

Agency vs. Stewardship Theory in Local Government Contracted Mobile Apps: Analysis of Survey Data on User Satisfaction in China

Bruce J. Perlman, School of Public Administration, University of New Mexico, USA

Christopher G. Reddick, Department of Public Administration, The University of Texas at San Antonio, USA

Yueping Zheng, Sun Yat-sen University, Guangzhou, China

ABSTRACT

This paper examines citizen satisfaction levels with local government contracted mobile platforms and applies two theories of the contracting relationship to them: principal-agent and stewardship theory. It uses survey data to compare citizen satisfaction factors for mobile phone applications (apps) contracted by Chinese local governments. It looks at contracting out, a key element of privatization, from a unique perspective. Most research on government contracting focuses on cost and quality in service delivery. This research looks at citizen satisfaction with contracted mobile platforms. Ordered logistic regression analysis is used on data from a user survey of local government contracted mobile apps in 30 cities in China. The study found that the strongest predictors of contracted mobile apps satisfaction were usability, overall app satisfaction, and trust, supporting the stewardship theory. The results challenge existing research showing that citizen satisfaction is influenced more by openness and trust than by cost, at least in mobile apps.

KEYWORDS

Citizen Satisfaction, Contracting, Local Government, Mobile Apps, Privatization, Survey Research

INTRODUCTION

Research shows that by enabling innovation in public services, government use of mobile applications or “apps” provides new opportunities for better governance and improved customer satisfaction (Gil-Garcia, Helbig, and Ojo, 2014). Mobile government can be defined as the use of mobile and wireless communication technologies, such as mobile apps, by government to deliver information to citizens and businesses and receive information from them (Ntaliani, Costopoulou, and Karetos, 2008). The use of these falls squarely in what has been called “m-government.” This contact channel provides a good way for governments to provide less expensive alternatives to data dissemination and access through smartphones, enabling citizens to obtain information and access public services through the mobile apps (Ohemeng and Ofosu-Adarkwa, 2015).

The purpose of this paper is to examine influences on citizen satisfaction with mobile apps contracted for use by government for citizen interactions. This is important because, prior research shows that e-government website contacts are related to citizen satisfaction with government in general (Cohen, 2006; Reddick and Zheng, 2017). Satisfaction is particularly important for governments that

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want to use mobile apps to increase civic engagement with government and improve public service delivery (Ingrams, 2015).

This paper looks at a relatively new phenomenon in an understudied context. The e-government literature has not studied existing, private mobile apps as a contracted platform for government service delivery communications. The literature largely has failed to distinguish between citizen satisfaction with bespoke mobile apps developed by government that are related to its own business and multi-purpose mobile apps that are used broadly across the public and private sectors. In addition, neither has been examined in the context of a fast-growing developing country such as China (Eom, Lee, and Kim, 2012), as this study does.

There are two dominant theories of contracting out to found in the privatization literature in the public administration literature. The most commonly cited theory is *public choice* which begins from a hierarchical relationship among two actors when a *principal* (government) hires an *agent* (contractor) to perform a specific task or service (Brown, Potoski, and Van Slyke, 2006). This theory anticipates that a self-interested agent will focus on reducing costs to generate the most profits and thus will “shirk” in some way in the specific performance. This theory assumes *individual* welfare maximizing behavior by both parties. The second more recently discussed theory in privatization research is *stewardship* (Davis, Schoorman, and Donaldson, 1997). Unlike public choice theory, stewardship posits a lateral relationship between two actors (government and contractor) collaborating to achieve a common good by a specific task or service. This theory expects that a mutuality of interest will lead the agent and government to construct trust and align public and private value. This theory assumes *collective* behavior of both government and the contracted contractor.

This paper applies the public choice and stewardship theories to government contracting for the use of mobile apps and citizens’ satisfaction with these apps. Through a statistical analysis of survey data in China, evidence is found that citizens seem more satisfied when local government contracts to use mobile apps from contracted vendors rather than using those developed by the government. One question left unanswered by this fact alone is the degree to which either public choice or stewardship theories can help explain this difference. In keeping with the foregoing, the following research question is stated, (RQ).

RQ: What are the principal influences of citizen satisfaction with contracted mobile apps used in public service interactions especially about factors involved in principal-agent and stewardship theories?

This paper is divided into eight principal sections including this introduction. The second section examines some literature and theories relevant to contracting out with a focus on their views of its potential effects on citizen satisfaction. This includes providing a context for the empirical study with background information on Internet use and mobile apps (public and private) in China. Third, the hypotheses to be tested are presented and derived. Fourth, the research methods are discussed. Fifth, descriptive statistics of the variables tested in this study are provided. Sixth, a regression model is presented and its results tested. Seventh, the initial hypotheses are discussed considering the results. The final section is a conclusion in which a summary, limitations, and future research recommendations are presented.

BACKGROUND AND LITERATURE

Contracting Out: A Principle Form of Privatization

Government contracting is commonly defined as the delivery of public service by agents other than government employees. The often-cited advantage of government contracting-out with private firms is that it enables the government to inject private sector management practices into public services.

In public administration contracting out is closely identified with New Public Management (NPM) in the 1980s and its use of market-based principles (Alonso, Clifton, and Díaz-Fuentes, 2015). The goal of contracting-out for many cities is to reduce costs especially in the face of tight budgets. The opponents of contracting-out often argue that the public sector provides steady, well-paying jobs for the middle-class and minorities and that services from private contractors are less safe, less reliable, and ultimately more expensive (Jerch, Kahn, and Li, 2016).

Government contracting occurs in numerous service areas. One is in the field of human services where it is an indispensable component (Lu, 2013) and affects the government, the contractor, and the consumer (Schmid, 2003). Also, it has been widely used in waste management at the local level. In addition, contracting out is commonly employed by local governments in specialty areas like environmental assessments. The promise of government contracting out is to provide benefits similar to those offered to consumers in private markets (Johnston and Romzek, 2010) by using a market-like system to ensure low-cost and high-quality performance. In theory, it yields satisfaction at the lowest price.

In practice, this promise cannot always be realized. Customer satisfaction can be squeezed by the tension between government control and contractor autonomy (Schmid, 2003). Governments seek to control contract price and guarantee user satisfaction while contractors attempt to reduce costs to ensure profits (Schmid, 2003). Often these ends are in conflict. For example, in social services, contracting out can lead to a reduction in cost but a reduction in customer satisfaction as well. Service interruptions can occur especially in areas like medical care and education or services provided to children in the welfare system when the contracting cycle itself disturbs existing relationships (Johnston and Romzek, 2010).

When governments attempt to control costs by using fixed prices for contracts, contractors may be motivated to reduce quality to increase profits and as a result impair user satisfaction (Schmid, 2003). This occurs in performance-based contracts too. These contracts which seem to balance government and contractor interests, allow contractors to determine how best to achieve outcomes rather than having government propose methods contractors should use (Terman and Yang, 2010). However, this autonomy frequently shifts additional risk to contractors through increased accountability which may entice them to take shortcuts and reduce service quality in unmeasured ways (Romzek and Johnston, 2005).

Even reduced costs cannot be guaranteed by contracting out. In waste management, for example, empirical research suggests that over-reliance on competition is not sufficient to ensure cost savings over time and that decreased city expenses in the short term may actually increase in the long term (Bel and Warner, 2008). Likewise, in environmental matters the advantages of contracting out consulting is difficult to realize when governments attempt to reduce costs by shifting risk. The reduction can be erased by contracts which stipulate that the consultant faces risk for unanticipated environmental mitigation needed in the future and thus increases the contract price beyond what it should have been to account for assumption of the risk (Bauld, 2018).

The idea of efficiency gains from contracting is not borne out by empirical examination (Boyne, 1998). A review of 27 studies comparing did not show a positive impact of competition on cost savings (Bel, Fageda, and Warner, 2010). Likewise, increased satisfaction of users cannot be taken for granted. An ICMA survey of municipal officials in America's 100 largest cities showed that the respondents were only relatively satisfied with such efforts and the satisfaction level varied with the type of activity, e.g., street light repair or employment training (Dilger, Moffett, and Struyk, 1997).

There has not been an extensive study of contracting for the use of applications e-government in the public administration literature (Ya Ni and Bretschneider, 2007). E-government contracting has unique characteristics compared to the government contracting discussed above. It differs from them in three principal ways. First, the diversity of government services that can be supported by digital application makes e-government contracting a unique challenge. Second, e-government technology is rapidly changing which increases the demands on management to understand these contracts and

the technology in them. Third, many e-government services involve issues of privacy and security of personal information which must be securely stored and monitored and raises the actual and hidden transaction costs for contractors and government (Ya Ni and Bretschneider, 2007).

Two Views of Contracting: Agency and Stewardship Theories

So, when contracting does work to deliver promised benefits, why does it? Really, there are two approaches to explaining this. The first, principal-agent (agency) theory is the conventional idea that it works to the degree that the award of a contract takes advantage of self-interest under conditions of market-style competition. Principals select agents through competition on price and performance. In essence, principals contract work “out” to an agent outside their organization. The second approach to explaining why contracting works, stewardship theory, is a more novel notion that it works to the degree that managers will select contractors who share values and regard themselves as responsible for realizing them. In this view, contractors are selected because they will work with the manager to achieve organizational goals. In essence, managers contract collaboration “in” to the organization.

When viewed from the standpoint of agency theory, contracting out is a way to check the tendency of government to over-supply services that occurs when elected officials respond to the incentive to maximize their political power by having bureaucrats (their agents) deliver more to voters (Savas, 1984) and by hiring more bureaucrats. Contracting out replaces the principal-agent relationship of politician-bureaucrat with the relationship of bureaucrat-contractor and introduces market system competition (contrasted with internal civil service competition) into the selection of the contractor. Market competition makes multiple providers compete for government contracts which should increase efficiency as the contractors attempt to lower costs to win contract bids on price. Likewise, market system competition makes contractors compete on performance as well as price and contractors must aim for customer satisfaction or the usual contractor performance requirement of citizen satisfaction. In essence, competition among contractors on price (efficiency) and quality (user satisfaction) allows citizens as indirect principals to influence contractor selection and retention by their bureaucratic agents in their roles as taxpayers and customers (Schmid, 2003). Effective contracting out requires an understanding of the preferences of stakeholders (Brown et al., 2006). It is an opportunity for the bureaucrat to match government preferences to the best available product (Johnston and Romzek, 2010).

Critics of the principal-agent model argue that it focuses on the agent’s behavior as self-interested (Brown et al., 2006) rather than also other-regarding or value laden. Agency theory ignores other organizational and professional aspects of the government contractor such as loyalty, pride, and a sense of mission. Stewardship theory, by contrast, was developed in response to the limits of agency theory (Davis et al., 1997). In this theory, long-term contractual relationships are based on trust, reputation, collective goals, and goal alignment. The stewardship theory places greater value on *collective* rather than individual goals. Advocates of the stewardship theory argue that at the beginning of a contractual relationship the upfront costs will be greater than the principal-agent model since there are joint decisions, but over time transaction costs should decline (Brown et al., 2006)

Stewardship theory argues that actors are not motivated only by their self-interests, but in many contexts, especially ideologically driven ones like government, are stewards of values and outcomes and that often have goals in line with their principals. In stewardship theory the bureaucrat-contractor relationship is based on trust and collaboration (Awortwi, 2012). Even, when the interests of the steward and principal are not fully aligned the steward places a higher value on cooperation because the steward receives greater utility in cooperative behavior. Therefore, the behavior of the contractor as a steward is *collective* and it maximizes its wealth by seeing the principal doing better (Davis et al., 1997)

A way to conceptualize the choices that public managers and contractors face can be shown in Figure 1. There are four potential scenarios that are shown in Figure 1 (Davis et al., 1997). The top left-hand quadrant shows one extreme wherein the principal (government) and agent (contractor) act

Figure 1. Principal-Manager model and choice

		Principal's (Government) Choice	
		Agent	Steward
Agent's (Contractor's) Choice	Agent	Minimize Potential Costs Mutual Agency Relationship	Agent Acts Opportunistically Principal is Angry Principal Is Betrayed
	Steward	Principal Acts Opportunistically Manager is Frustrated Manager Is Betrayed	Maximize Potential Performance Mutual Stewardship Relationship

in accordance with his or her own self-interest. In this case asymmetric information results, one does not know the other's intentions, and one acts to protect one's own interests. The opposite extreme is the bottom right corner in which both the principal and agent act as stewards of collective aims. In this situation, there is trust among both parties and information is shared, purpose is shared, and action is taken to collaborate to achieve mutual goals. In the top right-hand quadrant, the principal acts as a steward and the agent acts as an agent. In this quadrant, the agent acts opportunistically and the principal having, a trusting relationship, feelings betrayed by the principal's lack of performance. The bottom left-hand quadrant shows the opposite: the principal acting opportunistically, and the agent being frustrated with the government.

Citizen Satisfaction and Contracting Out

Clearly, it is important to measure citizen satisfaction in different areas of public service delivery (Dilger et al., 1997). Satisfaction can be defined as the citizen's summary judgment about the product or service (Hodgkinson, Hughes, Hughes, and Glennon, 2017). When citizens have direct experience with a service and are satisfied the first time it is used, they will tend to use it again (James, 2007; Roch and Poister, 2006; Van Ryzin, 2004).

Overall, existing research showed mixed evidence that contracting had an impact on citizen satisfaction independent of a service. An analysis of Swedish municipalities found that higher levels of outsourcing were associated with lower levels of citizen satisfaction (Dahlström, Nistotskaya, and Tyrberg, 2018). Similarly, in an analysis of the municipal solid waste collection, customer satisfaction data results showed that privately delivered services generally reported lower ratings than publicly delivered services and in Latino concentrated areas, these ratings were significantly lower (Wang and McFadden, 2016). In contrast, as study of Norwegian municipalities, implied that contracting increases service quality and creates a service-oriented culture increasing satisfaction (Holum, 2016). Likewise, a survey of Tulsa Oklahoma citizens found that respondents found contracting to bring sound management practices (Guo and Ho, 2019).

There is limited empirical evidence examining citizen satisfaction with e-government and most of the research examines trust and citizens satisfaction with e-government (Welch, Hinnant, and Moon, 2005). However, one study examined the confirmation/disconfirmation theory of citizen satisfaction and found that contracting had a positive impact on e-government performance (Sharma, Al-Badi, Rana, and Al-Azizi, 2018).

Chinese Local Government Mobile App Use

In the past decade, mobile Internet users in China have sharply increased because of the spread of 3G/4G technologies and the decreasing costs. The tremendous growth promoted the services innovations and development through mobile platforms. The *2018 M-Government Development Report*, released by Center for Digital Governance of Sun Yat-sen University, shows that 70 large cities in China have 534 official government mobile applications, increased by 69% since 2015 (CDG, 2018). These applications provide a variety of government services, including public transportation, health care, education, and social welfare. The average download was 100.1 thousand, increased by 28.2% compared with 2015. The mobile government in China has been developing fast, although citizens' use and satisfaction are still not high.

The progress also stimulated the development of private mobile applications. Currently, "WeChat" is the most popular mobile application in China with 1.08 billion users (Wechat, 2019), is widely used for online chatting, paying electricity and water fees, purchasing transportation tickets and so forth. Another popular application in China is "Alipay", like "WeChat", providing convenient and diverse services to more than 700 million users. In the past five years, these two "super" applications have developed from a single service provider (online chatting or payment) to a platform delivering comprehensive services, covering almost all the aspects of citizen's everyday life.

Since 2015 these local governments have been contracting with these two mobile applications to, provide citizens with additional options for mobile apps. Take "Alipay" for example, cities have increasingly signed contracts with Ant Financial, the parent company of "Alipay", to provide government financial services on it. The 2018 M-Government Development Report shows that more than 400 cities are using "Alipay". The city of Guangzhou provides 126 different kinds of services through this app. With a huge user base, advanced technologies, well-designed functions, and so forth, "Alipay" enables government to reach users efficiently.

Chinese mobile app contracting by government serves as a valuable case for at least three reasons. First, its development shares commonalities with other countries, though with different institutional and cultural environment. Second, a lack of resources and capabilities in local governments created a reliance on the private sector for mobile government. Chinese local governments have contracted for mobile applications since 2015, allowing researchers and practitioners in other countries to better understand this new development model and related issues. Third, m-government development in China generated many long-term users, making it as a good context to study individual use and attitudes.

HYPOTHESES

In this section the hypotheses to be examined are presented regarding contracting out for the use of mobile applications in the modeling detailed below. The constructs deemed to be most important relating to agency and stewardship theories are considered in these hypotheses. Because the data in the model is from an attitudinal survey rather than from information on price or performance, these constructs consist primarily of factors which affect user satisfaction such as openness, familiarity, and trust. The hypotheses and predicted impacts concerning app use are outlined below. These are detailed in Table 1. Following the discussion of each construct, a hypothesis is stated for that variable.

User Openness to New Technology Use and Contract App Satisfaction

One factor that should influence satisfaction with contracted mobile apps is the overall openness to use and the acceptance of new technology in general by the potential user. The idea behind this is that greater overall acceptance of new technology, like mobile apps, in general leads to greater use of the specific technology (Chen, Vogel, and Wang, 2016). Research into improvements in the functionality of smartphone apps for library patrons supports this (Wei, Chang, and Cheng, 2015). Also, user's perceived enjoyment of mobile app use strongly influences satisfaction and adoption of

Table 1. Hypotheses tested

Hypothesis 1	Citizens' openness to technology use will increase their acceptance of mobile apps and their satisfaction with these apps.
Hypothesis 2	Citizens' familiarity with and use of government apps and their satisfaction with them will affect their satisfaction with contracted mobile apps.
Hypothesis 3	Citizens' trust in government will influence (positively) their satisfaction with contracted mobile apps.
Hypothesis 4	Citizens' individual to the internet and skills in using apps will affect their satisfaction with contracted mobile apps.
Hypothesis 5	Citizens' socioeconomic status will influence their satisfaction with contracted mobile apps.

the app (Hsiao, Chang, and Tang, 2016). In the same vein perceived convenience of use by citizens and convenience should affect their use of mobile apps use and increase satisfaction with them. Thus, hypothesis 1 is proposed as below:

Hypothesis 1: Citizens' openness to technology use will increase their acceptance of mobile apps and their satisfaction with these apps.

User Use of Government Apps and Contract App Satisfaction

In addition, citizens who regularly use mobile apps that are not contracted out by government but developed by it will have an overall level of satisfaction with apps that will influence their satisfaction with those apps that are contracted by government. Citizens who are more satisfied with mobile apps overall can be expected to show an increased level of satisfaction with contracted apps (Reddick and Zheng, 2017). As a new form of technology, those that already use mobile apps will be positively affected by new apps.

Hypothesis 2: Citizens' familiarity with and use of government apps and their satisfaction with them will affect their satisfaction with contracted mobile apps.

User Trust in Government and Contract App Satisfaction

Another factor predicted to impact contracted mobile apps satisfaction is their trust in government. Reversing the decline of trust in government has been one of the major issues that modern governments face and use of mobile apps has been a vehicle to facilitate citizen contact and increase trust. Trust of e-government services by citizens has been shown to increase their use in Lebanon (Fakhoury and Aubert, 2015). Research also shows that users of mobile government services are more likely to use them if they have increased trust (Hung, Chang, and Kuo, 2013). Likewise, in Seoul, Korea higher levels of trust in government are positively associated with higher levels of satisfaction with one's administrative district (Porumbescu, 2016). Conversely, an earlier study showed that with e-government citizens survey that uses this technology will increase their trust in government (Tolbert and Mossberger, 2006). Other research does not find an impact (Welch et al., 2005) and a study in the U.S. found that e-government adoption does not correlate with greater trust in the federal government by users overall (Morgeson, VanAmburg, and Mithas, 2011). Two additional factors could influence satisfaction here increased corruption may have a negative impact on contracted mobile app satisfaction as well as their trust that government can safeguard information.

Hypothesis 3: Citizens' trust in government will influence (positively) their satisfaction with contracted mobile apps.

User Access and Skills and Contract App Satisfaction

Potential users differ in access and skills in using mobile apps as well as demographic characteristics (Ferro, Helbig, and Gil-Garcia, 2011) Access to the internet is an important dimension of the difference for e-government use (Helbig, Ramón Gil-García, and Ferro, 2009). Research on citizens in the Hague, Netherlands, indicates that skills differences are not as important as access (Ebberts, Jansen, and van Deursen, 2016). For instance, whether a person possesses a smartphone or not creates an access gap, and differences in rates of use create further discrepancies (Park and Lee, 2015). Essentially, individuals with greater internet skills develop better abilities to use technology. Smartphone users may be subject to an access gap, utilization gap, and gap in capability and thus a satisfaction gap. The notion here is that citizens with greater technology skills and more access to technology would get greater satisfaction with mobile apps.

Hypothesis 4: Citizens' individual access to the internet and skills in using apps will affect their satisfaction with contracted mobile apps.

User Socioeconomic Status and Contract App Satisfaction

Individual access and skill are only one dimension underlying user characteristics that may influence mobile app satisfaction. Group characteristics or socioeconomic status such as race/ethnicity, income, market skills, geography, cultural context, education, and training (Helbig et al., 2009) may as well. An analysis of the City of Boston's 311 system showed that there was a significant positive relationship between low-income groups and the number of service requests sent by smartphones (Clark, Brudney, and Jang, 2013). In addition, smartphones are used heavily by the college-age population which is less likely to participate through other channels. Thus, socioeconomic status (measured through education, income occupation, and gender) is likely to influence citizens' satisfaction with contracted mobile apps.

Hypothesis 5: Citizens' socioeconomic status will influence satisfaction with contracted mobile apps.

RESEARCH METHODS

Data

Data for this study was collected through a telephone survey of Chinese residents in November of 2017. The authors contracted with Ark Marketing Research and Consulting Co., Ltd., which is a professional survey research firm that uses a Computer-Assisted Telephone Interview (CATI) system. As shown in Table 2, 30 of the most representative cities in China were selected, considering their economy, population, and locations. To compare the cities, the mean population of these cities is 9.41 million with a minimum of 2.96 million, the maximum population was 33.72 million, and a standard deviation of 6.78 million for the survey sample. As for their GDP, the mean is \$126.49 (billion USD) with a minimum of \$16.69, a maximum of \$445.57, and a standard deviation of \$112.89 for the survey sample. These cities cover all the main regions of China, including East, North, Middle, South, Southwest, Northwest, and Northeast.

Instrumentation

The questionnaire was designed to explore citizens' attitudes toward and use of mobile apps for government services such as Alipay and WeChat. A stratified sampling method was used. Since great variances exist in population of these 30 cities, a proportionate allocation strategy was not appropriate

Table 2. Cities Surveyed by Population and GDP

Region	Cities	Average GDP (billion USD)	Average Population (million)
East	Nanjing, Wuxi, Xuzhou, Hangzhou, Wenzhou, Ningbo, Shanghai	183.46	10.56
North	Shijiazhuang, Qinhuangdao, Taiyuan, Beijing	145.15	9.98
Middle	Wuhan, Xiangyang, Yichang, Zhengzhou	112.48	7.60
South	Guangzhou, Shaoguan, Zhanjiang, Nanning	110.19	7.95
Southwest	Chengdu, Luzhou, Nanchong, Chongqing	136.20	15.58
Northwest	Xi'an, Lanzhou, Urumchi	61.36	5.66
Northeast	Dalian, Shenyang, Jinzhou, Changchun	77.54	6.76

because the sample drawn from small cities will be quite small (less than 10) and data quality could not be guaranteed. Thus, the optimum allocation strategy in this study to produce 100 completed questionnaires for each city was selected. The CATI system randomly selected phone numbers from a call list covering almost all the cell phone users in these 30 cities and dialed and recorded responses automatically. The total number of completed surveys collected was 3,000, and each city had 100 responses recorded. Table 3 shows the sample distribution by age, education, and income, indicating the representativeness of the survey sample.

DESCRIPTIVE STATISTICS

Dependent Variable

In this study, the determinants of citizens' satisfaction with contracted apps are explored. The dependent variable is "Contracted Apps Satisfaction", measured by citizens' reported satisfaction with contracted apps when they used them for government services, as shown in Table 4 along with the independent variables.

Recently, contracted mobile apps have rapidly developed as important platforms to deliver government services in China, serving as supplements to government apps. This question was taken from people who actually used mobile government services through these contracted apps in their cities. The satisfaction of these apps is important as it directly affects citizens' continued use. It also reflects the value of contracted apps as mobile government service platforms and influences government strategies in developing future efforts in mobile government.

Table 3. Sample Distribution by Age, Education, and Income

Age	25 and below	26-35	36-45	46-55	56-65	Above 65
	19.27%	32.12%	21.82%	13.48%	7.82%	5.48%
Education	Junior high school or below	High school	Undergraduate or junior college	Graduate and above		
	25.19%	24.17%	46.56%	4.08%		
Monthly income	Under 3,000 Yuan	3,000-6,000 Yuan	6,001-10,000 Yuan	10,001-20,000 Yuan	Above 20,000 Yuan	
	37.03%	40.11%	15.36%	5.75%	1.74%	

Independent Variables

As indicated in Table 4, there are several groups of independent variables serving as constructs. The first group is “Contracted Apps Use and Attitudes”, composed of three variables “Current Use”, “Usability”, and “Perceived Convenience”. “Current Use” is measured by the frequency of citizens using contracted apps to get government services, such as applying for certifications or paying fees. Users’ attitudes toward the overall usability of these contracted apps are employed to measure “Usability”. Finally, “Perceived Convenience” is measured by citizens’ degree of agreement with the statement that government services provided through contracted apps bring convenience to their life.

The second group of variables is the “Government Apps Use” construct. It is believed that the level of use by citizens of all government apps influences their willingness to use and attitudes toward contracted government apps. In short, to twist an old phrase, “familiarity, breeds approval.” Two variables belong to this group, “Current Use” and “Satisfaction with Government Apps”. The first one is measured by the frequency of citizens’ use of government mobile apps overall and the second is the citizens’ satisfaction level with these government provided apps generally.

As discussed earlier, trust is quite important in determining mobile government use, as it’s harder for citizens to use government services if they do not trust the government. Mobile Internet and technologies bring challenges in protecting citizens’ privacy and information security. Thus, citizens’ trust in the Internet generally and contracted apps specifically affects their government mobile app use that was the third construct. In this study, different aspects of citizen trust that might be related to mobile government and mobile apps are included. Four variables were used, “Trust in Contracted Apps”, “Trust in the Internet”, “Trust in Government”, and “Perceived Government Corruption”. The question “to what extent do you trust that these contracted applications could protect your personal information security when providing government services to you” was used to measure citizens’ “Trust in Contracted Apps”. The question “to what extent do you trust the information on the Internet” was adopted to measure citizens’ “Trust in the Internet”. In addition, “Trust in Government” was measured with the question “generally speaking, to what extent do you trust your local government” and “Perceived Government Corruption” with the question “what do you think about the corruption condition of your local government officials”.

The role of citizen differences, specifically in their access to and skills in using mobile internet/devices generally and in their socioeconomic status were hypothesized to influence contracted mobile app use, as well. It is the fourth construct used. In this study, there are two clusters of variables related to this construct of citizen differences. One cluster is “Access and Skills”, the other cluster is “Socioeconomic Status”. The first cluster has three variables “Access to Apps Use”, “Skill in Apps Use”, and “New Technology Acceptance”. The self-reported frequency of using mobile applications was used to measure the “Access to App Use.” How skilled users perceived themselves to be at using a smartphone’s functions was used to measure the variable “Skilled in App Use.” The question “generally speaking, what’s your acceptance of new technology (especially information technology)” is used to measure users’ “New Technology Acceptance”. The second cluster of variables “Socioeconomic Status” is composed of “Education”, “Income”, “Occupation”, “Age”, and “Gender.” These were provided by respondents. There is no control variable in this study.

Descriptive statistics are reported in Table 5, indicating citizens’ use and attitudes toward government contracted apps. It shows that citizens’ satisfaction with these contracted apps is moderate (3.68 out of 5), and the current use is low (1.94 out of 5). However, they are still slightly higher than the satisfaction and use of government apps (3.65 for satisfaction and 1.57 for current use).

Table 6 shows the correlation matrix of all the variables included in the model. There are no highly correlated relationships among them. Except the correlations between usability and perceived convenience (0.61) and between trust and perceived corruption (0.67), all are below 0.60 and even 0.50. The mean Variance Inflation Factor (VIF) is 1.45, which is lower than the threshold 5 and acceptable threshold. The correlation analysis results and the VIF indicated that multicollinearity is not an issue for the statistical analysis.

Table 4. Measurement of Dependent and Independent Variables

Variables	Survey Item	Min	Max
Dependent Variable			
<i>Contracted Apps Satisfaction</i>	What is your overall satisfaction level toward government services provided through the third-party applications (e.g., Alipay and Wechat)?	1=Not satisfied at all	5=Very satisfied
Independent Variables			
<i>Contracted Apps Use and Attitudes</i>			
Current Use	How often do you use government services provided through the third-party applications (e.g., Alipay, Wechat)?	1=Never	5=Almost every day
Usability	What do you think about the overall usability of these government services provided through the third-party applications (e.g., Alipay, Wechat)?	1=Very low	5=Very high
Perceived Convenience	Do you agree that these government services provided through third-party applications (e.g., Alipay, Wechat) bring convenience to your life?	1=Don't agree at all	5=Cannot agree more
<i>Government Apps Use</i>			
Current Use	How often do you use these government mobile applications?	1=Never	5=Almost everyday
Satisfaction with Government Apps	What is your overall satisfaction level toward the services provided through these government mobile applications	1=Not satisfied at all	5=Very satisfied
<i>Citizen Trust Aspects</i>			
Trust in Contracted Apps	Do you trust that these third-party applications (e.g., Alipay, Wechat) could protect your personal information security when used by government?	1=No trust at all	5 =Totally trust
Trust in Internet	To what extent do you trust the information on the Internet?	1=No trust at all	5=Totally trust
Trust in Government	Generally speaking, to what extent do you trust your local government?	1=No trust at all	5=Totally trust
Perceived Government Corruption	What do you think about the degree of corruption of your local government officials?	1=Very clean	5=Very corrupt
<i>Citizen Differences</i>			
<i>Cluster 1: Access and Skills</i>			
Access to Apps Use	How often do you use smartphone applications?	1=Never	5=Almost everyday
Skill in Apps Use	How skilled are you at using smartphone's functions?	1=Not skilled at all	5=Very skilled
New Technology Acceptance	Generally speaking, what's your acceptance of new technology (especially information technology)?	1=Very passive	5=Very active
<i>Cluster 2: Socioeconomic Status</i>			
Education	What is your highest education?	1=Jr. HS or less	4=Grad and above
Income	What is your monthly income?	1 = < 3,000 Yuan	5 = > 20,000 Yuan
Occupation	Are you working for government agency or public institutions?	0 = No	1 = Yes
Age	What's your age?	1 = 25 and below	6 = Above 65
Gender	What is your gender?	0 = Female	1 = Male

Table 5. Descriptive statistics

Variables	Mean	SD	Minimum	Maximum
Dependent Variable				
<i>Contracted Apps Satisfaction</i>	3.68	0.74	1	5
Independent Variables				
<i>Contracted Apps Use and Attitudes</i>				
Current Use	1.94	1.29	1	5
Usability	3.99	0.78	1	5
Perceived Convenience	4.01	0.71	1	5
<i>Government Apps Use</i>				
Current Use	1.57	0.95	1	5
Satisfaction with Government Apps	3.65	0.75	1	5
<i>Trust</i>				
Trust in Contracted Apps	3.51	0.88	1	5
Trust in Internet	3.17	0.86	1	5
Trust in Government	3.35	0.98	1	5
Perceived Government Corruption	2.96	1.21	1	5
<i>Citizen Differences</i>				
<i>Cluster: Access and Skills</i>				
Access to Apps Use	4.24	1.31	1	5
Skill in Apps Use	3.51	1.22	1	5
New Technology Acceptance	3.11	0.98	1	5
<i>Cluster: Socioeconomic Status</i>				
Education	2.29	0.89	1	4
Income	1.95	0.95	1	5
Occupation	0.07	0.26	0	1
Age	2.75	1.40	1	6
Gender	1.33	0.47	1	2

RESULTS OF MODELING

As the dependent variable is ordinal with only 5 categories, it's appropriate to use ordered logistic regression to examine the influence of different variables on citizens' satisfaction with contracted apps when using them to get government services. The statistical analysis results are reported in Table 7. The Pseudo R-squared is 0.3225, showing the overall good fit of this model in explaining the variances in the dependent variable. As a robust test, the ordinary least squares (OLS) regression was used and got the same results. Hypotheses supported/rejected in the ordered logistic regression were confirmed/not confirmed in the ordinary least squares regression.

As indicated in the results, the usability and perceived convenience of contracted apps have a statistically significant influence on citizens' satisfaction. Citizens, who believe apps bring higher usability and convenience to their lives, are more likely to be satisfied with these contracted apps. Overall satisfaction with government apps is significantly associated with satisfaction with contracted

Table 6. Correlations Among Different Variables

x	Contracted Apps Satisfaction	Current Use*	Usability	Perceived Convenience	Current Use**	Satisfaction	Trust in Contracted App	Trust in Internet	Trust in Government	Perceived Corruption	Access	Skill	New Technology Acceptance	Education	Income	Occupation	Age	Gender
Contracted Apps Satisfaction	1.00																	
Current Use*	0.22	1.00																
Usability	0.50	0.32	1.00															
Perceived Convenience	0.57	0.31	0.61	1.00														
Current Use**	0.12	0.19	0.06	0.14	1.00													
Satisfaction	0.54	0.11	0.33	0.39	0.18	1.00												
Trust in Contracted App	0.55	0.19	0.46	0.45	0.09	0.46	1.00											
Trust in Internet	0.40	0.06	0.33	0.31	0.12	0.32	0.49	1.00										
Trust in Government	0.36	0.05	0.21	0.27	0.08	0.38	0.33	0.25	1.00									
Perceived Corruption	0.28	0.04	0.11	0.23	0.09	0.36	0.27	0.14	0.67	1.00								
Access	0.05	0.15	0.07	0.03	0.08	0.08	0.11	0.06	0.09	0.15	1.00							
Skill	0.12	0.13	0.11	0.13	0.13	0.15	0.16	0.15	0.08	0.17	0.29	1.00						
New Technology Acceptance	0.28	0.14	0.34	0.26	0.13	0.23	0.28	0.27	0.16	0.16	0.20	0.28	1.00					
Education	-0.01	0.03	-0.03	0.01	0.07	0.06	-0.06	-0.06	0.17	0.21	0.17	0.26	0.03	1.00				
Income	-0.04	0.10	0.02	0.02	-0.04	-0.04	-0.06	-0.02	-0.06	-0.07	0.10	0.15	0.04	0.22	1.00			
Occupation	0.04	0.00	-0.02	0.02	0.09	0.13	0.01	0.00	0.17	0.15	0.06	0.06	-0.02	0.19	0.01	1.00		
Age	0.03	-0.07	0.04	-0.01	0.03	0.01	0.02	0.07	-0.03	-0.16	-0.05	-0.30	0.04	-0.17	0.06	0.07	1.00	
Gender	0.00	-0.02	0.00	0.08	-0.06	0.06	-0.04	-0.01	0.11	0.17	-0.02	0.04	-0.07	0.10	-0.18	0.02	-0.15	1.00

Table 7. Ordered Logistic Regression Analysis

<i>Contracted Apps Satisfaction</i>	Coefficient	Std. Err.	Z-score
<i>Contracted Apps Use and Attitudes</i>			
Current Use	0.10	0.11	0.95
Usability	0.47***	0.18	2.58
Perceived Convenience	1.12***	0.20	5.53
<i>Government Apps Use</i>			
Current Use	0.01	0.13	0.07
Satisfaction with Government Apps	1.00***	0.17	5.73
<i>Trust</i>			
Trust in Contracted Apps	0.57***	0.16	3.66
Trust in Internet	0.32**	0.15	2.20
Trust in Government	0.23*	0.14	1.67
Perceived Government Corruption	0.01	0.12	0.07
<i>Access and Skills</i>			
Access to Apps Use	-0.07	0.15	-0.46
Skill in Apps Use	0.02	0.14	0.11
New Technology Acceptance	0.08	0.13	0.57
<i>Socioeconomic Status</i>			
Education	-0.04	0.15	-0.25
Income	-0.09	0.12	-0.77
Occupation	-0.06	0.36	-0.17
Age	0.04	0.10	0.42
Gender (Male)	-0.26	0.24	-1.11
Notes: Pseudo R-squared = 0.3225; *p < 0.1, **p < 0.05, ***p < 0.01			

apps. Also, those showing trust of contracted apps for protecting citizens' information security, trust in the Internet, and trust in government are more likely to be satisfied with these contracted apps. However, the results indicate that citizens' current use of both contracted apps and government apps had no statistically significant impact on their satisfaction. Interestingly, individual smartphone access and skills and socioeconomic status have no statistically significant impact on citizens' contracted apps satisfaction.

DISCUSSION OF RESULTS

The examination results of the hypotheses are included in Table 8, showing that the first three hypotheses were partially confirmed while hypothesis 4 and 5 were rejected. As for the influence of contracted apps use and attitudes, the results indicated that usability and perceived convenience both had significant impacts while current use was not confirmed. Citizens' satisfaction with contracted apps is determined by different factors, among which are usability and perceived convenience. This can be explained by the fact that good usability helps to reduce the cost of learning, especially for those citizens that have lower skill levels in technology. Apps that are well designed contribute to

Table 8. Results of Hypotheses Tested

Hypothesis 1	Citizens' openness to technology use will increase their acceptance of mobile apps and their satisfaction with these apps.	Partially Confirmed
Hypothesis 2	Citizens' familiarity with and use of government apps and their satisfaction with them will affect their satisfaction with contracted mobile apps.	Partially Confirmed
Hypothesis 3	Citizens' trust in government will influence (positively) their satisfaction with contracted mobile apps.	Partially Confirmed
Hypothesis 4	Citizens' individual to the internet and skills in using apps will affect their satisfaction with contracted mobile apps.	Rejected
Hypothesis 5	Citizens' socioeconomic status will influence their satisfaction with contracted mobile apps.	Rejected

the efficiency of service delivery. Perceived convenience reflects the usefulness of the apps and indicates the effectiveness of service delivery. Citizens that are more satisfied with the apps will keep using them since they are more convenient. However, the current level of use of contracted apps did not affect citizens' satisfaction. This shows the baseline level of the importance of improving the functionality of mobile apps, which is what really helps to increase satisfaction (Sharma et al., 2018).

The results confirmed the relationship between the two types of satisfaction, indicating that people who are satisfied with government apps are more likely to be satisfied with contracted apps. The important role of trust in affecting citizens' contracted apps satisfaction has been confirmed in this study, which is consistent with e-government literature. The development of information technologies brings convenience to users on the one hand but places their privacy at risk. With limited protection from privacy laws and policies, citizens have more concern that their personal information will get compromised. The results confirmed that citizens who trust the Internet and government more will be more satisfied with contracted apps. However, although perceived corruption is another indirect measurement of trust, its impact was not confirmed in the results. The role of trust in contracted apps is an extension of the e-government research on the role of technology and trust in government (Fakhoury and Aubert, 2015).

Surprisingly, access and skills in smartphone apps use had no significant impact on contracted apps satisfaction. The satisfaction with contracted apps relies more on usability and convenience to users, rather than the capabilities of users themselves. Furthermore, socioeconomic factors, including education, income, occupation, age, and gender, did not explain variance in the satisfaction of contracted apps. These results challenge some of the existing literature on the digital divide and its application to mobile apps use (Clark et al., 2013). To promote citizens' satisfaction with contracted apps, measures need to be taken to improve service quality, usability, perceived convenience, and their trust.

CONCLUSION

This paper examined citizen satisfaction with mobile government contracted apps through an analysis of a survey of the 30 cities in China. Traditionally the literature has examined the validity of agency theory as a rationale for contracting out (Holum, 2016). In this theory the principal, which is government, monitors the agent's or contractor's performance. This theory focuses on individual interests and the economic efficiency of markets to generate cost savings. A more modern approach is the stewardship theory, which advocates that contractors work collectively as partners with government to build upon mutual beneficial trust in public service delivery (see Figure 1). Cost is just one consideration for government contractors under the stewardship model (Brown et al., 2006).

Survey evidence supported the stewardship theory since citizens were more satisfied with the services received from the contracted mobile apps providers for reasons relating to openness, trust, and fairness. Therefore, the driver of satisfaction with contracted apps is not just economic efficiency, but creation of public value for bureaucrats and citizens. These results show that the government can contract with the private sector and improve public service delivery and this finding challenges the notion that satisfaction is only driven by government provision. The public and private sectors can work together and deliver satisfactory experiences for citizens. This type of collaboration is a best practice model for the future, challenging the principal-agent model which has dominated the contracting literature. The results indicate that socioeconomic status did not register an impact on satisfaction with contracted mobile apps.

From these results, two recommendations for policymakers can be made. First, because the literature on contracting out was mostly developed before the digital age, that research needs to be updated. In most, if not all, of the relevant studies, the benefits of technology and privatization have not been considered (Ya Ni and Bretschneider, 2007). Second, stewardship theory explains the benefits of contracting out as well if not better than agency theory and in fact the latter may just be a special case of the former wherein the shared goal of efficiency is realized. Thus, governments should acknowledge this and explore opportunities for contracting out that begins from placing emphasis on aligning the contractors and the government's interests to create beneficial relationships based on trust rather than beginning from price and performance (Davis et al., 1997).

The implications for practitioners are that more research should be done on the contracting of public services. In China, citizens are more satisfied with private contracted providers of mobile government apps than government ones and have created important partnerships with Alipay and WeChat. These are important implications because mobile apps can be used as a tool to provide for greater civic engagement of citizens (Lee, Almirall, and Wareham, 2015). Therefore, greater collaboration and partnerships with the private sector are important for the future.

There are some limitations of this study that should be noted. First, the measurement of satisfaction is not a direct measure since it is based on the perceptions of those that responded to the survey. It is known that surveys can be prone to bias and this should be considered when interpreting the statistical results. Also, the phone survey approach limits the length of the questionnaire, as the response rate will be quite low if there are more than 25 questions. Thus, variables were only measured with one question, instead of an index composed of several items. Also, Kennedy and Hartig (2019) have pointed out that, the response rates to telephone public opinion polls conducted by Pew Research Center have fallen to 6% in 2018. Similarly, the average response rate of the three surveys after 2016 was below 14%, which elevated the risk of non-response bias and limited the data quality. Additionally, the survey covered only 30 cities in China and the sample is not representative of rural areas in China where access can be lower, and socioeconomics differ. Future research might contemplate a national survey in China, with a larger sample size to look at mobile apps and comparing urban and rural areas. Likewise, future research could use a qualitative research design and conduct a comparative case study analysis of these cities using focus groups of current citizen users, to identify unanticipated impacts of the use of this new technology.

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Bruce J. Perlman is a Regents' Professor and Director of the School of Public Administration at the University of New Mexico. His research interests are state and local government, comparative and international administration, and public sector organization and management.

Christopher G. Reddick is a professor in the Department of Public Administration at the University of Texas at San Antonio. His research interests are in information technology and public-sector organizations.

Yueping Zheng is the director of the Center for Digital Governance and Associate Professor at the Center for Chinese Public Administration Research, School of Government, Sun Yat-sen University, China. His research interests include e-government, digital governance, and smart city. His recent publications include articles in Administration & Society and Government Information Quarterly.