
Reengineering municipality citizen electronic complaint system through citizen relationship management

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Abstract: Government-to-Citizen (G2C) is the primary function of electronic government. Among various G2C services, Citizen Electronic Complaint Systems with interactive features play an important role in facilitating citizen participation. This research takes the Kaohsiung Citizen Electronic Complaint System in Taiwan as an example to demonstrate the benefits of employing citizen relationship management when revising a government-to-citizen electronic government system, including: better understanding of citizens, better service performance, increased public participation, and improved internal management and control. Policy implications and directions for system improvement are presented for municipality policymakers and system administrators in order to further enhance electronic democratic mechanisms.

Keywords: electronic government; e-government; customer relationship management; CRM; citizen relationship management; CzRM; Citizen Electronic Complaint System; CECS; Kaohsiung Citizen Electronic Complaint System; KCECS; reengineering; Government-to-Citizen; G2C; Kaohsiung City Government; KCG; Taiwan; municipality.

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1 Introduction

Government-to-Citizen (G2C) electronic government (e-government) services are designed to facilitate citizen interactions with government, and are perceived as the primary goal of e-government (Seifert and Petersen, 2002). G2C can enhance 'the degree and quality of public participation in government' (Kakabadse et al., 2003), and is regarded as a venue for enhancing the democratic process, and civil society is made possible through the development of electronic democracy (Kakabadse et al., 2003; Wu, 2004). Citizen Electronic Complaint Service (CECS) is one of the most critical G2C e-government services. CECS and its vehicle, e-mail, provide interactive features that allow citizens to pose questions to government officials and request information or service improvements, thus playing an important role in promoting public participation and electronic democracy.

According to the United Nations' 'Global e-government readiness report 2005: From e-government to e-inclusion', of the 191 member states, 168 provided interactive 'e-mail to the official' service (United Nations, 2005). West's (2007a, 2007b) global and the US e-government reports showed that 86% of global and 89% of the US government websites offered e-mail contact material to facilitate communication between citizens and governments and filing complaints is one of the most frequent services used by citizens. Many government websites around the world provide citizen e-complaint services. For example, the US Government website (<http://www.usa.gov>), the website of the Local Government Ombudsman in the UK, an independent organisation investigating complaints about councils and certain other bodies (<http://www.lgo.org.uk/index.php>), and Dubai Government's Department of Tourism & Commerce Marketing (UAE's website is <http://www.dubaitourism.ae/about/default.asp>). However, most government

e-mail contacts and CECS lack a customised and interactive interface, online tracking systems, satisfactory evaluation, etc., items which could create a customised, quick, and convenient complaint-handling service to better serve citizens and further acquire knowledge from them.

Customer Relationship Management (CRM) could be a solution for enhancing citizen e-complaint service. CRM is an integration of technologies and business processes used to satisfy the needs of a customer during any given interaction. From the CRM perspective, a customer is an individual with a unique set of interests and needs. He/she has the right to customised, quick and convenient service (Nasif, 2004). More specifically, CRM involves the acquisition, analysis and use of knowledge about customers in order to enhance efficiency (Bose, 2002). CRM has been identified as one of the greatest technological contributions to enterprises in the 21st century. Enterprises are applying CRM to improve efficiency of operation (Chao et al., 2007). A new challenge of business processes lies in the addition of new customers and in the retaining of old customers (Chang et al., 2006), yielding a necessity for CRM to complement enterprise resource planning applications, which acts as key enablers of business process reengineering (Al-Mashari et al., 2006; Xu et al., 2002). Osborne and Gaebler (1992) proposed the 'reinventing government' movement, in which citizens are regarded as 'customers' who become the focus when designing a way to deliver public service. As a result, many governments have viewed their citizens as customers of public goods and services (Nowlan, 2001), and CRM is then introduced into the public sector as Citizen Relationship Management (CzRM) (Coleman, 2004; Muther, 2002). That is, CzRM is a division of CRM that particularly focuses on how government bodies relate to their constituents (Xavier, 2002). Although some government bodies use the term 'CRM' for 'CzRM' to emphasise its application in the public sector, we refer to it as CzRM in this article.

E-government is designed as 'citizen-centered', 'results-oriented', and 'market-based' service (White House, Office Management and Budget, 2002), which corresponds to the spirit of CzRM. By employing CzRM, e-government has the opportunity to provide excellent service by increasing the efficiency of service, gain an accurate picture of citizen behaviour and requirements, as well as build and strengthen the links and cooperation among government, citizens and stakeholders (Kannabiran et al., 2004). For example, the US Government website serves as a convenient and efficient e-government and CzRM practices in the national government (Larsen and Milakovich, 2005). The CRM Pathfinder Program and CRM National Program in the UK have identified potential benefits of CRM, such as transforming services to citizen-led services, providing a holistic view of customers and a single citizen's account through the integration of systems across departments, and changing the public service experience by making services more responsive, accessible, convenient and cost effective (King, 2006). The Housing and Development Board (HDB) in Singapore implemented a holistic approach for CRM in government agencies. The HDB's CRM system showed a number of impacts, including: reduced cost of service delivery, improved customer service, improved operational efficiency, etc. (Teo et al., 2006). The adoption of CzRM approach within the public sector enables citizens to receive a higher level of service even at lower costs, since self-service of CzRM e-government is less expensive. Moreover, employing CzRM facilitates government becoming citizen-centric (Milakovich and Gordon, 2004), supporting a culture that aims to maximise the lifetime relationship value of citizens.

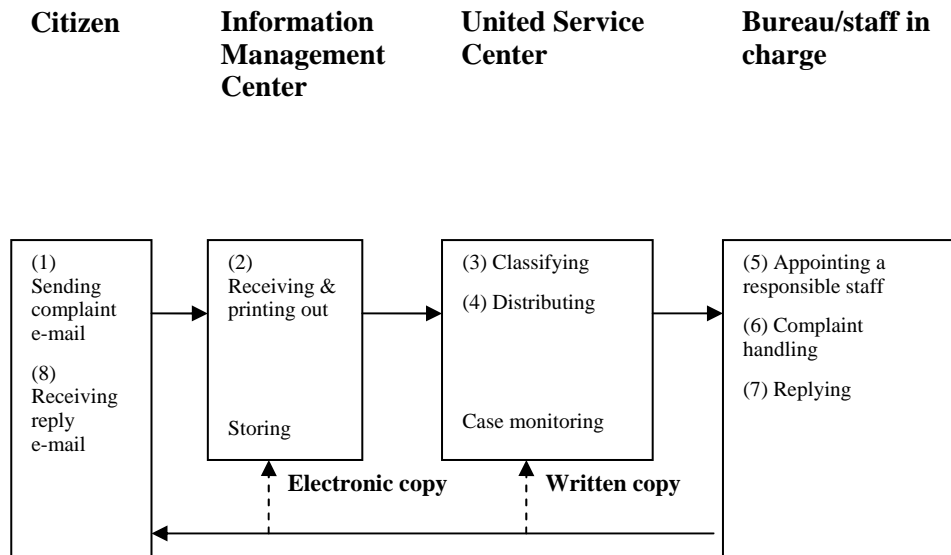
This research aims to illustrate the process reengineering of an e-complaint system through CzRM, and its benefits about system revision, including: increased usage, improved efficiency, better service, and the enhancement of internal management. This paper contributes to e-government literature by offering an empirical example to demonstrate the benefits of applying CzRM to e-service revision. The experiences in e-service process reengineering stated in this paper would also help municipality administrators to better design their e-government systems. The remainder of this article consists of the following sections: the first section introduces our example, i.e., the Kaohsiung Citizen Electronic Complaint System (KCECS), followed by the benefits of system revision, policy implications, directions for system improvement and concluding remarks.

2 The service model and functions of the CzRM-based KCECS

The Kaohsiung City Government (KCG), the second largest metropolis in Taiwan, first launched the 'Kaohsiung Mayor E-mail Box' (KMEB) to facilitate the KCG's communication with its citizens in 1996. The mechanism of the KMEB is all done by person, and is stated as follows (see Figure 1): A citizen sends a complaint by e-mail through the KMEB. The Information Management Center receives the e-mail, prints it out, and sends it to the United Service Center for classification and distribution. Each complaint is sent to a proper responsible bureau where a responsible staff would be appointed to handle it and reply. The KMEB presents a lot of shortcomings:

- 1 Irresponsive communication for citizens. From the KMEB's Microsoft Outlook interface, citizens could not get any online instructions such as Frequently Asked Questions (FAQs) to help them file complaints. The KMEB provided no inquiry and feedback mechanism. In addition, the KMEB lacked users' satisfaction information as an index for proper performance evaluation.
- 2 Inefficient complaint-handling. The manual classification and delivery design, which involved at least three agencies (the Information Management Center, the United Service Center, and a responsible bureau), led to inefficient complaint handling. The handling days for each complaint e-mail of the KMEB, from receiving to replying, was overly long, up to 7–10 days (Chuang, 2004).
- 3 Inefficient internal management. Spot checks on unsolved cases hardly happened because of the inefficient design, nor statistical analysis of complaints cases and users' demographics had been performed.

Due to the above-mentioned shortcomings, the KCG employed CzRM strategies to revise the KMEB as a new web-based system: the KCECS (<http://w6.kcg.gov.tw/wm/letter.php>, in Chinese). The time schedule of the system is as follows: The planning and research works were implemented from September 2002 to January 2003. The system was designed from January to June 2003. After the implementation and training in July 2003, the KCECS was launched.

Figure 1 The complaint-handling mechanism of the KMEB

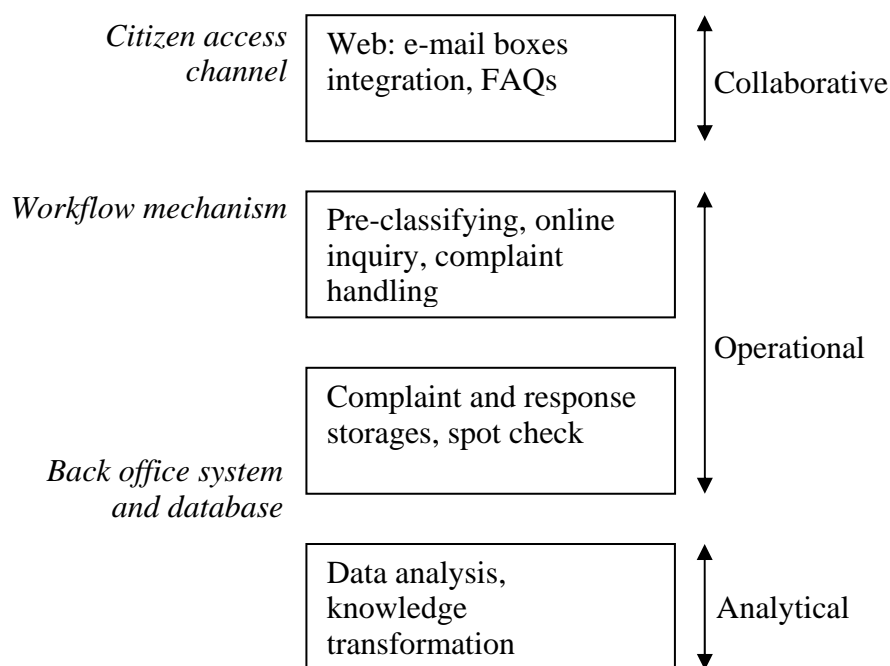
A CzRM concept is classified into three types of the application architecture: collaborative, operational, and analytical CzRM (Kim and Lee, 2007; Teo et al., 2006) (see Table 1). The collaborative CzRM covers the direct interaction with citizens, the operational CzRM provides functionality to support staff in serving citizens, and the analytical CzRM do the works of analysis of citizen data. From the procedural perspective, a CzRM-based system includes three modules (Greenberg, 2001; Xu et al., 2002):

- 1 The access channel. The multimedia access channels, such as website or call center, serve as an interface to provide citizens with timely, consistent and responsive access to government information and services as well as to collect information from them.
- 2 The workflow mechanism. Every agency involving the processing of citizen's transaction in an organisation must be enhanced. This entails a fundamental shift in the workflow, i.e. a process reengineering and/or organisation reengineering within an organisation.
- 3 The back office system and database of client information. It's a platform for acquiring citizen knowledge and transforming information into knowledge for policy-making purposes. This component provides managerial reports, and employs techniques such as data mining for knowledge development in database. Accordingly, the architecture of the KCECS, incorporating its functions, comprises the following segments (see Figure 2):

Table 1 Types of the application architecture of CzRM

<i>Types</i>	<i>Illustrations</i>
Collaborative	Direct interaction with citizens
Operational	Providing functionality to support staff in serving citizens
Analytical	Analysis of citizen data

Source: Authors

Figure 2 The CzRM-based KCECS architecture

2.1 Citizen access channel

The KCG integrates all agencies' e-mail boxes into the KCECS as a single access channel to facilitate communication with citizens, namely collaborative CzRM. A web-based mechanism is adopted to offer a 24-hour, 365-day, boundary-free service. Citizens could therefore request the government to deliver services without the limitations of time and space. In addition, the KCECS creates a user-friendly interface by simplifying user's instructions and provides frequently asked questions (FAQs) for citizens to make inquiries online (http://w6.kcg.gov.tw/wm/wmfaq_pub.php).

2.2 Workflow mechanism

To efficiently handle complaints, the KCG reengineered the complaint-handling mechanism and incorporated a responsive design for citizens. The workflow mechanism

comprises information delivery and processing, which can be categorised as operational CzRM. The workflow mechanism of the KCECS is introduced in terms of core functions of the KCECS as follows.

- 1 Pre-classifying of complaints. In order to process citizens' complaints properly and efficiently, complaints are classified in advance into 20 primary categories according to their characteristics, with each category containing several subcategories (<http://w6.kcg.gov.tw/wm/tomayor.php>). Each complaint will be directly sent by the intranet to a particular civil servant to handle within a specified time frame according to a pre-arranged table (see Table 2). For any uncategorised complaints, the United Service Center will classify them based on the complaints' characteristics and then choose a proper staff to take charge of them.

Table 2 Complaint categories, bureau in charge, and time frame of the KCECS (shortened)^a

<i>No.</i>	<i>Primary categories</i>	<i>Sub-categories</i>	<i>Office/bureau in charge</i>	<i>Time frame (days)</i>
1	Streetlamp maintenance	Streetlamp went dead	Maintenance Group, Maintenance Office	1
		Illuminating during daytime	Maintenance Group, Maintenance Office	1
		Broken streetlamp	Maintenance Group, Maintenance Office	3
		Request for moving streetlamp	Maintenance Group, Maintenance Office	3
2	Road maintenance	Hole on the road	Maintenance Group, Maintenance Office	1
		Failure to fill hole/depression	Engineering Planning Office, Public Work Bureau	1
		Crack on the road	Maintenance Group, Maintenance Office	1
		Water on road surface	Water Conservancy Engineering Office, Public Work Bureau	1
		Oil on road surface	Environmental Protection Bureau	3
3	Park and shade tree maintenance	Dirty	Maintenance Group, Maintenance Office	1
		Broken	Maintenance Group, Maintenance Office	1
4	Sidewalk maintenance	Breakage/depression	Engineering Planning Office, Public Work Bureau	1
		Failure to fill hole/depression	Engineering Planning Office, Public Work Bureau	1

Table 2 Complaint categories, bureau in charge, and time frame of the KCECS (shortened)^a (continued)

No.	Primary categories	Sub-categories	Office/bureau in charge	Time frame (days)
5	Gutter maintenance	Dredging a gutter	Environmental Protection Bureau	1
		Lid broke	Water Conservancy Engineering Office, Public Work Bureau	1
		Lid lost	Water Conservancy Engineering Office, Public Work Bureau	3
6	Garbage clean up	Trash on road	Environmental Protection Bureau	1
7	Noise	Public nuisance	Environmental Protection Bureau	3
8	Traffic signal/sign/markings maintenance	Dead traffic signal	Transportation Bureau	1
9	Road occupation	Road occupation	Traffic Group, Police Bureau	1
10	Civil affairs	Vacant lot management	Civil Affairs Bureau	5

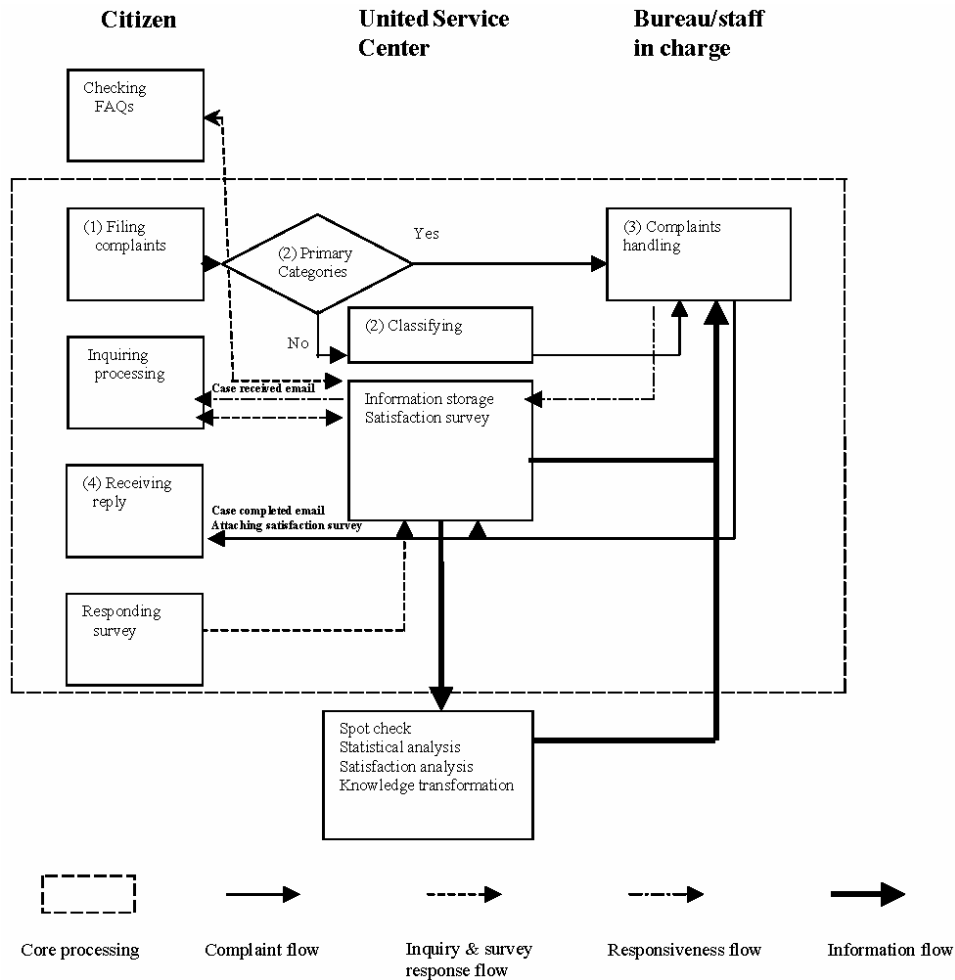
^aSome categories are omitted to avoid large space.

Source: Kaohsiung City Government Information Management Center (2007)

- 2 Online inquiry, reply, and satisfaction survey. Once the complaint submission is completed by a citizen, the system sends a 'case received e-mail' with case follow-up code and phone number of the responsible staff. The citizen can therefore check the handling progress of his or her case online (<http://w6.kcg.gov.tw/wm/result/result.q1.php>). When the complaint is resolved, the citizen who filed the complaint will receive a 'case completed e-mail' with a formal report and satisfaction survey questionnaire attached.
- 3 The complaint handling mechanism, which is also the revised complaint-handling mechanism, operates as in Figure 3. We take an illegal parking example to illustrate the advantage of the complaint-handling mechanism of the KCECS. If a citizen wants to inquire about something, he or she can check the FAQs to find answers without filing the question. When filing complaints, a citizen can choose a proper category for his or her complaint from the pre-classified categories to file complaints (or he/she directly files the complaint and the United Service Center will subsequently classify the complaint case). The KCECS directly sends the complaint case according to the pre-arranged staff in charge, the Police Bureau in this example, for handling. Meanwhile, the system gives a 'case received e-mail' with the follow-up information, including case follow-up code and phone number of the responsible staff, to the citizen for checking the handling progress of his or her case online. Once the responsible policeman resolves the complaint case,

a 'case completed e-mail' will be sent to the complainant, with a satisfaction survey questionnaire attached by the system to receive feedback opinions.

Figure 3 The complaint-handling mechanism of the KCECS



2.3 Back office system and database

This segment involves operational CzRM and analytical CzRM, in which the former includes complaint and response storages, while the latter comprises data analysis, and knowledge transformation of complaint cases. The government regularly chooses closed complaint cases to check the content of the reply. If a formal reply is considered inappropriate by spot check, the responsible staff has to re-handle the complaint or reply to the complainant again to better serve citizens. The system provides statistical reports for internal control and management. Citizen satisfaction questionnaires are also analysed to improve the KCECS. Moreover, interior performance of agencies and staff involving the KCECS, are evaluated and reported at the regular managerial meetings.

3 Benefits of the CzRM-based KCECS

The revision from the KMEB to the KCECS generates enormous benefits, such as: increased citizen participation, better understanding of citizens, better service, and improvement of internal management and control.

3.1 Increasing citizen participation

According to Kaohsiung City Government Information Management Center (2007), the KMEB monthly cases were less than 608 before the revision (see Table 3), while the revised version, the KCECS, received over 1,400 complaint cases monthly, double that of the original system. Moreover, the usage volume of the KCECS keeps growing; the monthly volume of year 2005 and 2006 exceeds 1,936 cases. As the usage of the KCECS increases, citizen participation in Kaohsiung also improves. Hence, the revision of the system enhances citizen participation in Kaohsiung City.

Table 3 Monthly average cases of the KCECS

<i>Year</i>	<i>Monthly average cases</i>
2001	467
2002	506
2003 (Jan.–Jul.)	608
2003 (Aug.–Dec.) ^a	1,450
2004	1,404
2005	2,077
2006	1,936

^aSystem revised as a CzRM-based version.

Source: Kaohsiung City Government Information Management Center (2007)

3.2 Better understanding of citizens

Through data collected from the satisfaction survey, the KCG has a picture of both the demographics and characteristics of the KCECS users. Here we present statistics of returned citizen satisfaction questionnaires accompanied with formal replies on the KCECS, from July 15th 2003 to the end of 2006, with a total of 10,088 questionnaires. More men (64.2%) used the KCECS than women did (see Table 4). Users between the ages of 21–50 accounted for 86.8% of users, with 39.8% of the respondents from 31–40 years old. The users were generally better educated than average adults in Kaohsiung City, with 83.1% of the respondents having completed college or obtained higher degrees. In general, middle-aged, well-educated, and male are the predominant demographics of the users of the KCECS.

Table 4 User demographics of the KCECS

	2003	2004	2005	2006	Four-year average
Gender					
Female	36.6	35.8	36.5	34.6	35.8
Male	63.4	64.2	63.5	65.4	64.2
Age					
20 and below	5.2	7.0	4.3	2.5	4.9
21–30	31.2	29.6	24.9	22.0	26.5
31–40	40.5	37.2	41.5	40.9	39.8
41–50	17.7	19.3	20.6	23.3	20.5
51–60	4.0	6.0	7.2	9.8	7.1
61 and above	1.4	0.9	1.5	1.4	1.3
Education					
Primary school and below	0.5	0.8	0.5	0.7	0.6
Junior high school	1.1	1.6	1.7	1.2	1.5
Senior high school	15.8	15.5	13.9	14.3	14.8
College/university	67.3	65.8	67.0	64.6	66.0
Graduate school and above	15.3	16.4	16.9	19.2	17.1

Source: Kaohsiung City Government Information Management Center (2007)

As shown in Table 5, most respondents used the KCECS to file complaints for the first time (73.3%, four-year average). However, the first time users declined year by year, with the percentage dropping from 76.3% to 69.6% from 2003 to 2006. The willingness to re-use the KCECS was high, up to 94.5%. In addition, users of the KCECS extremely favoured the system in regard to filing complaints. 90% of the above respondents rated the KCECS as their favourite channel among all the alternatives (90.3%, four-year average). The results show that users of the KCECS accepted the system as a good mechanism for communicating with the KCG, and that they will keep on using it to file complaints.

Table 5 User characteristics of the KCECS

	2003	2004	2005	2006	Four-year average
First time user	76.3	76.0	72.1	69.6	73.3
Willingness to reuse	95.0	95.7	93.9	93.4	94.5
Favourite complaint channel					
KCECS	89.2	91.7	89.8	89.5	90.3
Written letter	0.5	0.3	0.4	0.7	0.5
Fax	0.2	0.3	0.1	0.0	0.2

Table 5 User characteristics of the KCECS (continued)

	2003	2004	2005	2006	Four-year average
Favourite complaint channel					
Telephone	3.6	3.4	4.0	4.2	3.8
Face to face	0.9	0.6	0.9	0.9	0.8
Legislative body	5.7	3.8	4.7	4.7	4.5

Source: Kaohsiung City Government Information Management Center (2007)

3.3 Better service

Table 6 shows the results of five satisfaction indexes from the satisfaction survey. 'Perception of the system as an effective channel for filing complaints' received most satisfaction, with the satisfactory rates high up to 89.3%, indicating that users of the system accept this G2C service and recognise that it is a helpful tool for expressing their complaints, exceeding traditional channels such as fax, telephone, written letter, etc. The perceived response manners of the KCECS were satisfactory (68.6% positive, 15.6% neutral, and 15.9% negative). The perceived handling time of the KCECS is passable (with satisfactory rates 65.0%, neutral 20.3%, and unsatisfactory 14.8%). The two indicators reveal that the response tone or service attitudes of the agencies and efficiency improvement have been recognised by a majority of citizens. However, the positive rates of both 'perception of the extent of problem being solved' and 'perception of overall satisfaction' were both under 50%, with the positive percentages being 38.5% and 44.5%; 12.1% and 24.3% neutral; and 42.2% and 31.1% negative, respectively.

To determine if users of the KCECS received better service than they had before, we theorised that the overall satisfaction toward the system consists of the three positive-perceived indicators:

- 1 the system as an effective channel for filing complaints
- 2 the response manners
- 3 the handling time

The correlation coefficients between the overall satisfaction and these indicators were 0.429, 0.654, and 0.410, respectively, with all reaching 1% confidence level of statistical significance (see Table 7). The result of the linear regression model, using overall satisfaction as the dependent variable, with three indicators as independent variables, showed that all three indicators served as significant predictors of overall satisfaction. They totally accounted for 47.3% total variance (adjusted R^2) with standardised coefficients 0.15, 0.53, and 0.16, respectively (Table 7). The results generally show that the better services provided, including the revision of the system as an effective complaint-filing channel, the response manners, and the complaint-handling efficiency by the KCECS, all significantly contribute to overall satisfaction.

Table 6 Satisfactory rates of the KCECS

	<i>The system as an effective channel for filing complaints</i>				<i>The response manners</i>				<i>The handling time</i>				<i>The extent of problem being solved</i>				<i>The overall satisfaction</i>			
	Satisfied/Very Satisfied	Neutral	Dissatisfied/Very Dissatisfied	Satisfied/Very Satisfied	Satisfied/Very Satisfied	Neutral	Dissatisfied/Very Dissatisfied	Satisfied/Very Satisfied	Satisfied/Very Satisfied	Neutral	Dissatisfied/Very Dissatisfied	Satisfied/Very Satisfied	Satisfied/Very Satisfied	Neutral	Dissatisfied/Very Dissatisfied	Satisfied/Very Satisfied	Satisfied/Very Satisfied	Neutral	Dissatisfied/Very Dissatisfied	Satisfied/Very Satisfied
2003	89.9	7.0	3.1	66.2	17.1	16.7	15.6	64.1	20.3	11.5	42.4	36.4	42.4	27.1	30.9	42.1	42.1	27.1	30.9	42.1
2004	90.1	6.3	3.7	69.6	16.1	14.2	13.2	67.0	19.9	13.1	40.4	38.8	40.4	25.0	28.7	46.3	46.3	25.0	28.7	46.3
2005	88.3	7.1	4.6	69.0	15.1	16.0	15.6	64.0	20.5	12.6	42.0	39.2	42.0	23.9	31.1	45.0	45.0	23.9	31.1	45.0
2006	89.0	5.6	5.5	67.3	14.4	18.3	15.9	63.6	20.5	9.8	45.7	37.8	45.7	22.0	35.9	42.0	42.0	22.0	35.9	42.0
Four-year average	89.3	6.5	4.3	68.6	15.6	15.9	14.8	65.0	20.3	12.1	42.2	38.5	42.2	24.3	31.1	44.5	44.5	24.3	31.1	44.5

Source: Kaohsiung City Government Information Management Center (2007)

Table 7 Correlation and a regression model for satisfaction of the KCECS

<i>Dependent variable</i>	<i>Correlation coefficients</i>	<i>Regression standardised coefficients</i>
<i>The overall satisfaction</i>		
<u>Independent variable</u>		
The system as an effective channel for filing complaints	0.429**	0.15**
The response manners	0.654**	0.53**
The handling time	0.410**	0.16**
$R^2 = 0.473$, Adjusted $R^2 = 0.473$, $F(3, 9476) = 2836$, $p\text{-value} = 0.000$		
** $p < .01$		

Source: Authors

3.4 Improved evaluation of complaint-handling workloads and efficiency

According to the Kaohsiung City Government Information Management Center (2007), the top five heaviest workloads of complaint-handling among all KCG agencies from 2003 to 2006 were consistent (see Table 8): the Public Work Bureau, the Police Bureau, the Environmental Protection Bureau, the Transportation Bureau, and the Education Bureau. Knowing that some agencies handled more complaints than the others, more resources including budget and personnel should be allocated for them to better accomplish their work.

Table 8 Top five agencies of the KCG with high complaint-handling workloads from 2003–2006 (complaint case numbers in parenthesis)

<i>Year</i>	<i>2003 (Aug.–Dec.)</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>
1	The Police Bureau (1,433)	The Police Bureau (3,300)	The Public Work Bureau (4,582)	The Public Work Bureau (5,352)
2	The Public Work Bureau (1,004)	The Public Work Bureau (2,935)	The Police Bureau (4,499)	The Police Bureau (3,807)
3	The Transportation Bureau (780)	The Transportation Bureau (2,064)	The Transportation Bureau (3,157)	The Environmental Protection Bureau (1,889)
4	The Environmental Protection (487)	The Education Bureau (1,401)	The Education Bureau (2,159)	The Transportation Bureau (2,911)
5	The Education Bureau (425)	The Environmental Protection (1,244)	The Environmental Protection (1,981)	The Education Bureau (936)

Source: Kaohsiung City Government Information Management Center (2007)

Table 9 Efficiency of complaint-handling report: by agency, 2006 (shortened)^a

	Cases handled	Cases closed in one day	Cases closed in two days	Cases closed in three days	Cases closed in four days	Cases closed over five days	Averaged handling days	Cases exceed time frame	Cases exceed time frame (%)
Civil Affairs Bureau	216	33	49	41	52	35	3.68	0	0.00
Finance Bureau	170	20	21	28	46	43	5.69	2	1.18
Education Bureau	936	99	129	186	176	334	7.30	6	0.64
Economic Affairs Bureau	977	69	137	166	186	357	4.30	1	0.10
Public Work Bureau	5,352	502	199	276	291	3,611	58.59	0	0.00
Police Bureau	3,807	1,000	410	505	500	1,314	4.03	7	0.18
Department of Health	421	32	61	102	84	138	4.79	1	0.24
Environment Protection Bureau	1,889	333	232	395	239	651	5.13	46	2.44
Cultural Affairs Bureau	271	67	66	58	37	40	3.04	2	0.74
Transportation Bureau	2,911	208	302	389	275	1,545	12.17	8	0.27
Urban Development Bureau	292	27	51	48	44	102	13.20	1	0.34
Mass Rapid Transit Bureau	424	14	49	100	106	142	4.18	4	0.94
Total	19,335	2,654	2,049	2,594	2,296	8,726	6.15	109	0.56

^aSome agencies with fewer complaint handling cases are omitted.

Source: Kaohsiung City Government Information Management Center (2007)

Table 10 Efficiency of complaint-handling report: environmental type, 2006

	Cases handled	Case closed in one day	Case closed in two days	Case closed in three days	Case closed in four days	Case closed over five days	Averaged handling days	Cases exceed time frame	Cases exceed time frame (%)
Oil on road surface	5	3	0	1	0	1	2.80	0	0.00
Dredging a gutter	52	17	1	3	5	26	5.29	0	0.00
Trash on road	174	123	9	1	6	31	3.01	6	3.45
Garbage needs to clean away	62	35	7	3	5	12	3.31	8	12.90
Illegal advertisement	125	12	11	28	25	45	5.25	2	1.60
Public nuisance	400	29	74	195	15	77	4.65	18	4.50
Air pollution	158	58	6	17	16	60	6.31	5	3.16
Discarded car without a license plate	101	1	6	13	18	61	6.71	1	0.99
Environmental examination	358	21	52	58	64	153	5.72	2	0.56

Source: Kaohsiung City Government Information Management Center (2007)

The complaint-handling efficiency of the KCECS is regularly evaluated and discussed at the Kaohsiung City municipal meetings. As shown in Table 9, although responsible staff can extend the time frame after reporting to his/her supervisor due to complexity or difficulty encountered in handling certain complaints in the required time frame, the averaged handling days for all complaint cases was 6.15 days in 2006, a better result than those of the KMEB. Only 0.56% complaint cases exceeded the time frame, of which the Environmental Protection Bureau contributed the largest number in terms of responsible agencies. Public nuisance was the most inefficiently handled complaint category (see Table 10). The KCG, therefore, required the Environmental Protection Bureau to find proper ways to resolve the delay problem. In addition, each delayed and unsolved complaint case will be closely monitored. Each delayed case will be required to report the reason for the delay and will be monitored until the case is actually closed.

3.5 *Better understanding of citizens' needs from their complaints*

The KCG can acquire information from continuous annual reports on the tendency of citizens' complaints, in order to prevent problems in advance. For example, Table 11 shows that, in 2006, reporting buildings constructed without licenses to the authorities and school management complaints entered the top five complaint categories, indicating that citizens' needs had gradually changed over the years. In practice, since the KCG knows that illegal constructions have mounted and outnumbered other complaint cases, a long term administrative program for investigating illegal constructions is necessary to thoroughly check the numbers of illegal constructions, and to obtain requisite information, such as location, year built, in use or not, etc. In this way, the KCG can proactively handle illegal constructions rather than only handling those reported by citizens.

Table 11 Top five complaint types of the KCECS from 2003–2006 (complaint case numbers in parenthesis)

<i>Year</i>	<i>2003 (Aug.–Dec.)</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>
1	Illegal road occupation (268)	Illegal road occupation (512)	Illegal road occupation (833)	Illegal road occupation (959)
2	Illegal parking (135)	Illegal parking (325)	Illegal parking (588)	Buildings constructed without licenses (937)
3	Traffic signal went dead (88)	Traffic signal went dead (203)	Failure of filling hole/depression (365)	Illegal parking (542)
4	Public nuisance (55)	Failure of filling hole/depression (146)	Traffic signal went dead (254)	School management (454)
5	Failure of filling hole/depression (54)	Streetlamp went dead (132)	Traffic marking needs to repaint (228)	Public nuisance (400)

Source: Kaohsiung City Government Information Management Center (2007)

3.6 Knowledge management of the KCECS

The complaint case database of the KCECS serves in a supporting role for reference of complaint-handling and customised reply. Each staff member in charge can research complaint cases on record in the database for the better handling of complaints and provision of customised answers. For example, when a staff member of the Police Bureau is assigned to handle an illegal parking complaint on a certain place/road, he/she can first search the complaint case database for previous complaint cases on the same place/road to determine the frequency of illegal parking complaints on the place/road. The reply contents and processing of previous complaint cases can be accessed when the staff in charge checks certain complaint cases, so that he/she can learn from previous cases. Besides, he/she can search through the name or e-mail address of the complainant to better understand the complainant's concern. In summary, the staff in charge can get assistance from the complaint case database of the KCECS for creating a better and customised reply.

4 Policy implications

4.1 Promoting a CzRM-based e-complaint service in municipal government

The adoption of the CzRM approach and strategy within the G2C e-government services in the public sector enables citizens to receive better service, which in turn would generate better citizen satisfaction. The example of the KCECS shows that citizens receive more efficient complaint-handling through a reengineering process, with more responsive service including: inquiring mechanism, mannered reply, and opinion feedback through satisfaction surveys. In fact, employing CzRM in G2C e-government generates service excellence resulting from increased efficiency of service and reduced cost of service. Internet transaction, such as web-based KCECS, is less expensive than traditional mutual transactions such as face-to-face contact service (Larsen and Milakovich, 2005).

In addition, Kannabiran et al. (2004) indicated that public administrations have an opportunity to access and manipulate data to gain an accurate picture of citizen behaviour and requirements through CzRM. As described in this study, the KCG profiles citizens' demographics and characteristics through satisfaction surveys, and determines the predominant types of citizens' complaints and the general trend of citizens' requirements, through statistical analysis. By providing statistical reports, the government can better control the operation of complaint handling.

Through the use of the CzRM database, the government can acquire, analyse and use the knowledge about citizens derived from the CzRM-based e-government systems. The case database and analytical results serve as a decision support for decision-makers in the government. By further employing techniques such as data (text) mining, case-based reasoning, etc., data on complaints could be transformed into knowledge for policy-making to better serve citizens. Each staff in charge can research complaint cases on record in the database for the better handling of complaints and for providing customised replies. In summary, the CzRM database helps the government to collect citizen's information and realise their needs, provide a government-wide view of each

citizen, to ensure that the government will create better and customised service for individual citizens.

As only 31% of municipalities provide a mechanism allowing comments or feedback through online forms (Horlzer and Kim, 2005), and most CECS lack a convenient, responsive, and customised service, we suggest that municipal governments build their own citizen electronic complaint system with CzRM strategies embedded. As such, a municipal government would not only create an efficient communication channel between government and citizens to increase public participation, but also enable the government itself to better understand citizens' needs and maintain better internal control and management related to citizens' opinions.

4.2 From process reengineering to organisation reengineering

The KCECS, employing CzRM, improved the handling efficiency through process reengineering. Furthermore, organisation reengineering could be considered. The concept of the KCECS as a one-stop service center could be employed, enabling the system to offer diverse services in a timely, convenient and user-friendly manner from a single source. A one-stop service center is an umbrella organisation that operates on top of existing functional departments and is intended to maximise the convenience and satisfaction of users through service integration (Ho, 2002). Thus, when citizens submit complaints, the KCECS would serve as a platform for centralised handling, coordinate with functional departments and integrate responses. Users of this system would not only acquire integrated service with a one-stop service, but they would also no longer need to know which department was responsible for their complaints. With the establishment of a one-stop center, the government has the opportunity to shift from a bureaucratic organisation to a citizen-centered one.

4.3 Preventing digital divide

In spite of the promotion and implementation of e-government programs and the rapid growth of computer and internet usage in Taiwan, there is still a digital divide. Many do not have the same opportunity to benefit from the improved quality of service of the KCECS because the internet is out of their reach. The results of this study indicate that the demographic characteristics of users of the KCECS may lack variety. Middle-aged, well-educated, and male denote those who use the KCECS more than others. The governments may lose important opinions because many citizens are unable to deal with a web-based service system. To bridge the digital divide, public facilities such as libraries and museums should provide computer facilities and internet rooms. Governments may provide assistance to those who lack digital competence. For example, city halls, district offices, and local district leaders' offices should have staff on hand to provide assistance and instruction for the KCECS and other G2C e-governments users. When all citizens can communicate with their government, a key objective of G2C e-government will have been achieved.

5 Directions for system improvement

5.1 Integration of complaint channels

There are many traditional complaint channels, such as telephone, fax, written letter, and legislative bodies still exist for citizens in Kaohsiung City to communicate with the KCG. However, the handling mechanism of such traditional complaint channels differ from the KCECS, meaning greater inefficiency regarding the city's overall complaint-handling. A simple way to resolve this problem is to integrate traditional complaint channels into the KCECS. After complaints are gathered from traditional channels, their complaint contents can be keyed in the KCECS by the KCG staff members to take advantage of the KCECS's handling mechanism, thus deriving benefits such as increased efficiency, enhanced responsiveness, and internal control, etc.

5.2 Employing techniques to enhance service

Xu and Walton's (2005) study, which is based on examining data reported from a four-year survey of CRM applications in the UK, stated that the application of analytical CRM has been low, indicating the analytical CRM is required. The KCECS could incorporate techniques such as data (text) mining, case-based reasoning, etc. to further enhance its analytical functions and efficiency. For example, a classification technique could be employed. When citizens are filing a certain category of complaints, the KCECS can provide citizens with similar complaints for citizens' reference by automatically checking its complaint database. Citizens might then be able to get answers without filing their complaint, thus reducing the complaint-handling workloads. With reference to complaint response contents provided by the KCECS for the responsible staff members, when they are dealing with complaints, it would boost the efficiency of the entire complaint-handling services and create consistency in responses.

The system could transform citizen complaints into policy-making knowledge by employing the above-mentioned techniques. For instance, predictive modeling could be used to predict specific groups' needs, say, to realise what elders or women are complaining about. Association analysis helps the government to find relevant complaints. As we might expect, the KCG may get the policy-making knowledge that citizens who complain about illegal parking will also complain about other traffic problems. By sequential modeling, the KCG might realise that citizens always complain about traffic conditions, followed by public works. Therefore, the government could prevent problems in advance and thus deliver better service. Segmentation technique could be conducted to divide complaints into sub-groups according to specific variables. An example is the KCG separating complaints by two variables: 'perceived satisfaction' and 'complaint submission times', to determine which complaint receives repeated submission while the complaint-handling result still remains unsatisfactory. In general, employing techniques such as data (text) mining or case-based reasoning helps the government to obtain policy-making knowledge from citizens' complaints and with this information the government could better serve its citizens.

6 Concluding remarks

G2C e-government services are designed to facilitate communication between citizens and governments, in which a CECS is one of the most frequent used services by citizens worldwide. Through a well-designed CECS and its vehicle, e-mail, public participation can be enhanced. To better serve citizens and to satisfy their needs, the CzRM concept and strategies, mainly involving acquisition, analysis and use of knowledge about citizens during any given interaction, could be adopted when designing a G2C e-government service, especially for an e-complaint system. The experiences in system revision and the benefits of the KCECS illustrated in this article provide an example for municipality administrators to refer when planning, building, or revising online G2C services. In addition, implications presented may make it possible for policymakers and system administrators to better enhance the G2C e-government system.

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