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Digital Health Surveillance: Usability Requirements Applied to Rumor Alerting and Monitoring Tools

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ABSTRACT

This article has the objective of associating the contribution of social media to a system for detecting rumors in public health, aiming to provide timely inputs for the Strategic Information and Health Surveillance Response Centers (CIEVS) in their event monitoring activities in health through the capture and analysis of unofficial information (rumors). Through a process based on usability requirements identified with analysts at the Surveillance Centers, messages are captured, stored and subsequently analyzed cooperatively by analysts to detect the existence of a possible event in public health.

Keywords: Public health surveillance, Syndromic surveillance, Prevention, Rumors, Social networks, Cooperation, Usability

INTRODUCTION

The dynamics of diseases follows the global social and economic dynamics. Globalization brings, in its development, a greater flow of populations and goods, as a result of which the spread of diseases increases (Booher, 2003). The world has been undergoing transformations that impact the public health of countries, with repercussions on people's daily lives and on the world economy (Booher et al., 2003).

All these dynamics have contributed to the recording of new epidemics caused by diseases that in recent decades were under control, such as measles, cholera, yellow fever and dengue, while diseases such as HIV/AIDS, hemorrhagic fever due to the Ebola virus, hantavirus, Nile fever western influenza, severe acute respiratory syndrome, avian influenza, zika and the one caused by COVID-19 began to affect large population groups, causing pandemics and alerts to a high risk of dissemination (Booher, 2003).

Thus, the need for early detection, registration and perception of important changes in the pattern of occurrence of infectious diseases, or in the dynamics of transmission of their agents, has stimulated intense reflection on the factors involved in the process of monitoring and controlling them (Chapanis, 2003).

The recent case of the COVID-19 pandemic illustrates this situation, as the large concentration of people in large cities favors the rapid spread of diseases

(Folds et al., 2008). In this sense, it is important to consider the International Health Regulations (IHR) (Friedenthal et al., 2008), which aims to prevent and control the international spread of diseases.

It is in this context of increased epidemiological risk, in line with the preparation of health actions, that fits the monitoring of compulsory notification diseases and the recommendations for sets of activities for the prevention and mitigation of risks based on an assessment of the scenario of risk, aligned with emergency and contingency plans (Folds et al., 2008).

In the information flow of epidemiological surveillance, the sick individual will only be known by surveillance when entering a health service, whether public or private. After the diagnostic hypothesis, it may be notified as a suspected case. The interval between illness and notification generates impacts on collective health if the case is exposed to several contacts susceptible to that disease.

Filling this space can be done through analysis of information captured from social networks, in which users frequently post their personal lives, having passive participation, or even, filling in specific instruments for the collection of syndromic data, thus presenting participation active, a process known as Participatory Surveillance. In this case, the interval between the illness and the notification can be filled by capturing relevant information and subsequent analysis through the technological support provided by software that can meet this need through a friendly interface focused on the main objective of the user.

The Role of Social Media in Disease Monitoring

The emergence of social media has changed the way information is accessed and shared, allowing the consolidation of the participatory culture, which is for Jenkins (Jenkins, 2009) the main aspect of this era. For the author, the "circulation of contents – through different media systems, administrative systems of competing media and national borders – strongly depends on the active participation of consumers" (Jenkins, 2009). This movement allows the sharing of opinions, texts and videos in a bidirectional way, that is, those who previously only consumed content now produce it, thus providing the possibility of using the resources of these means of communication to classify, give opinions and recommendations.

This dynamic creates value for healthcare organizations because it directly affects the population. In the era of social networks, sharing public health information and local events on the subject are increasingly appearing. Information on social media can be used to understand how the local population sees health problems or even more quickly predict and identify these outbreaks (Abdullah & Wu, 2011). The adoption of online communication, particularly through social networks such as Facebook, Instagram, WhatsApp and Twitter, created ways for people to collaborate to share information about emergencies, especially in health (Chauhan, 2014).

In this context, can be considered the great importance of developing computational systems that help the work of health surveillance in the detection of rumors, through social media, to face epidemics and pandemics.

From the characterization of threats and vulnerabilities, related to the assessment of symptoms associated with their geographic coordinates (latitude and longitude), it becomes possible to provide alerts through the extraction, processing and treatment of messages captured on social networks such as Twitter (Meilich, 2008).

According to Helander (Helander et al., 1997), the development of computer applications should not be carried out through intuition or trial and error. Users' mental models, through which a human being tries to explain, to himself and others, how the real-world works, must be taken into account so that systems are built providing an easy and simple usability, compatible with the reality that the software intends to meet.

This work is the initial stage of a broader research whose main objective is to identify the most appropriate usability requirements for support systems for digital health surveillance based on capturing messages from social media such as Twitter. The objective is to show how the usability requirements were fundamental in meeting the expectations of the use of the computational tool by health users. From the capture of Twitter messages, analyzed under the syndromic perspective, combining evaluation criteria based on symptoms and signs, it was possible to develop a software that prioritized usability aspects focused on the classification and grouping of health parameters capable of supporting the decision of the digital health surveillance teams. Therefore, this work intends to present the method and conceptual framework applied in the design and development of usability requirements for an information system dedicated to health surveillance with potential for evolution in future works.

HEALTH SURVEILLANCE CENTERS

When it comes to Surveillance, each patient can be just an isolated case or represent the beginning of an outbreak that can put several people at risk.

As a result, communication between assistance and Surveillance needs to be agile enough so that cases considered suspicious are registered, the population risk is identified and any control measures are adopted as soon as possible.

However, communication between services and Surveillance is not always as fast as necessary. Several factors influence this lack of agility, such as:

- Delay in confirming the diagnosis
- Service overload
- Operational bureaucracy

In order to speed up this work and strengthen outbreak surveillance actions, in 2006 the Brazilian Ministry of Health founded the Center for Strategic Information and Health Surveillance Response (CIEVS). These information centers have the main objective of strengthening the capacity of the National Health Surveillance System to identify public health emergencies early and in a timely manner, in order to organize the adoption of appropriate responses that reduce and contain the risk to the health of the population.

The CIEVS are responsible for verifying the veracity of rumors of potential Public Health Emergencies of National and International Importance, which, if true, must carry out investigation and timely response so that they do not become emergencies, preventing the spread of outbreaks and epidemics.

Project Purpose and Justification

The "ALERTA SAÚDE" ("HEALTH ALERT", in English) rumor monitoring system was created with the aim of increasing the resolving capacity of the CIEVS (Centers for Strategic Information and Health Surveillance Response) to complex problems related to crisis management in public health and to improve coordination conditions, control and decision-making in a high-pressure environment during the crisis response phase.

With fast and reliable information, professionals can use information from social networks more quickly, optimizing the response time and allowing public health emergency rumors to be addressed in time that can be prevented from being aggravated, in the face of activation of fronts of public health actions with public health agencies.

The project is justified, then, by having the objective of facilitating the work of CIEVS professionals, through the identification and implementation of usability requirements, applied to the rumor alert and monitoring tools, in the analysis of information from social networks through a Collaborative support system that integrates, organizes, and prioritizes information.

Content generated by users on social networks illustrate the potential and feasibility of using the participatory web to carry out epidemiology studies for public health. Tweets related to health issues can be used for content research, generating knowledge in near real time, allowing health authorities to be communicated and thus provide measures for the containment and prevention of possible outbreaks of diseases raised by the public. According to Pagoto (Pagoto et al., 2019), social media is an expanding area of study in the field of public health; however, many sectors of the media have focused on the bad and damaging parts. Given that social media is intrinsically embedded in our lives, in this perspective, it is necessary to create a public health research agenda to guide the use and design of social media in order to improve health and well-being of people.

While most syndromic surveillance systems operate with conventional data sources, new forms of research that explore the Internet as a method of mining, aggregation and online analysis of textual data in real time, become increasingly accessible and promising. for public health surveillance. According to Gupta (Gupta & Katarya, 2020), syndromic surveillance systems aim to collect data, which can help build scenarios for infectious diseases. These systems can vary depending on the data source, planned duration, and how the data is recorded and acquired. They can also utilize traditional data and real-time data from various social media platforms. In the health field, these systems usually focus on the early identification of groups of diseases and symptoms before the confirmation of a certain disease. Syndromic surveillance, therefore, is generally associated with the systematic collection, analysis, and interpretation of data and prediction of health events.

In this paper, two concepts were fundamental to define the conceptual framework: Human-Computer Interaction (HCI) and systems usability. For Nielsen (Nielsen, 1993) and Shneiderman (Shneiderman, 1998), the easy use of a system, considering the Human-Computer Interaction, should consider individual differences and user characteristics. However, according to them, one should not only consider whether the user is experienced or a beginner, but also whether the user has experience with computers in general, with the system being developed and with mastery of the task.

According to Preece (Preece et al., 1994), the objectives of the HCI are to produce or improve the degree of security, usefulness, efficiency, effectiveness and usability of the systems. The objective of human beings when interacting with computers is to perform tasks in real situations, generally correlated with the work environment in which they are inserted (Eason, 1991).

Usability can be defined as the set of factors that ensure that products are easy to use, efficient and pleasant from the user's perspective. Usability can be divided into the following goals: effectiveness, efficiency, safety, usefulness, ease of learning and ease of remembering how to use (Preece et al., 2005). Usability is a key concept in HCI and, among other features, it refers to making systems easy to learn and use, allowing users to reach acceptable performance levels within a specified time, performing basic tasks easily during the first time they are faced with the design of the system (Nielsen, 2003).

Based on these assumptions, this work focuses on the Center for Strategic Information and Health Surveillance Response (CIEVS). Providing the CIEVS with new tools for tracking rumors in health is important in dealing with epidemiological risks, requiring extensive monitoring, investigation of rumors and a prompt coordinated response to suspected cases of infectious diseases, in order to prevent dissemination. Surveillance of public health events of national and international relevance is necessary insofar as it alerts the Brazilian health surveillance system to possible risks and potential public health emergencies (Carmo & Penna, 2008).

One of the system's key requirements is met by the interface and usability item related to identifying the geolocation of where the captured message was posted. This is a mechanism, which exemplifies an effective use of the system, facilitating the process of analysis and treatment of rumors, because in this way, it is possible to identify where possible health emergency events are concentrated, allowing the provision of health agencies public information for effective combat still in its initial stage.

CONCLUSION

Several companies have been working for decades to extract information from social media that add real value to society, in different areas. Among them, we can cite responses to outbreaks of infectious diseases not yet reported as a national or international risk, or even just local in a specific city or neighborhood. In this context, social media proves to be a powerful tool for capturing information from the population, allowing the investigation of various aspects related to possible symptoms reported by users, enabling

early diagnosis and thus reducing response time in coordinated and efficient actions for the containment of outbreaks in public health.

Providing the CIEVS with new tools for tracking health rumors related to COVID-19 and other contagious diseases contributes significantly to maintaining the population's health security, through the adoption of new practices for capturing rumors and analyzing sentiments.

With the aim of narrowing the gap between the characterization of threats, and their related vulnerabilities, and decision-making by Organs responsible bodies, it is proposed to provide a system whose interface allows capture in specific locations, through their geolocation (latitude and longitude), and processing messages on social networks, such as Twitter and Facebook, so that through further processing of their specific content, alerts can then be generated.

For this type of system, where the aim is to identify possible emergency events in public health at an early stage, meeting one of the central usability requirements where the user has the possibility of identifying the location where the possible emergency is occurring is crucial in the system development. Public health agencies, provided with this information, can thus concentrate efforts to mitigate or even completely remedy the identified emergency.

Still within the scope of the usability requirements for the system, as a possibility of improvement in future works, it is possible to think about the improvement of the usability requirements considering the classification of the captured messages, thus helping to have a more assertive evaluation to understand if the captured messages have sufficient value or not, being classified as relevant, partially relevant or irrelevant in identifying and controlling possible disease outbreaks.

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