

## Managing Citizen Relationships in Disasters: Hurricane Wilma, 311 and Miami-Dade County

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### Abstract

*As recent events have shown, effective knowledge sharing has become important at all political levels, especially when disasters occur. In this paper, we present the case of Miami-Dade County, which implemented a multi-jurisdictional, multi-channel environment (311/portal) and successfully utilized it during Hurricane Wilma. Drawing from our research on citizen relationship management (CiRM) and literature on absorptive capacity (ACAP), we argue that this setting increases an organization's ability to acquire, assimilate, transform, and exploit information and knowledge regarding the citizen's needs. We shall discuss implications for further CiRM research and managerial insight for emergency management at the end of the paper.*

### 1. Introduction

Natural disasters have dramatic effects on wide geographic areas, millions of people, and are complex to manage. Successful disaster management strongly depends on local, state, and federal government's capacity to deal with such events [19]. Capacity in this context refers to sufficient funding, effective communication, operation procedures/ emergency plans, training, public education, and collaboration across state levels and agency boundaries.

Citizen Relationship Management (CiRM) draws from the commonly known concept of Customer Relationship Management (CRM) in the private sector, and is a cluster of management practices, communication channels and technological solutions to handle issues, problems, concerns, and demands of the citizen. Among the

goals of CiRM is improving citizen orientation, enhancing accountability and changing the citizen government relationship. CiRM is a relatively new sub-field of scholarly research, and comprises considerable potential for both theoretic and empirical research. In current public sector practice, call centers (especially "311") and web-centric citizen service centers (such as one-stop-shop government portals) represent the most common forms of CiRM projects. At the moment, cross agency and cross jurisdictional collaboration exists only at the technology level. The organizational value of CiRM, such as effective knowledge management and knowledge exploitation, has not been fully explored yet. In the management literature, scholars developed the absorptive capacity (ACAP) construct to explain why organizations differ in their ability to acquire, assimilate, transform, and exploit external knowledge sources and experience [33]. Researchers use the ACAP construct to explain how individuals within organization seek novel information [4], build information relationships [10], or transfer knowledge across organizational boundaries [25].

In this paper, we draw from that literature and argue that ACAP presents a worthwhile perspective to illuminate how technology and management initiatives affect public administration. We hypothesize that CiRM/311 increases a public administration's (PA) absorptive capacity, by providing it with the technical and organizational means to manage information and communication flows. We examine our hypotheses with qualitative data from Miami-Dade County. With the paper we attempt to make two contributions. First, we introduce ACAP as another important and worthwhile perspective to look at CiRM. Second, we draw managerial insights from the case study and discuss their implications for effective emergency management.

## 2. Theoretical Model

In the following section, we review literature on CiRM, emergency management, knowledge sharing, and absorptive capacity. We then develop a theoretical model, which sheds light into the effects of information and knowledge management on CiRM.

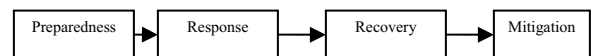
### 2.1 Citizen Relationship Management

The term Citizen or Constituent Relationship Management is derived from Customer Relationship Management [22]. In the private sector, CRM is a widely applied concept to build stronger relationships between firms and its customers. The ultimate goal of CRM is increasing sales. CRM typically builds on information technology and a variety of channels to interact with customers. Successful CRM furthermore requires a customer centric business philosophy, effective business processes, and often dramatic cultural and organizational change at the business firm [32]. The overwhelming success of information technology and electronic commerce in the private sector gave rise to a distinct stream of electronic government research. Scholars and practitioners alike devote considerable attention to transferring private sector concepts into public sector environment. One of these concepts is CRM. As current research shows, this process is mostly technology driven through the use of CRM software in (311) call centers. Major differences exist, as government is incident and not product based or provides complex services which are difficult to standardize. Some public owned utility agencies (e.g., water, sewer, or power) have even been using CRM software for a while. At the interface between government and citizen, public sector agencies offer electronic means to communicate with the citizens, such as call centres or web-portals. Although there are great efforts to build customer driven governments ([21], [20], [12]), in most of the cases, public sector agencies do neither have a consistent customer service strategy, nor do they have the means to systematically analyze the concerns and issues of their citizens. In the context of eGovernment research, both practitioners and academic scholars argue that citizen orientation is still far away from being fully exploited ([6], [7], [8]). In its Global Readiness eGovernment Report the UN concludes that information and service provision to citizens has not been fully exploited yet [27]. Instead of

infusing organizational and institutional change, most of the eGovernment projects represent simple reproductions of existing institutional patterns and structural relations among public sector agencies [26]. With respect to CiRM, public administrations still tend to be very weak in integrating a citizen centric culture with accountability and transparency. We therefore argue that effective CiRM helps public administrations to develop and maintain a strong relationship with its citizens. CiRM fosters information exchange and promotes participation on either side. One of the key means to achieve is the implementation of effective communication patterns and procedures between the citizen and public administration. When it comes to planning, providing and measuring the success of public sector services citizens represent a valuable resource.

### 2.2 Emergency Management

The wake of Hurricane Katrina shows that administrators have to review their emergency plans regarding several issues [23]. Responsibilities and escalation procedure have to be defined. It is important to know what the available resources are, be they public or private, which need to be considered. Effective internal communication about who is doing what, when, and why is crucial. External communication (to the public) needs to be consistent, clear, and broad. Expectations among the public and the public administration have to be controlled and discrepancies between planning and reality must be managed effectively. In his work on readiness, Lasker concludes that the latter discrepancies are very likely since the people's experiential knowledge and emergency behavior cannot be fully planned upfront [15]. In consequence, emergency management plans need to be flexible and adjustable to the specific requirements of an emergency situation. In the literature, scholars identify four distinct phases of emergency management: preparedness, response, recovery and mitigation [19].



**Figure 1: Phases of Emergency Management**

Preparedness entails activities closest to the onset of a disaster. The goal of being prepared is minimizing response time. The key elements of

preparedness include the upfront planning of emergency operations, the provision of warnings and information about current developments, as well as training and preparing the general public.

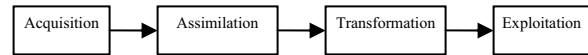
Response includes those activities undertaken closely after a disaster occurred. These activities may consist of evacuation (this may also happen prior to the disaster), mobilization, emergency assistance for victims, and so forth [30]. A key challenge emergency managers face during the response phase is effective communication and information provision. The better information flow during the response phase, the better coordination among the responding forces and operations will be. The third phase is long and short term recovery. All activities aim to restore the pre-disaster status-quo. The objective of the mitigation phase is to exploit the information and knowledge that has been collected during the previous phases. The ultimate goal is the identification of measures that help reducing the impacts prospective disasters might have [18]. Mitigation thus involves the reduction of all hazards, which might emerge in the context of a natural disaster. With respect to Hurricanes, dams, land-use ordinance, or particular construction codes represent both structural and non-structural mitigation types.

CiRM therefore has important implications for effective emergency management. The ability of public administration and emergency management centers to acquire and to provide real-time information and communication regarding the status-quo determines the success of the overall emergency management.

## 2.3 Absorptive Capacity

Effective knowledge sharing and learning is an important source of organizational performance [17; 31; 13; 29; 2; 16]. Ever since Cohen and Levinthal [9] introduced the absorptive capacity construct, scholars frequently used it to explain why organizations vary in their ability to either profit from or exploit novel knowledge. So far, scholars used the ACAP construct to account for a couple of phenomena. One line of research argues that ACAP explains how organizations acquire and assimilate novel knowledge from external sources [14]. Another line of research focuses on ACAP as a predictor of the organization's ability to transform internalized knowledge in order to exploit and subsequently increase organizational

performance with it [24]. Research at the inter-organizational level concentrates on questions whether or not dyadic relationships improve learning processes [14], extend the organizational knowledge base [5], or improve diffusion processes with the ultimate goal of predicting the focal organization's ability to gain and sustain competitive advantage [1]. The four key dimensions of ACAP are knowledge acquisition, assimilation, transformation and exploitation.



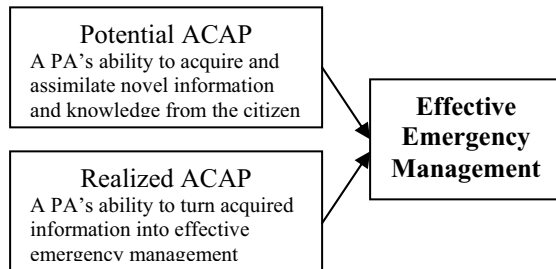
**Figure 2: Dimensions of ACAP**

To highlight what absorptive capacity exactly means, let us briefly present the example of a government agency trying to adopt an eGovernment practice. First of all, the agency needs to be aware of what eGovernment is, how it is implemented and what its benefits are. This process of collecting and understanding eGovernment related data is what ACAP scholars refer to as potential ACAP [33]. The more knowledge the agency acquires and the more the agency is capable of understanding what the implications for its particular operations are, the higher is the organization's potential ACAP. Subsequently, the ability of an organization to profit from such novel knowledge is what scholars refer to as realized ACAP [33]. Researchers would assign a high degree of realized ACAP to a government agency, which successfully runs eGovernment services. In order to build and maintain effective eGovernment services, an agency needs to transform the acquired eGovernment related knowledge and adapt it to its operations. Moreover, the agency needs to reconfigure existing routines and organizational process to fully exploit the opportunities eGovernment is offering.

Why is it worthwhile looking at absorptive capacity in the context of CiRM? Absorptive capacity allows us to assess whether or not organizations are able to manage information flows and knowledge exchange. A high degree of potential ACAP helps public administrations to understand what the citizens think, what they want, and what they might need. In turn, a high degree of realized ACAP allows public administrations to identify strategies and organizational measures to optimize operations

and their relations to the citizen.

Building on the latter review, we construct the following model. It helps us to understand how information distribution and knowledge sharing helps public administrations to manage emergency situations effectively.



**Figure 3: ACAP model for assessing the impact of CiRM/311**

We argue that potential ACAP drives a PA's ability to learn from prior emergency situations and improve organizational and managerial measures. Realized ACAP, in turn, helps PA's to handle active emergency situations.

### 3. Case Study: Miami-Dade County 311 and Hurricane Wilma

Miami-Dade County is home to 2.3 million residents, comprising an unincorporated area of more than 1 million people and 35 municipalities. On Thursday, October 20th, 2005 Miami-Dade Counties Emergency Operations Center (EOC) activated to level 2 status in anticipation of Hurricane Wilma. By the time it crossed Miami-Dade County, Hurricane Wilma had reduced to category 2. However, it left 957,000 homes in Miami-Dade County without electricity and inflicted damage to a broad area. Miami-Dade's 311 Answer Center serves as a single point of contact for all non-emergency public services, including information and service requests since summer of 2005. At this point it is the only multi-jurisdictional (County, municipalities) 311 case in the US. The Federal Communications Commission (FCC) reserved the 3-1-1 telephone number for the public to reach non-emergency police and other government services. One role of 311 is to offer citizens access to government information in pre-, during and shortly after emergency situations. It also diverts calls from 911 emergency systems. The software solution (CRM type: Motorola CSR) connects to a GIS and other

agency specific applications. During emergency situations 311 operates 24 hours. Online services staff also provides 24h services in emergency situations and coordinates directly between EOC and 311. Miami-Dade County has a multi-channel environment as its portal ([www.miamidade.gov](http://www.miamidade.gov)) provides online information, communication and transaction services but also acts as a secondary knowledge base for 311 call takers. A web-enabled reporting system called "ServiceStat" combines different databases and makes performance and 311 call information available to decision-makers, elected officials and ultimately the public for increased accountability. These customer service functions have most recently (May 30th, 2006) been centralized in the newly established Government Information Center.

Future plans include 24/7/365 operations, reverse 911 or integration of all County agencies and municipalities. Finally, a long term initiative intends to foster collaboration between counties.

#### 3.1 Pre-Hurricane developments

As Wilma began acceleration toward Florida, 311 was handling 591 calls per hour on Sunday. Call volume surged 636% from an average call volume of 2000 calls per day to 12737 callers. **Fehler! Verweisquelle konnte nicht gefunden werden.** shows the acceleration of hurricane-related calls as the storm approached, from the day before activation until the day before arrival.

**Table 1: 311 call developments**

	Total Calls	Wilma Calls	%
Day			
Wed	4690	1172	25
Thu	<b>6514</b>	<b>3257</b>	<b>60</b>
Fri	5762	4033	70
Sat	4911	4911	100
Sun	<b>12737</b>	<b>12737</b>	<b>100</b>

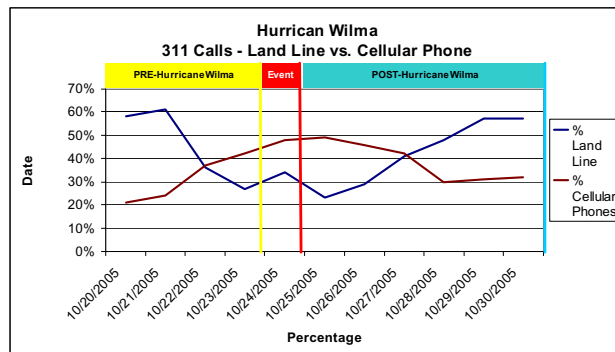
The slow approach of Wilma gave residents more time to react. This is reflected in the type of requests. Major topics are seen in **Fehler! Verweisquelle konnte nicht gefunden werden.**

**Table 2: Pre-Hurricane citizen requests**

Issues	#
School closures (Any level)	3442
Evacuations and evacuation routes	1197
Shelter openings and locations	1195
Hints for individual preparation	1042
Availability/ distribution of sand for sandbags	984

### 3.2 Hurricane developments

As the hurricane made landfall at 6:30 a.m. on October 24th, Miami-Dade County was already affected. 311 received over 400 calls between 6-7am. Up to 50% of total calls were made from mobile phones (Figure 4). Similar dominance of cell phone use is indicated by reports on areas directly affected by hurricane Katrina and is a general development for 911 calls. Furthermore, while phone services might not be available due to



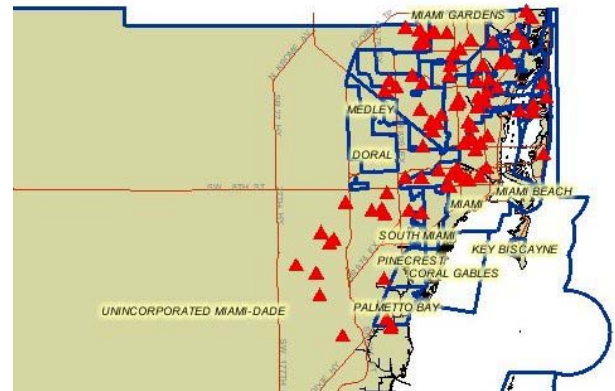
**Figure 4: Land vs. Cell phone use**

jammed or damaged cells, text messaging continues to work. Difficulties also exist for VoIP users. They might not be able to connect to 311 or 911. The role of call takers changed from being information providers to providing reassurance to residents. Moreover, damage reports, service requests (SRs) or other arising issues were mapped on the GIS system and forwarded to the EOC for real time assessment. Currently, the system can take service requests for:

Power Line Down/Power Outage (FPL); Bellsouth Line Down/ Phone Outage; Tree/Vegetation Blocking Roadway/Sidewalk; Fallen Tree; Mobile Home Damage; Roof Damage; Structural Damage; Traffic Lights Out; City of Miami Garbage Pile; Flooding

Figure 5 illustrates citizen reports of roof damage via 311, web-portal and emergency response units. Depending on the severity of the disaster all emergency resources have to stand down from any operations for a certain time period to prevent the loss of those resources. This significantly diminishes the information basis for decision making. As DHS Secretary Michael Chertoff acknowledged while testifying before Congress, "In Katrina, FEMA faced challenges in having full situational awareness of where the

needs were greatest, getting supplies into affected



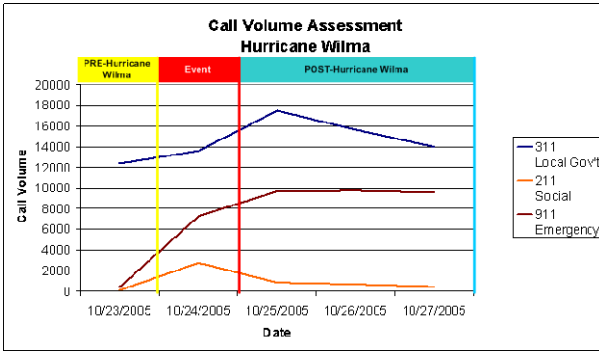
**Figure 5: Roof damage reported by citizens**

areas and tracking shipments of supplies to ensure that they reach the people who need them [...] [11]. In contrast, 311's ability to continuously map citizen notification about damage is used to assist the County as well as other agencies (i.e. FEMA, Army Corp of Engineer's) in determining where to allocate resources. SRs on electricity outages, electricity poles down and roof damage were, e.g. used to determine locations for water and food distribution. As the Director of Miami-Dade's Office of Emergency Management notes, "We work closely with them (> 311) in getting, [...] the up to date information both ways. One, that we can provide them the information [...] to tell the people who call, and two is that based on the types of calls and inquiries they're getting, [...] we could use that information to determine what other information should go out say in a media release [...]. So it, it gives us, as close as possible to a real time pulse on what's going on."

### 3.3 Post-Hurricane developments

Call volume peaked with a 1200% increase the day after the hurricane, totaling in 150000 calls during activation. Call volumes leveled off at a higher daily average volume than before Wilma which is now around 4000 calls as emergency operations helped advertising the "new" channel. The same trend can be found in the other case studies of New York City, Chicago and Baltimore.

311 received significantly more calls than 911 or 211 (information and referral for health and human services) as seen in Figure 6. Interviewees stated that some residents preferred to call 311 during the disaster situation for emergency



**Figure 6: 311 versus 911 and 211 use**

requests (i.e. baby stopped breathing) due to shorter waiting times. This creates difficulties as 311 is not using an ALIANI system (for automatic caller ID / address validation) due to privacy considerations and call takers have to be undergo special training to deal with such situations. Although we don't have access to historical 911 data before 311 (i.e. 911 call volume, abandoned calls, request types) diversion of inquiries like FPL or roof damage mentioned in pre- and post-disaster to 311 is certainly relieving 911 operations.

**Table 3: Post-hurricane citizen requests**

Issues	#
Status of closures (schools, bridges, government offices, transit systems)	14048
Curfews	11001
Power outage / power line down	9018
Distribution of water, food, ice	7571
FEMA related	4609
Locations of opened gas stations	2772

## 4. Results

While special phone services during emergency activations or hurricanes were not new to the State of Florida, 311 had broader implications for the County's emergency and daily service operations.

311 improves accessibility to information and government services. Information and services for an area of 2,431 sq miles are centralized and integrated seamlessly throughout the different channels and levels of government. Average landline/cell phone penetration is around 94% [3] compared to an average internet penetration of 68% (50-60% in FL) in the US [28]. Furthermore, in disasters citizens are not necessarily at home which makes the phone the key communication channel. So a single, easy to remember number –

311, facilitates contact with government by reducing complexity (900+ numbers to 1) and crosses the digital divide. George M. Burgess, the County Manager, says: "If you have a system like this that's responsive to people regardless of where they live, regardless of their age, their demographic, you kinda brought people together. [...] It helps you manage, [...] to better deploy resources, [...] better understand what's important to different geographic areas."

In addition, based on the scalability of 311, government agencies were able to manage continuous rise in information demand through Hurricane Wilma. As the data (Figure 3 and table 1, 2) reveals, the closer the emergency approaches, the greater the information need. Volume and nature of calls shift as a disaster approaches, strikes and departs.

311 provides timely access to continuously updated information and services for the public and government entities. This is two-fold. Information can be adapted to external situational changes or issues raised by the public. Government bodies also get real time feedback and insights into the changing public's needs. The 311 organization, technologies and embeddedness into the EOC provides the routines to analyze, process, interpret and understand the knowledge acquired from citizens (external sources). 311 data allows for a broader retrospective analysis when combined with data from other entities for continuous improvement. This can also be very useful for the mitigation aspect of emergency management. In case of Hurricane Wilma this was the question why there was a high number of roof/building damage despite rigid building codes.

As our interviews with administrators confirm, Miami-Dade is trying to combine, structure, and evaluate the data provided through 311 with other sources of information. This work is continuously done by "Customer Service Advocates" which work together with a defined set of departments on performance, business process reengineering and service improvement. As far as technology is concerned the County Manager concludes, "I think what technology can do is allow you with the resource you have to be far more efficient and handle a lot, probably volumes of need that [...] you were, you weren't getting at effectively. [...] Technology gives us more data, more information, so we can be more responsive. [...] You know wireless technology, handheld devices in the field,

potential of that's incredible [...] you're probably giving that individual in the field a little bit broader skill set." As a final point, we take a look at the knowledge exploitation dimension of ACAP. In February 2006 Judi Zito, the CIO of Miami-Dade County, introduced the "Employee Eyes and Ears" program that engages all County employees to call 311 to report issues within their community in any situation. 311 has notably led to more accountability and transparency. The County Manager states, "Well, I wanna see in a very succinct way how we're doing on these different product lines. 311 is a source of information that feeds in certain areas on what's important to the public".

Citizen insights acquired via 311 lead to budget or responsibility gains for some departments while others experience losses. The centralized position of 311, its data and momentum is a key source for knowledge sharing, organizational change, citizen orientation, multi-jurisdictional government and cross-boundary collaboration. The 311 staff is currently working on reducing vertical and horizontal boundaries within and between government agencies in order to make knowledge sharing/transformation of 311 related data more effective, and in order to exploit the organizational change potential, 311 is bringing along.

As the case reveals, 311 helps Miami Dade County to increase its ability to learn about and understand the citizens' needs before, during, and after an emergency situation. 311 also helps the administration to monitor events and developments all over the county. Drawing on the collected information, modern technology helps the country administration to transform the collected data into effective emergency response measures.

## 5. A formalized model to capture the benefits of 311/CiRM

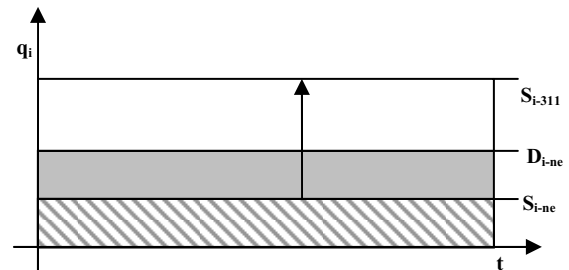
To formalize the benefits 311 might bring along, we assume the following:

$q_i$	=	Quantity of requested information or services
$t$	=	Time
$D_{i-ne}$	=	Demand of public info/service in non-emergency
$S_{i-ne}$	=	Supply of public info/service in non-emergency

$S_{i311}$  = Supply of public information through in 311 environment

We further assume that in general, the broader public does not know much about local government, available public services, agency responsibilities or their obligations regarding government. We argue that there is always a distinct demand for information and public services (transactions). Both are summarized in our linear demand function  $D_{i-ne}$ , which is constant over time  $t$  (perfectly elastic). Measures of government to provide information and services to the public are summarized in the linear supply function  $S_{i-ne}$ . Technological and organizational constraints as well as a lack of knowledge regarding the citizen's real demand  $D_{i-ne}$  (grey + striped area), strongly limits governmental service provision. Therefore,  $S_{i-ne}$  is also constant over time.

By introducing a 311 multi-channel environment government's supply function changes to  $S_{i311}$ . It is capable of serving a higher quantity of information/service requests as we have shown in section 4. However, as it is limited in terms of technology, staffing or organizational constraints it also follows a slope of 0 ( $Ed = \infty$ ).



**Figure 7: Information supply and demand before the 311 system integration**

Figure 7 illustrates such a shift in non-emergency situations. First, government unveils latent demand (grey area) through utilization of technology and channels. Second, it is able to meet  $D_{i-ne}$  and react flexible ( $S_{i311} - D_{i-ne}$ ) to potential changes in demand over time. Let us now take a look at the first emergency situation within a 311 environment. In doing so, we are able to show its impact of government. For further discussion we use a second demand function:

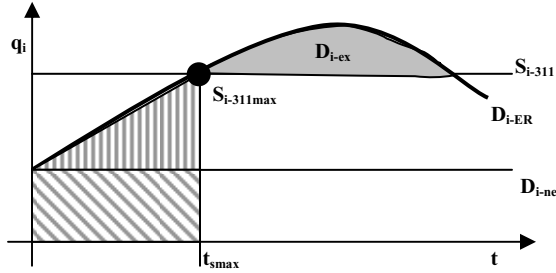
$D_{i-ER}$  = Demand of public info/service during emergency situations

As we can see in the Wilma case,  $D_{i-ER}$



increases over time, peaks and decreases before it levels off at  $D_{i-ne}$ . The resulting function resembles an rectangular hyperbola as shown in Figure 8. The 311 environment enables government agencies to meet the information requirements  $D_{i-ER}$  before its limit is reached in  $S_{i311max} = (D_{i-ER} = S_{i311}, t=t_{max})$ . Excess demand is as follows:

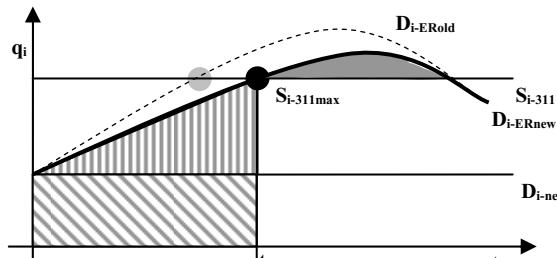
$$D_{i-ex} = \int_{t_{max}}^{t_2} (D_{i-ER} - S_{i311}) dt$$



**Figure 8: Information situation during an emergency with 311**

Although government is not able to serve the excess demand  $D_{i-ex}$ , (due to limitations in technology, staff, and emergency organization), it is now capable to at least monitor, collect, and evaluate the excess data for further planning.

Depending on the government agency's absorptive capacity, it uses the collected data on served and excess demand to improve its organizational routines and processes to satisfy information demand in future emergency situations. By taking appropriate measures, government agencies can either improve the supply side  $S_{i311}$  or reducing the demand side  $D_{i-ERold}$ . Thanks to the 311 system, government is aware of  $D_{i-ne}$  and  $D_{i-ex}$ . Executives have both options. Assuming that government aims to increase the upfront preparedness of the public, information quality increases, concerns arise slower, less reassurance and less government support is demanded (Figure 9).



**Figure 9: Midterm effect of 311 on information demand**

In consequence, the demand function is flattening and less excess demand is likely to occur in the next emergency. As Miami-Dade's County Manager George Burgess concludes, "[...] during these hurricanes, 311 was just an unbelievably positive tool. Not just before the storm as far as rumor control and answering questions, and [...] right after the storm [...] us getting information to the public. So it's customer service, it addresses perceptions people have of government, it reduces emergency call volumes, it's a great disaster management tool, it's also just a strategic management tool you can use to either get information out or get information in."

## 6. Limitations to this research

The latter theoretical discussion further supports our argument that 311 increases public administration's capacity to manage information relationships between itself and its broader public. However, there are some important limitations to our research, which we would like to address in this section. The data we have collected is mostly qualitative in nature, and thus allows for alternative interpretations. To increase the strength of our argument, we plan on defining measurable variables, collecting quantitative data, and thus try to identify causal relationships between the variables. One possible test scenario might look at all ACAP dimensions in the pre- and post-311 scenario of other EO entities. Our theoretical model is mostly based on qualitative observation and sparse quantitative data. In fact, it appears that public information demand via 311 rather looks like a convex function. However, to better bring our argument across we worked with a simplified model. In a next step we might look at large scale datasets to construct and validate our demand and supply function. Another potential scenario might be the formal mathematical modeling of demand and supply functions as well as a subsequent simulation with real-world datasets.

## 7. Conclusion

In this paper, we make important contributions to both academic scholars and practitioners.

With respect to literature on CiRM, we take the example of emergency management to illuminate the importance of effective knowledge and information management between government agencies and the broader public. By utilizing the



absorptive capacity construct we have opened another avenue for future theoretical and empirical research on CiRM. For practitioners, we provided a real life case study on how effective CiRM practices might look like. We furthermore attempted to demonstrate that 311 is more than just a call center solution. As the case of Miami-Dade County shows, 311 is about adopting state-of-the art information management practices to build successful relationships between government agencies and its broader public in emergency and non-emergency situations.

## 8. Acknowledgements

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