A service development process framework for services including people with disabilities

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Abstract

The service sector participation has become increasingly representative in the world economy. Thus, it becomes necessary to invest in research related to processes for the proper development of these services, starting from reference processes, represented by models. Its importance is emphasized even more in multidisciplinary areas, such as the Assistive Technology. To contribute in this sense, this paper has as a main objective to develop a framework for the services development process for People with Disabilities. The two main methodologies used were the exploratory research, for the literature review, and the theoretical and conceptual approach, to obtain the framework. The framework presented as a result was developed based on existing models, the elements of the Service- System, Assistive Technology-System and on the principles of Universal Design. From the framework, it is expected to obtain reference models for the services development process for People with Disabilities.

KEYWORDS: Service Development Process, Assistive Technology, People with Disabilities, Universal Design

Introduction

Global statistics show, by indicators such as GDP and employment generation, the service sector growth to the economy. The Service Development Process (SDP) is a business process and is essential for the survival and growth of services organizations. For this process to be effective, it should involve the development of service requirements that meet the needs and demands of consumers. This is done by making use of a wide range of information coming from various sources, generating a great variety of requirements to be met.

To ensure that nothing is forgotten in the SDP and that this process can be repeated for future developments, it is important to develop products and services from reference processes. Its importance is emphasized in multidisciplinary areas, such as the Assistive Technology (AT) in which there is a great diversity of professionals working directly with the People with Disabilities (PwD), such as physiotherapists, occupational therapists, educators,

etc. These professionals should interact with products and services developers and therefore a reference model is required that meets the specifics of each area.

More than a billion people worldwide have some kind of disability, according to the World Report on Disability, published by the World Health Organization and the World Bank (WHO, 2011). The term AT was officially established in 1988 as an important legal element within the US legislation, known as Public Law 100-407, which makes up, along with other laws, the Americans with Disabilities Act. This set of laws regulating the rights of citizens with disabilities in the US and has served as the basis for PwD studies worldwide.

Many of the existing AT definitions are currently based on products logic, as originated from the definition of AT devices under US law. In addition to defining devices, the US legislation also defines AT services, such as any service to assist PwD in the selection, acquisition or use of an AT device (Public Law 108-364, 2004). However, the focus of the definition remains the product, having services considered in isolation only as support activities for product applications.

Although AT definitions refer not only to products but also to services, there were no papers found that deal with the SDP for PwD. Services for PwD, where they exist, do not have a systematization for their development, or are designed for people without disabilities and later adapted for PwD, or simply do not exist for most of the needs of PwD, due to the large amount of specificities of each individual.

It reinforces, therefore, once again, the adoption of models for the SDP, describing activities seeking the delivery of value to customers. Thus, SDP for PwD shows up as an area that still has incipient exploration and lacking in research for better understanding and advancement of existing theories.

It was still considered as background for the proposed framework, the use of the principles of Universal Design, which aim to develop products and services to the widest possible range of users, seeking understanding and respect for diversity. So, the proposed framework aims to stimulate the service development for all individuals. Thus, the services developed from a reference framework for PwD, applying the principles of Universal Design can also be used by people without disabilities. The opposite would not be possible, since it would not meet the PwD specificities.

Thus this paper aims to propose a framework for the SDP to PwD. The methodology used was the exploratory research, for a wide search with several keywords in databases, looking for SDP models, for Service-System elements and for AT-System elements. The theoretical and conceptual approach was used to obtain the framework, based on the methodology of Value Creation Cycle of Stanke & Murmam (2002), on the elements of the Service-System and AT-System, on the principles of Universal Design and on the SDP models.

SDP models

First the keywords identified on the subject of research were "service development process", "service design process", "service development model", "service development project" and "service development method". These keywords were used to identify and access publications in databases whose scope relate to the theme of this research. After reading the summary, introduction and conclusion, additional keywords used in publications were identified, such as "service engineering process" and "service innovation model". The total

number of documents raised was 1229. After eliminating duplicates, reading title and abstract, and, in case of doubt, a scan of the full text, it reached a final portfolio of 97 documents.

The models classification was based on Fitzsimmons & Fitzsimmons (2000): (i) partial models, which only related to certain steps of the SDP; (ii) translated models, based on the product development model proposed by consultancy Booz, Allen and Hamilton in 1982; and (iii) complete models, which have a holistic view of SDP. Of the 97 documents, 45 presented SDP models, represented almost half of the portfolio. Among these, none has been identified as a translated model and only three were classified as partial models. The complete models were categorized into four classes. Models classified as conceptual had the highest representation, with 35.6%, just ahead of the phase models, with 31.1%, and not too far from macrophases models, with 22.2%; the models who presented details of its phases in activity levels were less representative, with only 11.1%. The documents that did not show models were grouped into five categories of contributions to the SDP: specific applications, methods and tools, customer integration, systemic view, success factors and micro and small enterprises.

Service-System

For Hitomi (1979), a system is a set of interrelated elements which together perform a particular function; since in the literature review no SDP models for PwD were found and taking up the SDP as a system, it was sought in this topic a classification of the elements that make up the Service-System, aiming to organize, propose and manage a SDP. The visualization of the service components had already been identified by Fynes & Lally (2008) as a key discussion area, aiming for their ease of operation, by means of a holistic view.

It was sought to identify the Service-System elements by the definitions of service that were found in the literature. However, because of its nature and diversity, the definition of services has not been easily formulated. Characteristics of specific services such as intangibility, simultaneity between creation and consumption, perishability and heterogeneity (Fitzsimmons & Fitzsimmons, 2000), makes this task even more complicated. For Grönroos (2003), service is one procedure consisting of a series of more or less intangible activities, interactions between the customer and the service personnel and/ or physical goods and/ or provider systems that are provided as solutions for customer problems. For Goldstein et al. (2002), it is a set of tangible and intangible elements, which combine to create a service.

None of the publications analyzed (Fitzsimmons & Sullivan, 1982 apud Gianesi & Corrêa, 1996; Lovelock, 1992 apud Lovelock & Wirtz, 2006; Goldstein et al., 2002; Fynes & Lally, 2008) showed a complete definition of the Service-System elements. Thus, Forcellini (2013) introduced the concept of Service-System with seven elements (Figure 1):

» Process: set of behaviors, activities or tasks logically interrelated, carried out in front and back office and supporting the service delivery
» Information: data and information generated and provided by customers or companies, vital to perform the service
» Facilitating goods: materials that are consumed, purchased or provided in the back and front office, to perform the service
» Supporting facility: physical resources and facilities necessary for the services provision

- » Product: equipment, machinery and devices necessary and/ or associated with the services provision
- » People: customers, front and back office employees, suppliers, and others directly or indirectly involved in providing the service
- » Service: benefits that are perceived by customers and considered to the service features
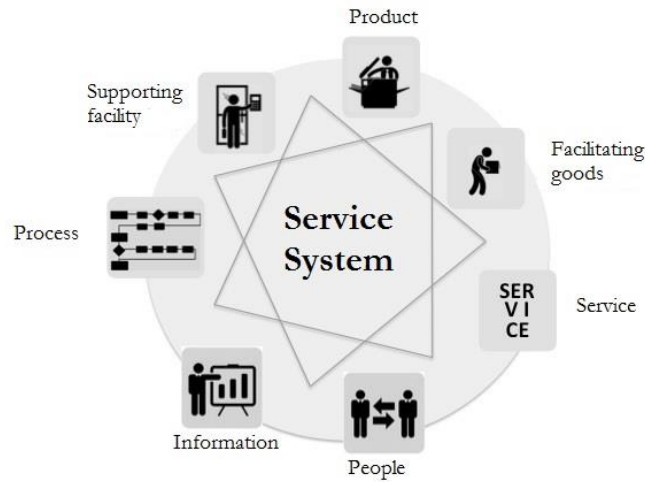

Figure 1 – Service-System proposed by Forcellini (2013)

Without this concept, the development would be liable to failure by not explicitly showing some of the Service-System elements. This would occur, for example, when using the Service Package concept of Fitzsimmons & Sullivan (1982) apud Gianesi & Correa (1996), which were not made explicit processes, such as people and technology, requiring these assets to be implicitly considered. Similar failures would occur with other models presented.

Assistive Technology-System

Since the appearance of the term Assistive Technology in 1988, there have been an increasing number of researches focused on the technological application to solve PwD problems. The first publication involving a set of principles in this sense occurred in 1994 with the first edition of Cook & Polgar (2008), whose concepts have been referenced for PwD studies.

Cook & Polgar (2008) presented an AT-System definition, consisting of a device, a human operator who has a disability and an environment in which the activity should be developed; i.e. the AT-System consists of someone (PwD), doing something (activity), somewhere (environment). This system recommends devices that meet the PwD needs, consistent with their capacities, assisting them to perform certain functions within their life context.

Searching for literature relationships amongst these elements, five models of AT-System were analyzed: (i) International Classification of Functioning, Disability and Health (ICF) (WHO, 2001), (ii) Canadian Model of Occupational Performance (CMOP) (CAOT, 2002), (iii) Model of Human Occupation (MoHO) (Kielhofner & Forsyth, 1997 apud Stamm et al., 2006), (iv) Occupational Performance Model – Australia (OPM-A) (Chapparo & Ranka, 1997) e (v) Human Activity Assistive Technology Model (HAAT) (Cook & Polgar, 2008).

The person, activities and environment were similar elements presented in these models. However, the role and considerations of AT are not specifically mentioned in CMOP, OPM-

A and MoHO, but in the ICF, as an aspect of the environment, relating to products used in daily life (WHO, 2001).

Beginning with the AT-System definition and based on CIF and CMOP, Cook & Polgar (2008) proposed the HAAT model (Figure 2), in order to relate to people, activity and environment, aiming to select and evaluate AT, including explicitly AT as a component for daily activities. Thus, differently from the other models, HAAT has four components: human, activity, AT and context. The human component is composed of physical, cognitive and emotional elements; activity includes personal care, work and leisure; AT involves intrinsic and extrinsic enablers; and context encompasses physical, social, cultural and institutional contexts.
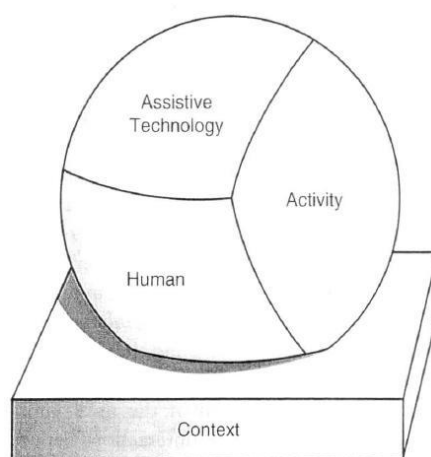

Figure 2 – HAAT model by Cook & Polgar (2008)

Framework

As the classification of SDP models proposed in the theoretical foundation, the framework developed the following levels of detail: macrophases, conceptual, phases and activities. For the framework to be lean, with activities that add value and avoid waste, it was based on the three phases of the Stanke & Murmam (2002)'s Value Creation Cycle methodology, characterizing the macrophases for the proposed framework: Value Identification, Value Proposition and Value Delivery.

Although they were premises for the framework development, these three macrophases were corroborated by the literature. As examples, amongst others, are Deakins & Dillon (2005), Edvardsson (1997) and Kindström & Kowalkowski (2009). In the Deakins & Dillon (2005) helical model, the identify problem phase is in the Value Identification macrophase; generate alternatives, evaluate alternative and soft-coded solutions are within the Value Proposition; and hard-code solutions characterize the Value Delivery. Similarly, Edvardsson (1997) model's macrophases are distributed in idea and project formation (Value Identification), design (Value Proposition) and implementation (Value Delivery). For Kindström & Kowalkowski (2009), the macrophases are market sensing (Value Identification), development (Value Proposition), sales and delivery (Value Delivery).

The service development conceptual framework for PwD shown on Figure 3 resulted from the combination of these three macrophases to the Service-System elements of Forcellini

(2013), to the AT-System HAAT elements and using as a background the principles of Universal Design. The central area of Figure 3 refers to the phases and activities framework.
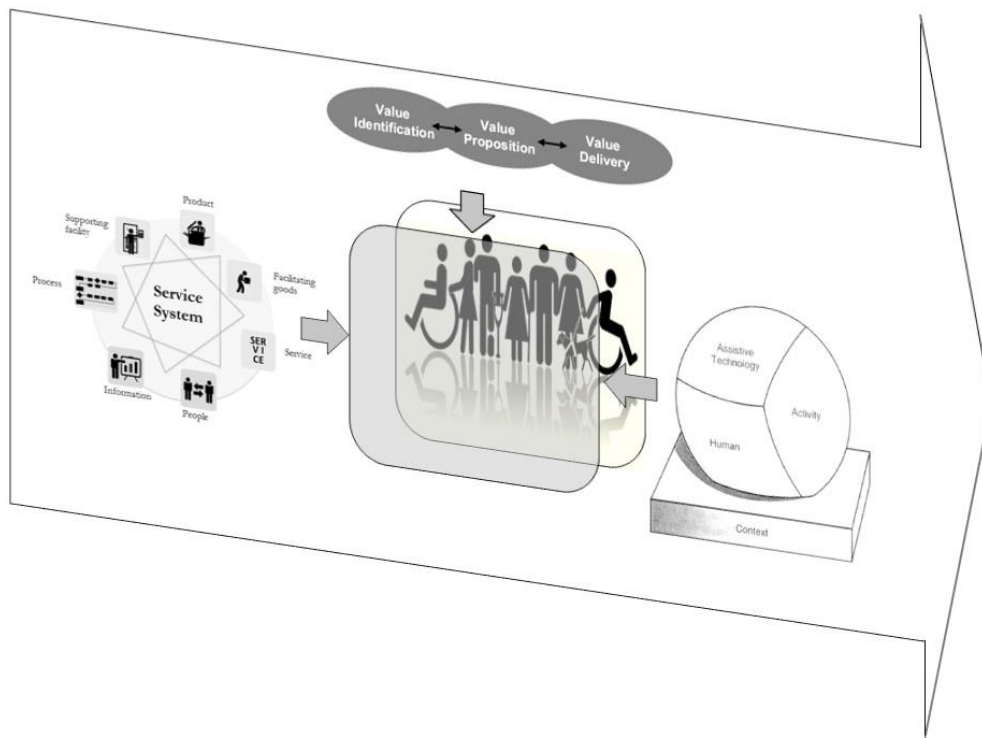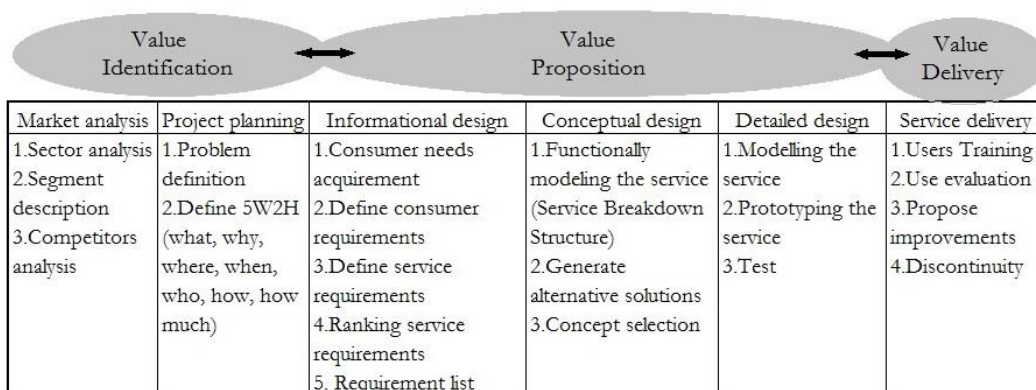

Figure 3 – Conceptual Framework

Based on the theoretical foundation, it was identified in which phases the proposed macrophases could be deployed in order to respectively identify, propose and deliver value. Initially, as services to be developed are projects, there must be a planning phase, before starting the development itself. In the literature, there are models that begin with strategic planning and others that start with project planning, as referred in the phases bellow, and even some models that start directly with the service development (Jiang, 2008; Li et al., 2010; Shimomura et al., 2009). After planning, the service is developed, from the customer's

Value Identification		Value Proposition			Value Delivery
Market analysis	Project planning	Informational design	Conceptual design	Detailed design	Service delivery
1.Sector analysis 2.Segment description 3.Competitors analysis	1.Problem definition 2.Define 5W2H (what, why, where, when, who, how, how much)	1.Consumer needs acquirement 2.Define consumer requirements 3.Define service requirements 4.Ranking service requirements 5. Requirement list	1.Functionally modeling the service (Service Breakdown Structure) 2.Generate alternative solutions 3.Concept selection	1.Modelling the service 2.Prototyping the service 3.Test	1.Users Training 2.Use evaluation 3.Propose improvements 4.Discontinuity

needs until design and testing. Finally, there is the service delivery, by introducing it into the market. Thus, Figure 4 shows the phases and activities framework and the following topics describe it.

Figure 4 –Phases and activities Framework

Market Analysis

The strategic planning of an organization is presented in the literature as being of great importance to the achievement of its mission and objectives (Hunger & Wheelen, 2002). Among the main models that had strategic planning as a phase (Alam & Perry, 2002; Costa Junior, 2012; Magnago & Echeveste, 2012; Marques et al., 2013; Mello, 2005; Pezzotta et al., 2012; Suarez, 2009; Tatikonda & Zeithaml, 2002; Torres Júnior et al., 2006; Yang, 2007; Zaninelli, 2012), are, among others, activities related to the target consumers definition.

Although the target consumers were previously established as PwD, in the framework it became necessary to insert a phase related to the strategic planning, regarding the organization knowledge about the market in which it operates, trying to understand its customers and its competitors. It will also consider, in addition to PwD, the possibility to also attend the people without disabilities, seeking the desired goal of the universality for the proposed service. This phase was named market analysis and was divided into the sector analysis, segment description and competitor analysis.

Project Planning

One of the biggest mistakes of designers is to keep in mind a solution to solve a problem earlier, which impairs the development of products and services, limiting creativity (Santana et al., 2010). To avoid this, before starting the project planning, it was included in the framework the problem definition activity. Thus, the entire project will be developed and planned to search for a solution to be revealed based on the information raised during the service development. Some authors presented a similar stage to the problem definition before going to the development, naming it idea generation (Alam & Perry, 2002; Mello, 2005; Suarez, 2009; Tatikonda & Zeithaml, 2002; Zaninelli, 2012), generation of service idea and concept (Yang, 2007) and idea management (Karapidis, 2005).

The second activity of the project planning phase refers to the planning itself. Among the main authors that apply the planning phase (Juehling et al., 2010; Karapidis, 2005; Marques et al., 2013; Pezzotta et al., 2012;. Magnago & Echeveste, 2012; Suarez, 2009; Torres Júnior et al., 2006; Yang, 2007), Pezzotta et al. (2012) relates this phase with activities necessary for defining resources, deadlines and other information related to the project. Suarez (2009) details a little more what those activities are, like definition of deliverables, assumptions, limitations, restrictions, costs and prices, stakeholders, staff, responsibilities, risk and impact analysis, critical path, schedule and viability analysis.

The proposed framework is not intended to exhaust the extensive and complex content involved in project management, but only to emphasize the importance of using a guide for planning at the beginning of the SDP, highlighting some essential activities and suggesting broadening in cases where there is need for more details. Therefore, the 5W2H plan was defined as an activity for the planning phase, answering the questions: what, why, where, when, who, how and how much it costs.

Informational Design

The Value Proposition macrophase is characterized by activities of service creation, i.e. design. Several authors have presented design phases in their models, without, however, subdividing them (Alam & Perry, 2002; Costa Junior, 2012; Jiang, 2008; Juehling et al., 2010; Karapidis, 2005; Li et al., 2010; Magnago & Echeveste, 2012; Marques et al., 2013;. Mello, 2005; Pezzotta et al., 2012; Shimomura et al., 2009; Suarez, 2009; Tatikonda & Zeithaml, 2002; Torres Júnior. et al., 2006; Yang, 2007; Zaninelli, 2012). In this paper, the Value

Proposition macrophase was subdivided into Informational Design, Conceptual Design and Detailed Design. Although it has origin in Product Development models, this nomenclature has also been used in SDP models (Costa Junior, 2012; Magnago & Echeveste, 2012; Suarez, 2009); other authors use synonyms as identifying customer experience needs (Jiang, 2008), service requirements development (Li et al., 2010), needs identification (Marques et al., 2013), specifications definition (Mello, 2005), client communication and requirements generation (Pezzotta et al., 2012).

The first creation activity consists of raising and organizing information, necessary to design the service. Therefore, in Informational Design information about all elements of Service-System and AT-System are acquired, as clients involved in the service, AT related to the service, competitors, service usage context, etc. Several authors have emphasized the importance of customer participation in SDP, considering it as a central element in their models (Chun Chu & Jung, 2006) or highlighting the importance of considering their experience (Jiang, 2008).

At the end of Informational Design, information is organized in such a way that it is possible to say that these are a service, represented textually by the service specifications. For the context of this framework, the pursuit of service to the Universal Design principles will be inserted in the service specifications list, even if not explicit by the customers.

Conceptual Design

The word concept was used by all authors who mentioned this phase in their models, and some have even named it as conceptual design (Costa Junior, 2012; Pezzotta et al., 2012; Suarez, 2009; Zaninelli, 2012; Magnago & Echeveste, 2012), while others have used similar words as idea description (Alam & Perry, 2002), concept generation (Yang, 2007) and concept development (Li et al., 2010; Marques et al., 2013; Tatikonda & Zeithaml, 2002).

It is in the Conceptual Design phase, after information gathering and organizing, where the service proposition itself takes place. Compared to product development, the information gathered at the previous phase would become a product concept, in the form of a drawing. Similarly, to the service development, concepts in graphical form for the proposed service are developed at this phase.

Graphic solutions proposed for the information gathered before make Conceptual Design the main phase of Value Proposition macrophase. So, special attention is given to the Universal Design principles, according to requirements introduced in the Informational Design specifications list, searching for solutions that meet the requirements defined, in the most universal way possible.

Detailed Design

Detailed design is cited in the literature by Costa Junior (2012), Magnago & Echeveste (2012) and Suarez (2009), while synonyms were used in the models of Li et al. (2010) (service components development), Marques et al. (2013) (modeling), Tatikonda & Zeithaml (2002) (testing and prototyping) and Zaninelli (2012) (construction).

In this last phase of Value Proposition the Service-System and AT-System elements are more detailed, specifying them for the service itself, as well for the facilitating goods, AT and support facilities. The service begins, therefore, as a textual concept in the Informational Design phase, going to a graphic concept in the Conceptual Design phase, coming to a

graphic concept in more detail in the Detailed Design phase, which can be tested, finishing the Value Proposition macrophase and starting the Value Delivery macrophase.

Service Delivery

After values are identified and proposed, by acquiring and organizing the information, with the proposal and the details of the service concept, in the Value Delivery macrophase occurs the service delivery. The term delivery is used by Karapidis (2005), Mello (2005) and Tatikonda & Zeithaml (2002), while other authors use service launch (Jiang, 2008; Magnago & Echeveste, 2012; Torres Júnior et al., 2006; Suarez, 2009; Zaninelli, 2012), implementation (Costa Junior, 2012; Juehling et al., 2010; Yu et al., 2008; Zeng et al., 2010), release (Pezzotta et al., 2012), transition (Li et al., 2010) or commercialization (Alam & Perry, 2002).

One of the most important activities of this phase, which is crucial considering the AT-System elements, is training for the correct use of the service, in order to avoid abandonment by misuse; equally important is to consider the elements of Service-System, for the training of the front office staff, assuring the correct service delivery. Afterwards it is possible to evaluate the service use and Service-System and AT-System elements by users, making it possible to propose improvements. Service Delivery ends with the continuous monitoring of service planning withdrawal from the market, which may be a starting point for developing a new service to replace the current one.

Conclusions

The present situation consists of a lack of appropriate procedures for services development services for PwD. The currently existing Service-System does not meet the specificities of these people. What exist are attempts to adapt the services developed for people without disabilities, thus offering inadequate services. Traditional SDP models are not oriented for PwD and therefore do not contain specific features; for this purpose, the existing generic models are too vague, have little detail, only at the level of phases, and in some cases, activity level, not performing tasks, guidance, actions and specific tools. In this scenario, the generated services are unsuitable for PwD. Since the output depends on the process, it is concluded that the means to generate the service, that is, the SDP itself also is inappropriate.

In the absence of literature, the presented framework aims to contribute to the start of SDP research in the AT area, collaborating with the understanding of services for modification and improvement of existing theories, which hinder the provision of services for PwD. It was developed at the level of macrophases, phases and activities. However, for specific cases, it is suggested to investigate existing services in their real context of use, aiming to instantiate the framework and refine it to the level of tasks. According to Yin (2010), the case study method is best suited for this situation, taking the framework as an initial theory for the case study, once it explains the main issues to be studied, the key factors, constructs, variables and the presumed relationships between them.

The instantiated and task-leveled framework becomes a reference model for the services development for PwD, with specific procedures, so that the service developed presents a better performance than the prior services offered. This model should aim to be lean, containing procedures, people and essential tools, with approaches in carrying out activities that add value and avoid waste.

With the reference models, it is expected to reach a Service-System for PwD, covering the needs of all stakeholders in this system. Close cooperation among different academic disciplines will be required in the future to enable the provision of seamless integration methods that are appropriate to the practical requirements.

An application example is recommended to evaluate the model, through comparative results between the solution reached with the model and previous situations, with existing services developed without it. As a result of this application, new requirements can be obtained for further model refinement.

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References

Alam, I.; & Perry, C. (2002). A customer-oriented new service development process. Journal of Services Marketing, v.16, n.6, p.515.

Canadian Association of Occupational Therapists (CAOT) (2002). Enabling occupation: an occupational therapy perspective, ed.2, Ottawa, CAOT Publications ACE.

Chapparo, C., & Ranka, J. (1997). Towards a model of occupational performance: Model development. In C. Chapparo and J. Ranka (Eds.). Occupational Performance Model (Australia): Monograph 1 (p.24-45). Occupational Performance Network: Sydney.

Chun-Chu, L., & Jung, C. (2006). Constructing a Value-Based Service Development Model. Journal of Applied Business Research, v. 22, n. 4, p. 47-60.

Cook, A.M., & Polgar, J. (2008). *Delivering assistive technology services to the consumer*. Cook & Hussey's Assistive Technologies: Principles and Practice. 3rd Ed. Philadelphia Mosby Elsevier. 121 p.

Costa Junior, J. D. (2012). *Reference model proposal for eco-efficient design services in product-service system*s (translated by author). p.201. Masters dissertation. Federal University of Paraná, Curitiba.

Deakins, E., & Dillon, S. (2005). A helical model for managing innovative product and service initiatives in volatile commercial environments. International Journal of Project Management, v.23, n 1, p 65-74.

Edvardsson, B., & Kristensson, P., & Magnusson, P., & Sundstrom, E. (2012). Customer integration within service development—A review of methods and an analysis of insitu and exsitu contributions. Technovation, v.32, n.7–8, p.419-429.

Fitzsimmons, J.A., & Fitzsimmons, M. J. (2000). *New service development – creating memorable experiences*. Sage Publications: Thousand Oaks, p.1-32.

Forcellini, F.A. (2013). *Service Development* – Lecture Notes, Postgraduate Program in Production Engineering (translated by author). Federal University of Santa Catarina.

Fynes, B., & Lally, A.M. (2008). Innovation in Services: From Service Concepts to Service Experiences. In: Service Science, Management and Engineering for the 21st Century Service Science: Research and Innovations in the Service Economy, v.3, p.329-333.

Gianesi, I.G.N, & Corrêa, H.L. (1996). *Strategic management services: operations to customer satisfaction*. São Paulo: Atlas.

Goldstein, S. M., & Johnston, R., & Duffy, J., & Rao, J. (2002). The Service Concept: The missing Link in Service Design Research. Journal of Operations Management. v.20, p.121-34.

Grönroos, C. (2003). *Marketing, Management and Services* (translated by author). Rio de Janeiro: Elsevier.

Hitomi, K. (1979). *Manufacturing Systems Engineering*. Taylor & Francis.

Hunger, J. D., & Wheelen, T. L. (2002). *Strategic management. Principles and Practice. Technical review*. Roberto Meireles Pinheiro. Reichmannn & Affonso Editores, Rio de Janeiro.

Jiang, K. (2008). New service development for interactive experience. *Proceedings of IEEE International Conference on Service Operations and Logistics, and Informatics,* IEEE/SOLI. p.10-14.

Juehling, E., & Torney, M., & Herrmann, C., & Droeder, K. (2010). Integration of automotive service and technology strategies. CIRP Journal of Manufacturing Science and Technology, v.3, n.2, p.98-106.

Karapidis, A. (2005). Service management in production companies. In: (Ed.). Integrating Human Aspects in Production Management: Springer, p.375-385.

Kindström, D., & Kowalkowski, C. (2009). Development of industrial service offerings: a process framework. Journal of Service Management, v.20, n.2, p.156-172.

Li, E. Y., & Chen, L.W., & Shen, C. L. (2010). A framework for Service Innovation Capability Maturity Model. In: (Ed.). *Proceedings of the Fourth International Conference on Operations and Supply Chain Management*, v.4, p.529-534.

Lovelock, C., & Wirtz, J. (2006). *Marketing services: people, technology and results*. ed.5. São Paulo: Pearson Prentice Hall.

Magnago, P.F., & Echeveste, M. (2012). Characterization of a minimum model for the PDS through a systematic literature review (translated by author). Produto & Produção, v.13, n.1.

Marques, P., & Cunha, P.F., & Valente, F., & Leitão, A. A Methodology for Product-service Systems Development. *Procedia CIRP*, v.7, n.0, p.371-376.

Mello, C.H.P. (2005). *Model for services design and development*. (translated by author). São Paulo. p.317. Doctoral thesis. University of São Paulo, São Paulo.

Pezzotta, G., & Cavalieri, S., & Gaiardelli, P. (2012). A spiral process model to engineer a product service system: An explorative analysis through case studies. CIRP Journal of Manufacturing Science and Technology, v.5, n.3, p.214-225.

Public Law 108-364. (2004). 108 Th. Congress. Retrieved 03 31, 2014 from: http://www.gpo.gov/fdsys/pkg/STATUTE-118/pdf/STATUTE-118-Pg1707.pdf

Santana, F.E., & Silva, P.R.G., & Figueredo, A. (2010). Acquirement process of customer needs to design an inclusive product (translated by author). *XXX National Meeting of Production Engineering*. São Carlos.

Shimomura, Y., & Hara, T., & Arai, T. (2009). A unified representation scheme for effective PSS development. CIRP Annals - Manufacturing Technology, v.58, n.1, p.379-382.

Stamm, T.A., & Cieza, A., & Machold, K., & Smolen, J.S., & Stucki, G. (2006). Exploration of the link between conceptual occupational therapy models and the International Classification of Functioning, Disability and Health. Australian Occupational Therapy Journal. v.53, p.9-17.

Stanke, A., & Murman, E. (2002). A framework for achieving lifecycle value in aerospace product development. International Council of Aeronautical Sciences.v.61, n.2, p.1-10.

Suarez, T. M. (2009). *Development of a customized model of PDP to a joint venture of product and services* (translated by author). p.144. Masters dissertation. Federal University ofo Rio Grande do Sul, Porto Alegre.

Tatikonda, M.V., & Zeithaml, V.A. (2002). Managing the new service development process: Multi-disciplinary literature synthesis and directions for future research. In: New Directions in Supply-Chain Management: Technology, Strategy, and Implementation. p.200-233.

Torres Júnior, N., & Miyake, D.I., & De Paula Pereira, C.C. (2006). Proposal for a reference model for the description of the Service Development Process (translated by author). *Proceedings of XIII SIMPEP*, Bauru.

World Health Organization (WHO) (2011). World Report on Disability. Geneva.

_____ (2001). The International Classification of Functioning, Disability and Health (ICF). Geneva.

Yang, C.C. (2007). A systems approach to service development in a concurrent engineering environment. Service Industries Journal, v.27, n.5, p.635-652.

Yin, R.K. (2010). *Case study: Design and Methods* (translated by author). ed.4 Porto Alegre: Bookman. p.248.

Yu, M., & Zhang, W.M., & Meier, H. (2008). Modularization Based Design for Innovative Product-Related Industrial Service. In: *Proceedings of IEEE International Conference on Service Operations and Logistics, and Informatics*, v.1,2. p.48-53.

Zaninelli, T. B. (2012). Innovation management: considerations around the service process development (translated by author). Informação & Informação, v.17, n.2, p.133-155.

Zeng, L., & Proctor, R.W., & Salvendy, G. (2010). Creativity in ergonomic design: A supplemental value-adding source for product and service development. Human Factors, v.52, n.4, p.503-525.