Marketing and Management of Innovations
Issue 2, 2022

ISSN 2227-6718 (on-line)
ISSN 2218-4511 (print)

https://doi.org/10.21272/mmi.2022.2-12

JEL Classification: M15, M10

Abdelhak Ait Touil,
Hassan 2 University, Morocco
ORCID ID, 0000-0003-4816-1420
Email: aitouil@hotmail.com
Siham Jabraoui,
Hassan 2 University, Morocco
ORCID ID, 0000-0001-7427-896X
Email: sihamjabraoui@gmail.com

Correspondence author: aitouil@hotmail.com

AN EFFECTIVE COMMUNICATION STRATEGY BASED ON TRUST: THE KEY ELEMENT TO ADOPTING OF A COVID-19 CONTACT TRACKING APPLICATION

Abstract. *To cope with the COVID-19 pandemic, contact tracing applications have been proposed to limit positive cases and reinforce other measures, especially before the appearance of vaccines. A high rate of adoption by citizens is required. This study investigates the impact of trust on the adoption of tracking applications. A survey was administered in Morocco, where the authorities proposed the «Wiqaytna» application. Structural Equation Modeling was used to test the hypotheses of the proposed model. The model explains 53% of the variance of the "intention to use" and 40.8% of the "actual use" of the application. The model was based on the UTAUT technology acceptance model and the GAM model of e-gov service acceptance. Our main objective was to study the impact of trust in the decision of Moroccans to use this type of application. Technology trust, government trust and social influence were important determinants of intention to use. The proposed model also shows that perceived awareness is an important antecedent of trust constructs. The impact of «perceived awareness» on the trust constructs (technology and government) is stronger than the social influence on the latter. Moreover, our model shows that «Perceived Awareness» has a more significant impact on «technology trust» than on «government trust». Due to their lack of interest (in seeking information) and attention (communications on the application), citizens lack information about the application's usefulness and the security of users' data. Even those who have had contact with the information they are looking for cannot often verify its credibility (e.g. the source code of the «Wiqaytna» application was available on Github). Therefore, cognitive and individual factors give way to social influence, and the intention to use becomes dependent on the norms and suggestions of influential people in the individual's environment. The latter construct is complex and has multiple determinants. Several factors act on the construction of trust in the authorities' quality of public services. Finally, the strongest relationship in the model is the effect of intention to use on using the Wiqaytna application. Based on these findings, suggestions are made for policymakers. First, a significant effort must be made to improve citizens' awareness of the importance of such an application for the control of the pandemic, even after the launch of the vaccination campaign and the application of social distancing measures. Indeed, a few posters here and there and a few commercials are not enough. An effective communication strategy must be built to explain to citizens the critical role these applications can play and reduce fears about citizens' privacy to increase the adoption rate of these applications. Secondly, the role of social influence is critical in adopting applications. This must be considered in communication campaigns and the involvement of opinion leaders and influencers to be more effective and increase the intention to use them.*

Keywords: contact tracing app; technology trust; government trust; social influence; perceived awareness.

Introduction. The world is facing a severe health crisis. All the traditional means of fighting against pandemics have been put in place: general confinement, progressive de-confinement, social distancing, mass testing, use of masks, travel restrictions, etc. In this fight against COVID-19, the use of technology

Cite as: Touil Ait, A., & Jabraoui, S. (2022). An Effective Communication Strategy Based on Trust: the Key Element to Adopting a Covid-19 Contact Tracking Application. *Marketing and Management of Innovations*, 2, 128–140. http://doi.org/10.21272/mmi.2022.2-12

Received: 13 May 2022 **Accepted:** 3 June 2022 **Published:** 30 June 2022

has not been outdone. Indeed, several countries have managed to take advantage of technologies such as Big Data and Artificial Intelligence. There are many ways in which Big Data and artificial intelligence can contribute to the fight against the coronavirus pandemic. The benefits of Big Data include facilitating communication, making telecommuting more feasible, using artificial intelligence to identify new opportunities to fight the virus, streamlining the use of resources (material and human) and minimising the need to go out using the IoT (Internet of Things).

Among the technological solutions adopted in the early stages of the pandemic, Covid-19 positive case tracking applications were presented as a complementary tool to the manual tracking already in place. South Korea is one of the countries that has effectively used Big Data in the face of this pandemic (Kh, 2020). Big Data has been used to track infected contacts and search for patterns to identify sources of infection. Other countries are following their model. For example, China uses Big Data technologies to analyse people's movements via cell phones and mobile applications (Yuan, 2020). Data from telecom operators are used to construct the path of the spread of COVID-19, which is essential to know who has been in contact with infected people to quarantine them. Currently, as contamination within communities reaches exponential levels, the focus is on data collected from cell phones (Oliver et al., 2020). This data is valuable in assessing the effectiveness of policies implemented through monitoring mobility between and within affected municipalities. In this quest for data retrieval from contact tracing applications, two approaches have emerged (Cohen et al., 2020): a more centralised approach favoured by governments in China, South Korea, Taiwan and elsewhere and a decentralised, user-centric approach supported by the joint Apple-Google system and favoured by some but not all European countries. Some governments (Austria, Estonia, Germany, and Switzerland), including Morocco, favour the decentralisation approach developed by a group of European academics called DT-3P, in which contacts are notified of their proximity to infected persons. However, health authorities are only informed if the individual chooses to do so(Cohen et al., 2020). However, many of these initiatives have failed. They have met little enthusiasm from the population. In France, for example, the president has recognised the failure of the application «StopCOVID», which was downloaded only 2.6 million times (Reynaud, 2020). This is the case also in Morocco, where the application «Wiqaytna», launched by the Ministry of Interior on May 22, 2020, has not reached until the end of November the two million users out of a population of 36 million (an adoption rate of less than 5%). After the appearance of the vaccine in Morocco, this application is no longer available for download. However, the literature states that contact tracing applications cannot effectively improve traditional methods without widespread population adoption. A recent simulation suggests that the COVID-19 pandemic can be eliminated with 80% of the population, whereas the minimum required for the tracing application to be practical is 56% of the total population (Ferretti et al., 2020). Furthermore, a voluntary system without effective incentives is unlikely to achieve sufficient adoption. Therefore, understanding the factors influencing adoption (app installation) and engagement (app use) with digital tracing apps is crucial to implementing appropriate measures to smooth the curve of the pandemic spread.

Research has identified issues such as capacity (e.g., knowledge, skills), opportunity (e.g., resources, norms), and motivation (e.g., perceived usefulness, trust in institutions, concerns about use) as prevalent factors in the adoption of and commitment to using e-health applications as well as their success.

This research aims to contribute to understanding the reasons for the adoption by Moroccans of the «Wiqaytna» application. To do so, the interest is focused on a factor that the literature considers important in the adoption of technologies, the adoption of government services and the adoption of e-health services, namely «Trust».

The objective of this research is to identify the impact of trust in the decision of Moroccans to adopt the «Wiqaytna» application.

The research question is, therefore, the following: What is the impact of trust on Moroccans' adoption of the COVID-19 contact tracing application?

Literature Review. Contact tracing applications can significantly help control the rate of expansion of the COVID-19 pandemic and thus allow to «smooth the curve» until a vaccine is administered and cures are developed. However, public adoption of these applications remains dependent on the «trust» that is placed in them. Citizens are concerned about data privacy issues and data security issues. Data concerns may reduce adoption rates below those required to ensure the effectiveness of tracking applications (Horvath et al., 2020). It follows that the adoption by citizens of tracing applications is a situation of risk-taking. Namely, the risk of having information about one's private life disclosed or made available to people with bad intentions. According to Johnson-George and Swap, «the willingness to take risks may be one of the few characteristics common to all situations of trust» (Johnson-George and Swap, 1982). For Kee and Knox (1970) to adequately study trust, significant incentives must be involved, and the «trustor» must be aware of the risk involved.

To address the research question, a research model drawing on three theoretical frameworks is developed: the Unified Theory of Acceptance and Use of Technology (UTAUT), the e-Government Acceptance Model (GAM) and the eHealth Trust Model.

Research on technology adoption has given rise to a multitude of models. These include, for example, the Diffusion of Innovation Theory (Rogers, 1995), the Theory of Reasonable Action (Ajzen and Fishbein, 1975), the Theory of Planned Behavior (Taylor and Todd, 1995), and models of technology acceptance (Davis et al., 1989; Venkatesh et al., 2003; Venkatesh and Davis, 2000) synthesised the main models of individual technology acceptance into a Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003). Built from eight previous models, UTAUT has significantly improved its understanding of technology adoption mechanisms. This model aims to provide a more comprehensive understanding and prediction of user behaviour not individually achieved by previous models (Khechine et al., 2016). The UTAUT model contains four constructs (Expected Performance, Expected Effort, Social Influence, and Facilitating Conditions) that influence two explained variables (Behavioral Intention (BI) and Usage Behavior (UB).

According to UTAUT, Performance Expectancy, Effort Expectancy and Social Influence have been theorised and empirically found to influence Behavioral Intention to use technology, while Behavioral Intention and Facilitating Conditions determine the use of the technology (Venkatesh et al., 2016). The most significant advantage of this model over other models is that it was able to explain 74% of the variance in consumers' behavioural intention to use technology and 52% of the variance in consumers' use of the technology (Venkatesh et al., 2016). Although all the variables of this model influence the "Intention to Use" and the "Actual Use", this research is particularly interested in the explained variables, namely "intention to use" and the "actual use" of the application, as well as an explanatory variable which is "social influence". The latter refers to the «degree to which an individual perceives that important others believe that he or she should use the new system» (Venkatesh and Davis, 2000).

According to Shareef et al. (2011), the GAM model could be used in different researches and with different applications such as e-banking, e-commerce, and e-government in order to explain the adoption of technology from different perspectives: behavioural, technological, social, cultural and organisational (Shareef et al., 2011). Moreover, GAM is a robust model (Almaiah et al., 2020), and it has a comprehensive structure, which contains fourteen constructs to provide a good explanation of e-government adoption. From this model, the explanatory variable «Perceived Awareness» is adopted. Indeed several researches, such as that of (Almarashdeh and Alsmadi, 2017), have confirmed the perceived awareness as a critical motivating factor for citizens to adopt e-gov services. Public authorities must make a considerable effort to show the interest and usefulness of tracing applications for pandemic control. They must also address any concerns about data protection and privacy. Also, public health officials must inform the public of the shortcomings and limitations of voluntary digital contact tracking systems through mobile applications (Cohen et al., 2020). Otherwise, the public may acquire a false sense of security, which could encourage

an increase in risky behaviours such as the non-respect of social distancing. Digital systems cannot effectively augment traditional methods without widespread adoption. A voluntary system without effective incentives is unlikely to achieve sufficient adoption. Hence the crucial role of perceived awareness in adopting a new system.

The eHealth Trust Model was proposed by Nelson Shen et al. (2019a). The main objective of this model is to understand patient privacy in a digital health environment (Shen et al., 2019b). One of the primary constructs of this model is "Trust". Trust is a driving force in influencing an electronic service's initial and ongoing use. Researchers have long recognised that the need for trust arises only in the presence of risk. Risk is a source of uncertainty and insecurity, whereas trust is a «willingness to take risks» (Mayer et al., 1995) by altering one's perception. The construct of «trust» is borrowed from this model. In the proposed model, this construct constitutes the main explanatory variable of the intention to use. Although several disciplines (sociology, psychology, economics, etc.) define trust differently, this research adopts the definition of the field of psycho-sociology, which presents «trust» as «perceptions about others 'attributes and a related willingness to become vulnerable to others» (Alsajjan and Dennis, 2010; Rousseau et al., 1998). In the same sense, Mayer et al. (1995) define trust as «the willingness of one party to be vulnerable to the actions of another party based on the expectation that the other party will perform a particular action important to the trustor, regardless of his or her ability to monitor or control that other party». This definition highlights the trustor's vulnerability and willingness to take the risk to achieve ends that he considers more beneficial (in the context of this study: limiting the spread of the virus) than the risk taken. E-gov services are online services that require the participation of technology, citizens and government organisations (Warkentin et al., 2002). Previously, trust in e-government services was accepted as a single concept. With the growing body of research on trust in this context, authors have begun to conceptualise trust as a combination of different components such as trust in technology and trust in government (Akkaya et al., 2011).

Studies (Horvath et al., 2020) have shown that users of e-health applications are more willing to cooperate in the co-production of public services provided by public organisations compared to services provided under contract with private companies (James and Jilke, 2020). In other words, the involvement of a trusted public health provider in the development and preferably in the deployment of the tracing application can provide more motivation for citizen adoption of these applications. Something necessary to reduce the spread of infection. In this study, the trust relationship is between, on the one hand, the citizen, who is the one who trusts (trustor), and on the other hand, the government (trustee), which is the party that the citizen trusts. This research defines «trust in government» as the belief that the government will adopt and implement a system («Wiqaytna» application) with functionalities that ensure the privacy and security of citizens' data. The main concern of citizens in many countries worldwide is the fear that their information will be misused (Alomari et al., 2009).

In Morocco, the «Wiqaytna» application has been sponsored by several governmental institutions (Ministry of Health, Ministry of Interior, National Agency for the Regulation of Telecommunications, Digital Development Agency) and has received the authorisation of the National Commission for the Protection of Personal Data (CNDP) and was subject of a communication campaign (TV, Radio, posters, dedicated website, etc.).

Methodology and research methods. It is, therefore, possible to state the following hypothesis:

H1: Perceived awareness has a positive influence on trust in government.

In general, a variety of architectures are deployed for contact tracing applications. Those system architectures have different implications both for data privacy and security. A distinction is made between centralised and decentralised systems. The centralised system's main functionality is performed by a central server that processes user data, managed by a health authority and can eventually inform contacts

of an infected user of the exposure. On the other hand, a decentralised system has most of its functionality provided by the users' devices, including exposure notifications (Ahmed et al., 2020).

The privacy implications of these two systems are a serious topic of discussion. While decentralised systems are recommended to have more overall privacy features than centralised systems, the lack of central monitoring limits human involvement in the contact tracing process. On the other hand, while centralised systems have the capacity to integrate digital with human research and contact, their data servers are vulnerable to data breaches, which implies more sensitive protected data. Morocco has chosen the decentralised architecture (i.e., the most secure). A random crypto-identifier is generated and associated with the cell phone number. The cell phone number and the identifier are stored encrypted in a secure server and are never disclosed to the public. Only the identifier is then used in processing. The recorded data is encrypted at all times. The identifiers of nearby mobiles are stored only on the phone. The temporary identifier that the phone exchanges with nearby mobiles are regularly updated. The absence of a permanent identifier means that third parties cannot identify or track the application user. In no case the name of the person, the phone number, the date or the place of contamination are communicated to the crossed phones. The citizens' awareness of the technology guarantees protecting personal data contributes to the diffusion in the society of the conviction of the security of the technology used. It thus will have a positive influence on the confidence in the technology.

Therefore, it can be assumed that:

H2: Perceived awareness positively impacts the trust in the technology used by the «Wiqaytna» application.

The «Wiqaytna» application presents a challenge in terms of adoption by Moroccans on several levels. First, it is a mobile application related to health services and touches sensitive personal data. Second, it is an application presented in the particular context of an unknown international pandemic (COVID-19). Finally, it is an application proposed by the «government». These parameters suggest that citizens will be more likely to adopt or not adopt the application based on public opinion. Social influence can affect the adoption of a new system (Alsajjan and Dennis, 2010; Zhang et al., 2020). Li et al., 2008 indicated that social influence might even have a stronger weight than individual factors in forming «initial trust» in a new system. From the above, it is possible to assume that:

H3: Social influence positively affects trust in the Wiqaytna application technology.

H4**:** Social influence positively affects trust in the government concerning the Wiqaytna application.

In a systematic review of the literature on the adoption of E-Gov services in developing countries, Mustafa et al. (2020) report that out of the 41 studies examined over the period 2007-2018, a total of 19 studies used the variable of «social influence» (through several models: TAM, DOI, UTAUT...etc.) as a determinant of usage intention. Social influence can play a positive role in the intention to use contact tracing applications and thus improve their adoption of this system. Therefore, this study presents the following hypothesis:

H5: Social influence positively impacts the intention to use the «Wiqaytna» application.

In the e-government context, the literature indicates that trust is an essential predictor of e-service use. Shareef et al. (2011); Shareef et al. (2011)showed that trust (in their studies, defined as a combination of trust in the Internet and trust in the organisation) affects citizens' intention to use an e-government Service. Trust in technology is defined as «an individual's belief that the use of a technology is safe and secure» (McKnight et al., 2002). System architectures (e.g., security measures such as encryption, cited above) should instil confidence in citizens that the use of the technology will not cause harm or lead to negative consequences, such as identity theft. Confidence in technology plays an important role in forming an intention to use such technology. Van Velsen et al. (2015) found that trust in technology significantly affects the intention to use any form of online services for e-Government. On the other hand, Almaiah et al., 2020 showed in their study on the adoption of E-Gov services on cell phones that perceived trust

composed of two dimensions (trust in the Internet and trust in the government) is a significant antecedent for the promotion of usage intention.

In this paper, «Technology Trust» and «Government trust» are considered the main explanatory factors for usage intention. Therefore, this study presents the hypotheses as follows:

H6: Technology Trust positively influences the intention to use the application «Wiqaytna».

H7: Government Trust positively influences the intention to use the application «Wiqaytna».

The intention is a conative component intermediate between attitude and behaviour (Fishbien and Ajzen, 1975). Intentions cause the individual to behave in a certain way. They involve ideas such as «I will do» (Limayem and Rowe, 2003). Ajzen and Fishbein (1975) suggest that intentions are the best prognosticator of an individual's behaviour, as they allow each individual to incorporate all relevant factors that may influence actual behaviour independently. To ensure consistency with the underlying theory of all intention models, it is expected that intention to use has a significant favourable influence on technology use (Venkatesh et al., 2003). Thus, the next hypothesis is as follows:

H8: Intention to use positively influences the Actual use of the Wiqaytna application.

After presenting the theoretical foundations and the hypotheses of the research model illustrated in Figure 1, the following section will present the methodology adopted and the results obtained.

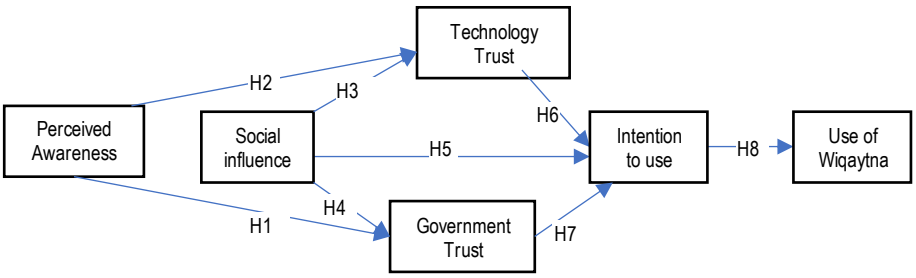

Figure 1. Conceptual model: The impact of trust on the adoption of a contact tracing app

Sources: developed by the authors.

To test the research model, a survey was administered from January 10, 2021, to February 05, 2021. The non-probability method was chosen. Mainly the snowball effect was used through instant messaging applications and social networks to disseminate an online survey. 321 valid responses were collected. The demographics of the respondents are presented in Table 1. Respondents had the choice of answering the survey in Arabic or French. Of those who chose French, were 244. To verify the homogeneity of the answers of the two categories of respondents, the Student's *t*-test on SPSS 26 was performed. All the survey items tested the hypothesis of equal variances (Levene's test) except for two. No statistically significant difference was found in the survey items between the two groups of the sample (the lowest significance level being 0.096). All survey items about the model constructs were measured on a 5-point Likert scale with 1: strongly disagree and 5: strongly agree. The structural equation modelling method (SEM-PLS) using the SmartPLS 3.0 software was adopted to analyse the research model. This analysis has the merit of distinguishing between the evaluation of the measurement model and the structural model, thus allowing for the consideration of measurement errors (Henseler et al., 2009). It is often done in two steps (Anderson and Gerbing, 1988). The first step involves assessing the measurement model (Convergent validity, Discriminant validity). The second concerns the assessment of the structural model (Path coefficient, Coefficient of determination, Goodness of fit, etc.). The rest of this section will be done in this order. To evaluate the convergent validity of the model factors loading of Items, Chronbach's Alpha (CA), Composite Reliability (CR) and the Average Variance Extracted (AVE) were used.

Table 1. Demographics of the sample

		percentage %
Genre	Female	63,6
	Male	36,4
Education	BAC +4 and plus	38,9
	BAC +2/3	45.2
	BAC or Less	15.9
Occupation	Student	73,5
	Employee	22.6
	Unemployed	2.8
	Retired	0.9
Age	16-25	75.7
	26-55	22.7
	>55	1.6
Health problem	No	86
	Yes	14

Sources: developed by the authors.

All model constructs are tested except "Actual Usage", which is a single item variable and not a latent variable. Table 2 shows the results obtained. The value of CA and CR of all the constructs exceeds the threshold of 0.7 recommended by Nunnally and Bernstein (Marler et al., 2006). Moreover, the Average Variance Extracted indicator, which measures how much a construct explains the variance of these items and which must exceed the threshold of 0.5, is very satisfactory since the lowest value is 0.667. It can therefore be stated that the Convergent validity of the research model is very satisfactory.

Table 2. Convergent Validity

	Cronbach's Alpha	Composite Reliability	AVE
Perceived Awareness	0,757	0,857	0,667
Government Trust	0,856	0,903	0,704
Intention to Use	0,837	0,903	0,758
Social Influence	0,795	0,880	0,712
Technology Trust	0,851	0,900	0,694

Sources: developed by the authors

For the reliability measure of each item, the Outer loading (or factor loading), which must exceed 0.5 (Hair et al., 2017), is tested. Table 3 shows that all items register a value above 0.7 except for GT4, which registers only 0.623.

Table3. Item's reliability

ITEM	AW1	AW2	AW3	GT1	GT2	GT3	GT4	IU1	IU2
Factor loading	0,763	0,811	0,871	0,899	0,892	0,908	0,623	0,929	0,922
ITEM	**IU3**	**SI1**	**SI2**	**SI3**	**TT1**	**TT2**	**TT3**	**TT4**	
Factor loading	0,749	0,905	0,873	0,744	0,854	0,881	0,711	0,875	

AW: Perceived Awareness, GT: Government Trust, IU: Intention to Use, SI: Social Influence, TT: Technology Trust

Sources: developed by the authors.

Indicators with outer loading between 0.4 and 0.7 should be removed, but only if their removal increases the Composite Reliability of the construct (Hair et al., 2017). That was not the case here, so the indicator GT4 remained. In summary, the measurement scales present an excellent convergent validity and reliability. Discriminant validity is the extent to which a construct is distinct from other constructs.

Cross-loadings, as shown in Table 4, are used to assess discriminant validity. In this table, it is clear that the loadings of each item (in bold) are more significant on its associated construct than on other constructs.

Another measure of discriminant validity is the square root of AVE suggested by Fornell and Larker6 in 1981. The logic of this criterion is that each construct shares more variance with these indicators than with any other construct.

Table 4. Confirmatory factor analysis (Cross loadings)

	Perceived Awareness	Government Trust	Intention to Use	Social Influence	Technology Trust
AW1	0,763	0,263	0,258	0,295	0,303
AW2	0,811	0,387	0,467	0,435	0,378
AW3	0,871	0,452	0,430	0,407	0,531
GT1	0,364	0,899	0,556	0,378	0,553
GT2	0,449	0,892	0,503	0,415	0,583
GT3	0,488	0,908	0,575	0,428	0,583
GT4	0,197	0,623	0,342	0,147	0,259
IU1	0,414	0,580	0,929	0,529	0,549
IU2	0,439	0,553	0,922	0,588	0,551
IU3	0,420	0,420	0,749	0,401	0,434
SI1	0,479	0,408	0,547	0,905	0,422
SI2	0,418	0,369	0,515	0,873	0,411
SI3	0,274	0,300	0,416	0,744	0,317
TT1	0,501	0,562	0,533	0,457	0,854
TT2	0,438	0,472	0,498	0,375	0,881
TT3	0,319	0,410	0,394	0,269	0,711
TT4	0,433	0,577	0,526	0,397	0,875

AW: Perceived Awareness, GT: Government Trust, IU: Intention to Use, SI: Social Influence, TT: Technology Trust

Sources: developed by the authors.

Table 5 shows that the model respects this condition since the values on the diagonal (in bold) are more significant than those on the bottom or left.

Table 5. Correlations between constructs and square roots of the average variance extracted

	Awareness	Government Trust	Intention to Use	Social Influence	Technology Trust	Use
Awareness	0,817					
Government Trust	0,466	0,839				
Intention to Use	0,485	0,600	0,871			
Social Influence	0,471	0,429	0,588	0,844		
Technology Trust	0,515	0,613	0,591	0,458	0,833	
Use	0,355	0,364	0,639	0,504	0,466	1.000*

*single item

Sources: developed by the authors.

Based on these two criteria, it can be stated that the discriminant validity of the measurement model is good and that, in general, the measurement model benefits from a good convergent and discriminant

validity. To evaluate the research model, a set of indicators is used: the Goodness of fit (Gof), the path coefficient (standard Beta) and the Coefficient of determination (R^2). Figure 2 shows the path coefficients between the variables of the model as well as the Coefficient of determination of the endogenous variables.

The Gof indicator was proposed by Tenenhaus et al. (2005) to assess a model globally both on its measurement model and structural model. The indicator represents "an operational solution to this problem as it may be meant as an index for validating the PLS model globally" (Tenenhaus et al., 2005). It is calculated as the Geometric Mean of the Average Variance Extracted and average R^2 as follows:

$$Gof=\sqrt[2]{Average\ AVE * Average\ R^2} \quad (1)$$

$$Gof=\sqrt[2]{0.756 * 0.384} \quad (2)$$

Gof=0.539

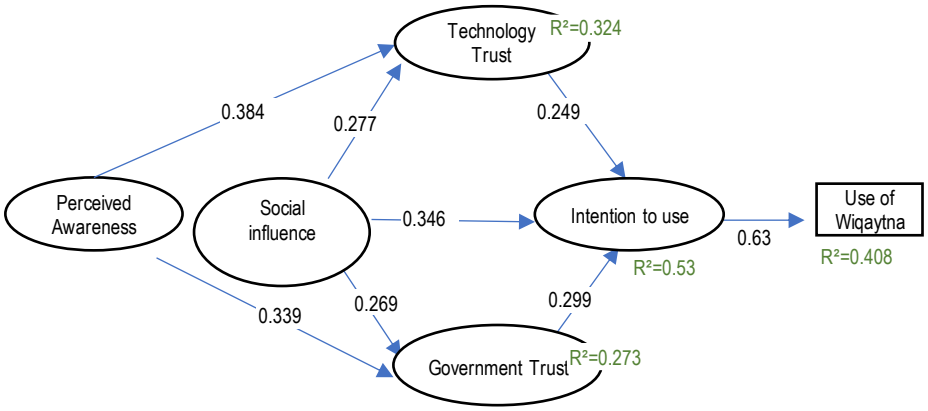

Figure 2. Results of the research model

Sources: developed by the authors.

According to Wetzels et al. (2009), a model must have a Gof higher than 0.36 to be considered globally valid. The proposed model has a Gof of 0.539, so it is globally valid.

Assuming a significance level of 5%, all the model relationships are significant, as shown in Table 6 (p-Value<0.001). The confidence interval provides information on the stability of the estimated Coefficient (Hair et al., 2017). When the confidence interval does not contain the zero value, it means a significant relationship. As shown in Table 6, none of the confidence intervals contains the zero value. This is one more indication (in addition to the p-Value) that all the assumptions in the model are significant.

In total, the research model was able to explain 53% of the variance in the «Intention to Use» the Wiqaytna application and 40.8% of the variance in its «Actual Use». In other words, the «Technology Trust», «Government Trust», and «Social Influence» constructs explain 53% of Moroccans' «Intention to use» the Wiqaytna application. There is no significant difference between the level of influence of «Technology Trust» and «Government Trust», respectively β=0.249 and β=0.299. The direct impact of «Social Influence» on the «Intention to Use» application is the strongest, with a β=0.346. This role played by the social influence on the intention to use has been relatively verified by research in information systems through the UTAUT model (Khechine et al., 2016).

These results seem different from those of the study of Zhang et al. (2020), for example, which found that the direct impact of «trust» on the intention to use is more significant than that of «social influence», but it must be noticed here that the authors of the aforementioned study used trust as a single global

construct. In contrast, the research model of this paper split this construct into two dimensions: «Technology Trust» and «Government Trust».

Table 6. Detail Results of Research Model

Hy	Relation	Path coefficients	t-Value	p-Value	95% confidence intervals	Supported
H1	Awareness ➔ Government Trust	0.339	5.412	0.000	[0.214,0.461]	Yes*
H2	Awareness ➔Technology Trust	0.384	7.035	0.000	[0.275,0.491]	Yes*
H3	Social Influence ➔ Technology Trust	0.277	5.011	0.000	[0.166,0.386]	Yes*
H4	Social Influence ➔Government Trust	0.269	4.716	0.000	[0.155,0.380]	Yes*
H5	Social Influence ➔ Intention to Use	0.346	7.332	0.000	[0.254,0.438]	Yes*
H6	Technology Trust ➔ Intention to Use	0.249	4.530	0.000	[0.139,0.355]	Yes*
H7	Government Trust ➔ Intention to Use	0.299	5.757	0.000	[0.197,0.398]	Yes*
H8	Intention to Use ➔ Use	0.639	20.934	0.000	[0.577,0.695]	Yes*

*Note *p-Value<0.001*

Sources: developed by the authors.

That said, if considering both the direct and indirect effect (total effect) of the exogenous variables on the two endogenous variables, «Intention to Use» and «Actual Use», as shown in Table 7, one can find that the total effect of social influence on intention to use (0.495) is stronger than that of «technology trust» (0.249) and «Government Trust» (0.299) on «Intention to Use». This is the same finding as Zhang et al. (2020). This is normal since social influence acts directly on the intention to use and indirectly through «Technology Trust» and «Government Trust». However, the total cumulative effect of the two trust constructs is equivalent to that of social influence (0.249+0.299).

Table 7. Total effects of exogenous variables

	Original Sample	t-Value	p-Values
Awareness ➔ Intention to Use	0.197	5.638	0.000
Awareness ➔Use	0.126	5.411	0.000
Social Influence ➔Intention to Use	0.495	11.558	0.000
Social Influence ➔ Use	0.316	9.479	0.000
Government Trust ➔ Intention to Use	0.299	5.757	0.000
Government Trust ➔ Use	0.191	5.639	0.000
Technology Trust➔ Intention to Use	0.249	4.530	0.000
Technology Trust ➔ Use	0.159	4.385	0.000

Source: developed by the authors.

This determining role of «social influence» can be understood for two reasons. First is the novelty of this type of application in the Moroccan context. Indeed, due to their lack of interest (in seeking information) and attention (communications on the application), citizens lack information about the application's usefulness and the security of users' data. Even those who have had contact with the information they are looking for cannot often verify its credibility (e.g. the source code of the «Wiqaytna» application was available on Github). Therefore, cognitive and individual factors give way to social influence, and the intention to use becomes dependent on the norms and suggestions of influential people in the individual's environment.

The two exogenous variables «Perceived awareness» and «social influence» explain 32.4% of «Technology Trust» and only 27.3% of «Government Trust». Note, however, that «perceived awareness» has a more significant impact than «social influence» on both «technology trust» (β=0.384 versus β=0.277) and «government trust» (β=0.339 versus β=0.269). Moreover, from the results found, the two exogenous variables have more influence on «Technology Trust» than on «Government Trust». The latter construct is complex and has multiple determinants. Several factors act on the construction of trust in the authorities (politicians' image (Downe et al., 2013), quality of public services (Zhao and Hu, 2017) ...etc.).

Finally, the strongest relationship in the model is the effect of intention to use on the use of the Wiqaytna application (β=0.639), which alone explains 40.8% of the Actual Use of the application. This confirms the robustness of the UTAUT model.

Conclusion. This study proposed a model for accepting a COVID-19 tracing application and tested it empirically in the context of a developing country (Morocco) that launched the "Wiqaytna" application in May 2020. The research model was based on the UTAUT technology acceptance model and the GAM model of e-gov service acceptance. The main objective was to study the impact of trust in the decision of Moroccans to use this type of application. The results found confirm all the hypotheses. Indeed, instead of treating «Trust» as a single construct as many studies have done before, this construct was split into two dimensions: «Technology trust» and «Government trust». These two factors have a considerable impact on the «Intention to Use» of the «Wiqaytna» application, and «Social Influence» is the factor that acts most on «Intention to Use» directly and indirectly through the two «trust» constructs. The research model also highlights the importance of «Perceived Awareness» as a determinant of trust. The impact of «perceived awareness» on the trust constructs (technology and government) is stronger than the social influence on the latter. Moreover, it shows that «Perceived Awareness» has a more significant impact on «technology trust» than on «government trust».

The finding of this study has some important implications. First, a significant effort must be made to improve citizens' awareness of the importance of such an application for the control of the pandemic, even after the launch of the vaccination campaign and the application of social distancing measures. Indeed, a few posters here and there and a few commercials are not enough. An effective communication strategy (Durrheim et al., 2021) must be built to explain to citizens the critical role that these applications can play and reduce fears about citizens' privacy in order to increase the adoption rate of these applications. Secondly, the role of social influence is critical in adopting applications. This must be considered in communication campaigns and the involvement of opinion leaders and influencers to be more effective and increase the intention to use them.

This study suffers from several limitations. First the low number of respondents to the survey. Indeed, many respondents refused to participate because of their unfamiliarity with the application (which refers to their low awareness of the application). Secondly is the sample's regional distribution, where some regions predominate, and others are poorly represented. Finally, the age group of 15-26 years is the most represented. On the one hand, it is beneficial since it represents the category of the society the most active and the most likely to transmit the virus, but the age group of 55 and more is the most fragile in front of Covid-19 but unfortunately the least represented in the sample. For all these reasons, generalisation of the results should be cautioned.

Author Contributions: conceptualisation, A. A and S. J; methodology, A. A and S. J; software, A. A.; validation, S. J.; formal analysis, A. A.; investigation, A. A; data curation, A. A.; writing-original draft preparation, A. A.; writing-review append editing, A. A and S. J.; visualisation, A. A.; supervision, S. J.; project administration, S. J.

Funding: This research received no external funding.

References

Ahmed, N., Michelin, R. A., Xue, W., Ruj, S., Malaney, R., Kanhere, S. S., ... & Jha, S. K. (2020). A survey of COVID-19 contact tracing apps. *IEEE access*, *8*, 134577-134601. [Google Scholar] [CrossRef]

Almaiah, M. A., Al-Khasawneh, A., Althunibat, A., & Khawatreh, S. (2020). Mobile Government Adoption Model Based on Combining GAM and UTAUT to Explain Factors According to Adoption of Mobile Government Services. *International Journal of Interactive Mobile Technologies*, (3). [Google Scholar] [CrossRef]

Almarashdeh, I., & Alsmadi, M. K. (2017). How to make them use it? Citizens acceptance of M-government. *Applied Computing and Informatics*, *13*(2), 194-199. [Google Scholar] [CrossRef]

Alsajjan, B., & Dennis, C. (2010). Internet banking acceptance model: Cross-market examination. *Journal of business research*, *63*(9-10), 957-963. [Google Scholar] [CrossRef]

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological bulletin*, *103*(3), 411. [Google Scholar]

Cohen, I. G., Gostin, L. O., & Weitzner, D. J. (2020). Digital smartphone tracking for COVID-19: public health and civil liberties in tension. *Jama*, *323*(23), 2371-2372. [Google Scholar] [CrossRef]

Davis, F. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, *35*, 982-1003. [Google Scholar] [CrossRef]

Downe, J., Cowell, R., Chen, A., & Morgan, K. (2013). The determinants of public trust in English local government: how important is the ethical behaviour of elected councillors?. *Revue Internationale des Sciences Administratives*, *79*(4), 643-664. [Google Scholar] [CrossRef]

Durrheim, D. N., Andrus, J. K., Tabassum, S., Bashour, H., Githanga, D., & Pfaff, G. (2021). A dangerous measles future looms beyond the COVID-19 pandemic. *Nature Medicine*, *27*(3), 360-361. [Google Scholar] [CrossRef]

Reynaud, F. (2020). Emmanuel Macron acte l'échec de l'application StopCovid et annonce une nouvelle version: «Tous anti-Covid ». Retrieved from [Link]

Ferretti, L., Wymant, C., Kendall, M., Zhao, L., Nurtay, A., Abeler-Dörner, L., ... & Fraser, C. (2020). Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing. *Science*, *368*(6491), eabb6936. [Google Scholar] [CrossRef]

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological bulletin*, *84*(5), 888. [Google Scholar] [CrossRef]

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, *18*(1), 39-50. [Google Scholar] [CrossRef]

Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage publications. [Google Scholar]

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. *20*, 277-319. [Google Scholar] [CrossRef]

Horvath, L., Banducci, S., & James, O. (2022). Citizens' attitudes to contact tracing apps. *Journal of Experimental Political Science*, *9*(1), 118-130. [Google Scholar] [CrossRef]

Johnson-George, C., & Swap, W. C. (1982). Measurement of specific interpersonal trust: Construction and validation of a scale to assess trust in a specific other. *Journal of personality and social psychology*, *43*(6), 1306. [Google Scholar] [CrossRef]

Kee, H. W., & Knox, R. E. (1970). Conceptual and methodological considerations in the study of trust and suspicion. *Journal of conflict resolution*, *14*(3), 357-366. [Google Scholar] [CrossRef]

Kh, R. (2020). Big Data Making Massive Strides On COVID-19 Battle. SmartData Collective. Retrieved from [Link]

Khechine, H., Lakhal, S., & Ndjambou, P. (2016). A meta-analysis of the UTAUT model: Eleven years later. *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration*, *33*(2), 138-152. [Google Scholar] [CrossRef]

Marler, J. H., Liang, X., & Dulebohn, J. H. (2006). Training and effective employee information technology use. *Journal of Management*, *32*(5), 721-743. [Google Scholar] [CrossRef]

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organisational trust. *Academy of management review*, *20*(3), 709-734. [google Scholar] [CrossRef]

Mustaf, A., Ibrahim, O., & Mohammed, F. (2020). E-government adoption: A systematic review in the context of developing nations. *International Journal of Innovation: IJI Journal*, *8*(1), 59-76. [Google Scholar] [CrossRef]

Oliver, N., Lepri, B., Sterly, H., Lambiotte, R., Deletaille, S., De Nadai, M., ... & Vinck, P. (2020). Mobile phone data for informing public health actions across the COVID-19 pandemic life cycle. *Science advances*, *6*(23), eabc0764. [Google Scholar] [CrossRef]

Rogers, E. M. (1995). Lessons for guidelines from the diffusion of innovations. *The Joint Commission Journal on Quality Improvement*, *21*(7), 324-328. [Google Scholar] [CrossRef]

Rousseau, D. M., Sitkin, S. B., Burt, R. S., & Camerer, C. (1998). Not so different after all: A cross-discipline view of trust. *Academy of management review*, *23*(3), 393-404. [Google Scholar] [CrossRef]

Shareef, M. A., Kumar, V., Kumar, U., & Dwivedi, Y. K. (2011). e-Government Adoption Model (GAM): Differing service maturity levels. *Government information quarterly*, *28*(1), 17-35. [Google Scholar] [CrossRef]

Shen, N., Strauss, J., Silver, M., Carter-Langford, A., & Wiljer, D. (2019). The eHealth Trust Model: A Patient Privacy Research Framework. *Studies in Health Technology and Informatics*, *257*, 382-387. [Google Scholar]

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information systems research*, *6*(2), 144-176. [Google Scholar] [CrossRef]

Tenenhaus, M., Vinzi, V. E., Chatelin, Y. M., & Lauro, C. (2005). PLS path modeling. *Computational statistics & data analysis*, *48*(1), 159-205. [Google Scholar] [CrossRef]

van Velsen, L., van der Geest, T., van de Wijngaert, L., van Den Berg, S., & Steehouder, M. (2015). Personalisation has a Price, Controllability is the Currency: Predictors for the intention to use Personalised eGovernment Websites. *Journal of Organizational Computing and Electronic Commerce*, *25*(1), 76-97. [Google Scholar] [CrossRef]

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478. [Google Scholar] [CrossRef]

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science*, *46*(2), 186-204. [Google Scholar] [CrossRef]

Venkatesh, V., Thong, J. Y., & Xu, X. (2016). Unified theory of acceptance and use of technology: A synthesis and the road ahead. *Journal of the association for Information Systems*, *17*(5), 328-376. [Google Scholar] [CrossRef]

Warkentin, M., Gefen, D., Pavlou, P. A., & Rose, G. M. (2002). Encouraging citizen adoption of e-government by building trust. *Electronic markets*, *12*(3), 157-162. [Google Scholar] [CrossRef]

Wetzels, M., Odekerken-Schröder, G., & Van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS quarterly*, 177-195. [Google Scholar] [CrossRef]

Yuan, S. (2020). How China is using AI and big data to fight the coronavirus. Retrieved from [CrossRef]

Zhang, T., Tao, D., Qu, X., Zhang, X., Zeng, J., Zhu, H., & Zhu, H. (2020). Automated vehicle acceptance in China: Social influence and initial trust are key determinants. *Transportation research part C: emerging technologies*, *112*, 220-233. [Google Scholar] [CrossRef]

Zhao, D., & Hu, W. (2017). Determinants of public trust in government: Empirical evidence from urban China. *Revue Internationale des Sciences Administratives*, *83*(2), 365-384. [Google Scholar]

Alomari, M. K., Sandhu, K., & Woods, P. (2009, November). E-government adoption in the Hashemite Kingdom of Jordan: factors from social perspectives. In *2009 International Conference for Internet Technology and Secured Transactions,(ICITST)* (pp. 1-7). IEEE. Google Scholar[] [CrossRef]

Akkaya, C., Obermeier, M., Wolf, P., & Krcmar, H. (2011, August). Components of trust influencing e-government adoption in Germany. In *International Conference on Electronic Government* (pp. 88-99). Springer, Berlin, Heidelberg. [Google Scholar] [CrossRef]

Абдельхак Айт Туїл, Університет Хасана 2, Марокко
Сіхам Джабрауї, Університет Хасана 2, Марокко

Ефективна комунікаційна стратегія: ключовий елемент відстеження COVID-19

Одним із заходів обмеження поширення пандемії COVID-19 є впровадження обов'язкового використання додатків з відстеження місця перебування захворілих. У статті проаналізовано вплив довіри на застосування додатків для відстеження місця перебування. Опитування проведено в Марокко щодо використання державного додатку «Wiqaytna». Для перевірки гіпотез дослідження використано рівняння структурного моделювання. Результати дослідження засвідчили, що побудована модель пояснює 53% дисперсії «наміру використовувати» і 40,8% «фактичного використання» додатку. Дослідження засноване на моделі прийняття технології UTAUT та моделі прийняття послуг електронного урядування GAM. Емпіричні результати засвідчили, що довіра до технологій та державних органів влади мали статистично значущий вплив на намір використовувати додаток. Запропонована модель також показує, що сприйнята обізнаність є важливим антецедентом конструктів довіри. Вплив «усвідомленої обізнаності» на довірчі конструкції (технології та уряд) сильніший, ніж соціальний вплив на останні. Більше того, сформована модель дослідження показує, що «сприйнята обізнаність» має більш значний вплив на «довіру до технологій», ніж на «довіру уряду». Через відсутність інтересу (пошук інформації) та уваги (комунікації щодо програми) серед громадян, їм бракує інформації про корисність програми та безпеку даних користувачів. Навіть ті, хто мав контакт з інформацією, яку вони шукають, часто не можуть перевірити її достовірність. Тому когнітивні та індивідуальні фактори поступаються місцем соціальному впливу. Визначено, що на рівень довіри до державних послуг влади впливає декілька факторів. Авторами визначено доцільність просвітницьких заходів щодо підвищення рівня обізнаності громадян про важливість боротьби з пандемією навіть після початку кампанії вакцинації та застосування заходів соціального дистанціювання. Необхідним є розроблення ефективної комунікаційної стратегії, щоб пояснити громадянам важливу роль додатку «Wiqaytna». Це тим самим сприятиме зменшенню побоювань щодо втрати конфіденційних даних. Крім цього до рекламних кампаній доцільно залучати лідерів думок та впливових осіб для формування громадської думки.

Ключові слова: додаток для відстеження контактів; довіра до технологій; державна довіра; соціальний вплив; сприйняте усвідомлення.