


## PROTOTYPE OF A HEALTH APPLICATION (E-HEALTH) FOR FOOD SURVEILLANCE MONITORING

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**Cesario Rui Callou Filho<sup>1</sup>, Maria Salete Bessa Jorge<sup>2</sup>, Regiclaudia Izabelly Ferreira Rodrigues<sup>3</sup>, Gleyce Kelly to Silva Uchôa<sup>4</sup>, Celina Hellen da Silva Dutra<sup>5</sup>, Gerusa Matias dos Santos<sup>6</sup>, Renata Maria Alves de Avelar Menezes<sup>7</sup> and Carlos Antonio Bruno da Silva<sup>8</sup>**

### ABSTRACT

Introduction: The literature highlights that mobile applications in collective food services increase the efficiency of monitoring and accuracy in choices, contributing to health and food security. Objective: To build a prototype of health technology for mobile devices focused on monitoring food surveillance in restaurants to help identify health risks and apply preventive and corrective measures. Methods: The model followed was ADDIE (Analysis, Design, Development, Implementation and Evaluation). In the analysis, the needs for the implementation of risk correction strategies were identified; in design, interface, layout and functionalities were developed; In the development, technological resources for mobile devices were used. The implementation and evaluation will be carried

<sup>1</sup> Physiotherapist

PPSAC – Graduate Program in Collective Health at the State University of Ceará – UECE

Ateneu University Center- UniAteneu

E-mail: [ruifisio@gmail.com](mailto:ruifisio@gmail.com)

Orcid: <https://orcid.org/0000-0002-0390-2830>

Slats: [lattes.cnpq.br/1906506877343117](https://lattes.cnpq.br/1906506877343117)

<sup>2</sup> Nurse

PPSAC – Graduate Program in Collective Health at the State University of Ceará – UECE

E-mail: [maria.salete.jorge@gmail.com](mailto:maria.salete.jorge@gmail.com)

Orcid: <https://orcid.org/0000-0001-6461-3015>

Slats: [lattes.cnpq.br/2295426092712681](https://lattes.cnpq.br/2295426092712681)

<sup>3</sup> Nutrition Student

Ateneu University Center- UniAteneu

E-mail: [regiclaudiaef@gmail.com](mailto:regiclaudiaef@gmail.com)

Slats: [lattes.cnpq.br/4105628289798856](https://lattes.cnpq.br/4105628289798856)

<sup>4</sup> Nutrition Student

Ateneu University Center- UniAteneu

<sup>5</sup> Nutrition Student

Ateneu University Center- UniAteneu

<sup>6</sup> Nutritionist

Ateneu University Center - UniAteneu

E-mail: [gerusa.santos@uniateneu.edu.br](mailto:gerusa.santos@uniateneu.edu.br)

Slats: [lattes.cnpq.br/5959181501383822](https://lattes.cnpq.br/5959181501383822)

<sup>7</sup> Nutritionist

Ateneu University Center- UniAteneu

E-mail: [Renata.menezes@uniateneu.edu.br](mailto:Renata.menezes@uniateneu.edu.br)

Slats: [http://lattes.cnpq.br/2944471358786844](https://lattes.cnpq.br/2944471358786844)

Orcid: <https://orcid.org/0009-0008-4439-7018>

<sup>8</sup> Graduate Program in Collective Health at the University of Fortaleza - UNIFOR

E-mail: [carlosbruno@unifor.br](mailto:carlosbruno@unifor.br)

Orcid: [Orcid.org/0000-0002-2968-9206](https://orcid.org/0000-0002-2968-9206)

out later, after approval by the ethics committee. Results: Safe Kitchen was developed as an intuitive software, aimed at management and surveillance in the collective food sector. Created for mobile devices, it has 14 screens, providing resources such as agenda, supplier management, regulatory documents, visit reports, deadline notifications, meeting the needs of nutritionists and managers, with planned validation for adjustments and compliance with regulations. Discussion: The Safe Kitchen application uses technology for supervision and administration in kitchens in the field of collective food, facilitating the identification of non-conformities. Future usability tests will seek improvements, and the patent grant will bolster its innovation in the industry. Final Considerations: Safe Kitchen is an instrument that enhances the monitoring of compliance with technical standards to ensure safety in collective feeding based on resources that seek to streamline monitoring processes, prioritizing food safety.

**Keywords:** Food Security. Health Technology. Collective Food Services. Food Surveillance.

## INTRODUCTION

The application of technology in the health field is an important instrument for improving the quality of the services offered, mainly through strategies for use in mobile devices such as tablets and smartphones. Veras *et. al.* (2022) reinforce that Information and Communication Technologies are also used to assist health professionals and users of the services provided, facilitating access to information and expanding its reach.

For the authors, Alves *et. al.* (2021), Brazil has an organized regulatory system for the use of health technologies. However, greater agility is needed in the effective use of these technologies, as well as equity in their access. With regard to these technologies, Vidal Ledo (2023) explains that there are everything from data monitoring systems to the use of Big Data, artificial intelligence, and the internet of things, allowing the collection, analysis, and dissemination of information in a more agile and accurate way.

In nutrition, technologies have presented instruments that encourage their users to adopt healthier eating habits. There are apps that can help monitor food intake (Cepeda-Marte *et al.*, 2024; Teixeira *et. al.*, 2020), reinforcing that the use of gamification strategies for mobile applications is an important instrument to stimulate the search for knowledge in health education, stimulating behavior change and the adoption of healthier habits. They provide resources such as recording and monitoring food and caloric intake, reminders and guidelines, health indicators, and feedback to promote greater adherence by users to eating plans and more conscious choices (Melo *et. al.*, 2023).

The applications of health technologies also contribute to the process of food preservation and safety, considering that there are applications for surveillance, inspection, supervision and verification of adherence to good practices in food production. In this way, data collection and verification of non-conformities are favored and aim to solve problems and enable the safe handling of food (Strasburg *et. al.*, 2020).

The use of software of this type offers users several technological resources such as real-time supervision of food units, contributing to the implementation and inspection of the standardization of food safety practices, monitoring of items, products and services offered through applications. These apps can minimize health problems related to collective food by tracking and minimizing health adversities by identifying health risks (Belestrin *et. al.*, 2022).

Therefore, in order to fill a gap present in the theme addressed, this study presents as a general objective to build a prototype of a health technology for mobile devices on IOS

and Android platforms in the face of food surveillance monitoring in restaurants. Thus, it will be possible to facilitate the process of identifying health risks and implementing preventive and corrective measures, subsidizing nutritionists and managers of food and nutrition units, especially in the monitoring of processes in the restaurant industry.

The present study is justified by social, academic and professional desires, since this prototype intends to develop an application aimed at monitoring and supervising the production processes belonging to collective feeding and is presented as a collaboration mechanism to minimize health crises through the supervision of compliance with the regulations that permeate the practices of collective feeding. This type of software makes a link between various areas of knowledge such as technology, health and food safety, and sanitary surveillance, contributing to minimizing health risks. It can also be a tool that simplifies the collection and processing of information, enhancing the process of monitoring compliance with health standards. Speeds up the correction of non-conformities, seeking compliance with good practices in food management and production.

So, as a general objective, it is necessary to build a prototype of health technology for mobile devices focused on monitoring food surveillance in restaurants to help identify health risks and apply preventive and corrective measures.

## **METHODS**

It is a prototype of technological construction, that is, a methodological study that proposes the elaboration and production of the application to be developed according to the guidelines of the ADDIE model of Analysis, Design, Development, Implementation and Evaluation.

This model is made up of five stages: analysis, design, development, implementation and evaluation, corresponding terms in Portuguese for the English words that make up the acronym ADDIE. The first stage of the prototype, analysis, encompasses understanding the demands of users and collecting data for the instrument to be meaningful. The next step consists of the design, which proposes the application's interface. At this stage, the proposal is to outline the presentation, functionalities and layout of the application. It seeks to ensure access in an intuitive, fast and efficient way. The third stage is development, where the applicability of the information, needs and observations collected are codified for the development of the software, including the tools and functionalities for its good use. It then follows the implementation stage, launching the

prototype to the test group, identifying the usability of the instrument and checking for any adversities related to the product so that they can be adjusted before the official launch. In the fifth stage, the evaluation is presented, where it is analyzed whether the proposed objectives have been met (Aydin, Gürsoy; Karal, 2023).

In the analysis stage of the development of the prototype, it was sought to understand the demands related to food safety processes, the identification of risk factors in food handling, as well as routines and regulations that govern the collective food segment. The challenges for monitoring the practices and functionalities that contributed to the real-time monitoring were identified. Thus, a pillar was established in the analysis for the elaboration of the design in order to meet the end users (nutritionists and restaurant owners).

In the design stage, it focused on the organization of the software content for monitoring food safety in collective feeding environments. The priority applicabilities identified in the analysis stage were established, as well as the elements that would integrate the system. Thus, checklists, dashboards for monitoring compliance processes, management reports, and alerts for critical deadlines were developed.

The software development stage applies to both Android and iOS platforms, with Swift development tools for iOS and React Native for both operating systems. It is based on accessibility to the target audience, with an interface that offers intuitive and versatile navigation, favoring use on mobile devices. To this end, tools such as Sketch or Figma were used to create the first prototypes of the interface, while back-end technologies, such as Firebase or AWS, are used for secure storage of user data.

Usability testing with the implementation and evaluation stages will be carried out at a future stage. It should be noted that this moment will occur with the submission of the work to the ethics committee and, when approved, it will be applied to users, managers and nutritionists in the area of the segment.

The literature review was carried out through a bibliographic survey on electronic platforms, which began in August 2024 and concluded in November 2024. For the selection of articles, the inclusion criteria were considered for publication in the last five years, between 2020 and 2024, in Portuguese, English, and Spanish, listed in the databases of the Virtual Health Library, LILACS, PubMed, and Scielo. The Health Sciences Descriptors (DeCS) were used as keywords: health technology, food surveillance, mobile applications, software, nutrition.

The prototype brought the proposal of an attractive interface, seeking to stimulate the interest of the target audience. During the development stage, the resources offered allow users to follow processes and practices applied to collective food services in restaurants, in order to make the monitoring and inspection processes more effective.

## RESULTS

The app was named *Safe Kitchen*, which means safe kitchen in English. The application was designed as an efficient digital tool to assist in the follow-up and monitoring of processes in the field of collective food, especially in restaurants. The aim is to ensure compliance with sanitary standards to ensure food safety and optimize operational management by nutritionists and managers.

The application's home screen has its presentation, name and space for the user to log in with email and password, in addition to the access link for credential recovery, if the user does not have the previously registered password (Figure 1).

Followed by login, the user accesses the customer identification tab. After choosing the customer served (Figure 2), an overlapping screen is provided and has the user's identification and a calendar that provides all activities related to the open customer such as visits made, scheduled and deadlines related to various documents (Figure 3). There are also two icons to access the customer menu with links both to change customer data, and providing a menu with Agenda, Suppliers, Legislation, Reports and Notifications. In this same space there is also a means of access to the next screen, which connects to other links (Figure 4).

Figure 1: Application splash screen



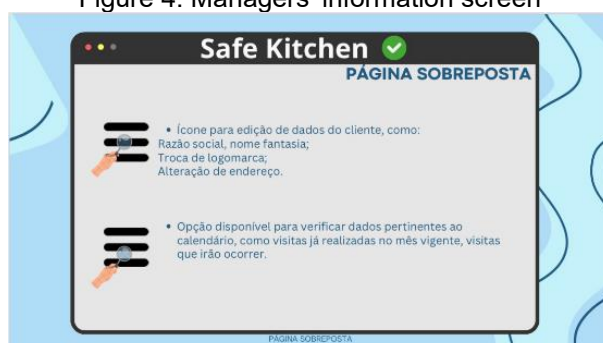
Figure 2: Customer Choice Screen



Figure 3: Customer Identification Screen



Figure 4: Managers' information screen



In the Agenda, found in the application menu, there are all the company's commitments such as document exchange, audits, among others. By clicking on Suppliers, the information of the selected establishment is presented, such as address, contact and e-mail. The legislation in force and applicable to the establishment served is presented in the link Legislations, providing support to the technical professional (Figure 5).



Figure 5: Client Menu



Figure 6: Report Screen



Figure 7: Report Screen



Figure 8: Report Screen



The option of the minutes of visits presents, in a summarized way, the information of the last visit to the establishment. Your access is provided from the access to the link in the



upper right corner. Access to the screen provides the options of two icons: an arrow or an eye (Figure 6). When selecting the eye image, the user is directed to the option to view, edit or delete the report (Figure 7). If you choose to select the arrow, you will be directed to the option to subscribe to the report and send it via PDF (Figure 8).

Accessing the report allows you to send the signed and dated file, sharing via e-mail, according to the options described (Figure 9). If you choose to send it via WhatsApp, the user will be directed to the sharing page (Figure 10). In this way, when you select the report sharing option, a new screen opens and the report link for submission is provided (Figure 11). Following the process, the WhatsApp screen opens automatically and it is already possible to see that the link has reached the recipient, as long as the user is already registered on the platform to receive the application's reports (Figure 12).

Figure 9: Report Screen



Figure 10: Report Screen



Figure 11: Report Screen



Figure 12: Report screen

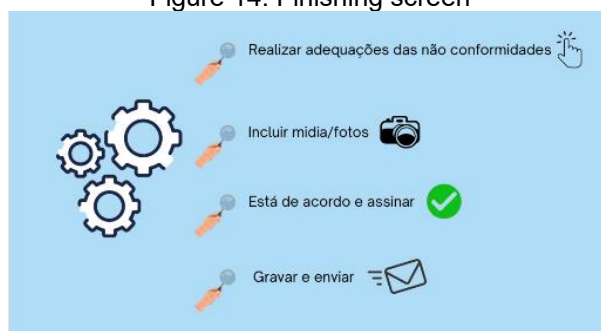


After accessing the report, the customer will find two icons in the lower right corner to interact with the platform. By clicking the confirmation button, the client validates the report (Figure 13). However, if the contractor wants to make notes and observations, he can make them by clicking on the settings icon, also in the lower right corner of the screen (Figure 13). In this way, the customer will locate a screen with options to respond or adapt the divergences found and described in the report, establishing communication between the company and the food safety professional (Figure 14).

Figure 13: Consolidation screen



Figure 14: Finishing screen



The Reports provide all the information regarding the visit to ensure the monitoring of the meal production processes, aiming at food safety. These reports have all the information relevant to the monitoring of processes such as food preparation, antiseptic, good practices, contaminants, integrated control of vectors and urban pests, disinfection, hygiene, cleaning, product handlers, records, waste, sanitizers, food service and standard operating procedures (Figures 6, 7, 8, 9, 10). The Notifications link provides notices, deadlines, notes, and alerts related to the establishment.

The app is designed to be installed on mobile devices (smartphones) through Google Play or App Store, as long as the device is connected to the internet. It is designed to be easily handled on devices of different levels of accessibility. It has 14 screens with direct functions and clear elements.

The results showed that *Safe Kitchen* meets the needs of operational management and food safety in a practical and intuitive way. Its validation will involve additional tests with professionals in the sector and adaptation to specific local standards, consolidating it as an indispensable tool for the collective food sector.

## DISCUSSION

Technology is fundamental and indispensable for contemporary life, being present in practically all aspects of daily life through communication, information, leisure and health. In the health area, mobile technology can facilitate access to information, strengthen links between patients and health services, encourage greater adherence to treatments, and provide various subsidies to health professionals (Maia; Marin, 2021).

It was observed that inadequacy in the execution of good practices such as excess of dirty leftovers, inadequate storage of food so that it is open, without identification, coverage or sealing, lack of expiration control, among others, can cause proliferation of microorganisms, cross-contamination and pathologies in consumers of local meals (Soares

*et.al.*, 2018). These coefficients served as an impetus for the creation of the *Safe Kitchen Food Monitoring* prototype, which aims to optimize activities in collective food units.

Oliveira *et. al.* (2022) state that the applications used for the supervision of collective food services can contribute significantly, as they simplify the more traditional processes and instruments that require the use of lists, various spreadsheets, complex formulas, and extensive calculations for the organization and verification of compliance with regulatory processes.

The development of the app follows technology and health trends, as it uses tools for effective monitoring and management. The prototype was built based on the identification of specific issues in hygiene control in collective catering establishments, with a focus on facilitating the identification of non-conformities and the implementation of corrective measures (Bonfim, 2024).

Requirements gathering is critical to understanding the real needs of end-users such as nutritionists and restaurant managers. These resources were developed based on usability and efficiency standards and include interactive dashboards, management reports and real-time notifications (Tostes, 2003).

The selection of development platforms and tools offers accessibility on Android and iOS and is designed to reach a wide and diverse audience. The use of secure data storage systems meets information security recommendations in healthcare applications because it is designed to facilitate data management, allowing users to verify security. In terms of design and architecture, the application was produced with the proposal of facilitating its use, with all screens and commands being intuitive and simple to access. The adoption of this intuitive and accessible interface reflects the importance of making the application powerful and adaptable to different user profiles, aiming at the practicality of use. *Safe Kitchen* has a group of components designed to make it easier to use and connect to other applications. The literature points out that using simplified visual elements and dynamic menus can reduce problems during use and improve operational efficiency (Martins *et al.*, 2023).

Usability tests, which are still being adjusted, are essential to verify the effectiveness of the prototype and identify improvements. Carrying out these tests will allow technical and functional adjustments ranging from programming monitoring and clinical studies, with the purpose of ensuring the practical application of safe kitchens in food safety monitoring. Documentation is extremely important for the registration of applications and to provide

protection to users. Registration as a patent reinforces the originality of the proposal and contributes to technological innovation in the field of food monitoring. In addition, the continuity of the project, including integration with health monitoring devices and the expansion of functionality, could amplify the impact and applicability of the application.

## **FINAL CONSIDERATIONS**

The development of this prototype represents a significant advance in the field of food monitoring, demonstrating practical and technical solutions for the monitoring and management of good practices in collective food enterprises. The app is designed with a focus on usability and accessibility, compliance with all food safety and monitoring standards, and essential functionalities to ensure its acceptance and application in the industry. The integration of resources such as automated checklists, interactive dashboards, and management reports can meet the main needs of nutritionists and managers, optimizing operational processes and improving efficiency in controlling health risks. In addition, multi-platform compatibility extends its reach, ensuring accessibility for all types of user profiles.

The initial results are promising and the validation of the prototype in the field will be a crucial step to identify improvements and consolidate its effectiveness. Tests with real users, such as nutritionists and managers, will allow functional adjustments and the inclusion of new functionalities such as integration with measurement devices and engagement strategies.

Finally, *Safe Kitchen* stands out not only as a technological tool, but also as an instrument of social impact and public health promotion. Its implementation has the potential to reduce health risks, ensure food safety, and contribute to the continuous improvement of practices in collective food services, consolidating itself as an innovative solution for the sector.

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