

Design management applied to the assistive technology service provided by occupational therapists: a case study

Gestão de design aplicada à prestação de serviço de tecnologia assistiva realizada por terapeutas ocupacionais: estudo de caso

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ABSTRACT

This article aimed to apply Design Management in occupational therapists' provision of Assistive Technology services. It is an applied, qualitative, and exploratory-descriptive study. The technical procedures were divided as follows: Moment 1 — Theoretical Framework, consisting of bibliographic research that addressed the central topics of Design Management, Assistive Technology Service, and Occupational Therapy; and Moment 2 — Case Study, carried out through applied research that discussed the provision of Assistive Technology service in the academic environment. The collection techniques employed were systematic observation, document analysis, and focus group. We concluded that the applied Design Management contributed to an accurate diagnosis, which pointed out weaknesses in the planning of joint actions, communication and systematization of processes; and potentialities in the performance of the interdisciplinary team, with the sharing of knowledge and technologies, strengthening the actions of the Assistive Technology service.

Keywords: Design management. Assistive technology service. Occupational therapy.

RESUMO

Este artigo teve como objetivo aplicar a gestão de design na prestação de serviço em tecnologia assistiva realizada por terapeutas ocupacionais. Trata-se de um estudo aplicado, qualitativo e exploratório-descritivo. Os procedimentos técnicos dividiram-se em dois momentos: momento 1) referencial teórico, realizado por meio de uma pesquisa bibliográfica que abordou os temas centrais gestão de design, serviço de tecnologia assistiva e terapia ocupacional; e momento 2) estudo de caso, mediante uma pesquisa aplicada que discorreu sobre a prestação de serviço em tecnologia assistiva acontecendo em âmbito acadêmico. As técnicas de coleta utilizadas foram observações sistemáticas, análise documental e grupo focal. Concluiu-se que a gestão de design aplicada contribuiu para um diagnóstico preciso que apontou fragilidades no planejamento das ações conjuntas, na comunicação e sistematização dos processos e potencialidades na atuação da equipe interdisciplinar, com o compartilhamento de saberes e tecnologias, fortalecendo as ações do serviço de tecnologia assistiva.

Palavras-chave: Gestão de design. Tecnologia assistiva. Terapia ocupacional.

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INTRODUCTION

Design is a process of solving problems by intuitive and systematic thinking and from a person-centered perspective (BEST, 2012). The field of design is not limited to the product, presenting a broader perspective of the entire system, which includes the work processes and the relationships between the involved actors, characterizing a management process (MOZOTA; KLOPSCH; COSTA, 2011; BEST, 2012). In this context, there is the design management approach, which is concerned with the good relationship, interaction, and quality between people, project, processes, and procedures (BEST, 2012). The intention is to contribute to organizations and positively impact the results of projects (MOZOTA, 2011). Thus, the application of design management can happen in several areas of knowledge such as health.

Design allows a possibility to offer innovation and well-being to healthcare services, strengthen interdisciplinarity, and welcome the users (TEAL; FRENCH, 2016), thus playing an important role in the services (JONES, 2013). The health area, despite showing many scientific and technological advances, faces challenges regarding the quality of the service and the care provided to patients (ANDALEEB, 2001). These challenges are, likewise, a reality in the area of assistive technology (AT), which faces difficulties in the functioning and management of interdisciplinary teams (PICHLER *et al.*, 2016), as well as in the organization, standardization, and systematization of service provision (ARTHANAT; ELSAESSER; BAUER, 2017; WITTE *et al.*, 2018; MACLACHLAN; SCHERER, 2018).

AT is defined as

field of knowledge, of interdisciplinary nature, which encompasses products, resources, methodologies, strategies, practices, and services aimed at promoting functionality related to the activity and participation of people with disabilities, impairments, or restricted mobility, aiming at autonomy, independence, quality of life, and social inclusion (BRASIL, 2019, p. 38, free translation).

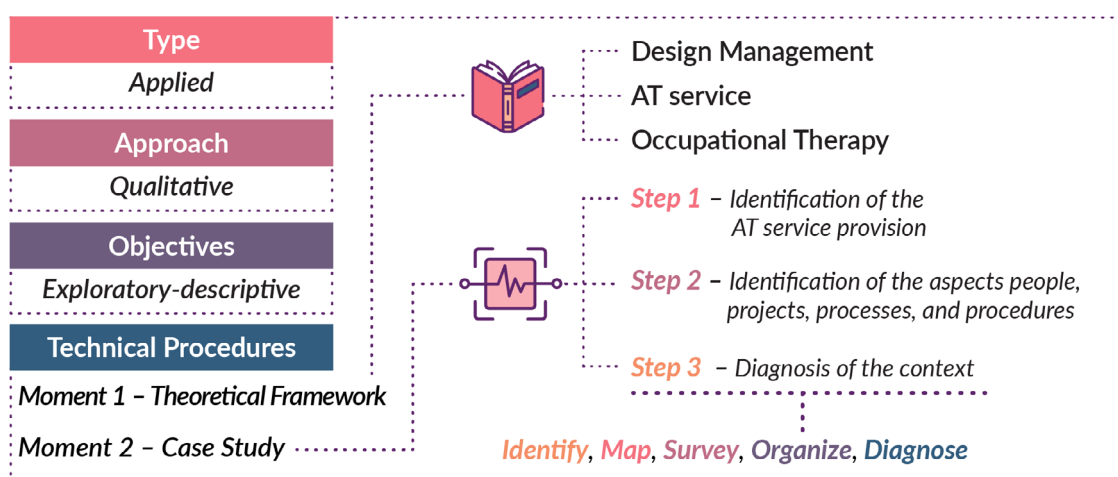
The provision of AT service involves the entire process of indication, prescription, and follow-up that occurs between the professional and the user (WITTE *et al.*, 2018). The quality performance of this service is considered paramount to expand access to AT and minimize product abandonment, consisting in a global issue in the area of AT (WHO, 2018; WITTE *et al.*, 2018; BRANDT; HANSEN; CHRISTENSEN, 2020). Occupational therapists are a reference for the performance in the AT service provision; however, they report challenges such as lack of professional training, organization, and systematization of processes and standardization (ALVES, 2013; IGBO, 2016; ALVAREZ *et al.*, 2019).

Considering the aforementioned challenges, the design management approach is indicated for application in the context of AT services, as it provides a comprehensive perspective of all systems and processes and has skills to coordinate products, people, and services (MARTINS; MERINO, 2011); it is able to materialize processes with specific tools and methodologies (MOZOTA, 2011); it focuses on human beings, considering the satisfaction and well-being of users and all involved individuals (BEST, 2012); and it emphasizes the context (MOZOTA, 2011; BEST, 2012).

We consider as problems the demand for management, articulation, and organization of the AT service provision and the need for support to occupational therapists who work in this practice. Therefore, the purpose of this research was the application of design management in the provision of AT service performed by occupational therapists in the academic environment, seeking to diagnose the context. Its importance lies in the opportunity to expand the knowledge of experiences and practical strategies in the application of design management in health services and because it is a starting point for studies focused on supporting occupational therapists who work in the provision of AT services.

METHODOLOGICAL PROCEDURES

This is an applied research, with a qualitative approach, and with an exploratory-descriptive objective, whose proposals are the knowledge and description of a specific context (MARCONI; LAKATOS, 2021). The technical procedures (Figure 1) were carried out in two moments: theoretical framework and case study.



AT: assistive technology.

Figure 1. General characterization of the research.

Moment 1: theoretical framework

The theoretical framework was carried out by a bibliographic research on the central topics of the research: design management, AT service, and occupational therapy.

Moment 2: case study

The case study aims at the investigation of a phenomenon happening in a real context (GIL, 2007). In the present research, the considered case was the provision of AT services that took place in the project entitled *Atenção à saúde de pessoas com doenças reumatológicas: desenvolvimento de produtos assistivos e formação de recursos humanos em tecnologia assistiva* ("Health care of people with rheumatic diseases: development of assistive products and training in human resources in

assistive technology”)¹. Design management was the approach applied to guide the organization, analysis, and diagnosis of the context (MERINO; MERINO, 2016), by the identification of the people, projects, processes, and procedures involved and the understanding of their relationships (BEST, 2012). The successful management of these elements is relevant to achieve the expected results (BEST, 2012). Moment 2 took place in three steps:

1. Identification of the provision of AT service, as a starting point for understanding the flow and identification of the stages performed in the context of the project. The employed data collection techniques were systematic observation and field analysis; and documentary analysis, via project reports and records;
2. Identification of the aspects “people,” “projects,” “processes,” and “procedures” as part of the flow of AT service provision, seeking to understand the profile and activities of each person and the flows and coordination of the processes intended by the project. To this end, documentary and field analysis were performed;
3. Diagnosis of the context by the identification of strengths and weaknesses in the process of providing AT service and in the performance of the occupational therapist. The authors were based on the overview of the design management process, considering the following script: identify, map, survey, organize, diagnose, and propose actions (MERINO; MERINO, 2016). The employed technique was a focus group conducted with the project team.

Regarding the ethical aspects, the research was approved by the Ethics Committee on Research with Human Beings of Universidade Federal de Santa Catarina, according to Opinion No. 4972636 and Certificate of Presentation of Ethical Appreciation No. 51462021800000121.

THEORETICAL FRAMEWORK: MOMENT 1

Design management

Design comprises a problem-solving process, with innovative strategies that encompass not only products, but also systems and services (BEST, 2012; WDO, 2021). The focus on the user is an inherent characteristic, and methods and techniques that allow involvement, interaction, and empathy among all those involved in the project are used (GIACOMIN, 2012).

Design arose from the demands of the Industrial Revolution in Europe, focusing on large-scale production and consumption. The historical global changes have transformed the premises of the profession, which has broadened the concern beyond the product, including the perspective of the processes and the relationship between people (BEST, 2010; 2012). In recent decades, movements — such as design and technology,

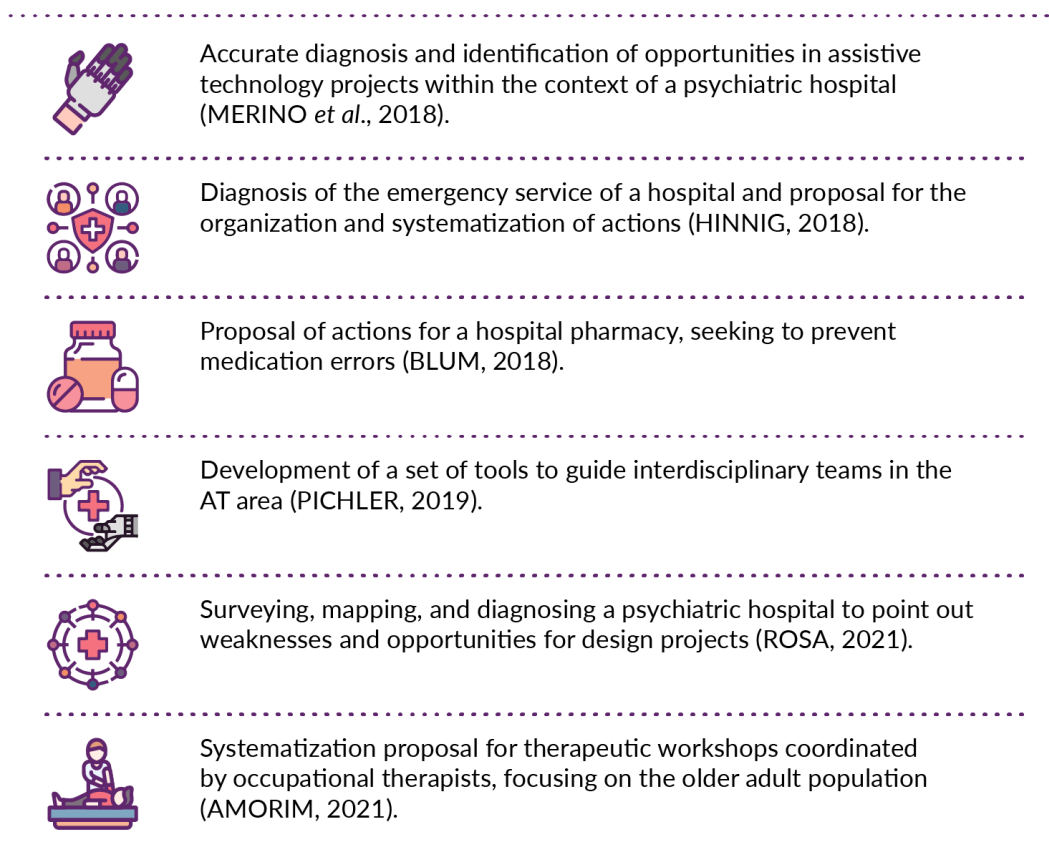
¹ The project was approved by the Notice of Call for Submissions of the Pernambuco Research Foundation (FACEPE) No. 10/2017, linked to the Research Program for the Brazilian Unified Health System: Shared Management in Health PPSUS – Pernambuco (CNPq/MS/SES/FACEPE), in force from December 2018 to December 2021, under the coordination of Professor PhD. Danielle Carneiro Sanguinetti.

sustainable design, and human-centered design — have gained strength, demonstrating concern with the inclusion of new technologies, the need for protecting the planet, and the intensification of the look to and care for the user (GIACOMIN, 2012). In this scenario, there was the integration of new approaches and methods, as was the case of design management (MARTINS; MERINO, 2011; MOZOTA; WOLFF, 2019).

Design management aims to promote creation and innovation by organizational systematization, process management, decision making, and strategic plans (DMI, 2021). The processes and interactions that take place between the lines of the creation of a product or service need a successful management to enhance the achievement of the expected results (BEST, 2012). The designer's skills in aligning the tangible and intangible aspects contribute to good project management (MOZOTA; KLOPSCH; COSTA, 2011). Design management can be applied to all three levels of organizations:

- the strategic level, which is related to the policy and mission of the organization;
- the tactical level, which involves systems and processes;
- and the operational level, which considers the tangible aspects (BEST, 2010).

Considering the fundamentals of design management and the characteristic of transversality, the performance in several areas, such as health, is pertinent (JONES, 2013). Design management applied to the health area can generate better quality of service and well-being of staff and users (TEAL; FRENCH, 2016). Recent studies have applied design management in the health field (Figure 2).



AT: assistive technology.

Figure 2. Set of studies whose authors applied design management to the health area.

According to studies conducted by Blum (2018), Merino *et al.* (2018), and Rosa (2021), design management contributed to making an accurate diagnosis of the context. The diagnosis is considered a significant stage of a project, as it guides the planning of actions and identifies opportunities; and it allows knowing the authors, the potentialities and weaknesses, in addition to all the variables acting in the studied context, which will lead to the assertiveness of the next stages (DALBERTO; GONÇALVES, 2013). Design management contributes to the identification of opportunities and proposals for action (MERINO *et al.*, 2018). In the present research, it was applied for diagnostic purposes.

Assistive technology service and occupational therapy

AT has two important aspects: the product and the service. The assistive product is described as any product with the aim of maintaining or improving the functioning or independence of the individual (WHO, 2018). In turn, the AT service is considered the entire system of users' access to the assistive product, which can take place privately or publicly and is influenced by legislation, public policies, and the local socioeconomic reality (WITTE *et al.*, 2018; ANDRICH *et al.*, 2019). As part of this broad service, the provision of AT service is the process of evaluation, indication, delivery, training, and follow-up, which happens between the professional and the user and should not suffer any interference from the environment. Good practices recommend that the provision of AT service should have qualified professionals and adopt the user-centered approach (WITTE *et al.*, 2018; ANDRICH *et al.*, 2019).

In the global context, the provision of quality AT service is considered one of the ways to expand users' access to AT and reduce product abandonment. Nowadays, these are considered, by the United Nations and the World Health Organization, priority problems to be combated (WHO, 2014, 2018). In Brazil, the legislation provides for that every person has the right to AT (BRASIL, 2015), and the AT concession service occurs by the free provision of orthoses, prostheses, and means of assistance to locomotion. This is guaranteed by Decree No. 3.298, of December 20, 1999 (BRASIL, 1999); nevertheless, access to this type of resource is still difficult and insufficient. There is a deficit in the provision of care services to people with disabilities, especially in specialty and rehabilitation outpatient clinics (CGEE, 2012; OMS, 2012).

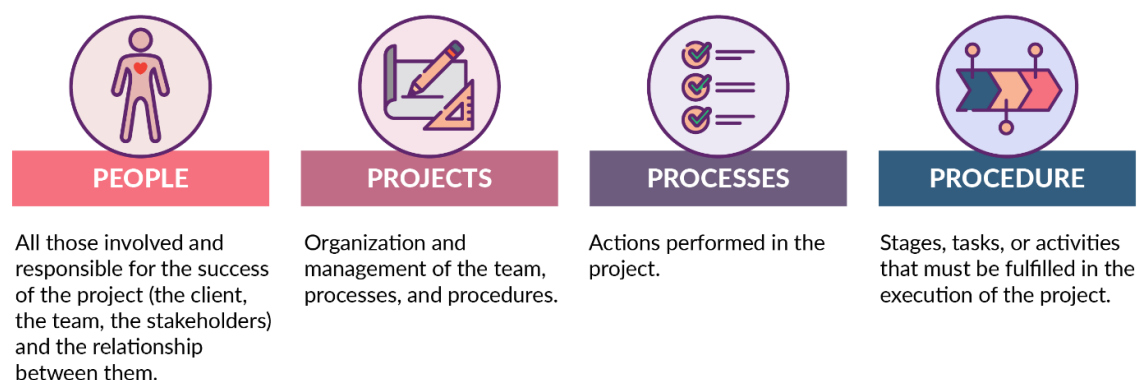
Considering the importance of the provision of AT service, its performance should be sought based on the good practices recommended by the literature (WITTE *et al.*, 2018). Theoretical and practical models support this practice, such as the human activities assistive technology model, which is based on the focus on the interaction between the person, the AT, the activity, and the context (COOK; POLGAR, 2015); and the matching person and technology model, whose premise is to promote a great combination between the user and the AT (SCHERER; CRADDOCK, 2002). The AT service provision framework for the European context was carried out by the Association for the Advancement of Assistive Technology in Europe and the Global Assistive Technology Information Network, in 2012, and recommended guidelines and quality indicators for taking the following steps of

the process: initiative, evaluation, AT solution, product selection, authorization, implementation, management, and follow-up (ANDRICH, 2012). A qualified and specialized interdisciplinary team is essential for the AT service (WITTE *et al.*, 2018). The occupational therapist is referred to as a professional capable of acting in the AT service provision (CGEE, 2012; WITTE *et al.*, 2018).

Occupational therapy is a profession in the health and social areas that uses human activity as the basis of its therapeutic projects (COFFITO, 2015). It has the expertise to analyze activities and uses several resources as an intervention strategy in treatments, including AT. By making use of this resource, the occupational therapist proposes to expand functionality, participation, and engagement with the user's occupations (AKYUREK *et al.*, 2017; WFOT, 2019). Although these professionals are deemed capable of evaluating and indicating the use of assistive products (WFOT, 2010; COFFITO, 2015; AOTA, 2020), they face challenges in the care practice such as performing the stages in a fragmented way and the lack of support strategies that can enhance their performance (ALVES, 2013; MAIA; FREITAS, 2014; IGBO, 2016; ALVAREZ *et al.*, 2019).

CASE STUDY: MOMENT 2

The case study discussed the AT service provision in an AT project, from the perspective of the occupational therapist, in which design management was applied in order to diagnose the context. The design management approach was characterized by the use of the theoretical bases of Best (2012), which involve good coordination between people, the project, processes, and procedures. People constitute all those involved and responsible for the project, including the client, the team, the stakeholders, and the relationship between them. The projects reflect the organization and management of the team and the articulation with the processes and procedures. Processes can be defined as the actions performed in the project, and the procedures, as the stages, tasks, or activities that must be fulfilled in the execution of the processes (BEST, 2010; 2012). In Figure 3 we present the description of each aspect.



Source: Best (2012).

Figure 3. Aspects of design management: people, projects, processes, and procedures.

Step 1

The identified flow of AT service provision was part of the project's data collection and took place in four stages (Figure 4).

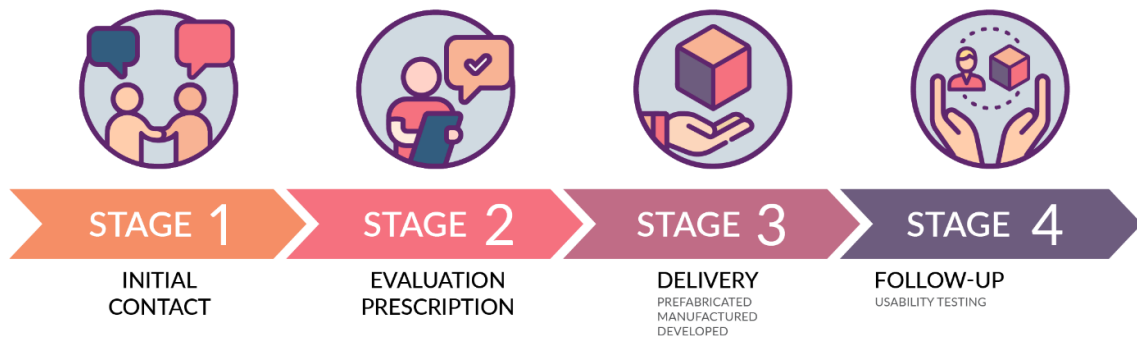


Figure 4. Stages of the flow of assistive technology service provision identified in the project.

Step 2

Subsequently, people, project, processes, and procedures involved in the provision of AT service were identified.

The people who were part of the provision of AT service were users, occupational therapists, engineers, designers, and rheumatologists. In Figure 5 we show the specification of the profile, the description of the performance, and the stages in which those involved were.

PEOPLE	USERS	OCCUPATIONAL THERAPISTS	ENGINEERS	DESIGNERS	RHEUMATOLOGISTS
PROFILE	<ul style="list-style-type: none"> - 50 patients; - Diagnosis of rheumatoid arthritis and osteoarthritis; - Followed up at the rheumatology outpatient clinic (HC-PE); - Difficulty carrying out activities of daily living. 	<ul style="list-style-type: none"> - 3 Occupational Therapists affiliated to LabTATO – UFPE; - 2 Occupational Therapists volunteer researchers; - 8 Students from the Department of Occupational Therapy – UFPE. 	<ul style="list-style-type: none"> - 2 Mechanical Engineers from IFPE; - 1 Student affiliated to IFPE; - 1 Mechanical engineer from UFPE. 	<ul style="list-style-type: none"> - 2 Designers from UFSC affiliated to NGD/LDU. 	<ul style="list-style-type: none"> - 3 Rheumatologists affiliated to HC-PE.
ROLE	<ul style="list-style-type: none"> - Active participation in the provision of AT service, with observations and opinions. 	<ul style="list-style-type: none"> - Functional assessment; - Analysis of activities; - Proposals for AT solutions. 	<ul style="list-style-type: none"> - Idealization and concept of assistive products; - Indication of materials; - Use of technological instrumentation (thermography and 3D printing). 	<ul style="list-style-type: none"> - Design, processes, functionality; - Methods and technological equipment (GODP, motion capture, and thermography). 	<ul style="list-style-type: none"> - Clinical discussion; - Outpatient flow.
Participation in AT Service Provision	<p>Stages 1, 2, 3 and 4</p>	<p>Stages 1, 2, 3 and 4</p>	<p>Stage 2</p>	<p>Stages 2 and 4</p>	<p>Stage 1</p>

AT: assistive technology; 3D: three-dimensional; GODP: Guidance Handbook for Project Development. Figure 5. Identification of the people involved in the provision of assistive technology service in the project.

The project in question was the interdisciplinary AT project, coordinated by the Laboratory of Assistive Technology and Occupational Therapy of Universidade Federal de Pernambuco (*Laboratório de Tecnologia Assistiva e Terapia Ocupacional*

– LabTATO/UFPE), in force until December 2021. Its general objectives were to develop assistive products and strengthen the Assistive Technology service for people with rheumatic diseases, linked to the FACEPE Call for Submissions No. 10/2017. To achieve the proposed objectives, data collection involved the provision of AT services, in which patients registered at the rheumatology outpatient clinic of Hospital das Clínicas de Pernambuco (Clinics Hospital of the state of Pernambuco – HC-PE) were referred to occupational therapy for evaluation, indication, and delivery of AT, along with training and guidance on use. The assistive products granted to this project were prefabricated, manufactured, or developed according to the needs of each patient.

The project involved the participation of researchers, students, and collaborators of the Occupational Therapy programs and researchers from LabTATO/UFPE; the program of Medicine and Mechanical Engineering of UFPE; researchers from the Research and Development Network in Assistive Technology of the Design Management Center, Design and Usability Laboratory (*Núcleo de Gestão de Design, Laboratório de Design e Usabilidade – NGD/LDU*), of Universidade Federal de Santa Catarina; the Mechanics program of Instituto Federal de Pernambuco; and professionals from Hospital das Clínicas de Pernambuco. Thus, the project was characterized as interdisciplinary, interinstitutional, and interstate, which enabled the sharing of knowledge, technologies and methodologies, strengthening the proposal and the scope of the results.

The results were: provision of care for 50 people with rheumatoid arthritis or osteoarthritis, 30 of whom had complete follow-up; contribution to the updating and adjustments of a guidance booklet (illustration, content, and layout), with registration (International Standard Book Number — ISBN) of the material, and the proposal for use by professionals of the Brazilian Unified Health System (SUS), focusing on health education, together with AT and the implementation of orientation groups; the development of four products (additive manufacturing), which are in the patent process; the provision of a training workshop for ten occupational therapists (SUS network), focusing on the application of AT and health education for patients of the rheumatology outpatient clinic; and scientific productions (articles and presentations at congresses).

The technological instrumentation was highlighted in the project, with the use of thermographic camera, motion capture, electromyography, and additive manufacturing. As methodology, the design management approach was used, in order to carry out more organized processes and obtain better communication between the team. All the peculiar characteristics of this project allowed a global and efficient perspective of the processes, with the ultimate purpose of favoring the quality of life of people with rheumatic diseases.

The processes and procedures of the AT service provision were carried out as part of each stage of the service.

Stage 1 (initial contact) was considered the moment of welcoming. The patients attended their routine consultation with the rheumatologist at the osteoarthritis

and rheumatoid arthritis outpatient clinics of Hospital das Clínicas de Pernambuco and, during the consultation, the physician referred patients who were having difficulties performing their activities of daily living, due to impairment in the hands, to occupational therapy.

In occupational therapy, patients were informed about the project proposal and the AT topic, by using handouts with explanatory photos and, finally, were invited to participate in it. Upon accepting to participate, the patients signed an informed consent form and the image authorization and were referred to the orientation group.

The orientation group consisted of an average of six patients. A researcher from the team presented, by a slideshow, explanations on: the diagnosis of osteoarthritis and rheumatoid arthritis, including symptoms and treatments; the objectives of occupational therapy with this public; principles of joint protection and conservation of energy and how to apply them in everyday activities; and how to use AT as a form of joint protection. After the presentation, the patients were provided with a space for discussion, having the opportunity to exchange experiences and to socialize, and the researcher reinforced the importance of changing the lifestyle and adapting the performance of compromised activities. At the end, the printed guidance booklets were handed out, containing information on everything that was presented in the group, and the patients were scheduled for the next meeting (Stage 2).

It is noteworthy that the used guidance booklet underwent graphic and content adjustments, by the use of motion capture equipment (AMARAL et al., 2020).

At stage 2 (evaluation and prescription), patients were evaluated according to the following evaluation protocols: Canadian occupational performance measure, which evaluates changes in the individual's perception of their performance over time, as well as changes in their level of satisfaction with this performance (LAW et al., 2009); the score for assessment and quantification of chronic rheumatic affections of the hand, a useful tool to measure the degree of hand impairment in rheumatic diseases in relation to pain, stiffness, and function (FERREIRA; MARQUES, 2008); the visual analog scale (VAS) of pain and the hand discomfort map. The VAS assists in the investigation of pain intensity. Its score results from marking a scale whose extremities correspond to the absence of pain (0) and maximum pain (10). It is noteworthy that it was applied specifically to the upper limbs and linked to the application of the hand discomfort map, an instrument of easy application that allows visualizing a drawing of all areas of the hands and, based on this, the indication of the specific place of discomfort (KUIJT-EVERS, 2006).

Subsequently, the patients were referred to islands of AT experimentations. These experimentations consisted of testing assistive products that were being made available in the project, according to the performance areas (self-care, productive and leisure activities). There was also a specific island for upper limb orthoses, with an individualized evaluation. Patients were encouraged to simulate the performance of these activities, as if they were in real-life contexts. Henceforth,

prescriptions were given by using a form developed for the project, considering the patients' opinion about the assistive products that would be properly integrated into the routine.

The available assistive products were prefabricated, manufactured, or developed by the team. The prefabricated ones were bought in the common market or specialized stores in rehabilitation, while the manufactured ones were the orthoses made with low-temperature thermoplastic material and assistive devices, produced with low-cost materials, such as rubber materials and epoxy.

The development of assistive products followed the following process: demand survey, characterized by the evaluation of patients, associated with the discussion of the team; assessment of ideas and proposals; trials; and, finally, three-dimensional (3D) printing. Four products were developed via 3D printing, which are in the patent process. After completing the prescription, the patients were scheduled for stage 3.




At stage 3 (delivery), patients received the assistive products and tested their use. The occupational therapist observed the size, whether there were pressure points, and whether the products were in a condition for safe use. During the delivery, the patients received and signed an acknowledgment receipt, with the objectives and guidelines for the use of AT. The occupational therapist also signed the document, and a copy was guaranteed for both the patient and the project. In addition, a demonstration of the use was performed and, when necessary, the guidelines were filmed by the patient or companion. In some cases, it was requested to film the use at home, for observation by the therapists. Upon concluding this stage, the patients were scheduled for stage 4, to take place 90 days after.

At stage 4 (follow-up), there was a reassessment of the user and the product, in which the evaluation protocols considered in stage 2 were repeated and the Quebec instrument for assessing users' satisfaction with the AT was applied, namely the B-QUEST (2.0) (CARVALHO; GOIS JUNIOR; SÁ, 2014). A usability protocol was developed for the evaluation of the products developed by the team and printed in 3D. It consisted of the analysis of the products by the specialists, based on the reference blocks of the product, user, and context (Guidance Handbook for Project Development, *Guia de Orientação para Desenvolvimento de Projetos – GODP*) (MERINO, 2016) and the principles of Jordan (1998). In the evaluation of users, the applied techniques were the semantic differential and the user's experience (MARTIN; HANINGTON, 2012), in addition to the thermographic camera, which allowed to visually evaluate and measure the temperature of regions, when there was a complaint of pain; and electromyography, to analyze the user's muscle recruitment with and without the product.

Step 3

A focus group was conducted with the main project team, in which the data collected in steps 1 and 2 were validated. The perceptions of each professional in the flow of service provision were discussed, and the service process taking place

in the project was evaluated, with the identification of the main potentialities and weaknesses. The performance of occupational therapists was detailed, pointing out the faced challenges. In Figure 6 we show the weaknesses and potentialities of AT service provision, based on people, project, processes, and procedures.

	POTENTIALITIES	WEAKNESSES
 PEOPLE	<ul style="list-style-type: none"> - Interdisciplinary team – knowledge sharing, more efficient actions with less time spent; - Experience of the team with field research; - Importance of each professional in the provision of AT service; - Participation of the user in the provision of AT service. 	<ul style="list-style-type: none"> - The team (engineers and occupational therapists) has little experience with project management; - Expand and improve the team's participation in all stages of AT service provision; - Users poorly informed about AT and their rights.
 PROJECT	<ul style="list-style-type: none"> - Extensive project, achievement of an important Notice; - Results with a direct impact on people's lives; - It proved to be feasible (the execution of an interdisciplinary, interinstitutional, and interstate project) and contributed to the quality of actions (provision of AT service). 	<ul style="list-style-type: none"> - Control and monitoring of the schedule (data collection – stages of AT service provision).
 PROCESSES AND PROCEDURES	<ul style="list-style-type: none"> - GODP as a strategy for Design Management; - Design Management contributed to the achievement of results, due to the organization of AT service provision processes; - Integration of Technologies such as Thermography, Electromyography, motion capture, and 3D printing; - Execution of predefined protocols for carrying out actions (usability testing, islands of experimentations, pilot project for data collection). 	<ul style="list-style-type: none"> - Difficulty in monitoring the actions taken and their results, by all the professionals in the team; - Need to intensify the performance of Design Management to improve the still fragile processes of the project (increase the participation of researchers in the stages, even if they do not directly act on them; improve the organization, planning, and systematization of processes and procedures); - Establish greater contact of engineers and designers with patients (<i>in loco</i> participation).

AT: assistive technology; 3D: three-dimensional; GODP: Guidance Handbook for Project Development. Figure 6. Weaknesses and potentialities of the provision of assistive technology service of the project.

When individually analyzing the performance of the occupational therapist in the provision of AT service in the Research Program for the SUS, we identified the following issues:

- Occupational therapists presented affinities and specific competencies with the AT area and actively participated in all stages of the flow of AT service provision;
- At stage 1, the main activity of the occupational therapist is providing guidance on the participation in daily activities, based on the principles of joint protection and conservation of energy;

- At stage 2, the emphasis was on competence in performing the functional assessment of the patients, the analysis of activities, and the indication of proposals for solutions in AT;
- At stage 3, the occupational therapist made orthoses for the upper limbs with thermoplastic material; acted on the training and guidance on the use of assistive products, stimulating the engagement with the user's occupations, at the time of delivery; and participated with the product development team;
- At stage 4, there was greater involvement in the functional reassessment and the professionals contributed, together with the team, to the usability testing.

In relation to the challenges of the occupational therapist in the provision of AT service within the specific context, we point out the need for organization and systematization, due to the large number of processes and procedures; improving communication and integration with other professionals and students; and difficulties in project management.

Taking this into consideration, we assume as a diagnosis of the studied context that the interdisciplinary, interinstitutional, and interstate team potentiated the actions of service provision, with the integration of technologies and approaches. The joint action of the team was more active in the activities of product development, usability testing, and project management. The design management approach resulted in the use of protocols, for example, for the usability testing and the development of the islands of experimentation, which had an impact on the performance of the tasks. However, we noticed, by the weaknesses pointed out, that the organization of processes and procedures and the integration among professionals were the main challenges of the team in the provision of AT service. This points to the need to invest even more in issues related to management.

By individualizing the aspects people, processes, and procedures, in Figure 7 we present the diagnosis.

Thus, we recommend, both from the perspective of the team and from the occupational therapists', the important expansion or deepening of design management as a feasible way to think about a more organized, systematized service provision process with greater participation of all those involved as well as strategies for supporting occupational therapists who work in the provision of AT service in research projects within the academic context.

DISCUSSION

The design management applied to the provision of AT services contributed to reach an accurate diagnosis, by a clearer and more organized view of those involved, their roles, interactions, and challenges. Getting an accurate diagnosis is important to promote true understanding of the context and for identifying opportunities (MERINO *et al.*, 2018).

In the present research, the potential of the interdisciplinary team for sharing knowledge and technologies was pointed out, contributing to assertive actions for

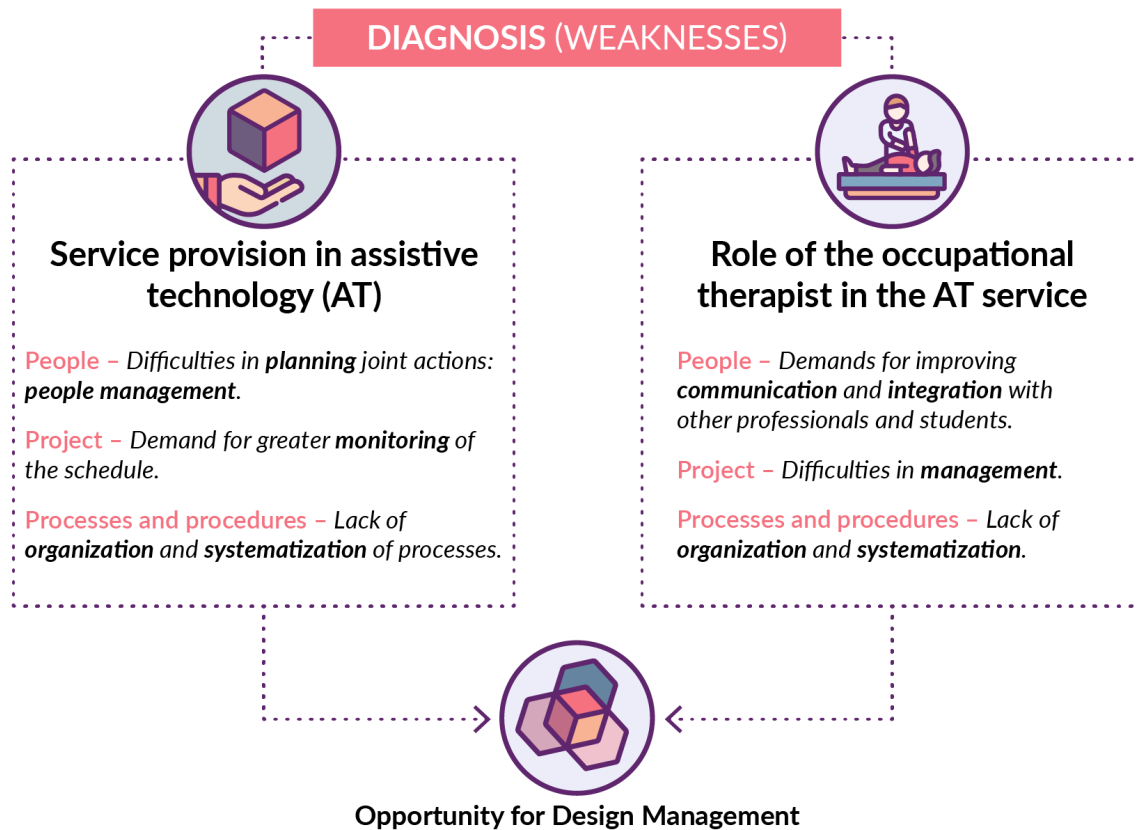


Figure 7. Diagnosis of the context.

the AT service in the academic environment. As weaknesses, we highlight the need for more organized, integrated, and systematic processes in the provision of AT services and in the performance of occupational therapists. Thus, as an opportunity, we suggest to carry out studies that involve the development of models, strategies, or tools that enable to systematize the provision of AT service and support the performance of occupational therapists.

In the present research, the application of design management, based on the theory of Best (2012), allowed the complete visualization of people and their interactions with the project, processes, and procedures (BEST, 2012). The approach allowed us to have a prior definition of an organized data collection protocol with established roles, considered a potential by the team. Likewise, the GODP was positively evaluated by the team, as it favored the communication and organization of the project (MERINO, 2014). The absence of team interaction and communication in interdisciplinary projects in AT can negatively impact the achievement of the expected results (PICHLER, 2019). The presence of the designer in the team was considered a differential in the process since the indication of specific methodologies of design management.

The provision of AT services is understood as complex, because it consists of several stages and processes that must take place in a continuous flow and because it involves many people and different actions (FEDERICI; MELONI; BORSCI, 2016; MACLACHLAN; SCHERER, 2018). Recurrent weaknesses are referred to in this practice such as the fragmentation of the stages, lack of professional qualification,

and the little participation of users in the process (MACLACHLAN; SCHERER, 2018; TRICCAS *et al.*, 2019). In this sense, design management can be considered a solution to the problem, by providing proposals for specific tools and methodologies (MOZOTA, 2011). According to Best (2012), thinking about more organized and systematized processes and procedures can broaden the scope of the expected results.

In this research, the provision of AT service took place in four stages and had the participation of the entire team, emphasizing that the occupational therapist was responsible for coordinating this process. According to Andrich (2012), it is not necessary for all stages of AT service provision to happen; however, quality should be prioritized, using evidence-based practice (ANDRICH, 2012; WITTE *et al.*, 2018).

The provision of AT services is an important topic, as it implies greater access and less abandonment of assistive products (WHO, 2014, 2018). In the present case study, the provision of AT services took place in the academic context, as a data collection strategy for an AT project, considering that the objective of the project was to develop assistive products for patients with rheumatic diseases. By making the diagnosis of the context, we noticed that the interdisciplinary and interinstitutional team potentiated the actions, by sharing knowledge and integrating technologies and methodologies, which culminated in more organized actions such as the execution of predefined protocols for the AT service, the development of low-cost assistive products, and the use of thermography and electromyography in the evaluation of the developed products. These facts suggest that providing AT services in the academic environment may be another possibility of AT access to users, considering the reality of difficulties of this type of service and access in Brazil.

Systems thinking in AT encompasses the connection between those involved and the relationship between processes (MACLACHLAN; SCHERER, 2018). Thus, the absence of this systematization can weaken the execution of the process. In this line of thought, studies were carried out to remedy such weaknesses. Pichler (2019), faced with the difficulty in communication between all authors involved in AT projects, developed a set of tools to guide the team in the collection, organization, and analysis of data. Merino *et al.* (2016) used GODP as a design management methodology to systematize product development processes in AT projects. Specifically, to support the performance of occupational therapists, Igbo (2016) developed a tool to assist these professionals in providing AT service focusing on patients with spinal cord injury, systematizing the processes. Conversely, Sierra (2017) proposed a systematization model for wheelchair prescription, seeking to guide the practice in a more organized way.

Finally, this research was the first coordinated by LabTATO/UFPE in which design management was applied. It was necessary to sensitize and train the team for this perspective. Although it is an initial moment, it has already been possible to observe good results. It also generated the opportunity to point to design management as a solution to the weaknesses found by the team in the focus group, suggesting the importance of deepening and continuing to adopt this approach in future research.

CONCLUSION

Considering the need for more organized, articulated, and systematized processes in the provision of AT services and for supporting occupational therapists to enhance their performance, this case study aimed to apply design management to obtain a diagnosis of the provision of AT service, in an academic environment.

The use of design management for diagnostic purposes contributed to the understanding of the context. The identification of the aspects of the service and the performance of occupational therapists, based on people, project, processes, procedures, and their relationships and the script “identify, map, survey, and diagnose,” facilitated the performed observations and analyses.

Considering the result of the diagnosis, the main weaknesses of the process culminated in a management problem, highlighting the need for planning and monitoring of actions by all professionals and the lack of more organized and systematized processes. Therefore, we understand that design management can be applied not only for diagnostic purposes, but also as an approach capable of contributing to the resolution of the problems identified in the provision of AT service and in the performance of occupational therapists, evidencing a demand for future studies with this focus.

Regarding the academic environment, it consists in a powerful space for the provision of AT services, as the performance of the interdisciplinary and interinstitutional team could contribute to the integration of technologies, approaches, and knowledge that qualified the performed actions, such as predefined protocols for the stages of the AT service, in addition to enabling users to access AT.

All in all, it is noteworthy that the present study resulted from the diagnostic phase of an ongoing PhD research focused on the development of a systematized guidance booklet for the provision of AT services, based on design management and aimed at occupational therapists.

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