


COMMUNICATING A GLOBAL PANDEMIC WITH WHATSAPP AND HEALTHBOT IN CROATIA

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Abstract: *The Covid-19 pandemic has caused a series of hasty changes and spurred the digital transformation of various services. The pandemic itself has the greatest impact on the health system, which faces several challenges. Health-focused chatbots (“healthbots”) and apps have more and more important role in collecting quality information about health from credible sources and by doing so, they contribute to quality healthcare. Chatbots, which were used exclusively in connection with the pandemic, were used in more than thirty countries in the world. But there is limited evidence on how such healthbots are perceived in public. This paper is a contribution to this field of research – it deals with the analysis of media presentation of the healthbot Andrija, which was developed and used in Croatia during the Covid-19 pandemic. Using the research matrix from the paper “Chatbot use cases in the Covid-19 public health response” by P. Amiri and E. Karahanna published in Journal of the American Medical Informatics Association, we analysed the health chatbot used in Croatia, with the emphasis on its design features and also media presentation of the project, which was crucial in popularization of the healthbot. Because of the need for a quick response to crisis, this chatbot was developed very quickly. As such, design is relatively simple, using system-directed initiatives and it is focused on a narrow set of simple tasks. In conclusion, the ease of use, and fast information dissemination provide complementary functionality which can potentially reduce the pressure on health workers in situations of increased need for access to primary health care. The use of health chatbots is confronting with many obstacles both at the level of the social system (consumers’ acceptability) as well as the technical system (design and usability). More sophisticated chatbot designs and opportunities for synergies with machine learning should be explored in the future in combination with more developed and sophisticated methods of media presentation.*

Key words: chatbot, design, visual information, health system

1. INTRODUCTION

New information technologies have enabled greater interactivity and greater degree of democracy and the level of participation in the creation of media content. Modern ways of communication have become such powerful communication tools not only for content management, but they have also become a new battlefield for individual, group, technological and social conflicts, and compromises (Plenković & Mustić, 2016). Holistic approach to media communication as a cultural phenomenon is a professional and social preoccupation of every communication scientist, graphic and media designer, author and distributor of visual messages, marketing and design agencies, creative media and educational institutions, advertising and propaganda institutions, economy and party entities, civil society, government, and non-governmental institutions. (Plenković & Mustić, 2020). A holistic approach to the design of media campaigns should be used in crisis communication, which was also necessary in the recent health crisis of global proportions. A holistic approach also implies the use of knowledge from different fields (social and technical) to shape messages using advanced information and communication technologies and knowledge while respecting cultural, educational, sociological and all other differences that each human community has. Visual aids are usually the most effective when transparent – when their elements are well defined and if they accurately and clearly represent relevant information making the relation with data, partially or completely, visually accessible (Garcia-Retamero & Cokely, 2013). An efficient, attractive, and excellent graphic language/communication is a product of joint efforts and integrated planning. The images are used to describe and communicate medical procedures, discoveries, and diseases throughout history and as such have the potential to clarify what is invisible to the naked eye, processes appearing internally, those occurring at long intervals or anywhere on the atomic to solar scale (Scheltema, Reay & Piper, 2018). The use and appropriate design of medical illustrations is becoming increasingly important with advances in technology and the increasing scope and complexity of information about the human body. At the same time, new technologies make it possible to produce anything from simple schemes to hyper realistic ones that cannot be distinguished from photographs. With increasing medical

specialization and increasing audience diversity that requires medical information one of the challenges for medical illustrators is to establish the reality or interpretation of the illustration (Scheltema, Reay & Piper, 2018). Krakov (2017) describes the connection between graphic narratives and health communication on the example of prevention of oncological disease. She says that graphic narratives have a growing trend in health communication, attracting adult reading audiences with convincing visual and textual images of health and disease (Krakov, 2017). In their work, the authors Garcia-Retamero & Cokely (2013) discussed a set of studies researching the advantages of visual aids in communicating health risks with different vulnerable persons (e.g. different abilities, age, risk characteristics and cultural background) and stated that studies have shown that appropriately designed visual aids are often very effective, transparent and ethically desirable means to improve decision making, change attitudes and reduce risky behaviour (Garcia-Retamero & Cokely, 2013). Scheltema, Reay & Piper (2018) stated in their paper that the existing literature on visual communication tends to the theory that simple representations are better for communication and that the use of visuals improves patient understanding of the medical topics (Scheltema, Reay & Piper, 2018). Medical information is complex, therefore a design that contributes to the simplification and better understanding of complex information is increasingly being used, which also contributes to a better understanding of medical topics among the general population. Likewise, the use of information and communication technologies that enable quick, simple, clear and unambiguous access to health information also contribute to the quality of health services. But, the focus of public health is very different from the individualized practice of clinical medicine, and as such public health values and ethics have several justifiable challenges that differ from medical or bioethical ones. Public health is aimed at the population, not individuals, and because of its nature it is interested in public good (Couch, Fried & Komesaroff, 2017).

1.1 Chatbot use in health crisis and public health response

A new, highly contagious disease has put a lot of pressure on healthcare systems around the world. On December 31, 2019, the World Health Organization Office in the People's Republic of China picked up a press statement from the Wuhan Municipal Health Commission from its website on cases of 'viral pneumonia' in Wuhan, People's Republic of China (World Health Organization, 2020b). In March, the World Health Organization reported the rapid escalation of COVID-19 in the European region, placing it at the centre of a pandemic (World Health Organization, 2020b). In the same month, WHO launched a messaging service with partners WhatsApp and Facebook, with the potential to reach 2 billion people. From government leaders to health workers, this messaging service was able to provide the latest news and information on coronavirus including details on symptoms and how people can protect themselves and others. It also provided the users with the latest situation reports and numbers in real time to help government decision-makers protect the health of their populations (World Health Organization, 2020a). Chatbots, in contrast to newspapers and online information sources, can often hear and respond in natural language, improving access for people who cannot read or have difficulty using the internet. They can be available any time of the day to answer questions with up-to-date information, and unlike human experts, can concurrently speak with millions of people at the same time in local languages and dialects (Miner, Laranjo & Kocaballi, 2020). During the Covid-19 crisis, health chatbots were used in more than 30 countries (Amiri & Karahanna, 2022). The purposes of use were different: education of citizens, surveillance and detection of contacts, risk assessment, dissemination of information etc. In Croatia, The Prime Minister Andrej Plenković informed the public about the first confirmed case of a coronavirus patient in Croatia at the end of February 2020 at a press conference (Ministry of Health, 2020b.). The requirement for social distancing made normal face-to-face communication with health professionals impossible, which made the usual health services more difficult to access. Along with the fight against the virus, there was a constant need to prevent misinformation and fake news, so solutions that offered fast, accurate and reliable information while respecting the requirements for social distancing became very attractive. To raise this cooperation to a higher-level technology, a project "Andrija" was created – the first digital assistant in the fight against coronavirus (Ministry of Health, 2020a). The digital assistant Andrija was intended for civil society and uses artificial intelligence to be connected at the same time with millions of citizens and all relevant institutions in the fight against coronavirus. (Ministry of Health, 2020a). Smartphone users were able to self-evaluate their health condition through chatbot on the koronavirus.hr platform and the WhatsApp business API platform, using the global communication platform of the Croatian IT company Infobip (Ministry of Health, 2020b; Government of Croatia, 2020). The project "Andrija, digital assistant" was made with the idea to help health professionals, doctors and

epidemiologists in controlling the development of the Covid-19 epidemic (Government of Croatia, 2020), and as a communication tool of the Ministry of Health of the Republic of Croatia that will help answer citizens' inquiries about coronavirus with reliable and timely health advice, all in order to make citizens feel safe (Ministry of Health, 2020b). Its purpose is education, proper assistance, and information, emphasizing the reliability, cooperation, community, involvement and accountability of citizens and relief of the health care system (Ministry of Health, 2020b; Government of Croatia, 2020). The project leader is the Ministry of Administration and a team of experts led by epidemiologist experts, with the technical and IT support of the joint forces of domestic companies Mindsmiths, Neos and Oracle Croatia, which are, along with Infobip, members of the Croatian Association for Artificial Intelligence CroAI. All Croatian companies involved decided to give their contribution generously and to participate together in a national effort to combat the new coronavirus epidemic free of charge (Ministry of Health, 2020b). Already on the first day there were about 30,000 users on the "Andrija" system, and over 75% of them said that they were satisfied with Andrija (Government of Croatia, 2020).

1.2 Purpose and goal

The purpose and goal of this paper is to present a case of digitalization in the health system on the example of Andrija, digital assistant, healthbot of the Ministry of Health and analysis of the media campaign whose goal was to popularize the digital assistant and motivate the population to use it.

2.METHODS

The review paper "Chatbot use cases in the Covid-19 public health response", in which the authors collected data on the use of healthbots during the Covid-19 crisis, was taken as the basis for the analysis of Andrija digital assistant, what was the first part of our research. Amiri and Karahanna analysed 61 chatbots from more than thirty countries, including 33 chatbots that used 45 languages other than English (Amiri & Karahanna, 2022). They created a research matrix for health chatbot analysis, which was also used in this paper. They determined through analysis that the use of chatbots can be divided into six basic categories within 15 different answers/purposes/instructions in public health can be identified. More than half of the analysed chatbots were used for risk assessment. Using the same categories, the Croatian version of the chatbot was also evaluated. In the field of design, the categories offered by these authors are multipurpose versus single purpose; chatbot platform; anonymity; anthropomorphism; interface design; and follow-up and recurring conversation. The purpose of first part of our research was to determine whether the health chatbot used in Croatia has the same characteristics as in other countries or whether there are still some specifics. For preparing this paper we also used the official website of the Government of the Republic of Croatia and the official website of the Ministry of Health of the Republic of Croatia and chatbot on WhatsApp. On the official website, the search engine was given a search under the keyword "Andrija" in the period from 31 December 2019 to 14th of February 2021. For the purposes of SWOT analysis, the official website of Andrija was used. In the analysis of media campaign with special emphasis on visual communication, the research matrix for analysis of media campaign was created.

3. RESULTS

3.1 Chatbot evaluation based on Amiri-Karahanna model

Six basic categories defined by Amiri & Karahanna (2022) are Risk assessment; Surveillance; Information dissemination; Post-Covid 19 eligibility screening; Distributed coordination and Vaccine scheduler. Andrija, like most previously analysed chatbot (Miner, Laranjo & Kocaballi, 2020; Amiri & Karahanna, 2022), was focused on risk assessment and providing only basic information and guidelines about the new disease (Table 1). During a pandemic, people do not know what to do, so reliable information sources are crucial to prevent a "misinfodemic": the spread of a disease facilitated by viral misinformation. Unfortunately, Andrija did not have that function in wide manner.

Table 1: Andrija chatbot use cases and definitions

Use-case category and associated use cases	Use-case description	Benefits
Risk assessment	Triage users based on their Covid-19 symptoms and exposure risk and recommend a course of action.	Social distancing, capacity expansion, efficient capacity utilization, prevent virus transmission
Surveillance	/	/
Information dissemination	Virus and vaccine education	
	Misinformation/disinformation debunking	
	Proactive misinformation/disinformation debunking	
	Nonpharmaceutical interventions (NPI) promotion	
	Virus transmission data reporting	
	Available public resources awareness	
	Encouragement of activities (other than NPIs) to fight the pandemic	
Post-Covid-19 eligibility screening	/	/
Distributed coordination	/	/
Vaccine scheduler	/	/

3.2 Andrija chatbot design analysis based on Amiri-Karahanna model

Amiri and Karahanna used few categories to define elements of design used in chatbots. First element is multipurpose versus single purpose. Andrija provides risk assessment and very limited information dissemination. Under the category information dissemination seven sub-categories were detected, but Andrija provided just three of them. Nevertheless, Andrija falls in the category of multipurpose chatbots. Amiri & Karahanna (2022) detected that the most common categories to be combined were risk assessment (22 cases) and information dissemination (21 cases), with the most common multipurpose chatbot combination being these 2 categories (18 co-occurrences). Chatbots were deployed on a variety of platforms, the most common being web-based (34 cases) and social media (22 cases). Andrija used official government webpage for Covid-19 informing – koronavirus.hr and the access was possible on WhatsApp. The chatbot was not embedded within a high-traffic platform what would enhance its visibility and discoverability. Some chatbots required user identifying information like telephone number, national identification number, social media account or. Institutional credentials. Andrija asks to save the number in the phonebook before establishing communication and is activated by sending the word “Greetings”. Most chatbots (70%) lacked anthropomorphism (Amiri & Karahanna, 2022), but Andrija chatbot was presented as male (Figure 1). The official presentation of the digital assistant Andrija was held on April 14th at a press conference of the Government of the Republic of Croatia where the choice of the name Andrija but not the visual presentation of the Andrija character was explained (Government of Croatia, 2020). Andrija was named after the father of preventive dr Andrija Štampar, who set the basic principles of public health applied all over the world.



Figure 1: Andrija (e-Građani, 2020)

Like the vast majority of chatbots analysed in the Amiri-Karahanna paper, Andrija is also text-based chatbot. It interacted via predetermined choice and response options (i.e., use system-directed initiative) and interactions were primarily designed to be user-initiated. Andrija, like the vast majority of other chatbots used for this purpose, does not have the follow-up and recurring conversation option implemented. Table 2 summarizes the chatbot design features for Andrija chatbot.

Table 2: Andrija chatbot design characteristics

Andrija	
Multipurpose versus single purpose	multipurpose
Chatbot platform	WhatsApp
Anonymity	does not enquire additional user identifying information
Anthropomorphism	male
Interface design	text-based
Follow-up and recurring conversation	no follow-up option

3.3 Analysis of media communication using official government channel

The use of chatbots in public health communication is a completely new venture, therefore the use of chatbots had to be accompanied by strong media promotion for the purpose of familiarizing the public with the product and motivating the population to use it. For this reason, we included in the research the analysis of official communication channels that were used in public communication and from which the media often took information. Of course, for a complete overview, it would be necessary to analyse a larger number of media sources, but we were primarily interested in how the government used its official channels to promote Andrija. A search has been entered in the search engine on the official website of the Government of the Republic of Croatia: "Andrija". Of the total number of searches (a total of nineteen (19) pages found), in the period from 31 December 2019 to 14 February 2021, three pages related, or are mentioned, Andrija, digital assistant of the Ministry of Health (Government of Croatia, 2020). The search on the official website of the Ministry of Health of the Republic of Croatia includes a search: "Andrija". Out of the total number of searches (a total of eight (8) pages found), in the period from 31 December 2019 to 14 February 2021, one (1) page referred to, or is mentioned, Andrija, digital assistant of the Ministry of Health (Ministry of Health, 2020a). The search results are shown in Table 3.

Table 3: Search results

Website name	Total number of pages found under the filter: "Andrija"	The total number of pages referring to or mentioning Andrew, digital assistant of the Ministry of Health
	Period: from December 31, 2019 to February 14, 2021.	
Croatian Government	19	3
Ministry of Health of the Republic of Croatia	8	1

There are no further publications on the official Government website on the topic of Andrew, digital assistant, while on the official website of Andrija - How I am developing - there are seven publications after the official presentation by April 14, 2020 to September 14, 2020 shown in Table 2. Thirty-three (33) publications are recorded in the media on the part of Andrija's website, i.e., a link in the media with the publishing dates from 13 April 2020 to 27 April 2020, as shown in Table 4.

Table 4: Display the date of publication and content in the part of the page “Andrija — How I develop”

No.	Date of publication	Content
1.	April 14, 2020	Andrija was officially presented at the press conference of the Government of the Republic of Croatia.
2.	April 14, 2020	Andrija reached 10 thousand users in the first 2 hours.
3.	April 15, 2020	Andrija reached 50,000 users in the first 24 hours.
4.	April 20, 2020	Andrija has a new opportunity to list active measures in the fight against Covid-19.
5.	May 08, 2020	From now on, Andrija provides information on crossing borders and traveling abroad.
6.	September 4, 2020	Andrija's algorithm for schools was tested by the profession under the guidance of prof. Branko Kolarić. Based on the feedback, the algorithm was further refined.
7.	September 06, 2020	Andrija can help parents decide whether to send their child to school, given his health condition and contacts.
8.	September 14, 2020	Andrija reports the daily number of new patients and the total number of patients with a graphic presentation.

Table 5 (part 1): Display of links on the page "Andrija in the media"

No.	Date of publication	Website
1.	April 16, 2020	YouTube
2.	April 15, 2020	24 sata
3.	Private video	YouTube
4.	Video removed	YouTube
5.	April 14, 2020	Tweeter
6.	April 21, 2020	24 sata
7.	April 15, 2020	Hercegovina.info
8.	April 15, 2020	IndexHR
9.	April 14, 2020	Peticija24.com
10.	April 27, 2020	Soundcloud
11.	April 14, 2020	Telegram
12.	April 14, 2020	Jutarnji.hr
13.	April 14, 2020	YouTube
14.	April 14, 2020.	YouTube
15.	April 13, 2020.	Netokracija.com
16.	April 17, 2020	Poslovni dnevnik
17.	Official site	Andrija.ai
18.	April 14, 2020	Tportal.hr
19.	April 14, 2020.	Večernji list
20.	May 4, 2020	Telegram
21.	April 14, 2020	Zimo.dnevnik.hr
22.	Page does not exist	hr.n1info.co
23.	Front page	vijesti.hrt.hr
24.	April 14, 2020	Lider Media
25.	April 15, 2020	Bjelovar.info
26.	April 13, 2020	Slobodna Dalmacija
27.	April 13, 2020	Direktno.hr
28.	April 15, 2020	Evaraždin.hr
29.	April 14, 2020	studentski.hr
30.	April 14, 2020	balkans.aljazeera.net
31.	April 14, 2020	www.antenzadar.hr

Table 5 (part 2): Display of links on the page "Andrija in the media"

32.	April 15, 2020	www.zgportal.com
33.	April 14, 2020	www.bug.hr

4. DISCUSSION

When we compare the characteristics of Andrija with other chatbots used for the same purposes, we can see that the purpose of use is dominantly the same for the vast majority of chatbots, namely risk assessment and information. Andrija did not go a step further and enabled users to get more information in one place. For example, for surveillance and contact tracing, and for vaccinations appointment, other products were developed with major problems in use, which is why they received a lot of negative media coverage, and their use did not take off on a large scale. During the observed period, the official website of the Government of the Republic of Croatia under the given search "Andrija" only three pages refer to or are mentioned in Andrija, the digital assistant of the Ministry of Health, while on official website of the Ministry of Health of the Republic of Croatia, in the same observed period and the same technique, only one page refers to Andrija, a digital assistant. Presenting the project at a press conference in front of the Government of the Republic of Croatia achieved the goal of legitimacy and credibility of the project itself. The selection of project presentation methods enabled the transfer of information according to epidemiological measures. High state officials and renowned experts from various fields such as health care, artificial intelligence, etc. participated in the presentation of the project. The symbolism of choosing the name "Andrija" in the introductory presentation is explained, but not the very selection of the official icon. The press conference was used as a means of disseminating information about the project. The contents of the press conference were broadcast by various portals presented in Table 3 whose contents can be easily accessed through a link. Certain videos show the application of Andrew on their own example. Out of 33 links, there are difficulties in three links, one leads to the official website of Andrija, while one leads to the cover of the portal itself. After 27 April 2020, there are no links.

Although the creation of a chatbot was an extremely quick reaction to the new challenging circumstances, top experts participated in its development, it had the support of high-ranking government officials, it could potentially enable a reduction of pressure on healthcare workers, when we compare it with the categories that Amiri & Karahanna (2022) observed in other chatbots, we see that Andrija has had simplest possible functions, design and services.

Observed advantages and disadvantages of Andrija chatbot are listed in the SWOT analysis in Table 6.

Table 6: SWOT analysis of Andrija, digital assistant

<p>Strengths</p> <ul style="list-style-type: none"> - Availability to all smartphone users - simplicity in need - expertise and innovation - support from senior officials and experts 	<p>Weaknesses</p> <ul style="list-style-type: none"> - lack of media campaign strategies - lack of promotion - unclearly defined visual communication figures - lack of use of auxiliary used funds
<p>Opportunities</p> <ul style="list-style-type: none"> - free individual health risk assessment - Education of Citizens - relief of the health care system - epidemiological measures - government presentation of the project 	<p>Threats</p> <ul style="list-style-type: none"> - loss of civic interest - increasing the query by health care system - shortcomings of the project itself

5. CONCLUSIONS

Over the last two decades, a solid body of evidence has shown the potential benefits of using embodied conversational agents for health-related purposes. Chatbots have the potential to play an increasingly important role in health and medical care and their use in this pandemic could potentially speed up the public's habituation to new forms of communication in healthcare. Because of the need for a quick response, chatbot Andrija was developed very quickly. As such, its design is relatively simple using decision-tree structures, system-directed initiatives, and it focused on a narrow set of simple tasks. More

sophisticated designs based on machine learning and sensor data are possible future direction for new or enhanced public health communication.

The coronavirus pandemic has caused a unique crisis that has stopped or changed the normal way of functioning, and in each country, there has been a choice of an effective and efficient combat strategy. During the digitalization of public administration, the Government of the Republic of Croatia presented the project of Andrija - the first digital assistant of the Ministry of Health in the fight against coronavirus. In conclusion, we can say that Andrija, digital assistant, introduced an innovation in health communication, presented a good example of public and private sector cooperation, but its application remained limited due to the relatively small amount of information that can be obtained through it, and insufficient media promotion. This paper presents the results of the analysis conducted on the official websites of the Government of the Republic of Croatia, the Ministry of Health of the Republic of Croatia, and the official website of the digital assistant project Andrija.ai. The results of the conducted analysis show that the project itself has defined goals, which were presented at the Government's presentation of the project to the public. The presentation of the project was performed by high state officials as well as renowned experts from various fields such as health, artificial intelligence, etc., which achieved the legitimacy and credibility of the project itself. In the presentation of the project, the purpose and role of the project, financing, availability, expertise were explained. However, further analysis of the official website of the project showed that there is very little activity on the project itself - only eight announcements about the development of the project. The project presented by the Government of the Republic of Croatia, as a fighter against coronavirus, records only one graphic on its official website - the icon of the project itself without explaining it and there is no clearly defined media campaign of the project. This paper provides an opportunity for further research of the project itself through the prism of the media campaign and its impact on the outcome of the project as a model for future projects of similar content.

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