The Role of AI Chatbots in Mental Health Related Public Services in a (Post)Pandemic World: A Review and Future Research Agenda

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***Abstract*— The purpose of this paper is to explore the advances in artificial intelligence (AI) chatbots as part of public services, mainly when applied to mental health in today's post-pandemic world. The adoption of AI chatbots to keep up with basic customer support business activities is based on extensive knowledge, both from the hard (software development) and the soft side (increasing the added value to the service/product). However, using chatbots as extenders of public services to support mental health in pandemic times is an emerging research topic. Hence, the paper identifies niche and under-explored research gaps in state-of-the-art literature, thus contributing to the body of academic knowledge. The paper adopts a design science approach to formulate the problem statement, articulate the objectives of target solutions, and propose a design and development framework for future mental health chatbots by employing an extensive literature review. Findings from this paper emphasize considerations of ethical issues and governance, purposeful and goal-oriented design, and AI-based technology as critical enablers for designing new mental health chatbots. The paper contributes to the knowledge by providing clear and structured future research priorities and offers a framework for designing more effective and intelligent mental health chatbots that public organizations and managers may find useful.**

Keywords*— *Artificial Intelligence chatbots, AI chatbots, public services chatbots, mental health services, chatbot design, pandemic

I. INTRODUCTION

Mental health-related issues among the population in the (post)pandemic world have been recognized to be one of the critical areas of concern for public health [1-5]. Behavioral Interventional Technologies (BITS), such as AI-based chatbots [6], are smart conversational agents that have supported marketing, sales, and customer satisfaction activities in various industries for several decades, including public services in recent years. The significance of citizen-centric digital services [7] has become even more evident during the current pandemic, where socio-economic uncertainties resulted in a rising demand for digital solutions that manage, support, and deal with existing and new mental health issues. Such technology-based solutions, especially chatbots as extenders of public health services, play a significant role in addressing mental health problems such as loneliness/social isolation because of the imposed quarantine and social distancing - through the provisions of affordable, more accessible, and anonymous access to mental health support resources thus reducing the stigma attached to mental health issues [8-9]. During the COVID-19 pandemic, chatbots continue to deliver the service uninterruptedly and, therefore, potentially strengthen the impact on citizen engagement [10].

Still, even though experts cautioned about the mental health crisis happening post major pandemics such as the SARS outbreak in the early years of the 21st century [11-12], the recognition of the importance of purposeful chatbot designs within the realm of public services is missing in the literature. Motivation for our research stems from such recognition of the problem and consequently justifies the relevance and value of the research in pursuing a solution to address the knowledge gaps. The aim of this paper is twofold. Firstly, it aims to advance the theoretical understanding of the consequences and effects of chatbots offered in public services, particularly their design to address mental health issues of the public (the users). Secondly, it aims to present our findings by employing a design science approach supported by the literature review and present directions for future research.

The paper aims to provide a theory-driven investigation of the effects of AI chatbots offered as part of public services in mental health, achieved by answering the following three research questions:

a) how chatbot technologies are currently being applied or implemented in public services.
b) the potential applications of chatbots in mental health interventions, and
c) the key issues and opportunities related to applications of chatbots as extenders of public services in addressing mental health issues in the pandemic situation.

These questions will be answered by identifying the gap around public service chatbots for mental health, notably what is missing within the chatbot solutions, and investigating alternatives for new design configurations, protocols, and applied techniques. Consequently, we will propose a theoretical framework for mental health chatbot design and implementation.

II. LITERATURE REVIEW

A. Overview of Chatbots

AI chatbots are conversational agents that receive either text or voice inputs from users using their own devices' Instant Messenger application [13], thus making them a software system that allows the user to interact with the machine through natural language [14]. Chatbots also aim to provide data, information, and corpora for the topic of interest by treating the user's inputs as queries by simulating a real-life conversation as if the user were talking to another person.

A chatbot being available 24/7 can provide support to a particular public service and be designed to provide general information on behalf of a local, county, or state government, or specific to an agency, such as a road department or a public library [15]. On the other hand, citizens – the users – can access, process, and produce information or content online via smartphones at anytime and anywhere, thus increasing the value of smartphone applications as providers of data [13]. Consequently, chatbots as a part of digital government policies can now be found in areas such as general information (locations, hours, and deadlines), contact information, document search, road conditions, emergency information, legal information, school information, library information and internal governmental services [15]. Specifically, government chatbots can give citizens an accessible, up-to-date calendar of events, simplify public services and civic duties, disperse healthcare information, and generate awareness about regulations and legislation [16]. Furthermore, by mimicking everyday human dialogue in informal and friendly language, governmental chatbots can also demonstrate increased engagement of younger audiences [17], who are, during the pandemic, a particularly vulnerable group.

B. Applications of Chatbots in Public Services

Since 2016, major technology companies have started providing open application programming interfaces (APIs) for building chatbots, resulting in a massive growth of chatbots on text messaging platforms. Government chatbots, however, are invoking mixed reactions from people as they are an inexpensive way to cater to any number of queries and complaints from citizens. On the one hand, some argue that human-to-human interaction cannot be replaced by AI bots [16]. Nonetheless, the practice is witnessing an increasing number of governmental chatbots such as US Homeland Security's EMMA [18], Dubai Electricity and Water Authority's RAMMAS [19], Singapore Government's GOV.SG [20], TravelBot for London [21], and Australian Tax Office's Alex [22], all aiming to create a more approachable image in the eyes of their citizens and help citizens to access the benefits and assistance that they are entitled to [16]. Fully automated chatbots can serve not only as highly cost-effective mental health promotion tools for massive amounts of people [23] when it comes to an economic perspective but can significantly reduce symptoms of depression and anxiety [24] from the mental health perspective.

According to [25], previous research suggests that chatbots may be a promising source of social support for humans and can benefit health and well-being, mainly if they address social isolation and loneliness by providing empathic feedback, exercise promotion anecdotal stories and ensure a safe environment for a vulnerable population [26]. The current fluid circumstances are forcing everybody to act in an increasingly unsocial way to overcome the pandemic's challenges [1].

With mental health support as an essential public service, no innovative solutions to overcome such issues should be overlooked. It is well evidenced that social and physical isolation, anxiety, feeling trapped, and loss of control can be linked to issues such as panic buying and hoarding behavior [1]. Anxiety arising out of the pandemic is also compounded by people being reminded of their own mortality that can lead to an 'urge to splurge' that increases spending to curb fear and regain control [26]. The World Health Organisation introduced a set of practical steps for individuals to manage their mental health during these challenging times, including managing media consumption and accessing information [2].

The pandemic has not hindered chatbots as extenders of public services. If anything, their modus operandi has in no way been affected. As such, they have an even more substantial impact on citizen engagement, similar to most digital technologies used in public service delivery [8], being at the frontline of the digital government communication channels [27-28].

C. Chatbots for Mental Health Interventions

The use of chatbots in mental health is growing steadily [29]. While the efficacy and acceptability of chatbots in mental health interventions are promising, research related to this area is in its nascent phase [30]. Over the last few years, numerous chatbots, for example, Woebot [24], Tess [31], Wysa [32], EMMA [33], and SERMO [34] have been designed, developed, and applied to address a range of mental health issues. The global pandemic and COVID-19 crisis have accelerated investment in digital mental health interventions, including chatbots [9]. The application of chatbots for mental health covers a wide range of areas, including support for cognitive/ behavioral therapy, coaching for self-management of lifestyle and mental well-being, assessment and screening for risks and coaching self-management (see Table 1).

Table 1 Chatbots: Areas of application for mental health

Application use cases	References
Support for cognitive/ behavioral therapy	[24], [33-34], [35-41]
Assessment of risks, suicide prevention	[42]
Rendering social support for loneliness and isolation	[25], [43-44]
Coaching for behavioral and lifestyle change, self-help, and well-being	[23], [32], [45-47], [48-50]
Providing digital counselling	[51-56]
Monitoring of mental health	[57]
Providing mental health information	[58]
Preventive mental health support for adolescents and young adults	[24], [38], [59-62]
Diagnostic screening for mental health	[63-64]

Loneliness is a growing public health issue [44] and came to the forefront during the current pandemic, with most individuals' social relations becoming to some extent illegal or undesired in the name of the greater good, health, and overall public safety. In turmoil as such, chatbots can be used not only for self-adherence and education enjoyments as well [39]. The pandemic has impacted the mental health of people in three ways [65] – short-term impacts (anxiety, loneliness, stress, depression), medium-term impacts (post-traumatic stress,

depression) and long-term impacts (grief, reoccurrence of previous mental health issues). Advances in technology create opportunities for computer systems to deliver healthcare interventions and services, either autonomously or in conjunction with a healthcare professional [36]. Chatbots and digitalization trends will also affect clinical psychology and psychotherapy by increased usage and consequently gain importance as next-generation psychological interventions [33] as the dialogues are based on scripts created by psychotherapists [55], [66].

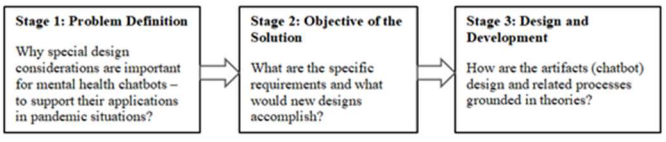
III. Methodology

The paper adopted a design science approach [67-69] to answer the three research questions and identify the required information to propose a mental health chatbot design and implementation framework. The design science approach seeks to extend the boundaries of human and organisational capabilities and to address critical organisational problems by creating new, innovative, and purposeful artifacts [67] and consists of the following six stages: identification of specific research problem, inference of the objectives of a solution from the problem definition, design and development of the artefactual solution, demonstration, evaluation, and communication [68]. To develop a theoretical framework for future designs of chatbot solutions, particularly tailored to their application in mental health services, we adopted the first three activities of the model in a nominal sequence (see Figure 1).

A. Stage 1: Problem definition

We recognize that current research on existing information technologies such as AI-guided chatbots lacks vital considerations for the purposeful design and development of new, robust, and innovative solutions that could mitigate future public crises or disruptions due to pandemics. There have been studies on potential designs of chatbots to address natural disaster management issues [13]. However, the crisis as experienced with the COVID-19 pandemic has shown us that fundamentally, the characteristics of pandemics differ from those of other natural disasters, especially with regards to the stigma attached to the disease and the social insolation due to quarantines and restricted physical gatherings [70]. The spread of misinformation remains one of the key risks during a pandemic [71]. Over-reliance on private and commercial conversational agents for actionable mental health information can pose risks for vulnerable users [72]. Accordingly, a review of the existing literature related to specific pandemic situations has guided our problem formulation [73].

Figure 1. Mental health chatbot design research cycle
(adapted from [68])



B. Stage 2: Objectives of the solution

Following the framing of the research questions, we draw upon the relevant literature to understand the current solutions, their efficacy and infer the desirable characteristics (or attributes) of a new artefact that could support the requirements not addressed in contemporary designs. In this stage, the primary use cases of mental health chatbots, mainly their purposes, are identified. We further examine the quality attributes that apply to chatbot design and development [74] and the specific requirements for designing more effective chatbots to address response to crises, including disaster response [75] and the outbreak of pandemics [70], [76]. By taking a broader perspective, this stage further explores how the concepts of 'public ethos' [77] and 'public value' that encompass public services demand due attention in the development and implementation of future chatbots [78].

C. Stage 3: Design and development

In this stage, we develop a theoretical framework grounded on a knowledge base derived from the review and synthesis of prior literature and can be applied to design and build new and innovative IT artifacts, such as chatbots [-68]. To identify mental health chatbot design considerations, we adopted an approach of a systematic review of relevant literature [79-80]- to perform and present a critical assessment of the findings from the previously published body of knowledge. We used the following review question in guiding us to locate relevant literature and, subsequently, to review and synthesise meaningful insights from a selected set of literature:

> *To what extent does the existing literature on chatbots guide the design and development of future mental health chatbots to support their applications in public services delivered under pandemic/post-pandemic situations?*

D. Paper Selection

Following our review question stated above, we searched the following bibliographic databases: Web of Science, Scopus, IEEE Xplore, and Google Scholar. In order to derive insights from the high impact and validated knowledge base, we have included only peer-reviewed journal articles and proceedings from some recent and influential conferences in this review.

We employed a range of search terms for our review combining elements from the two domains – one being mental health (example terms: mental health, mental well-being, mental disorder, depression, anxiety, psychology, and behavioral), and another addressing the technology intervention (example: chatbot, bot, conversational agent, virtual agent, and virtual assistant). The search terms are derived from a preliminary study of extant literature, particularly the scoping review papers, for example, a review performed by [30]. A few inclusion conditions were set (see Table 2) to guide the search eligibility criteria. Following a process of scrutiny, screenings, and exclusions, 34 papers were finally identified and selected for the literature review.

Table 2 Inclusion criteria applied for literature search

Inclusion criteria	Rationale
Chatbots that work on stand-alone software, web, and smartphone-based platforms.	Embodied/animated agents (e.g., robots, game-based 3D avatars), which require additional design considerations are excluded.
Articles that concern chatbots for mental health and wellbeing for non-clinical population.	Application of chatbots for medical interventions in clinical settings is considered out of scope of this paper.
Articles published in English with publication year > 2000	Use of chatbots in mental health is a relatively nascent topic that has evolved in last 10-15 years.

E. Review and synthesis of findings

In line with our literature review focus, we followed a thematic analysis approach [81], in which three focal concepts (or integrative themes) emerge from the 34 publications. Our thematic analysis approach identified a set of related ideas (or sub-themes) and then aggregated them under three broader category focal themes [79]. We reached a consensus on a logical grouping of the key concepts into three distinct themes through an iterative reasoning cycle. The findings of this analysis were used to construct the theoretical framework.

IV. FINDINGS

Table 3 illustrates the results of our thematic analysis, which reveals three overarching themes: Ethical design and governance, Purposeful and goal-oriented designs, and AI technology as the enablers for new chatbot designs.

Table 3 Three main themes from the literature review

Theme	Sub-theme(s)	Literature
Ethical design and governance	Confidentiality and data protection	[33], [39], [82]
	Regulatory compliance	[33], [39], [83], [82]
	Localization	[51], [83]
	Trust and transparency	[84-86]
Purposeful and goal-oriented designs	Personalization and choices	[32], [36], [76],[83]
	Ease of access	[54],[58], [87]
	Participation, engagement, and collaborative design	[36], [48], [85-86]
AI technology as enabler for new chatbot designs	Predictive ability	[30], [64]
	Emphathy and relationship	[39], [43-44]
	Integration with human support	[31], [45], [88-89]
	Error management strategy and resilience	[51], [89]

A. Ethical design and governance

The theme underlines the security, safety, and privacy aspects of mental health chatbots in maintaining anonymity and privacy of users' sensitive information and fostering legal safeguarding. Lack of confidentiality obligations in commercial chatbots have been raised as a concern that demands government regulations and ethical guidelines to protect against the misuse of information [84], especially for mental health interventions such as suicide prevention situations [42]. Ethical and legal risks associated with the application of AI in mental health interventions require fixing of legal responsibilities for unlikely adverse events related to the use of chatbots [39], [86] and appropriate safeguards to be embedded into the chatbot agent design and implementation processes [44]. The use of AI technology in public services is a controversial topic, which necessitates careful consideration of the issues of trust, fairness, and transparency, which should aim to gain citizens' confidence and trust towards the user interface, the technology platform, and the purpose [78], [84-86]. Additionally, ethical designs of mental health chatbots require them to be sensitive towards sub-cultural differences and localization aspects, for example, multi-lingual conversational ability [51], [83].

B. Purposeful and goal-oriented chatbot designs

Personalization and accommodation of users' choices are vital elements driving continued use and engagement for mental health chatbots. Easy and convenient access through Smartphone-based apps and voice-activated agents with self-monitoring and visual content appeals can promote the uptake of mental health coaching and well-being chatbots, particularly among young people and adolescents [49], [54], [58], [62], [83], [87]. Dosovitsky *et al*. [40] suggest that the designs of mental health chatbots should strike a careful balance between the length and sequence of the modules and complexity levels to sustain users' interest and engagement. Chatbots as conversational tools can be applied to gather valuable contextual insights and conversational inputs from users, including their profile, preference and priorities, among others [32], which a human moderator/therapist can review and assess before online mental health therapy [38].

Such a user-centric approach can be guided by a principle of 'concordance', in which the users' opinions and thoughts are a crucial part of the decision-making process in their well-being [36]. The accommodation of users' involvement in the design and evaluation of chatbots is congruous with the citizens' well-being agenda for consultative and collaborative public services and critical in driving social acceptance of technology solutions [84-86]. For example, AI chatbots can be designed as a preventive and acceptable alternative intervention for less problematic yet commonly found population-level behavioral issues such as addictive gambling, particularly in situations where users are reluctant to seek face-to-face or institutional support [35].

C. AI-based technology as enabler for new chatbot designs

AI-based conversational chatbots that can receive search inputs beyond only one or two words can elicit richer information about users' needs, perform better psychological assessments and provide more effective responses in real-time [38]. Interactive AI chatbots, such as GAMEBOT, are found to drive potentially better outcomes for therapeutic intervention for problem gamblers, in contrast with low-intensity preventive interventions for at-risk gamblers, as deployed by current chatbot implementations [35]. In their study, [45] find 'personalization' and 'consumability' as the most appreciated technical enablers for behavioral change through chatbot-mediated interventions. 'Consumability' is described as a broader term, which in addition to an end-to-end experience with AI technology solutions, also includes users' overall perspectives on the context of the application.

Limitations of algorithms applied in chatbots in recognizing and extracting users' implicit emotions from interactions pose a significant challenge [29]. Current chatbot designs require explicit dialogue between the chatbot and users, which might sound unnatural and potentially affect the relationship [39]. Empathy is vital in establishing the therapeutic relationship between human users and AI chatbots [24]. The empathetic behaviour of chatbots needs to be context-sensitive and use more human-like language to connect with the user. Therefore, future AI chatbot designs need to emulate 'mammalian attachment-building' social and behavioral models that espouse attentiveness and empathetic language, thus improving the quality of relationships, engagement, and retention between the chatbot agents and users [32], [43-44]. Like [23] note, users should perceive the chatbots as 'somewhat living characters', giving a feel of human touch and building a relationship or bond with the user. However, conscience, uncertainty, and users' preferences are considered more with wisdom. Accordingly, the correct

positioning of AI-mediated chatbots within mental health services has been recommended [88].

Better error management strategy and resilience have been considered another area of opportunity for AI technology-enabled chatbot designs [51]. Especially during crises such as pandemics, the impact of breaking down of conversations initiated by chatbots due to network availability and/or bandwidth issues, interoperability among distinct types of platforms needs careful assessment and addressing to avoid unnecessary frustrations and disappointments for the users [89]. Diagnostic use of mental health chatbots can benefit from the predictive ability of AI algorithms [30], [64]; however, the predictions need to be evaluated through sound evidence-based decision-making practices [33], [37], [39].

V. Discussion and Future Research Agenda

Our objective with this paper is to review the use of mental health chatbots as a part of public services, whether already integrated and deployed or as a (near) future possibility, particularly in the current turbulent environment where the COVID-19 pandemic has been heavily influencing/limiting the way public services are delivered. A recent study conducted by RAND Corporation reports a sharp increase in the use of telehealth by people during the COVID-19 pandemic seeking mental health support [90]. Therefore, public services can utilise this trend by extending their reach and providing chatbot-mediated mental health support to citizens who would not otherwise seek care because of stigma or cost. Following a design science research approach, our objective has also been to develop a theoretical framework derived from a knowledge base of existing literature that may inform and guide us in designing and developing new and innovative chatbots for mental health, especially within the context of public services.

Despite the exciting potential of AI-based technologies, such as chatbots in public services, their acceptance and implementation within the public sector have been limited. This gap has been aggravated further because the research on chatbots' applications in mental health services is nascent [30]. Our findings from the review and the synthesis of prior and relevant literature indicate several ethical, social, and legal challenges related to AI-based chatbots concerning privacy, data protection, transparency, and accountability. Design and development of AI-based chatbots that leverage the technological advancements in natural language processing, machine and deep learning can potentially perform complex tasks, such as generating responses to complicated questions from users and leading more contextual and empathetic conversations. Our study also highlights the critical role of social acceptance, trust, participation, and user engagement with disruptive technology innovations such as chatbots.

Anchored by these streams of arguments, we propose a theoretical framework (see Figure 2) that consists of three major dimensions – people (citizen-centric goals), technology (opportunities of AI), and process (regulations and governance), to serve as a basis for the design and development of future mental health chatbots.

A. Citizen-centric goals

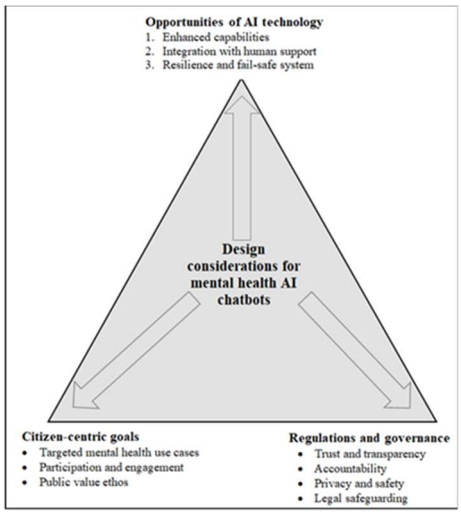
The consequences of the COVID-19 pandemic are vast, both for governments and citizens from economic, social, regulatory, and health perspectives. Evidence-based research is already sufficiently proving that the pandemic's direct and indirect psychological and social effects could affect mental health now and in the future [79]. Furthermore, those having experienced a life-threatening infection first-hand are more likely to be exposed to post-traumatic stress disorder and depression [91], as are those who have experienced the quarantine, that now find themselves in a vulnerable group. On the other hand, the COVID-19 crisis and global pandemic have underlined the role of telehealth and digital tools to offer care in times of need as they present an innovative approach for the remote delivery of lifestyle interventions that can "heal at a distance" [92] and can fast-track access to public services and quality of care. Ease of access and use facilitated by smartphone-based apps and voice-activated agents such as Apple Siri, Amazon Alexa, and Google Assistant can promote uptake and continued use of mental health chatbots (see Table 3). The findings underscore the importance of accommodating the public service values (and ethos) within the ethical design, including the algorithm-based decision-making of chatbot-mediated mental health services. Accordingly, adopting a broader public mental health approach using chatbots can be considered as an influential research agenda for the future.

Our findings further emphasize that users' participation and collaboration in chatbots' design and development processes are critical to social acceptance and adoption of AI technology-driven mental health interventions (see Table 3). This consideration calls for identifying the citizen-centric goals specific to application areas (or use cases) within public sector-mediated mental health services, together with examinations of their value creation opportunities and financial assessment. Examples for such use cases for chatbot designs could include low-threshold preventive mental health support and positive psychology coaching skills for the youth/adolescent population [59], [48], assessment of risk and suicide prevention [42] and addressing informational needs for adolescents [60], [83].

B. Opportunities of AI technology

Most chatbots currently applied in the mental health field are rule-based and are primarily used for performing simple, well-structured, and repetitive tasks [30]. Our findings reveal the opportunity for AI mental health chatbots, powered by natural language processing, machine learning and data mining technologies – with enhanced capabilities such as the higher predictive ability for diagnostic screening, assessment of risks, better personalization aspects, and enhanced empathetic, more human-like conversational abilities (see Table 3). However, the evolving nature of AI technology and the perceived risk with the predictability and security of AI-based chatbots and the complexity and effort of development pose challenges to such advancement [93-94]. Therefore, technology design and implementation must be complemented by appropriate domain knowledge of human stakeholders, such as mental health professionals and clinicians [75], to establish a therapeutic relationship between human users and AI chatbots. Pandemic circumstances demand resilient chatbot designs, which should allow fallback mechanisms to human support, should any technological disruption happen to avoid risks of unintended outcomes.

Figure 2. Proposed framework for future chatbot designs



Our findings further highlight the challenges of integrating AI chatbots into the public service infrastructure concerning data interoperability and quality and the potential scarcity of AI expertise in the public sector. Such issues bring additional challenges in leveraging AI technology's full benefits in public chatbots.

C. *Regulations and governance*

AI-based chatbots involve digital algorithms for data collection, analysis, and decision-making. Such usage of intelligent algorithms calls for necessary oversight by regulatory authorities through appropriate laws to safeguard privacy, data protection, eliminate bias in the system, and maintain transparency in services [86]. Such arguments gain even more relevance for mental health services, in which vulnerability and social disadvantage of users demand regulations and governance mechanisms for legal safety, maintenance of privacy, responsibility and accountability (see Table 3). Formulating industry-wide ethically aligned design guidelines and standards for autonomous and intelligent systems, such as AI chatbots [95], could be an essential step towards such governance.

It is essential to suggest a future research agenda to support other researchers in progressing further based on accumulated knowledge. This paper consolidates knowledge in the relevant areas and emphasizes future directions to comprehend the pros and overcome the cons of implementing AI-chatbots in public services. The application of AI chatbots as extenders of public services in mental health can play a transformative role in the communication between citizens and government [96]. Therefore, future research should investigate and explore all aspects of the significance of the COVID-19 pandemic on mental health, particularly regarding worldwide and individual social isolation and loneliness. Chatbots could help mitigate social isolation and mediate challenges/symptoms as early as possible as an always-available tech companion. Furthermore, future research also needs to address issues linked to ensuring that chatbots dealing with the challenges/symptoms will reach those seeking anonymised modes of help. Specifically, our paper raises three critical questions for future research, notably as under:

- What are the potential use cases for AI chatbots in mental health within the scope of public services?
- How can AI-based chatbots facilitate the effective and safe delivery of citizen-centric mental health services?
- What regulations and governance mechanisms are needed to maintain citizens' trust and engagement in chatbot-mediated mental health services?

VI. Conclussion

Our study has explored the technological advances of AI chatbots, primarily when applied to mental health in today's (post)pandemic world. Our review of existing literature shows that using chatbots as part of public services to support overall mental health is an emerging and niche research topic. Our paper has employed a design science approach, through which we systematically reviewed and synthesised key findings from the current body of knowledge. Based on the findings, our paper offers a theoretical framework for the design and development of future mental health chatbots across three major dimensions: (1) the opportunities of AI technology, (2) citizen-centric goals, and (3) regulations and governance.

We recommend further investigations to empirically evaluate and validate the framework with public service managers and mental health practitioners. While assessing the benefits of using AI chatbots for mental health is out of scope for our paper, future research must address this topic as the scale of acceptance and implementation of AI chatbots could have a significant causal relationship with the evidence-based benefit statements.

Our study holds important implications for both research and practice. A theory-driven investigation on the current applications of AI chatbots in mental health, within the context of public services, and their potential uses and opportunities in a pandemic situation, should advance the existing knowledge base. For practice, our paper offers a framework for designing more effective and intelligent chatbots as extenders of public services in the mental health area that public organisations and managers may find useful. The three design dimensions outlined in the framework should help them explore the opportunities for AI chatbots in mental health services and be aware of the related issues of accountability, privacy, safety, and transparency, and accordingly, to establish appropriate governance protocols and regulations. Finally, our paper adds value to the research area by providing clear and structured research priorities to broaden the topic's scope.

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