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The role of e-government in disaster management: A review of the literature

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Abstract

Aim/purpose – Disasters or catastrophic events create unforeseen circumstances and require new approaches from local and national administrations in addressing the negative impacts on society and the economy. Determining the role of e-government in providing the kind of services that are especially needed has become particularly relevant during COVID-19. This paper aims to assess the progress and current state of research on the role of e-government during or in the aftermath of catastrophic events. The purpose of this research is twofold: one, to benefit scholars by providing directions and a basis for further research, and two, to offer guidance to decision-makers involved with disaster management.

Design/methodology/approach – The methodology used in this study is a systematic literature review. Multiple databases, including EBSCO, Elsevier, Emerald, JSTOR, Google Scholar, SAGE, ScienceDirect, Scopus, Springer, Taylor and Francis, and Wiley Online Library were searched for appropriate papers. In total, 36 papers published between 2004 and 2022 met our inclusion criteria and were analyzed.

Findings – The study produced three types of findings. First, an analysis of the themes and trends in the existing literature. Second, a synopsis of the published research findings in the reviewed papers. And third, a description of the needs and opportunities for further research.

Research implications/limitations – This study should help other researchers in directing their efforts in further exploration, and it should help people involved with real-life disaster management to navigate through the effective role and application of e-government. The main limitation is that we found only 36 research papers that met our inclusion criteria.

Originality/value/contribution – Despite the potentially critical role that e-government may have in mitigating the negative effects of catastrophic events, research on e-government in disaster management seems to be still underdeveloped, and to our knowledge, there is no published systematic review of such research.

Keywords: disaster management, e-government, literature review.

JEL Classification: H11, H12, I31, O21, O35.

1. Introduction

Disasters or catastrophic events constitute crises that cause major disruptions in the normal functioning of the social system (Perry, 2018). A most recent example of a wide-reaching disaster is the COVID-19 pandemic, which has had substantial effects on society and the economic environment (Yang et al., 2020). Disaster management is a course of action that is executed before, during, and after a disaster. Frequently, disaster management is portrayed as a continuous cycle consisting of four phases: response to a disaster, recovery, mitigation, and preparedness for future events (O'Brien et al., 2010).

A central part of disaster management during and in the aftermath of a major crisis can be played by e-government (Jaeger et al., 2007). In the context of this study and based on an extended discussion of the term by Grönlund and Horan (2005), we define e-government as the use of information and communication systems, in particular the internet, by government agencies to connect with citizens and communities to provide needed information and services. Despite the potentially critical role that services provided through e-government may have in mitigating the negative effects of catastrophic events, research on e-government in disaster management seems to be still underdeveloped, and to

our knowledge, there is no published systematic review of such research. Nevertheless, literature reviews are important for research progress in a given field, as they allow other researchers to focus their attention on areas that are in particular need of being further investigated and may prevent scholars from inadvertently trying to reinvent the wheel (Rowe, 2014; Webster & Watson, 2002).

The importance of effective disaster management and the lack of a systematic assessment of the current status of research on the role of e-government during and in the aftermath of catastrophic events motivates our study. In our work, 36 published papers are reviewed and analyzed, to provide a summary of what has been done, and where additional research efforts should be directed. Besides looking at the specific topics that have been investigated, we also identify the research methods used and the theoretical foundations that these studies were based on, as well as provide ideas for much-needed future research; all relevant to other researchers working in the field of e-government and to the public officials and technical staff that rely on this research to better prepare for future disasters through improved e-government services.

Three main research questions guide our work:

- RQ1. What types of disasters have been investigated and in what contexts or settings?
- RQ2. What suggestions can be made to those in charge of providing e-government services, based on the findings in these published studies?
- RQ3. What areas are most critical to be further investigated?

The remainder of our paper is structured as follows. After this introduction, we provide some theoretical background to our work, followed by a description of our research approach, and the presentation and discussion of the results of our analysis. After deliberating on the answers to our three research questions, we conclude our paper by summarizing our contributions to the existing body of knowledge and pointing out several promising research avenues related to the role of e-government in the context of disaster management.

2. Background

The term “e-government” is applied to describe a variety of interactions between public authorities on one side, and individual citizens and other residents, or businesses and other non-governmental entities on the other side, using information and communications technology (Reitz, 2006). It generally refers to local or national government information and services being made available

through the internet via web browsers or mobile apps. Examples of information provided may include new business regulations, announcements of public events, and general updates on current affairs. Examples of services provided may include the renewal of driver's licenses, payment of taxes, and applications for business permits. E-government encompasses various sub-concepts describing specific types of interactions, such as "e-filing," "e-publication," "e-procurement," and "e-payment" (Reitz, 2006). It is commonly recognized that one of the most important factors in public acceptance of e-government, i.e., the willingness of public constituents to partake in e-government services, is confidence in government (Bélanger & Carter, 2008). In general, the more people trust government authorities, the more likely they are to make use of the e-government services provided to them.

The concept of disaster is a complex issue, and the definition of disaster is ambiguous and considered "too fluid" by many authors (Faulkner, 2001). In 2018, Perry reviewed the history of definitions of disasters and proposed to group these definitions into three paradigms that grew over time and became foci for disaster research. According to Perry (2018), these definitions can be classified into a classic approach, a hazards-disaster tradition, and an explicitly socially focused approach. The classic approach looks at disasters as consequences of events seen as precipitants to the failure of the social system to deliver reasonable conditions of life. Conversely, the hazards-disaster tradition centers on specific extreme events, such as earthquakes, tornadoes, or floods that cause significant hardship or damage. The third paradigm focuses explicitly on social phenomena as the defining feature of disasters, emphasizing social vulnerability and disruption (Perry, 2018). For our literature review, disasters that meet definitions in any of these paradigms are equally considered.

Disaster management comprises actions taken before, during, and after a disaster. That is, it includes preventive steps taken to ward off or mitigate the severity of disasters, as well as coping with adverse circumstances during a disaster, and trying to return to normalcy after a disaster. Designed to reduce the effects of disasters, a disaster management plan may be created ahead of time, outlining responsibilities, actions, and resource allocations when responding to a disaster. Executing a disaster management plan may be supported by a disaster management system, which can help provide real-time information and enhance decision-making capabilities, before, during, and after disaster response operations (Chatfield et al., 2010).

During a disaster, the main challenge often is effective and efficient communication (Manoj & Hubenko Baker, 2007), as one of the main tasks of disaster management is to keep up and inform on developments in appropriate ways and to foster awareness about risk and protective actions in the community. Well-designed e-government tools that are accepted and trusted by the community can provide the means for prompt and extensive communication in disaster management. Furthermore, appropriate e-government applications may become central in coordinating government responses to disasters and support speedy and effectual decision-making by responders.

3. Research approach

To address the research questions, we adopted a systematic literature review approach (Levy & Ellis, 2006; Webster & Watson, 2002). Literature reviews are a valuable resource for researchers in a specific field, as they allow them to focus attention on areas that are in particular need of further investigation and may avoid unnecessary effort in rediscovering what has already been discovered. Literature reviews thus help speed up progress in the given field (Wolfswinkel et al., 2013). Additionally, a systematic literature review, as observed by Mrowiec (2022), facilitates applying a rigorous framework for identifying, evaluating, and analyzing papers in a given research field.

3.1. Paper search and inclusion/exclusion criteria

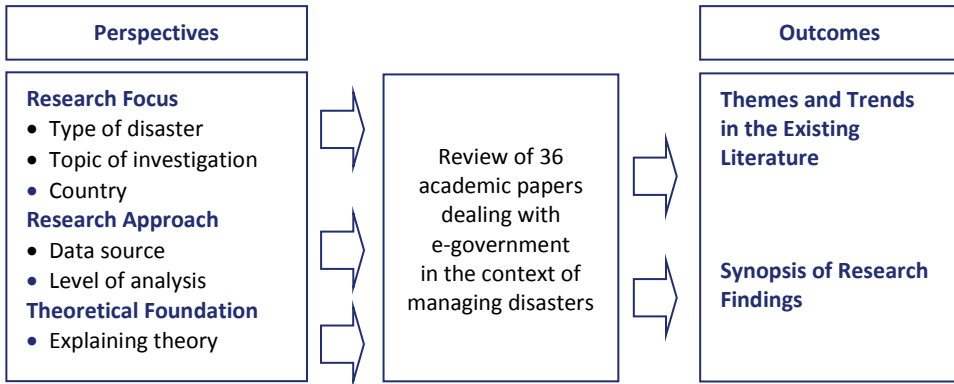
The search to identify relevant papers was conducted in 2021 and 2022 using a keyword search on various databases, including EBSCO, Elsevier, Emerald, JSTOR, SAGE, ScienceDirect, Scopus, Springer, Taylor and Francis, and Wiley Online Library. These ten research databases were chosen because they are large bibliographic databases covering the social sciences, including management information systems, e-government, and emergency management. Furthermore, we used Google Scholar to locate additional papers identified in the references of the papers found initially by searching the ten other databases. This fairly large number of databases was used because a preliminary search with only a few major databases yielded very few relevant papers. Even with our extensive search, we found only 36 papers that met our inclusion/exclusion criteria. In our keyword search, we looked for at least one word or phrase from each of

two groups of search words in the title, list of keywords, or abstract of the identified papers. The first group of search words included “digital government,” “electronic government,” “e-gov,” “e-government,” and “online government” while the second group contained the words “catastrophe,” “crisis,” “disaster,” “emergency management,” “epidemic,” “outbreak,” “pandemic,” and “unexpected event.” To be included in our final selection, we used the following inclusion/exclusion criteria: the identified papers needed to be full papers written in English and published in an academic journal or proceedings of an international academic conference and deal directly with the topic of our investigation, that is, e-government in disaster management. The limitation of being published in academic journals or international conference proceedings was to ensure the comparable quality of the published studies. We included conference papers in addition to academic journal papers because often current and groundbreaking research is published first in conference proceedings. Some research published in conference proceedings may never make it into an academic journal, and given the long review cycles for many journals, papers that finally get published in academic journals may report on studies that are already several years old.

3.2. Paper analysis

In analyzing the papers in our sample, we adapted the framework proposed by Roztocki and Weistroffer (2012), as depicted in Figure 1. The 36 papers in our sample are analyzed concerning research focus, research approach, and theoretical foundation, if provided. As to research focus, we classify the papers by the broad topic of investigation, the country in which the research was conducted, and the type of disaster involved. Objectives of our review include obtaining an overview of the common themes and trends in the existing literature, a synopsis of research results reported, and identifying the needs and opportunities for further investigations.

Figure 1. Analytical framework



Source: Based on: Roztocki & Weistroffer (2012).

4. Findings

4.1. Current themes and trends

To address our first research question: “What type of disasters have been investigated and in what contexts or settings?” we analyzed all papers in our sample for the research focus of the reported studies, the research approach used, and any theoretical foundation provided for the reported work.

All papers in our sample were published between 2004 and 2022, with a maximum of four papers in one year. The papers appeared in 33 different publication outlets as listed in Table 1. We classified only 15 of the papers in our sample as representing empirical work, and the other 21 as non-empirical studies, based on the classification method proposed by Alavi and Carlson (1992). In essence, empirical research obtains evidence from systematic observations, while non-empirical studies are based on authors’ past experiences, ideas, and speculations.

Concerning the research focus, we reviewed all papers as to the topic of investigation, the country in which the study was conducted or data was collected, and the type of disaster the study was concerned with.

For the research approach, we looked at the primary data source, such as interviews or questionnaires, and the level of investigation. The level of investigation refers to whether the study focused on individual persons, specific projects, or organizations, or was looking at the nation or country.

Table 1. Papers by publication outlet

Journal or conference proceedings	Count
Accounting and Management Information Systems	1
Asian Politics & Policy	1
Chinese Political Science Review	1
Evaluation and Program Planning	1
Frontiers in Public Health	1
Future Generation Computer Systems	1
Global Journal of Management and Business Research	1
Government Information Quarterly	3
HAICTA 2013 Proceedings	1
HICSS 2010 Proceedings	1
Homeland Security & Emergency Management	1
Information Polity	1
Information Technology and Management	1
Innovative Marketing	1
International Journal of Environmental Research and Public Health	1
ISPRS 2004 Proceedings	2
Jurnal Ilmiah Ilmu Administrasi Publik	1
Journal of Economics, Business and Management	1
Journal of E-Governance	1
Journal of Governance and Regulation	1
Journal of Information Technology Theory and Application	1
Journal of Universal Computer Science	1
MIS Quarterly Executive	1
Multimedia Tools and Applications	1
Online Information Review	1
Policy Sciences	1
Public Administration Review	1
Public Performance & Management Review	1
SHS Web of Conferences 2020 Proceedings	1
Telecommunications Policy	1
TEM Journal	1
Veterinaria Italiana	1
Wuhan University Journal of Natural Sciences	1
Total	36

Table 2 summarizes all the findings related to the research focus and research approach. As indicated in the table, many authors did not clearly specify how the data for their studies were obtained. Often statements made in this respect by the authors were very vague, with some authors mentioning their experience or observations working as consultants.

Table 2. Papers with a research focus and research approach

Paper/ Type of research	Topic	Country	Type of disaster	Data source	Level of analysis
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
Amosun et al. (2022) <i>Empirical</i>	Impact of e-government on citizens' engagement during outbreak	China	Epidemic outbreak	Survey	Individual
Batuk et al. (2004) <i>Non-empirical</i>	Disaster management standards for e-government	Turkey	Earthquake	Not specified	Project
Burlacu et al. (2021) <i>Non-empirical</i>	Use of e-government services during outbreak	Romania	Epidemic outbreak	Secondary data	Country
Ceesay & Bojang (2020) <i>Empirical</i>	Adoption of e-government services during outbreak	Gambia	Epidemic outbreak	Secondary data (online content)	Organization
Chatfield et al. (2010) <i>Non-empirical</i>	Role of RFID technology in e-government disaster response	Not specified	General disaster	Not specified	Organization
Chatfield & Reddick (2015) <i>Empirical</i>	Using e-government for risk communication	Indonesia	Eruption	Websites	Organization
Chen (2013) <i>Non-empirical</i>	Standardization of financial information and transparency	USA	Financial crisis	Observation, experience	Country
Colangeli et al. (2011) <i>Non-empirical</i>	Notification and management IS for animal disease outbreaks	Italy	Animal disease	Observation, experience	Country
Dawi et al. (2021) <i>Empirical</i>	Use of e-government and social media during outbreak	Malaysia	Epidemic outbreak	Survey (web-based)	Individual
Devadoss & Pan (2004) <i>Empirical</i>	E-government as disaster management tool	Singapore	Epidemic outbreak	Interviews, secondary data	Country
Djunid et al. (2020) <i>Empirical</i>	Evaluation of E-government websites	Indonesia	Epidemic outbreak	Secondary data (online content)	Organization
Eraslan et al. (2004) <i>Non-empirical</i>	Designing a disaster management system	Turkey	Earthquake	Observation, experience	Project
Giest (2017) <i>Non-empirical</i>	Utilize big data for crisis management	Not specified	General disaster	Literature, reports	Organization

table 2 cont.

1	2	3	4	5	6
Goulas & Kontogeorga (2013) <i>Empirical</i>	Impact of economic crisis on decentralization of e-government	Greece	Financial crisis	Survey	Organization
Ibrahim et al. (2019) <i>Empirical</i>	Preparedness of citizens for disasters and e-government	Iraq	General disaster	Survey	Individual
Jaeger et al. (2007) <i>Non-empirical</i>	Viability of using e-government to develop response systems	USA	General disaster	Not specified	Country
Kavanaugh et al. (2012) <i>Empirical</i>	Social media e-government and emergency management	USA	General disaster	Survey	Organization
Lv, Li, & Choo (2018) <i>Non-empirical</i>	Cloud-based e-government system for disaster management	Not specified	General disaster	Not specified	Organization
Lv, Li, Wang, et al. (2018) <i>Non-empirical</i>	Smart city platform for e-government services	Not specified	General disaster	Not specified	Organization
Millard (2018) <i>Non-empirical</i>	Open governance to respond to the financial crisis	Multiple	Financial crisis	Reports	Organization
Moon (2010) <i>Non-empirical</i>	Application of m-government for emergency management	USA	General disaster	Literature, reports	Organization
Nguyen & Tran (2022) <i>Empirical</i>	Acceptance of e-government	Vietnam	Epidemic outbreak	Survey (web-based)	Individual
Pan et al. (2005) <i>Empirical</i>	E-government for responding to the SARS outbreak	Singapore	Epidemic outbreak	Interviews, secondary data	Country
Pirog & Johnson (2008) <i>Non-empirical</i>	E-government for electronic payment programs in a crisis	USA	Hurricane	Not specified	Organization
Pollifroni (2015) <i>Empirical</i>	Using e-government for administrative transparency	Italy	Financial crisis	Websites, secondary data	Organization
Shan et al. (2012) <i>Non-empirical</i>	Framework for an effective emergency responses system	China	General disaster	Not specified	Organization

table 2 cont.

1	2	3	4	5	6
Shen & Chu (2014) <i>Non-empirical</i>	Social media and IT for emergency management	USA	General disaster	Websites	Organization
Sideridis (2013) <i>Non-empirical</i>	Challenges in offering e-services during financial crisis	EU countries	Financial crisis	Not specified	Country
Sorrentino & De Marco (2013) <i>Non-empirical</i>	Impact of e-government on economic growth	Italy	Financial crisis	Reports, secondary data	Organization
Ullah et al. (2021) <i>Empirical</i>	Role of e-government to reduce the impact of epidemic outbreak	China/Pakistan	Epidemic outbreak	Secondary data	Country
Uwizeyimana (2022) <i>Non-empirical</i>	Importance of e-government during outbreak	Rwanda	Epidemic outbreak	Secondary data	Country
Wang et al. (2006) <i>Non-empirical</i>	Proposing of disaster recovery system model	China	General disaster	Not specified	Organization
Wong & Ho (2022) <i>Non-empirical</i>	Effects of digital divide on e-government acceptance	Hong Kong	Epidemic outbreak	Literature, reports	Country
Yasir et al. (2020) <i>Empirical</i>	Role of e-government in online social presence during outbreak	China	Epidemic outbreak	Survey	Individual
Youngblood & Youngblood (2018) <i>Empirical</i>	Online communication tools in local emergency management	USA	General disaster	Websites, secondary data	Organization
Zafar et al. (2014) <i>Non-empirical</i>	Disease surveillance and reporting system	Pakistan	Epidemic outbreak	Not specified	Country

To determine the theoretical foundation used in the reviewed studies, we examined each paper in our sample for theories employed in the investigation or as justification or explanation of the findings. Table 3 shows that only six of the 36 papers made use of any type of theory. This absence of a firm theoretical base seems to indicate that research on the role of e-government in disaster management is still in its early stage of development.

The concept of digital-era governance (DEG) (Dunleavy et al., 2006) has three components: reintegration, needs-based holism, and digitization. Reintegration refers to placing certain societal elements back under government control, e.g., security operations. Needs-based holism suggests restructuring government around well-defined target groups. And digitization describes making use of the full potential of digital storage and communication in governance. Giest (2017) used the concept of digital-era governance to explain the differences in the speed of development and progress of various e-government initiatives.

The e-government adoption model (GAM) (Shareef et al., 2011) builds on the various theories related to technology adoption, diffusion, and behavioral, social, and cultural characteristics. This model relates e-government adoption to five primary constructs: attitude to use, ability to use, assurance to use, adherence to using, and adaptability to use. Nguyen and Tran (2022) employed GAM to develop their hypotheses on stimuli for adoption of e-government services during COVID-19.

Nudge theory (Simon & Tagliabue, 2018) is a concept in behavioral economics advocating positive reinforcement and indirect suggestions to guide the behaviors and decisions of societal constituents. Nudging differs from other means of achieving amenabilities, such as instruction, legislation, or enforcement. Nudge theory was used by Millard (2018) to explain changes in peoples' behaviors before, during, and after the disaster.

Social capital describes the relationship networks within a population. It allows the effective functioning of social groups through interpersonal connections and shared norms, values, and trust. Jaeger et al. (2007) used the concept of social capital in explaining actors' behaviors during a disaster.

Social presence theory (Short et al., 1976) relates to the ability of communication media to transmit social cues. Yasir et al. (2020) used the social presence theory to explain the value of online communication as a survival motivator during disasters.

Finally, the theory of change (Brest, 2000), a methodology for planning, participation, and evaluation to promote change, was used by Sorrentino and De Marco (2013) to explain the choice of agenda for the development of various e-government services.

In summary, the themes and trends identified in our review show a large variety of disaster types handled, mostly at the organizational level, with most work being descriptive rather than empirical research, and very few studies making use of theories in their analyses or explanation of results.

Table 3. Theories used

Theory	Application of theory	Paper
Digital-era governance	Speed of development in the public and the private sectors	Giest (2017)
e-Government adoption model	Stimuli to adopt e-government services during COVID-19	Nguyen & Tran (2022)
Nudge theory	Changes in people’s behavior	Millard (2018)
Social capital	Actors’ behaviors during disasters	Jaeger et al. (2007)
Social presence theory	Online communication as a survival motivator during disasters	Yasir et al. (2020)
Theory of change	Choice of agenda for the digital development of e-services	Sorrentino & De Marco (2013)

4.2. Synopsis of research findings

To answer the second research question, “What suggestions can be made to those in charge of providing e-government services, based on the findings of these published studies?” we identified and summarized the most important research findings reported in the reviewed studies, categorized by type of disaster. As shown in Table 2, the types of disasters handled in the reviewed studies are financial crises, animal diseases, epidemic outbreaks, earthquake, eruptions, hurricanes, and general or unspecified emergencies.

4.2.1. Geological disasters

Geological disasters were addressed in four of our reviewed papers, dealing with earthquakes, eruptions, and hurricanes. Two papers (Batuk et al., 2004; Eraslan et al., 2004) reported on the development of a disaster management system as a subsystem of e-government, in response to a severe earthquake in Turkey in 1999. The focus of the system is preparedness, mitigation, response, and recovery, with efficient and effective data management being the most important concern. Chatfield and Reddick (2015) investigated disaster risk communications during Indonesia’s Mount Sinabung eruptions in 2014, suggesting that Twitter can be used effectively as a multi-directional communication tool as part of citizen-centric e-government. Pirog and Johnson (2008) pointed out the importance of providing well-functioning electronic funds and benefits transfer technology as part of e-government, particularly in crises, like hurricane Katrina which hit New Orleans in 2005.

4.2.2. Animal diseases

Only one of the reviewed papers deals with e-government's role in an animal disease outbreak. Colangeli et al. (2011) described an e-government system for the notification and management of outbreaks of animal diseases in Italy. The system allows the collection and reporting of information on suspected and confirmed outbreaks consistently and enables veterinary services to perform epidemiological analyses, essential for the surveillance and control of animal diseases.

4.2.3. Epidemic outbreaks

Thirteen papers in our sample focus on three epidemic outbreaks: dengue (one paper), SARS (two papers) and COVID-19 (ten papers). Following the dengue epidemic in Pakistan in 2010, Zafar et al. (2014) reported on a new e-government healthcare monitoring system implemented in 2012 and making use of web 2.0 and cellular technologies. The system has been effective in preventing any further deaths due to dengue for the one and a half years after implementation and preceding the publication of their study.

Based on experience from fighting the 2003 SARS (severe acute respiratory syndrome) epidemic, two studies (Devadoss & Pan, 2004; Pan et al., 2005) suggested that the e-government infrastructure in Singapore provided a robust basis for responding to the situation by providing effective and streamlined communications, information exchange, and data flow, and facilitating collaboration among government agencies, foreign organizations, private businesses, and the general public.

Authors of all ten papers that focused on the recent COVID-19 pandemic underscored its uniqueness and complexity. Unlike the previously mentioned 2003 SARS outbreak that persisted for only a few months (Devadoss & Pan, 2004), the COVID-19 pandemic has been much longer lasting and much wider spread. The disruption and the consequences brought on by the reactions to COVID-19, as pointed out by Foss (2020), may be long enduring and may be discussed by scholars for years to come. One consequence of the pandemic has been a disruption in public education, and Uwizeyimana (2022) analyzed the importance of e-government and specifically e-education during lockdowns in a case study of Rwanda's education system failure to effectively handle the situation, due to the lack of adequate e-government infrastructure.

Several studies focus on various e-government initiatives. Djunid et al. (2020) found that e-government in Indonesia is in an early maturity phase, as there are effectively no websites that empower citizens to participate in decision-making. This lack of proper involvement of citizens in dealing with the COVID-19 pandemic is also reported in Gambia (Ceesay & Bojang, 2020). Moreover, according to a study conducted in Romania, the integration of central and local e-government initiatives presents a major difficulty (Burlacu et al., 2021). Two studies, one from the area of Wuhan in China (Yasir et al., 2020) and one from Malaysia (Dawi et al., 2021), in addition to confirming the importance of e-government, emphasized the value of social media during the COVID-19 pandemic. Finally, Ullah et al. (2021) compared e-government offerings in China with its many e-government initiatives and the less technologically advanced Pakistan. Using its technological edge, China seemed to be able to combat the COVID-19 pandemic effectively whereas Pakistan, lacking the same advanced technology, imposed a strict lockdown, furthering a deteriorating economic situation while doing little in reducing the active cases.

Three additional studies look at the acceptance and usage of e-government during the COVID-19 pandemic. Amosun et al. (2022) investigated the impact of e-government usage on citizens' engagement in China during COVID-19. Their results indicated that while e-government usage has no significant influence on citizens' engagement, it does have a significant positive influence on trust in government, government reputation, and perception of government transparency. A study conducted in Vietnam investigated critical elements affecting public acceptance of e-government during the pandemic and found three essential factors: the perceived value of services, citizen e-empowerment, and fear of COVID-19 (Nguyen & Tran, 2022). Wong and Ho (2022) also explored reasons for public reluctance to utilize e-government services. Looking at responses to three e-government services launched by the Hong Kong government during the COVID-19 pandemic, namely online vaccination registration, electronic consumption vouchers, and social distancing apps in smartphones, they found that perception of trust and security to be the major reservations.

4.2.4. Financial crises

Six studies in our sample deal with the role of e-government during or after a financial crisis. The global financial crisis of 2008 impacted all sectors of the economy and severely weakened trust in the financial market. Some authors

point to three main factors that may contribute to financial crises: lack of transparency, inefficient administrative structures, including insufficient local authority, and pressure from international organizations.

Among other issues revealed by the 2008 crisis was a lack of transparency concerning the risks involved in financial activities. To address this serious liability, Chen (2013) endorsed implementing the eXtensible Business Reporting Language (XBRL) (xbrl.org) as part of e-government to improve the standardization of financial information, and thus transparency in risks associated with financial transactions. Pollifroni (2015) posited that high-quality government websites improve administrative transparency, as more user-friendly details on the website and more natural and less bureaucratic language can improve communication with citizens. Millard (2018, p. 78) advocated for open governance systems to better handle financial or economic crises, “doing more with less,” i.e., leveraging more of existing assets and resources. The concept of open governance concerns citizens’ rights to transparency as to government activities and documents, and e-government is a natural means to achieve open governance. Overall, the studies in our sample imply that e-government initiatives have the potential to improve transparency and restore trust in financial markets.

Regarding inefficient administrative structures and insufficient authority at the local level, Goulas and Kontogeorga (2013) reported on a decentralization effort of e-government in Greece, in part as a response to the global financial and economic crisis, which started seriously affecting Greece in 2009. Decentralized and locally controlled e-government services are more flexible to respond to local needs in crises. The role of e-government in the reorganization of the public sector and in economic development during the economic crisis in Italy was discussed by Sorrentino and De Marco (2013). They found that old administrative patterns and attitudes determine the pace in achieving new and more efficient practices championed by economic stimulus packages, and that e-government as a driver of change is thwarted by the prioritization of cost-cutting over transformational objectives.

Concerning pressure or influence from international organizations and global regulatory bodies, Sideridis (2013) observed that in the era of economic crisis, e-government systems have become more complex but also more needed and that the European Commission is playing a significant role in initiating e-government projects for integrated, safe, secure, and trusty applications for all citizens, businesses, and administrations. However, the author also noted that diverse social, economic, and political systems in Europe make this endeavor of e-government “for all” a challenging effort.

4.2.5. General disasters

The remaining 12 papers in our sample deal with general disasters or unspecified emergencies. The most driving and discussed topics are the construction of disaster management systems and the use and role of social media in e-government. Also discussed are specific technologies in disaster management and the impact of demographic factors on disaster response.

Models, frameworks, and ideas for disaster management systems are discussed by multiple authors in our sample. Wang et al. (2006) proposed a disaster recovery system model applicable to e-government as far back as 2006, and Jaeger et al. (2007) explored the viability of using e-government to develop a disaster management system to provide communication and support before, during, and after major disasters. Moon (2010) explored the prospects of mobile government as an extension of e-government, particularly in the area of emergency management systems. Shan et al. (2012) proposed a framework for an emergency response decision support system. Two papers (Lv, Li, & Choo, 2018; Lv, Li, Wang, et al., 2018) suggested a cloud-based framework to provide e-government services as components of disaster management systems.

The use of social media for e-government is discussed in several papers. Kavanaugh et al. (2012) investigated the use of social media specifically for managing crises. Shen and Chu (2014) also looked at social media use by the government, focusing on municipal emergency management. Youngblood and Youngblood (2018) researched how local emergency management agencies communicate with their online public, looking at the usability of e-government websites as well as the use of social media.

Specific technologies for disaster management are the focus of two studies. Chatfield et al. (2010) suggested that radio frequency identification (RFID) technology could play an important role in e-government disaster response. Giest (2017) explored the future of big data in public policy, including disaster management. One paper (Ibrahim et al., 2019) discussed the role of e-government in reducing disasters by looking at the impact of demographic factors on the public readiness for e-government disaster management in Iraq.

4.3. Opportunities for future research

To answer the third research question, “What areas are most critical to be further investigated” and to determine current research gaps and possibilities for future studies, we looked at the specific suggestions provided by the authors in

their papers. We summarized these suggestions, and grouped them into six main directions of future research, as depicted in Figure 2.

Two studies among the reviewed papers identified the need to direct future research to citizen acceptance of e-government for disaster management. They specifically highlight the need to enhance citizens' readiness for these services (Ibrahim et al., 2019), and suggest researching how citizens perceive and experience e-government emergency communication (Chatfield & Reddick, 2015).

The authors of two other papers in our sample suggested that a crucial direction for future research is the use of big data in e-government for disaster management. Specifically, they called for better data collection and data integration as part of crisis management (Devadoss & Pan, 2004), and for incorporating big data into policymaking (Giest, 2017).

The authors of four studies called for further research in emergency communication via e-government, utilizing social media and websites. This includes transitioning to new media for more effective communication (Kavanaugh et al., 2012) and improving the usability of emergency communication websites (Youngblood & Youngblood, 2018). Some authors also suggested research on identifying misinformation in social media use (Chatfield & Reddick, 2015) and learning about emergency responses by analyzing social media activity (Shen & Chu, 2014).

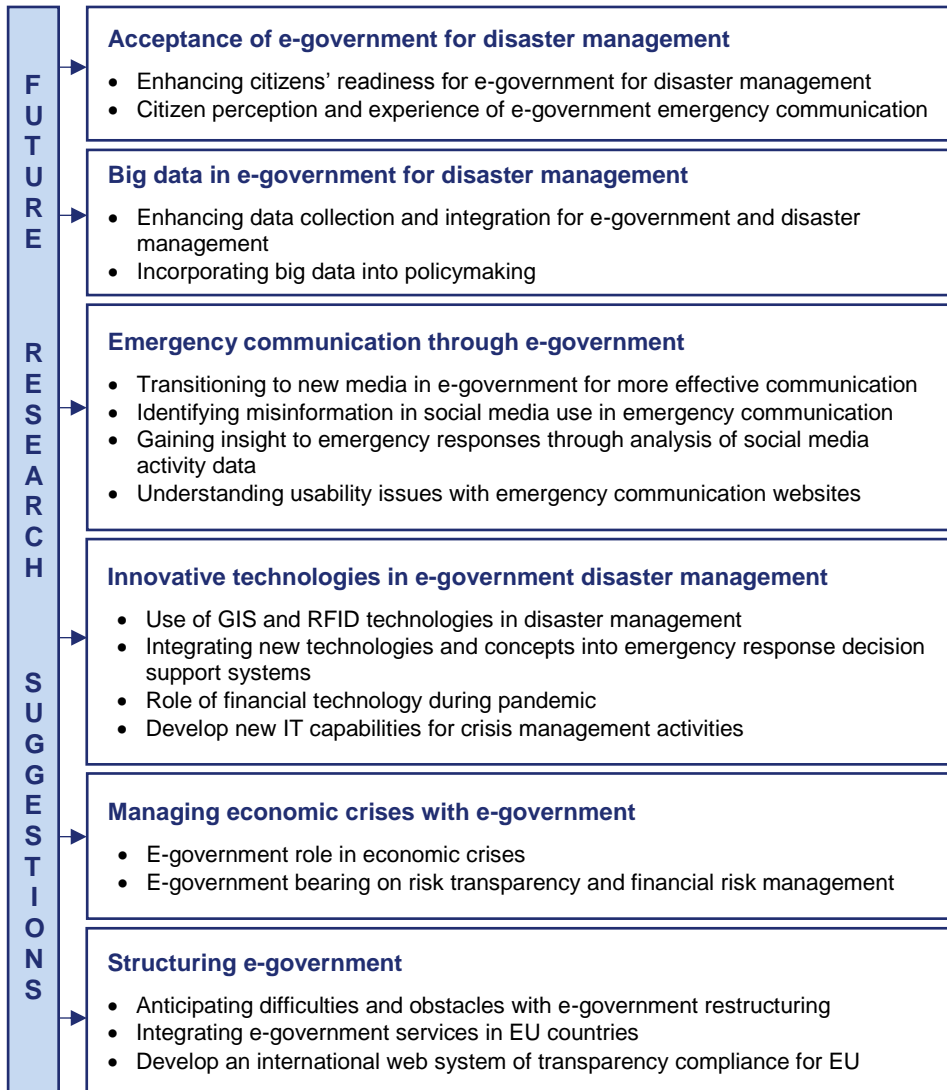
Research on the use of innovative technologies in e-government disaster management is advocated in four of the reviewed studies. This includes geographic information systems (GIS) and RFID technologies (Chatfield et al., 2010). Specific suggestions also include integrating new technologies and concepts into emergency response decision support systems (Shan et al., 2012), development of new IT capabilities for crisis management activities (Pan et al., 2005), and the role of financial technology during pandemics (Ullah et al., 2021).

Additional research on managing economic crises via e-government is advocated by the authors of two papers in our sample. They pointed out the need to study the nexus between e-government and economic crises (Sorrentino & De Marco, 2013) and the impact of IT on risk transparency and systemic financial risk management.

Three studies propose more research on structuring e-government. In this context, the desire for a digital single market in the European Union (EU) to integrate e-government services is raised (Sideridis, 2013), and also the idea to develop an international web system of transparency compliance for the EU (Pollifroni, 2015). Furthermore, researching the obstacles to e-government restructuring at the local or national level is recommended (Goulas & Kontogeorga, 2013).

Additionally, obvious opportunities for future work include widening some of the current research projects by increasing the sample size and expanding the geographical scope. Also, involving more diverse groups of society in research projects, who may have different experiences and provide alternative views on the role of e-government in disaster management, may be a promising avenue for more research.

Figure 2. Future research suggestions



5. Conclusions

In this study, we examine the current landscape of research dealing with the role of e-government in disaster management. Our results confirm that this research field is still young and underdeveloped, as there seem to be only relatively few published studies in this research area and the earliest of the 36 publications that we were able to find was from 2004. This immaturity of the research field seems to also be corroborated by the fact that very few studies in our review made general use of existing theories. Furthermore, we were not able to find another published literature review related to this topic. Thus, we believe that a systematic review of what has been investigated and where there is a need for further work, due to its pioneering nature, makes a definite and substantial contribution to the field, helping academic researchers directing their efforts in further exploration, and helping people involved with real-life disaster management navigate through the effective role and application of e-government in this regard.

Adapting the analytical framework of Roztocki and Weistroffer (2012) to our area of investigation let us identify the major themes and trends in the current literature, provide a synopsis of what work has been accomplished, and determine needs and opportunities for future research. Section 4.1 as summarized in Table 2 shows what studies have been published and whether they constitute empirical research or not, the topics of investigation, the countries in which the studies were conducted, the type of disasters investigated, the data sources used, and the level of analysis, i.e., analysis performed at the country, organization, project, or individual level. Section 4.2 provides a summary of all the reviewed research and published findings, and Section 4.3, as encapsulated in Figure 2, details the needs for future research, based on identified gaps and suggestions by the authors of the reviewed studies.

Our literature review is based on only 36 papers, which is the main limitation of our research. As more research studies on the topic emerge, a more extensive investigation and review may be warranted.

To conclude, we are positive that our study presented in this paper will provide inspiration and guidance to scholars and administrators working in the field of e-government for disaster management in their professional efforts.

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