DEVELOPMENT OF A SOFTWARE PROTOTYPE FOR INTERPROFESSIONAL MANAGEMENT OF SPECIALIZED EDUCATIONAL SERVICE: EXPERIENCE REPORT

DESENVOLVIMENTO DE UM PROTÓTIPO DE SOFTWARE PARA GESTÃO INTERPROFISSIONAL DO ATENDIMENTO EDUCACIONAL ESPECIALIZADO: RELATO DE EXPERIÊNCIA

DESARROLLO DE UN PROTOTIPO DE SOFTWARE PARA LA GESTIÓN INTERPROFESIONAL DEL SERVICIO EDUCATIVO ESPECIALIZADO: REPORTE DE EXPERIENCIA

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ABSTRACT: This article aimed to describe the experience of developing a software prototype for the interprofessional management of specialized educational services. Five steps were taken to develop the software prototype, guided by the Software Prototype Life Cycle Process, Interaction Ergonomics, and user-centered design criteria. In stage 1 (acquisition), a situational diagnosis was carried out. In stage 2 (supply), the SCAMPER technique was applied. In stages 3 (development), 4 (operation) and 5 (maintenance), standardization criteria and metrics from NBR ISO/IEC 12207 and 25010 were used. As a research result, a software prototype created on the Figma collaborative platform was obtained as a tool, refining the integration of components that add prototyping for user-centered development. Development and prototyping made it possible to contextualize the profile and identify the needs of those who will use the product.

KEYWORDS: Technology. Software prototype. Interprofessional Education. Special education. Education and Health.

RESUMO: *O presente artigo objetivou descrever a experiência do desenvolvimento de um protótipo de software para a gestão interprofissional do atendimento educacional especializado. Para o desenvolvimento do protótipo de software foram realizadas cinco etapas, guiadas pelo Processo do Ciclo de Vida de Protótipo de software, a Ergonomia da Interação e critérios do design centrado no usuário. Na etapa 1(aquisição), foi realizado um diagnóstico situacional. Na etapa 2(fornecimento), aplicou-se a técnica SCAMPER. Nas etapas 3(desenvolvimento), 4(operação) e 5(manutenção), utilizou-se critérios e métricas de normatização da NBR ISO/IEC 12207 e 25010. Como resultado de pesquisa obteve-se como ferramenta um protótipo de software elaborado na plataforma colaborativa Figma refinando a integração dos componentes que agregam a prototipagem para o desenvolvimento centrado no usuário. O desenvolvimento e a prototipagem viabilizou a contextualização do perfil e a identificação da necessidade de quem irá utilizar o produto.*

PALAVRAS-CHAVE: *Tecnologia. Protótipo* de software. Educação Interprofissional. Educação Especial. Educação e Saúde.

RESUMEN: *Este artículo tuvo como objetivo describir la experiencia de desarrollo de un prototipo de software para la gestión interprofesional de servicios educativos especializados. Se tomaron cinco pasos para desarrollar el prototipo de software, guiados por el Proceso de Ciclo de Vida del Prototipo de Software, la Ergonomía de Interacción y criterios de diseño centrado en el usuario. En la etapa 1 (adquisición) se realizó un diagnóstico situacional. En la etapa 2 (abastecimiento) se aplicó la técnica SCAMPER. En las etapas 3 (desarrollo), 4 (operación) y 5 (mantenimiento) se utilizaron criterios y métricas de estandarización de las NBR ISO/IEC 12207 y 25010. Como resultado de la investigación se obtuvo como herramienta un prototipo de software creado en la plataforma colaborativa Figma, afinando la integración de componentes que suman prototipado para el desarrollo centrado en el usuario. El desarrollo y la creación de prototipos permitieron contextualizar el perfil e identificar las necesidades de quienes utilizarán el producto.*

PALABRAS CLAVE: *Tecnología. Protótipo de software. Educación Interprofesional. Educación especial. Educación y Salud.*

Introduction

The use of technological tools presents various strategies that contribute to the development of work activities and interventions during student support. Based on the premise regarding the use of technological tools, the software assists in: effectively monitoring the cognitive development of the target audience, virtually storing documentation and/or reports of services provided, ensuring the security and maintenance of information entered into the system, and planning appropriately with specific actions necessary for each service (Andrade; Galhardo, 2022).

In healthcare, clinical indicators are derived from patient records; therefore, data storage facilitates informed decisions regarding individual health. From this perspective, information systems involve the use of information technology, as the user's health context is linked to the services provided by specialized professionals, thus necessitating distinct profiles within the software (Andrade *et al.*, 2019).

The conceptual basis for professional integration is interprofessional collaboration, which involves collective action for specific services. Healthcare and education professionals provide services in different settings, but with the shared goal of cognitive development and social empowerment of individuals with disabilities.

It is important to highlight that among the types of interprofessional collaboration, there are four dimensions (common objectives, internalization, formalization, and governance) and ten indicators for analyzing collective actions (orientation and sharing; trust and interdependence; responsibilities and agreements; policies, innovative practices, connectivity, and leadership). The interprofessional team fosters synergy in joint work, aiming for shared decision-making, integration of knowledge and expertise, and flexibility in addressing the complexities of a system (D'amour *et al.,* 2005).

Moreover, analyzing interprofessional collaboration can lead to collective participation reflected in actions aligned with the needs of the user, family, and community. Therefore, practical interprofessional collaboration should be integrated into organizational planning, as it aims to address a range of issues related to education, continuous care, and user participation (Rocha; Barreto; Moreira, 2016). Collective actions provide spaces for the development of critical and reflective thinking, strengthening the creation of dialogue tools among professionals, participants, and the target audience with respect for everyone's voice (Fittipaldi; O'dwyer; Henriques, 2023).

Another significant point is the management of services with interfaces between health and education sectors to ensure the school's inclusion of students with disabilities. In this context, there are difficulties in operationalizing institutionalized intersectoral services that integrate health and education services, thereby assisting in the access, retention, and success of students with disabilities. Thus, the comprehensiveness of health and education policies arises from the technical cooperation between the Ministries of Health and Education, respectively reflected in the School Health Program, basic education curriculum guidelines, strengthening autonomy, and the exercise of citizenship (Araújo; Manzini; Fiori, 2015).

It is crucial to note that the interaction between health and education characterizes the quality of student care within the physical space of the health unit or educational institution. To enhance communication, professional integration and prompt response to specialized demands for students with disabilities are essential. In this regard, information technology will enhance speed, quality, and effectiveness in specialized interventions.

Information systems researchers understand that designing dynamic usability requires: identifying the user's profile regarding psychological, social, ergonomic, and organizational factors; understanding the techniques and objectives of the work project; and applying tools that achieve efficacy, effectiveness, and safety in software interaction (Andrade *et al.*, 2019).

It is evident that expanding the dialogue on inclusive education concerning the context of Specialized Educational Assistance (SEA) is essential, as comprehensive monitoring signifies a two-way attention in evaluating development and providing individualized care for individuals with disabilities. Inclusive education addresses fundamental pillars for the formative process, upholds human dignity, and adheres to the principle of equality, promoting collective engagement within the social context of individuals with disabilities (Nacinovic; Rodrigues, 2020).

In this context, it is understood that the use of educational technologies can contribute to the development of appropriate strategies for SEA students through interprofessional collaboration, facilitated by a user-centered management software prototype developed in response to their needs.

Furthermore, it is believed that the construction and planning of a software prototype contribute to fostering interprofessional engagement and implementing actions that prioritize the social empowerment of students with disabilities.

This article aims to describe the experience of developing a software prototype for interprofessional management of specialized educational assistance.

Method

This is an experiential report on the development of a software prototype produced from a segment of a doctoral thesis in collective health. The development was conducted in five stages, referencing the "*Processo do Ciclo de Vida de Protótipo de software*[4]" and "*Ergonomia da Interação Humano - Sistema e Usabilidade*[5]" for technology development (NBR ISO/IEC 12207, 1998; NBR ISO/IEC 9241-11, 2021).

It is important to highlight that the "Software Prototype Lifecycle" is governed by distinct methodologies and systematic guidelines that accompany the design of each product quality project and software prototype organization, following five stages: Acquisition, Supply, Development, Operation, and Maintenance (NBR ISO/IEC 12207, 1998).

Regarding "Human-System Interaction and Usability," the emphasis is on user-centered learning and quality, promoting effectiveness, efficiency, and satisfaction throughout the development, acquisition, review, and use of the software prototype (NBR ISO/IEC 9241-11, 2021).

Additionally, another fundamental aspect of the software prototype construction process is user satisfaction with the technological resource. The user should feel their needs are met through the system interfaces, objectives, and expectations throughout the usability process (Teixeira; Nascimento, 2020).

Stage 1: Acquisition

In Stage 1 (acquisition), a situational diagnosis was conducted at three distinct points: (a) Identification of Brazilian states and capitals; (b) Implementation of semi-structured interviews with technicians from the Coordination of Inclusive Education and Diversity (CODIN) and technicians from the School Health Program (PSE) linked to the Community Articulation and School Management Coordination (COGEST) of the Fortaleza Municipal Department of Education; and (c) Planning of the Project for Developing the Software Prototype Lifecycle Management Process.

Regarding the identification of Brazilian states and capitals (first point), strategies were employed to select the websites of the Municipal Departments of Education in Brazilian capitals, using the political map from the Brazilian Institute of Geography and Statistics (IBGE)

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[4] Software Prototype Lifecycle.

[5] Human-System Interaction and Usability.

to locate the 26 Brazilian capitals. After the territorial mapping, the System Usability Scale (SUS) form, created by John Brooke in 1986, validated in Brazil by Tenório *et al.* (2011), and used as a benchmarking technique by Marques (2018), was employed. The SUS form is a quick and practical tool used to assess the usability of products, services, hardware, software prototypes, websites, and applications, consisting of 10 (ten) questions on a scale from 1 to 5, where 1 means Strongly Disagree and 5 means Strongly Agree.

After applying the SUS form, usability was calculated by subtracting 1 from the score for odd-numbered responses and 5 from the score for even-numbered responses. To obtain the final average, the resulting value was multiplied by 2.5 to reach a total of 68 points (Marques, 2018). Based on the SUS form application, an analysis of the websites of the Municipal Departments of Education in Brazilian capitals was conducted, highlighting the site that achieved 68 points. Excel from the Microsoft 365 Office suite was used for the analysis.

Regarding the semi-structured interviews with technicians from CODIN and technicians from PSE linked to COGEST of the Fortaleza Municipal Department of Education (second point), invitations were extended to professionals stationed at the Fortaleza Municipal Department of Education, and semi-structured interviews were conducted with 4 (four) technicians from CODIN and 3 (three) technicians from PSE. The interview comprised target audience identification and guiding questions, with the following inclusion and exclusion criteria: CODIN Technicians: Inclusion Criteria: Involvement in the development of strategic and/or pedagogical actions within CODIN. Experience in developing Special Education projects. Exclusion Criteria: Lack of technical experience in teaching. PSE Technicians: Inclusion Criteria: Involvement in the development of strategic and/or pedagogical actions within PSE. Experience in developing PSE projects. Exclusion Criteria: Lack of technical experience in teaching. The semi-structured interview was guided by five main questions: Do you have a system to work with and store daily tracking forms and evaluative instruments for students? If yes, provide examples. If no, share your opinion on the importance of having such a system. Do you consider it essential to ensure the security of information related to the student's development process? If yes, provide your opinion. If no, explain why you do not consider it important. Do you think it is essential to have access to evaluation reports from other professionals who accompany the student? If yes, provide your opinion. If no, explain why you do not consider it essential. Are you familiar with software prototypes that support the work activities of the SEA teacher? If yes, provide examples. If no, share your opinion on the integration of technologies into the SEA teacher's work activities. Do you consider it important for the teacher to have health knowledge for their work activities? If yes, provide your opinion on which content should be explored further. If no, explain why you do not consider it essential.

Regarding the Planning of the Project for Developing the Software Prototype Lifecycle Management Process (third point), a scope review was conducted to map strategies for guiding the construction of an interprofessional software prototype for Special Educational Assistance. These strategies facilitated the direction of necessary management tools and the interface for the intersectoral service of the Special Educational Assistance (SEA) student.

Stage 2: Provision

In this stage, the SCAMPER technique (Chart 1) was applied. This technique provides a set of instructions to stimulate the generation of ideas for improving or transcending the current state of an existing product or process (Santos, 2012; Pazmino, 2015; Marques, 2018).

Chart 1 - SCAMPER Technique, according to process or product redefinition, transformation, and typical questions. Fortaleza(CE), 2024.

Process/Product Redefinition	***Transformations***	***Typical questions***
S	Replace	What can I replace to improve? What happens if I change X to Y? How can I replace place, time, materials or people?
C	Combine	What materials, features, processes, people, products or components can we combine within the problem area? Where can I create synergy with other product/process areas?
A	Adapt	What other products/processes are similar to our problem? What could we change to adapt them to our problem?
M	Modify/Magnify/Minimize	How can we change the product/process entirely? Can it be improved by making it stronger, bigger, more exaggerated or more frequent? Can it be improved by making it smaller, lighter, shorter, less important or less frequent?
P	Put into other uses	What other products/processes could do what we want? How can we reuse other products/processes that are already happening?
E	Delete	What would happen if we removed a part of the product/process? What would happen if we removed the whole thing? How can we achieve the same goal if we were unable to do it this way?
R	Rearrange/Revert	What if we reversed the process? What if we did step B before step A? What if A becomes the last step and Z the first? What if the steps are done together?

Source: Santos (2012).

To initiate the prototyping of the software prototype, the initial screens of the system and their respective command buttons were manually designed. Subsequently, these designs were replicated in PowerPoint from the Microsoft 365 Office suite, using the SCAMPER technique, which assisted in: (a) designing screens (presenting proposals for the new system's format, thereby minimizing time spent on graphic editing); (b) developing storyboards (comic strips and dialogue validation) aimed at mapping the user's workflow; (c) creating user flow (detailing the system's steps); (d) task analysis (detailing the information processed by the system); and (e) system taxonomy (categorizing system content and information to facilitate user actions) (Silva, 1998).

Stage 3: Development

The development involved mapping the provision of information for designing scenarios and interactive tasks for the software prototype. The process of developing a software prototype encompasses a set of product characteristics, activities that analyze requirements, design, coding, integration, testing, deployment, and user reception (NBR/ISO/IEC 12207, 1998; Silva, 2007).

In this context, Figma was used, which is an online graphic editing and prototyping platform equipped with technological design tools, icon plugins, typography, and other services, enabling User Interface (UI) and User Experience (UX) design. Thus, Figma is utilized in creating screen flows that function as pathways where users interact with digital media (Putra *et al.*, 2021; Stiano, 2022; Gupta *et al.*, 2023).

Following the development of the software prototype, two independent tests were conducted: one for the developer, based on the criteria of NBR ISO/IEC 12207 (Chart 2), and another for one of the authors, based on the ISO/IEC 25010 standardization metrics, as presented by Silva *et al*. (2018) (Chart 3).

Chart 2 - Technical and operational quality criteria in system construction extracted from the development process. Fortaleza(CE), 2024.

CRITERIA	DESCRIPTION
Process Implementation	The life cycle models, activities, methods, tools, and programming languages must be selected, with due adaptations, if necessary.
System Requirements Analysis	The system requirements specification is defined.
System Architecture Design	A high-level system architecture must be established.
Software Prototype Requirements Analysis	For each configuration item, the developer must establish the requirements.
Software Prototype Architecture Design	The software prototype requirements must be transformed into an architecture that describes its structure at a high level and identifies the components of the software prototype.
Software Prototype Detailed Design	In this step, a detailed design must be developed for each software prototype component, which is refined at lower levels.
Software Prototype Coding and Testing	Each software prototype unit and database are developed and tested in this step.
Software Prototype Integration	An integration plan must be developed and applied to the software prototype units and components, and these aggregations must be tested.
Software Prototype Qualification Testing	Qualification testing must be conducted according to the software prototype requirements.
System Integration	This activity consists of integrating the software prototype configuration items into the system.
System Qualification Testing	It must be ensured that the implementation of each system requirement is tested.
Software Prototype Installation	In the software prototype installation, a plan must be developed for deploying the product in the target environment.
Software Prototype Acceptance Support	Finally, the developer must support the buyer's acceptance review and testing, providing training and support as agreed.

Source: NBR ISO/IEC 12207 (1998).

Chart 3 - Systematic Mapping of Metrics with Minor Contextual Adaptations to Align with the Quality Model of the Software Prototype. Fortaleza(CE), 2024.

CRITERIA	DESCRIPTION
Pedagogical features	The software prototype should allow the identification of attributes that demonstrate it as a pedagogical tool. These attributes highlight how the user will receive the software prototype and whether users will have greater performance with the use of the software prototypes. These are: educational environment, relevance to the curriculum and didactic aspects.
Ease of use	A set of elements that are limited to discussing the ease of use of the software prototype by the user.
Interface features	A group of characteristics that discuss the interaction that the interface has with the user.
Adaptability	A set of characteristics that discuss the evaluation of the software prototype about adapting to the real needs of the user when it is used to transmit any pedagogical content.
Documentation	A set of elements that evaluate the availability of documentation that helps with use and the user's doubts.
Portability	A set of elements that evaluate whether the software prototype has the necessary compatibility with the equipment that the school provides.

Source: ISO/IEC 25010 (2008) and Silva *et al.* (2018).

Stage 4: Operation

The objective of the operation stage is to describe the operational functionality of the product within its environment, provide user support, ensure changes, and manage technical control, which culminates in the system maintenance phase (NBR/ISO/IEC 12207, 1998; Brasil, 2016).

To address the operation, usability engineering is employed as a systematic effort by companies or organizations to develop interactive software (Cybis *et al.,* 2007). Usability is a characteristic of the human-computer interface, prioritizing the assessment of software quality through its use and effectiveness to achieve user efficiency, acceptance, and satisfaction (Souza, 2004). It is important to note that the term "usability" represents a set of properties and goals that must be evaluated in an interface to ensure the positive quality of a system, such as (Gomes; Padovani, 2005):

(a) **Utility:** Will the system achieve the necessary functional objectives?

(b) **Compatibility:** Will the system be compatible with other systems already in use?
(c) **Acceptability:** Will users perceive the system as appropriate?
(d) **Economic Costs:** What are the acquisition and maintenance costs?
(e) **Social Costs:** What are the social consequences and impacts on the organization?

It is important to highlight that this stage is based on the criteria from the Project Planning for the Construction of the Software Prototype Life Cycle Process, as it promotes the quality of the product directed at the user. The researchers used the working tools from the Planning, Budget, and Management Secretariat (SEPOG), applied in Stage 1 – Acquisition, which guided the Project Planning, thus underpinning the evaluative strategy for the interface metrics of positive system quality.

Stage 5: Maintenance

Maintenance aims to modify the product and subsequently release it for use while preserving its integrity, security, and technological quality of information (NBR/ISO/IEC 12207, 2008; Silva, 2007).

Moreover, to determine if the maintenance process is effective, it is crucial to assess whether the system adheres to ergonomic principles. Ergonomics is considered a technology of human-machine communication, as it is an interdisciplinary science that guides the physiology and psychology of work. It aims to address human needs regarding ease of use and the efficiency of human effort to accommodate work adaptations (Kemczinski *et al.*, 2012). In this context, to implement a software prototype effectively, significant improvements are required (Cybis; Betiol; Faust):

(a) Knowledge about the structure of the reference task (origin task) of the system;
(b) Appropriate principles for defining the new division of tasks between humans and machines;
(c) A specification process for the future system's requirements based on user participation in real or anticipated scenarios involving the new interactive task;
(d) A strategy for specifying the user interface, based on abstract components of presentation and dialogue;

(e) Various forms of ergonomic knowledge to execute the steps outlined above.

Results and Discussion

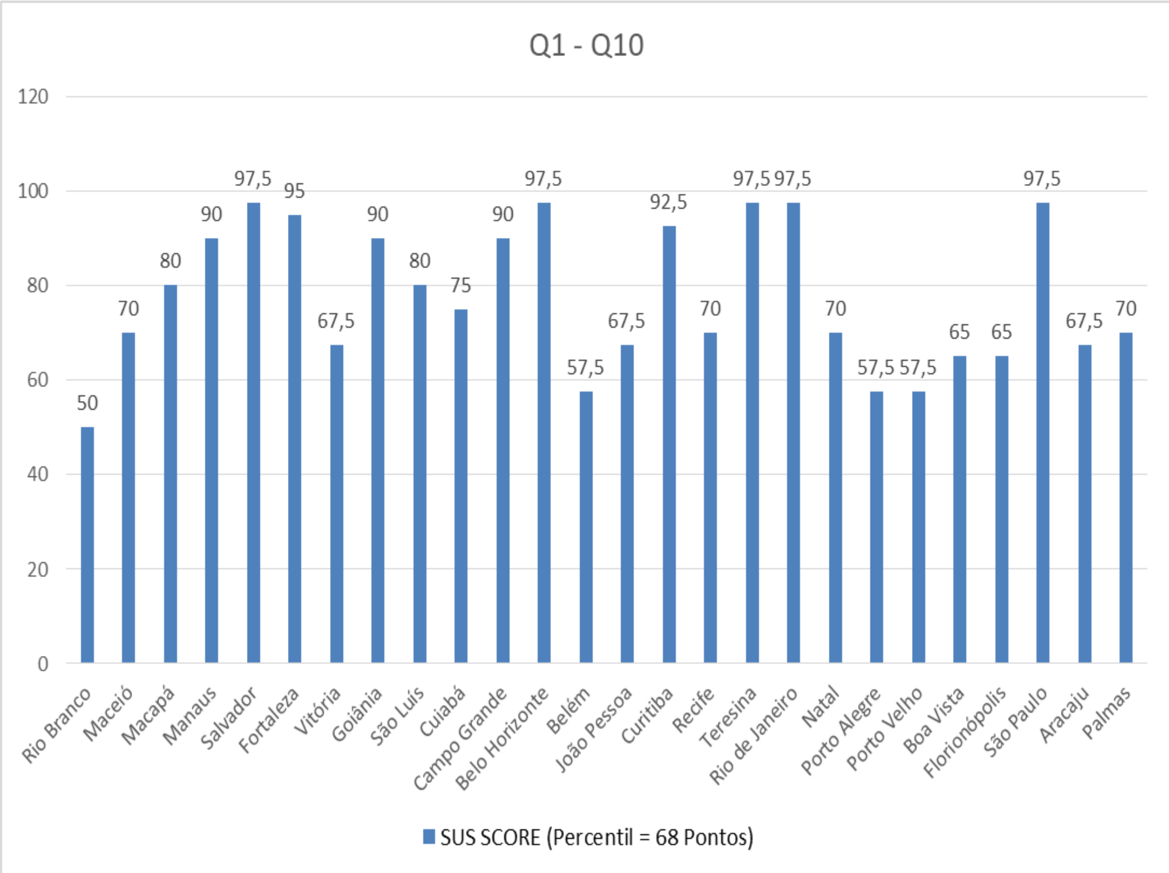
Stage 1: Acquisition

At the initial stage, 26 Brazilian capitals were identified on the IBGE website. Subsequently, using the SUS form, the SUS SCORE was obtained, reflecting the scores of Brazilian capitals and the reliability levels determined by "Questions 1 to 10 (Q1 to Q10)."

The consolidation of the SUS SCORE is achieved through the interpretation of the questions listed in the SUS form, which are: 1. I would like to use this system frequently; 2. I found the system unnecessarily complex; 3. I found the system easy to use; 4. I think I would need the support of a technician to use this system; 5. I found that the various functions of this system were well integrated; 6. I found there was too much inconsistency in this system; 7. I would expect most people to learn to use this system very quickly; 8. I found the system very difficult to use; 9. I felt very confident using the system; and 10. I needed to learn a lot of things before I could get started with this system.

Accordingly, **Figure 1** represents the observations among the 26 capitals, where 16 sites met the SUS SCORE criteria for benchmarking applicability, while 10 did not meet the criteria for interpretative evaluation.

Graphic 1 - SUS Form Results. Fortaleza(CE), 2024.



Source: Prepared by the authors.

In **Table 1**, it is observed that 38.46% of the Brazilian capitals were classified as "excellent" and 23.09% as "good," totaling 61.55% in quality according to usability criteria that contextualize the user-centered software prototype development process. Regarding the "fair" rating, 34.61% were identified, and 3.84% were rated as "poor," meaning that 38.45% of the municipal departments did not achieve the desirable score on the SUS form, failing to meet the required score for the technical validation of the subsequent stage. The "regular" SUS score is 68, which was not reached.

Table 1 - Frequency Distribution of the Classification Obtained from the SUS Form (n=26). Fortaleza(CE), 2024.

SUS Score	Adjective Evaluation	n(%) - Capital
>80,3	Excellent	10 (38,46 %) Salvador / Belo Horizonte / Teresina / Rio de Janeiro / Sao Paulo / Fortaleza / Curitiba / Manaus / Goiania / Campo Grande

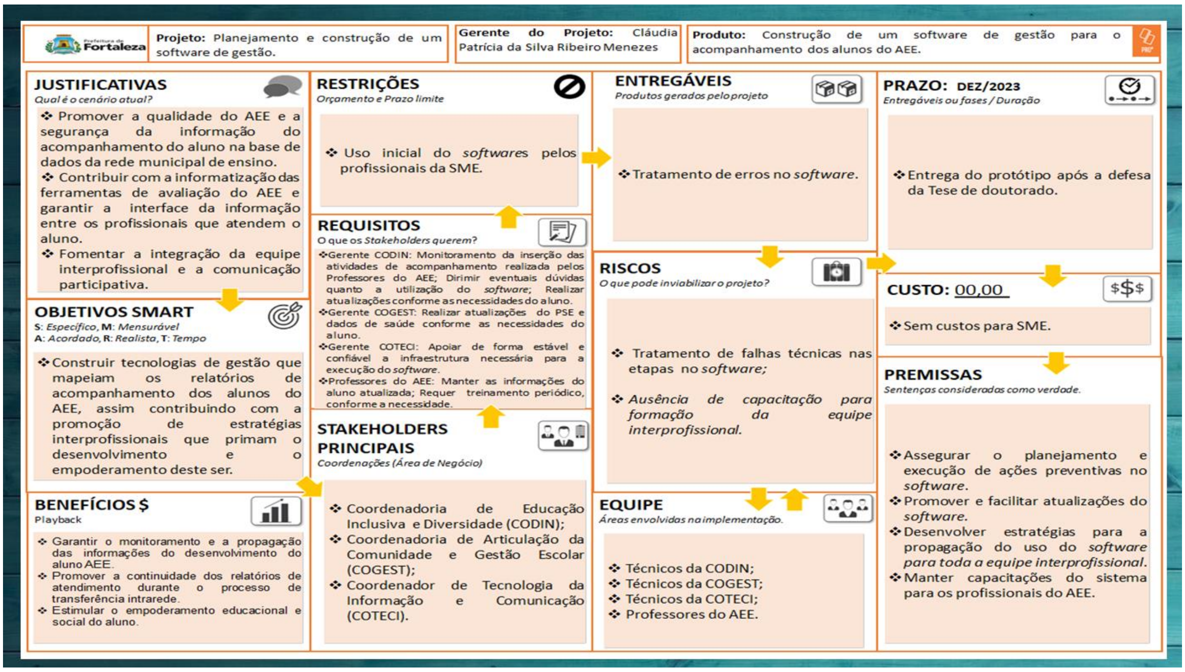
68,1-80,3	Good	06 (23,09 %) Macapá / São Luís / Cuiabá / Maceió / Recife / Natal
68	Average	0
51-67,9	Reasonable	09 (34,61%) Vitória / João Pessoa / Aracajú / Palmas / Boa Vista / Florianópolis / Belém / Porto Alegre / Porto Velho
<51	Poor	01 (3,84%) Rio Branco

Source: Prepared by the authors.

In the second phase, 15 (fifteen) professionals were identified, including 7 (seven) technicians from CODIN and 8 (eight) technicians from PSE. After applying the inclusion and exclusion criteria, 7 (seven) professionals were selected, comprising 4 (four) technicians from CODIN and 3 (three) technicians from PSE. Regarding the professionals' profiles, it was observed that the age range varied from 30 to 55 years, with years of experience ranging from 8 to 25 years in fields such as a full degree in pedagogy and philosophy and a bachelor's degree in library science. In terms of the highest academic qualifications: 1 (one) doctoral, 4 (four) master's degrees, and 2 (two) specialists. To assess professional development, it was noted that 2 (two) master's degree holders are in the process of obtaining their doctorate, and 1 (one) specialist is pursuing a master's degree. Regarding the analysis of responses, ideas for subsequent stages were identified.

In the third phase, the Planning of the Software Management Prototype Lifecycle Construction Project was systematized using the CANVAS model (Figure 1) developed by the Planning, Budget, and Management Secretariat (SEPOG) of the Fortaleza Municipal Government. The aim is to assist in organizational business processes' methodological and systematic transformation.

Figure 1 - CANVAS Planning. Fortaleza(CE), 2024.

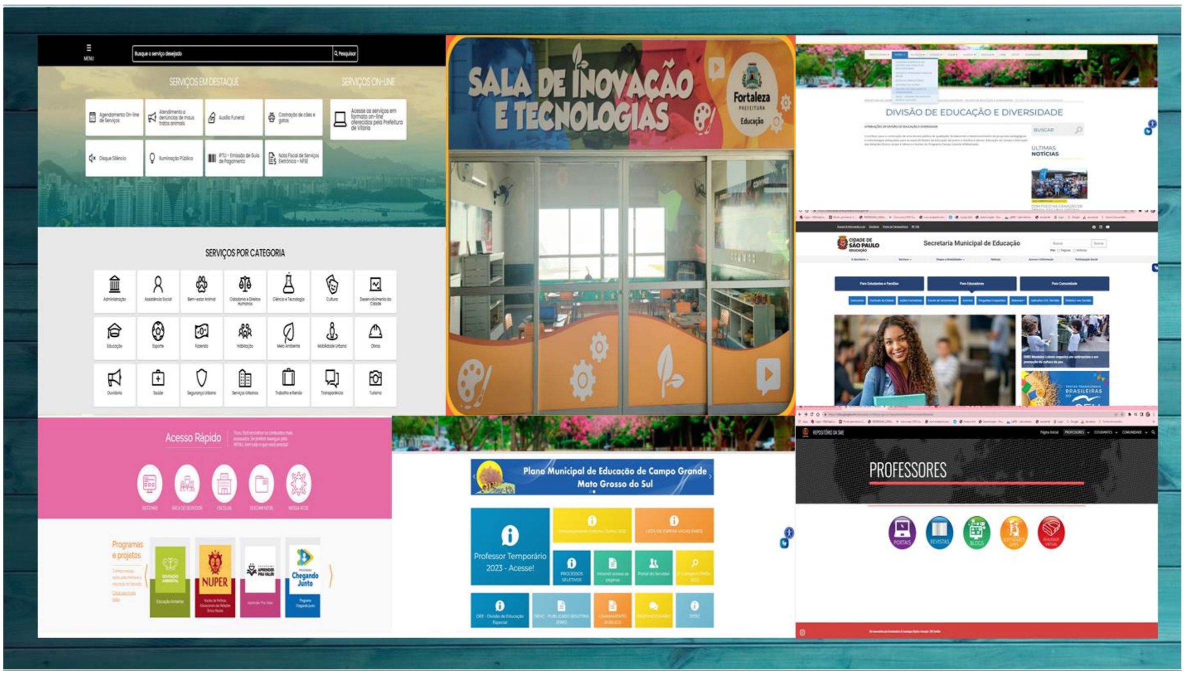


Source: Prepared by the authors.

Step 2: Provision

Based on the SCAMPER technique, screens from the municipal secretariats' websites were selected, accounting for a total of 61.55% for the evaluation of "excellent" and "good" characteristics. This resulted in parameters that support the measurement of user performance interacting with the software prototype.

Figure 2 - Screenshot Sampling (n=26). Fortaleza(CE), 2024.



Source: Prepared by the authors.

For the development of the software prototype redesign proposals, seven transformation elements were applied, leading to the following typical issues for the systemic alignment of a process or product:

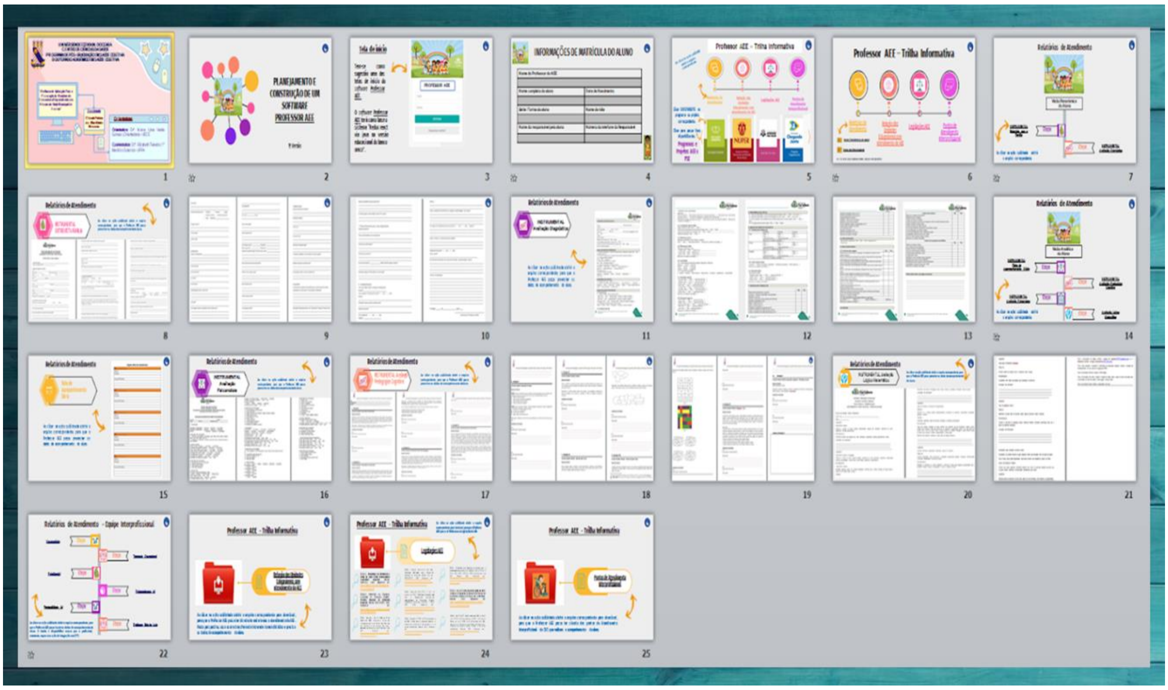
a) ***Replace:*** Neutral colors with strong colors and images that reflect the theme of the software prototype.
b) ***Combine:*** Dynamic and didactic actions that present information relevant to the student's health and cognitive development.
c) ***Adapt:*** Ensure functions have resolution capabilities; adapt the assessment of the student's development; expand to include reminders that the user deems relevant.
d) ***Modify/Enhance/Reduce:*** Expand access to the entire interdisciplinary team that supports the student in the Special Educational Service (AEE).
e) ***Put to Other Uses:*** Distribute information about the system and its benefits for storing student development and guiding work practices on the Municipal Secretary of Education (SME) website.
f) ***Eliminate:*** Restriction of access to the software prototype.

g) ***Rearrange/Revert:*** Reconfigure in accordance with the validation criteria of the target audience.

Step 3: Development

The technical/operational quality criteria for system construction were extracted from the development process outlined in NBR ISO/IEC 12207 and ISO/IEC 25010. Thus, it was necessary to construct the software prototype in two distinct phases. Figure 3 corresponds to the initial design of the software prototype screens. Initially, the software prototype was created using PowerPoint from the Microsoft 365 Office suite, with guiding components for the initial screen design including: acquisition and provision phases, and the User-Centered Design (UCD) parameters linked to technical educational knowledge.

Figure 3 - Initial Design of the Software Prototype in PowerPoint. Fortaleza(CE), 2024.

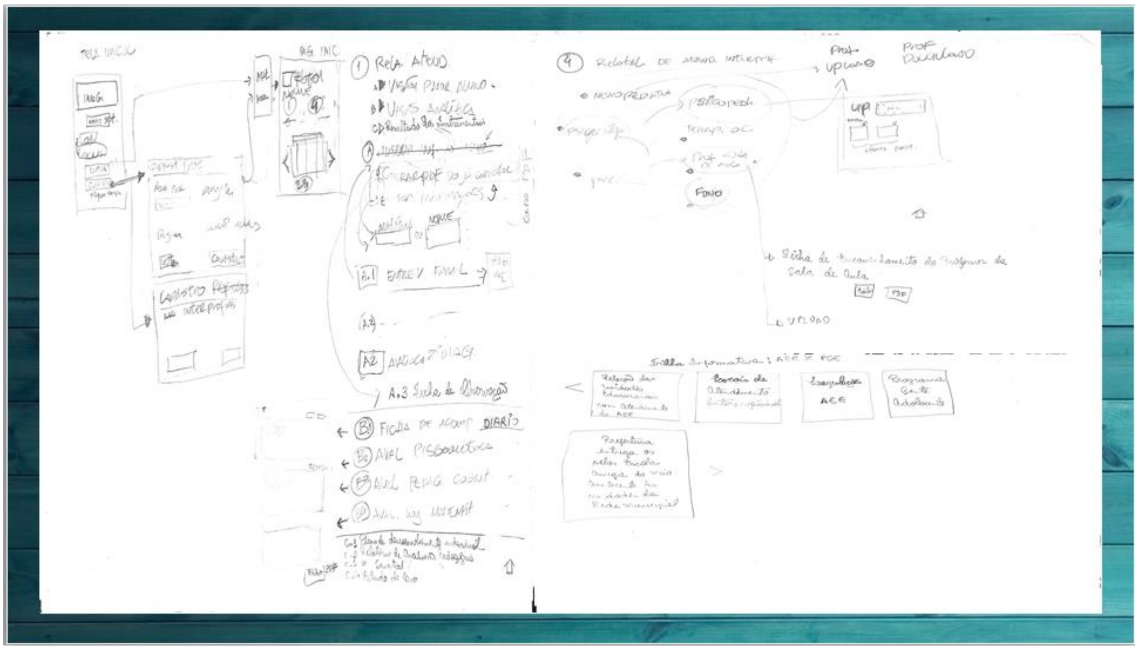


Source: Authors' Preparation.

The pedagogical characteristics applied in the prototyping were derived from didactic elements observed in the screen captures during benchmarking, emphasizing the ease of use of essential features for the interface, which outlines the interaction of the software prototype with the user's needs. To achieve this, identifying the adaptability of the software prototype involves establishing connections between the systemic and pedagogical tools required by the user, as well as providing a set of documentation compatible with the resources that support the development of the routines of professionals involved in the Special Educational Service (AEE).

Figure 4 shows the coding interfaces from the meeting with the developer to align the logic of the software prototype. Furthermore, Chart 2 mentions the method highlights the technical criteria used by the developer to construct the software prototype.

Figure 4 - Logical Planning Coding of the Software Prototype. Fortaleza(CE), 2024.



Source: Authors' Preparation.

Consequently, for structuring and implementing the software prototype's development lifecycle process, the prototype's interfaces were designed using the collaborative platform Figma. The system architecture design utilized the available tools in Figma, refining the integration of the components that enhance the prototyping, thus providing the product with User-Centered Design (UCD) principles.

The systematic mapping of the metrics extracted from the SUS Form improved the efficiency of communication within the software prototype interface, facilitated contextual adaptations to align with organizational quality standards, and aided in the understanding of the reports prepared by AEE professionals.

Stage 4: Operation

Usability represents the outcome of the integration of systemic and pedagogical properties that encompass the compatibility of goals and maintenance acquisition for the interface of a system's quality indices. Thus, the system achieved the necessary functional objectives without incurring economic costs for the SME. Usability is believed to be linked to functionality, attractiveness, and efficiency, thereby offering a design that ensures high quality in the user's interaction with the software prototype.

Regarding social costs, the focus was on adding social benefits to organizational dynamism, product quality directed at the user, and, above all, student empowerment. The adoption of the software prototype by the interprofessional team, delivered to the SME at this stage, will impact the quality and accuracy of the information, which will, in turn, influence the criteria for monitoring and developing the AEE student.

Stage 5: Maintenance

The importance of maintaining the technological relationship with the user requires attention to the process of specifying requirements that will be altered in the future. Therefore, the software prototype will need modifications as necessary, which will subsequently drive the strategy for specifying the user interface.

To this end, various forms of ergonomic knowledge were incorporated throughout all stages developed in interactive tasks between humans and machines, as all technology undergoes changes to meet user needs in real or future situations.

It should be noted that, following the delivery of the software prototype to the SME, the technical responsibility for maintaining information and fostering updates that meet the expectations of the interprofessional team will lie with CODIN. COTECI will be responsible for adjusting to identified needs. As an interprofessional tool, attention must be given to operational improvement suggestions from the PSE technical team.

Technological evolution has had a positive impact on the maintenance of Digital Information and Communication Technologies (DICT). One of the factors for achieving quality in corporate objectives is the development of a strategic plan that promotes the visualization of monitoring interfaces for managerial demands (Ferreira; Seruffo; Pires, 2021).

In this perspective, the development of a management proposal should be planned within the User-Centered Design (UCD) framework, as it is based on the interaction between product and service, where the project's methodology aims to understand user satisfaction and empowerment (Pagnan *et al.,* 2019).

The DCU process emphasized: 1) Identifying the need for a user-centered project; 2) Analyzing and specifying the operational context; 3) Specifying the requirements of users and the organization; 4) Producing design solutions; 5) Evaluating the design against the requirements. Thus, the evaluative context results in two concurrent actions: 5.1 Analyzing and specifying the operational context and 5.2 Ensuring that the system meets the requirements of users and the organization (ISO, 1998).

Given that the development of the management software prototype (application software prototype) has been gaining prominence and differentiating various fields of knowledge and labor activities, it was based on the construction of the Fundamental Processes of the Software Prototype Life Cycle and the DCU. The goal was to design an interactive system for standardization and quality during the development and usability process of the software prototype for the AEE teacher.

Thus, the development of educational technologies confers significance regarding the degree of reliability inherent to the teaching-learning process, enhances communication in health care, strengthens service delivery, and promotes clear communication of the provided services. Consequently, professional narrowing fosters interprofessional strengthening, directly benefits the target audience, and reinforces the development of public policies (Nobre *et al.*, 2021).

Technological advancements have shown positive results in various fields of knowledge, and this is no different when discussing topics in the realm of education and health. From this perspective, to gain a comprehensive understanding of the technological needs of a particular group, it is crucial to identify its weaknesses and develop a strategic plan.

Furthermore, early detection of a weakened action aims to ensure damage minimization and address techniques and tools that promote technological advancement, whether through monitoring or the formation of work activity flows.

It was observed that the application of the SUS form provided analyses regarding knowledge of websites, functionalities, and usability, thus generating a systemic view of the propagation of information and/or data provided by public agencies (Lopes; Florêncio, 2023). Additionally, the use of the SUS form with the SCAMPER method improved logical solutions and functional analysis, enabling an adaptive perspective for understanding the problem (Mendonça; Jorge, 2023).

Thus, SCAMPER allowed for an unusual perspective combined with other methods in an adaptive manner, which contributed to the creative problem-solving process. Consequently, the themes of design and creativity resulted in media thinking, critical capacity, questioning, and adaptations to existing situations for the user and the impact of the product.

In the interface of development and operation, the ISO presents a technical dialogue on human-system interaction and highlights contemporary demands through the United Nations Sustainable Development Goals (SDGs), with three key goals emphasized in this research: good health and well-being; quality education; and reduced inequalities (Ferreira; Venturelli, 2022; Cruz *et al.*, 2022). It is worth noting that all SDGs hold social and sustainable relevance; however, when discussing the development of technologies, it is important to reflect on specific issues that enable the expansion of interprofessional actions.

For maintenance, it is essential to encourage economic and intellectual investments, requiring interprofessional action and interaction. Another important aspect is the management of information, which must be current to provide an intuitive path for systemic modeling and promote logical and practical communication (Ferreira; Seruffo; Pires, 2021).

With technological advancements in the fields of education and health, there is a noticeable need for different professional profiles that produce reports fostering cognitive development from distinct perspectives in health care and educational contexts. Through the development of the software prototype, it was observed how the application of technologies supports high-quality management actions in educational and health services.

Thus, the research demonstrates adherence to technical principles regarding interprofessional integration and highlights the software development process, adhering to the framework of best practices and technological knowledge, aiming for future results to address social-specific needs.

The pursuit of integration and collaboration between health and education has historical significance; however, for an effective and inclusive educational system, it is necessary for health services to be swift and efficient in meeting demands, thereby ensuring active and engaged teachers in the student's development process. It is also observed that the training of the interprofessional team provides security in service delivery and ensures quality in the monitoring of AEE students.

Final considerations

In this article, we report the experience of developing a software prototype for interprofessional management of specialized educational services, successfully applying the five stages of the Software Prototype Life Cycle. Despite advancements in the context of inclusive education, there is a need to integrate management software prototypes and the consequent interprofessional collaboration for monitoring AEE. Furthermore, the inclusion process must be dynamic from the school context to collective health, as ensuring intersectoral actions is a constitutional right.

It is important to highlight that limitations were encountered during the development of this case study, such as the lack of identification of software prototype studies for the interprofessional management of specialized educational services. Despite these limitations, they did not interfere with the development of the research.

Therefore, the systemic infrastructure must be monitored, as the software prototype lifecycle is governed by methodologies and systematic guidelines that succeed through proper maintenance in line with user requirements. Thus, for the management software prototype to meet pedagogical expectations, it is essential to continue health services and the ongoing integration of interprofessional reports to achieve progress in AEE.

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