. We have privileged a Probit model in which it is estimated that the binary variable is the decision to "adopt" or "not to adopt" a Smartphone depending on the respondent's socio-economic profile. The objective of the model is to specify the probability of the adoption conditionally on the exogenous variables relating to the characteristics observed on the individuals of the sample.

1) The explanatory variables

We formulate the working hypothesis that the adoption and use of smartphones depend on the socio-economic conditions of individuals. Several empirical studies in the United States, Europe and Africa agree that access and use of ICTs is correlated with individual's socioeconomic factors, namely income, socio-occupational category, education, age, household composition, gender, place of residence, etc. ([49], [50], [51], [52], [53], [54], [55], [56]). Smartphone specific studies conducted in different contexts also highlight the significance of the individual's profile in adoption and use behavior ([49], [50], [51], [52], [53], [54], [55], [56],[57], [58], [59], [60], [61], [62], Park and al and. Lane and Manner [54] tested the impact of "big five" personality traits and socio-demographic characteristics on the possession and use of Smartphones. Also, logistic regression on a sample of 312 individuals revealed a significant impact of gender, age, education level and extroversion in the adoption of Smartphone. Alkhunauzan and Love [49], in an empirical study of a sample of 574 people living in Saudi Arabia, demonstrate that demographic factors, such as gender, age and level of education, have a significant statistical impact on trade acceptance Via the Smartphone (M-commerce). Pheeraphuttharangkoon [56] addresses the same problem on a sample of adults aged 50 and older using two databases, one from the Oxford Internet Institute and a second from the Office of National Statistics of 2009, 2010, 2011, 2012 and 2013. Probit models revealed the sway of socioeconomic data such as age, sex, marital status, education level, employment status and income within the use of Smartphones.

Like our predecessors, we used the same explanatory variables in our model, assuming the hypothesis that the adoption of smartphones depends on the socio-economic conditions of individuals. The variables we have used are: income, socio-professional category, educational level, age, neighborhood, gender, marital status, number of children.

In addition, we introduced two variables justifying the respondent's technological profile: the Internet connection and the possession of technological equipment (tablet, computer, laptop, Smart TV, mobile phone, e-reader, others). We thus constructed the variable "technological profile" which corresponds to the number of equipments possessed by the individual. We can thus predict that the propensity to have smartphones increases among technophiles (Leguel et al., 2004). Similarly, having an Internet connection at home or at work could have a significant positive impact on the likelihood of owning a smartphone. These people may feel the need to stay connected to the Internet constantly on their mobility.

B. The model results

Firstly, let's present the results of the Probit model, which appraises the probability of adopting the Smartphone according to the individuals socio-economic characteristics and their technological profile.

The results of the model are consistent with the literature and predictions previously formulated. The possibility of adopting a Smartphone increases with the fact of owning several IT equipment. This probability would be stronger if the degree of the individual technological dependence is high. Indeed, we find that the more the individual is technophile, the more likely he or she will have a Smartphone. Similarly, Internet ownership at home and / or work increases positively and significantly the chance of having a Smartphone. This can be explained by the desire to make use of the functionalities offered by a Smartphone, inter alia, being able to access the mobile Internet connection.

The socio-professional category has a very consequential impact on the probability of adopting Smartphones. We find that this probability is even stronger among students, managerial staff, liberal professions and company managers, non-managerial and manual workers, compared to retired or unemployed people. The rejection of this equipment by the latter categories can be explained by the cost factor which remains potentially high in Morocco. For retirees, non-adoption could be explained by perceived difficulty in use and perceived non-utility. Retirees may not find it useful to own a Smartphone or may be discouraged by the complexity of its use.

The level of studies significantly influences the likelihood of having a Smartphone. The model reveals that the higher the level of education is (two years of higher education), the stronger is the propensity to have a Smartphone. This implies

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that an important level of education allows to have qualifications and cognitive skills that promote adoption but also the use of the Smartphone.

Income seems having a significant positive impact. Individuals whose salary is between 5,000 MAD and 10,000 MAD are distinguishable from the others because they have a positive impact on the probability of adopting a Smartphone.

The number of dependent children significantly decreases the propensity to own a Smartphone. Individuals with more than one dependent child will be less likely to have a Smartphone. This negative relationship between the adoption of Smartphone and the number of dependent children can be explained by the potentially advanced age of people with lot of children. The latter, as explained above, may not be attracted by any new technology, in this case Smartphones, because of the complexity of manipulation they convey. and in other hand the decrease in the propensity to use technological products because of the number of dependent children.

Low aged people, especially between the ages of 18 and 35, are clearly distinguished from older people because we find that being young increases positively and significantly the probability of having a Smartphone. This result can be explained by a generational effect [2]: digital natives have lived with the digital revolution and are therefore naturally predisposed to consume information and communication technologies. Conversely, seniors can be completely overwhelmed by the digital and all the supports that it implies, because this requires skill and dexterity that this population does not have.

Moreover, the geographical location of the individual appears to be one of the decisive variables in access to technology. The model reveals that the propensity to adopt a smartphone is all the stronger as the person lives in a wealthy neighborhood relative to other neighborhoods. Conversely, living in a poor neighborhood significantly decreases the likelihood of having a Smartphone. An individual is therefore, ceteris paribus, less likely to have a smartphone when he lives in popular neighborhoods. This result may be related to the relatively high cost of access to this digital technology. We can also comment on this outcome by detaching from new technologies as these vulnerable people have other priorities and place more emphasis on meeting needs at the lower end of the pyramid of needs.

The remaining variables of gender and marital status did not show significant effects on the probability of Smartphone adoption. This result is interesting in itself, at least for the gender and marital status variables because it presages the non-existence of a difference in behavior between men and women as well as widowed, married, divorced or single Smartphone access.

In sum, our results reveal that the adoption of Smartphones by the inhabitants of the Casablanca metropolis, the future Smart City, is part of the technophile character and the socioeconomic profile of the individual. We find that the fringe of the most vulnerable population of the metropolis undergoes the fracture of first degree relative to access to the Smartphone. In fact, our estimates reveal that technophiles, young people, the most qualified, having a paid professional activity, who live in the bourgeois neighborhoods of the metropolis and who have few dependent children have a high probability adoption of their Smartphone. These are people who do not suffer from any form of inequality of whatever nature (social, digital, geographical, etc.). Conversely, it is technophobic, elderly, illiterate, or very poorly educated people who do not engage in professional activities, who live in working or middle-class neighborhoods and who have many dependent children, who have a low propensity to adopt smartphone.

1) The main uses of smartphones by the inhabitants of Casablanca

The importance of the adoption of Smartphones naturally gets us thinking deeply about their uses. Within a short timescale, the functionality of mobile phones has evolved from an interpersonal communication device to real multimedia equipment [63]. Intuitively, we could say that the near-generalization of technological equipment (resorption of the first degree fracture) could automatically be translated into its effective and efficient use. We therefore discuss the problem of inequalities related not only to the access to Smartphone equipment, but rather to the use that is made of it. This is what theoretical literature describes as a "fracture of use" or "second-degree fracture", which the causes depend on abilities, skills and cognitive abilities to appropriate any digital technology.

In this context, the survey results show that respondents have a rudimentary use of their Smartphones (Chart 1). We note that the main uses are Alarm clock, pictures, communication by free messages and clock, with rates reaching 83%, 82%, 73% and 65% respectively. The mobile Internet connection ranks fifth in the top uses with a rate of 65%. We also note, not surprisingly, the prevalence of the social media and interpersonal communications in the uses of Internet in a mobility situation. Thus, 64% of mobile users follow the news of their social networks and 50% manage their e-mail. Nevertheless, very few mobile users use their Smartphones for practical life applications such as E-banking (12%), public service applications (16%) or health applications (18%).

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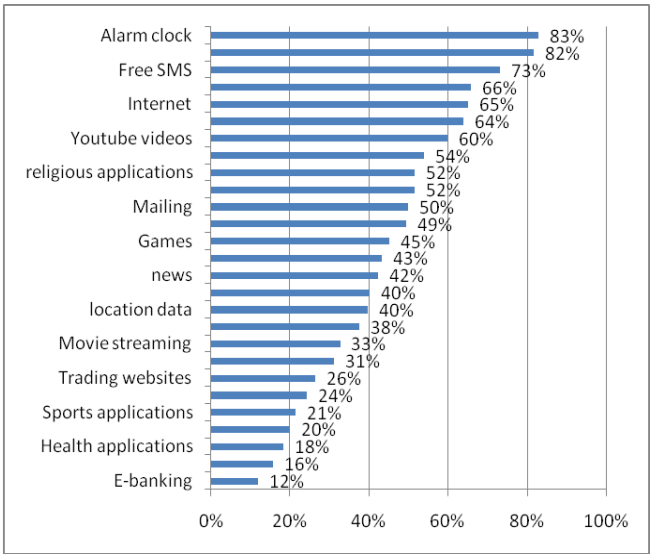

Fig. 3 Uses of smartphones

As for applications downloaded to the Smartphone (Chart 2), the re-sults corroborate our usage statistics, as once again, social networks ranked first with a rate of 83% of respondents followed with a con-siderable gap by lifestyle applications (24%), the news 12%. And fi-nally the applications for practical activities represent only 4%.

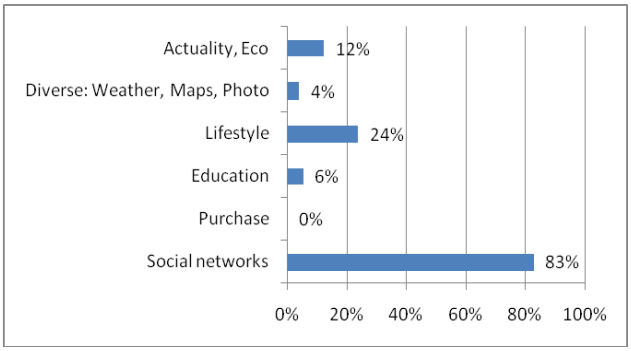

Fig. 3 Applications

We note that the uses of smartphones are dominated by the basic functions of smartphones and the social network. Other applications related to hobbies and practical activities represent only a small proportion. In order to use smart services, the citizen must have the three levels of digital skills: instrumental, structural, and strategic. In our case, the Casablancans are only at the first level linked to a basic use of digital technology, the more we interact with digital support, the more our skills are developed. This interaction requires some skills, only the educated category of the population reaches this stage.

The question of security is an obstacle to usage, this is seen through the use of banking service applications and merchant websites. Hence the need to set up an open data protection system related to the Smart City project.

The use of localization services, which stands at 40%, shows us that the Casablancans have issues in the indications and orientation in the city.

IV. Conclusion

We tried in this paper to analyse the relevance and the efficiency of the project Casablanca Smart-City through an econometric study of the adoption and the use of the Smartphone by the residents of the city of Casablanca. We then conducted a study on the main uses that adopters make of their smartphones. The underlying idea is that the main component of any intelligent city is an intelligent citizen having intellectual and cognitive faculties allowing him to generate and to treat the data from mobile terminals, in this particular case the Smartphone.

To do it, we designed and administered a questionnaire on the adoption and the use of Smartphones with 1305 individuals located in the great metropolis of Casablanca.

The estimation of the econometric model with endogenous variables adopting Smartphone according to the numerical and socioeconomic characteristics of the individuals allowed us to find interesting results.

Large gaps are found between young and old, technophile or technophobic, graduated or illiterate, working or non-working people, living in middle-class neighborhoods or poor neighborhoods, with many or few dependent children and by gender. We can see that smartphone accessibility is based on socio-economic conditions and differences in cognitive ability between individuals.

As a result, the Casablanca Smart-city project, which is supposed to improve citizens' well-being and quality of life, would benefit only those who do not suffer from any form of exclusion. On the other hand, it will accentuate the inequalities for the initially vulnerable people, because proposing a project not adapted to an individual knowing that he does not have the necessary dexterities to benefit from it, amounts to excluding it doubly.

Technology has never been neutral. It is a differentiation element between cities and between citizens. Some challenges facing the city of Casablanca can be solved by a simple technological solutions, but some others need a social innovation to support the citizen in this smart process.

The Smart City is a multidimensional concept which purpose is to provide a certain quality of life to its citizens. To build it, it must be coherent with its historical, political, social, territorial and cultural context. In case of phase shift between the sold product and the needs felt, the project remains doomed to failure.

Références bibliographiques

ISSN 2356-5608

[1] V. Albino, U. Berardi and R. Dangelico, "Smart Cities: Definitions, Dimensions, Performance, and Initiatives", *Journal of Urban Technology*, vol. 22, n°1, pp. 3-21, 2015.

[2] S. Oukarfi, « L'usage de l'internet au Maroc: Essai de mesure de la fracture numérique de second degré », *International Journal of Innovation and Applied Studies*, ISSN 2028-9324, vol. 2, n°2, pp. 118-130, 2013.

[3] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, vol. 13, n°3, pp. 319–339, 1989.

[4] O. Söderström, P. Paasche, K. Klauser, "Smart cities as corporate storytelling", *City: analysis of urban trends, culture, theory, policy, action*, vol. 18, n°3, pp307-320, 2014.

[5] E. Mair, T. Moonen, G. Clark, "What are Future Cities? Origins, Meanings and Uses", London: Government Office for Science, 2014.

[6] N. Douay, C. Henriot, "La Chine à l'heure des villes intelligentes," *L'Information géographique*, vol. 80, n° 3, pp. 89-102, 2016.

[7] A. Attour, A. Rallet, "Le rôle des territoires dans le développement des systèmes trans-sectoriels d'innovation locaux: le cas des smart cities", *Innovation*, vol. 1, n° 43, pp. 253-279, 2014.

[8] N. Komninos, "The Architecture of Intelligent Cities", *Intelligent Environments*, n°6, pp. 13-20, 2006.

[9] P. Lombardi, S. Giordano, H. Farouh, W. Yousef, "Modelling the Smart city Performance, Innovation" *The European Journal of Social Science Research*, vol. 25, n° 2, pp. 137–149, 2012.

[10] R. Giffinger, C. Fertner, H. Kramar, R. Kalasek, N. Pichler-Milanovic, E. Meijers, *Smart cities: ranking of European medium-sized cities*, Centre of Regional Science, Vienna, 2007.

[11] S. Faucheux, CH. Hue, I. Nicolaï, *TIC et Développement Durable. Les conditions du succès*, De Boeck, Bruxelles, 2010.

[12] P. Brotcorne, L., Mertens, G. Valenduc, "Les jeunes off-line et la fracture numérique : Les risques d'inégalités dans la génération des natifs numériques," Bruxelles : Service Public de Programmation (PPP) fédéral, Intégration sociale, Bruxelles, 2009.

[13] S. Zygiaris, "Smart city reference model: an approach to assist smart planners to conceptualize a city's smart innovation ecosystem", *Journal of the Knowledge Economy*, Vol. 4, n°2, pp. 217-231, 2013.

[14] M.A. Fishbein, I. Ajzen, "Belief, attitude, intention and behavior: an introduction to theory and research", Reading, MA: Addison Wesley, 1975.

[15] I. Ajzen, "The theory of planned behavior", *Organizational behavior and human decision process*, vol. 50, n°2, pp. 179-211, 1991.

[16] V. Venkatesh, F. D. Davis, "A model of the antecedents of perceived ease of use: Development and test", *Decision Sciences*, vol. 27, n° 3, pp. 451-481, 1996.

[17] V. Venkatesh, "Determinants of Perceived Ease of Use: Integrating Control, Intrinsic Motivation, and Emotion into the Technology Acceptance Model", *Information Systems Research*, Vol. 11, n° 4, December 2000.

[18] V. Venkatesh, M.G. Morris, G.B. Davis, F.D. Davis, "User acceptance of information technology: Toward a unified view", *MIS quarterly*, vol. 27, n° 3, pp. 425-478, 2003.

[19] E. Brangier, "L'assistance technique comme forme de symbiose entre l'homme et la technologie. Esquisse d'un modèle de la symbiose homme-technologie-organisation" *Revue d'Interaction Homme-Machine*, vol. 3, n° 2, pp. 19-34, 2002.

[20] E. Brangier, G. Vallery, Aspects psychologiques et organisationnels du développement des nouvelles technologies de la communication et de l'information, *Les dimensions humaines du travail : théories et pratiques de la psychologie du travail et des organisations*, Edition E. Brangier, A. Lancry, C. Louche, p. 213-250, PUN, Nancy, 2004.

[21] B. Szajna, "Empirical evaluation of the revised technology acceptance model", *Management Science*, vol. 42, n° 1, pp. 85–92, 1996.

[22] F. D. Davis, R. P. Bagozzi, P. R. Warshaw, "User acceptance of computer technology: A comparison of two theoretical models", *Management Science*, vol. 35, n° 8, pp. 982–1002, 1989.

[23] M. Igbaria, J. Iivari, "The effects of self-efficacy on computer usage", *OMEGA*, vol. 23, n°6, pp. 587–605, 1995.

[24] M. T. Mishaw, D. M. Strong, "Extending the Technology Acceptance Model with Task-technology Fit Constructs", *Information & Management*, 36, 1999.

[25] E. Karahanna, D. Straub, N. Chervan, "Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs," *MIS Quarterly*, vol. 23, n° 2, pp. 183-213, 1999.

[26] A. L. Lederer, D. J. Maupin, M. P. Sena, Y. Zhuang, "The Technology Acceptance Model and the World Wide Web", *Decision Support Systems*, 29, pp. 269-282, 2000.

[27] W. R. King, J He, "A meta-analysis of the technology acceptance model", *Information & Management*, 43, pp. 740–755, 2006.

[28] P. Legris, J. Ingham, P. Collerette, P., "Why do people use information technology? A critical review of the technology acceptance model," *Information & Management*, 40, pp. 191–204, 2003.

[29] D. A. Adams, R. R. Nelson, P. A. Todd, "Perceived usefulness, ease of use and usage of information technology: A replication", *MIS Quarterly*, vol. 16, n°2, pp. 227-247, 1992.

ISSN 2356-5608

[30] P. Y. K. Chau, K. Y. Tam, "Factors affecting the adoption of open systems: an exploratory study", *MIS Quarterly*, vol. 21, n°1, pp. 1-24, 1997.

[31] P. Y. K. Chau, P. J. Hu, "Examining a Model of Information Technology Acceptance by Individual Professionals: An Exploratory Study", *Journal of Management Information Systems*, vol. 18, n°4, pp. 191-229, 2002.

[32] H. S. Kwon, L. Chidambaram, "A Test of the Technology Acceptance Model The Case of Cellular Telephone Adoption", Proceedings of the 33rd Hawaii International Conference on System Sciences – 2000, pp. 1-10, Hawaii: IEEE.

[33] K. Mathieson, "Predicting User Intentions: Comparing the Technology Acceptance Model with the Theory of Planned Behaviour", Information Systems Research, vol. 2, n°3, pp. 173-191, 1991.

[34] S. Y. Yousafzai, G. R. Foxall, J. G. Pallister, "Technology acceptance: a metaanalysis of the TAM: Part 1", *Journal of Modelling in Management*, vol. 2, n°3, pp. 251-280, 2007.

[35] S. Y. Yousafzai, G. R. Foxall, J. G. Pallister, "Technology acceptance: a meta-analysis of the TAM: Part 2", *Journal of Modelling in Management*, vol. 2, n°3, pp .281-304, 2007.

[36] F. D. Davis, R.P. Bagozzi, P. R. Warshaw, "Extrinsic and intrinsic motivation to use computers in the workplace" *Journal of Applied Social Psychology*, vol. 22, n°14, pp. 1111-1132, 1992.

[37] R. J. Vallerand, "Toward a hierarchical model of intrinsic and extrinsic motivation", *Advances in Social Psychology*", vol. 29, pp 271-360, 1997.

[38] R. L. Thompson, C. A. Higgins, "Personal Computing: Toward a Conceptual Model of Utilization", *MIS quarterly*, vol. 15, n°1, 125-143, 1991.

[39] E. M. Rogers, *Diffusion of Innovations*, Free Press, New York, Fifth Edition 2003.

[40] D. R. Compeau, C. A. Higgins, "Computer self efficacy: Development of a measure and initial test", *MIS quarterly*, vol. 19, n°2, pp. 189-211, 1995.

[41] Y. S. Wang, Y. W Shih, "Why Do People Use Information Kiosks? A Validation of the Unified Theory of Acceptance and Use of Technology", *Government Information Quarterly*, vol.26, pp.158–165, 2009.

[42] K. Bandyopadhyay, K. A. Fraccastoro, "The Effect of Culture on User Acceptance of Information Technology", *Communications of the Association for Information Systems*, vol.19, pp. 522–543, 2007.

[43] J. Marchewka, C. Liu, K. Kostiwa, "An application of the UTAUT model for understanding student perceptions using course management software", *Communications of the IIMA*, vol. 7, n°2, pp. 93-104, 2007.

[44] C. P. Lin, A. Bhattacherjee, "Elucidating individual intention to use interactive information technologies: the role of network externalities", *International Journal of Electronic Commerce*, Vol. 13, n° 1, pp. 85-108, 2008.

[45] F. W. Dulle, M. K. Minish-Majanja, "Researchers' perspectives on open access scholarly communication in Tanzanian public universities", *South African Journal of Information Management*, Vol. 11, n°3, 2009.

[46] L. Curtis, C. Edwards, K. L. Fraser, S. Gudelsky, J. Holmquist, K. Thornton, K. D. Sweetser, "Adoption of social media for public relations by nonprofit organizations," *Public Relations Review*, vol. 36, n°1, pp. 90–92, 2010.

[47] A. Eckhardt, S. Laumer, T. Weitzel, "Who influences whom? Analyzing workplace referents' social influence on IT adoption and non-adoption", *Journal of Information Technology*, vol. 24, n°1, pp. 11–24, 2009.

[48] D. McFadden, "Economic Choices", Nobel Lecture, *American Economic Review*, vol. 91, pp. 351-378, 2001.

[49] A. Alkhunaizan, S. Love, "An empirical study of the social individual differences on mobile social network service use", European, Mediterranean & Middle Eastern Conference on Information Systems (EMCIS2013). Windsor, United Kingdom. October 17-18, 2013.

[50] R. Balakrishnan, H. P. Yeow, A Study of the Effect of Thumb Sizes on Mobile Phone Texting Satisfaction, *Journal of usability studies*, vol. 3, n°3, pp. 118-128, 2007.

[51] E. Bigne, C. Ruiz, S. Sanz, "The impact of internet user shopping patterns and demographics on consumer mobile buying behavior", *Journal of Electronic Commerce Research*, vol. 6, n°3, pp. 193-209, 2005.

[52] S. Butt, J.G. Phillips, "Personality and self reported mobile phone use", *Computers in Human Behavior*, vol. 24, n°2, pp. 346–360, 2008.

[53] L.A. Jackson, K.S. Ervin, P.D. Gardner, N. Schmitt, "Gender and the Internet: Women communicating and men searching", *Sex roles*, vol. 44, n°5, pp. 363-379, 2001.

[54] W. Lane, C. Manner, "The Impact of Personality Traits on Smartphone Ownership and Use", *International Journal of Business and Social Science*, vol. 2, n° 17, pp. 22-28, 2011.

[55] N. Park, Y. Kim., H.Y. Shon, H. Shim,"Factors influencing smartphone use and dependency in South Korea", *Computers in Human Behavior*, 29, pp. 1763-1770, 2013.

[56] S. Pheeraphuttharangkoon, "The Adoption, Use and Diffusion of Smartphones among Adults over Fifty in the UK", A Thesis Submitted to the University of Hertfordshire in Partial Fulfilment of the Requirements for the Degree of Doctor of Philosophy, 2015.

ISSN 2356-5608

[57] R. Entner, *Smartphones to overtake feature phones in u.s.by 2011*, Neilsonwire, 2010. Available at http://blog.nielsen.com/nielsenwire/consumer/smartphones-to-overtake-feature-phones-in-u-s-by-2011.

[58] S. Butt, J.G. Phillips., "Personality and self reported mobile phone use", *Computers in Human Behavior*, vol. 24, n°2, pp. 346–360, 2008.

[59] L. Yu-Kang, C. Chun-Tuan, L. You, C. Zhao-Hong, "The dark side of Smartphone usage: Psychological traits, compulsive behavior and technostress", *Computers in Human Behavior*, n° 31, pp. 373–383, 2014.

[60] K. Pitchayadejanant, "Intention to Use of Smart Phone in Bangkok Extended Utaut Model by Perceived Value", Paper presented at the International Conference on Management (ICM 2011) Proceeding. Conference Master Resources.

[61] W. Zhou, Y. Zhou, X. Jiang and P. Ning, "Detecting repackaged Smartphone applications in third-party Android marketplaces", in *Proceedings of the 2nd ACM Conference on Data and Application Security and Privacy (CODASPY)*, 2012.

[62] Y. Zhou and X. Jiang, "Dissecting android malware: Characterization and evolution", in *Proceedings of the IEEE Symposium on Security and Privacy (SP). IEEE*, pp. 95-109, 2012.

[63] D. H. Ting, S. F. Lim, T. S. Patanmacia, C. G. Low, G. C. Ker, "Dependency on Smartphone and the impact on purchase behavior", *Young Consumers*, vol. 12, n°3, pp. 193-203, 2011.

ISSN 2356-5608