Online Shopping Websites: An Evaluation of User Experience and Interface Ergonomic Criteria from the Perspective of Older Users

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Abstract. This paper presents a user experience evaluation of two online shopping websites from the perspective of older users (those aged 50 and older). Two online shopping websites were evaluated using methodological procedures established in prior research [1]. The methodology consists of four steps: (1) heuristic interface evaluation using an ergonomic criteria checklist, (2) online identification and experience questionnaire, (3) evaluation of user experience and interface interaction, and (4) satisfaction questionnaire. Results of the study revealed the analyzed websites are not suitable for older users, who find it difficult to interact with these interfaces.

Keywords: Design, user experience, usability, e-commerce, older users.

1   Introduction

In the last 30 years, Brazil's population has almost doubled from 90 million in 1970, according to data from the Brazilian Institute of Geography and Statistics [2]. Not only is the population growing, it is rapidly aging. In 2000, people aged 0-14 years represented 30% of the Brazilian population, while people aged 65 and over represented only 5%; however, by 2050, it is believed that each of these two age groups will represent 18% of the population (which, at that point, is estimated to reach 259.8 million). Moreover, by 2050, it is predicted that Brazilians will have a life expectancy at birth of 81.3 years—the same as the Japanese do today. According to the national census [3], the proportion of elderly people is growing faster than the proportion of children, due primarily to declining birth rates and increasing longevity.

As the elderly population has increased, so, too, have older consumers. According to Pedro Guasti [4], CEO of E-bit[1], a study conducted by the company found that 25% of consumers are people aged 50 and over; however, as of 2001, people aged 60 and over comprised only 10% of the population. Moreover, as digital technologies evolve, proliferate, and become more informative and easily accessible, people aged 50 and

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[1] E-bit evaluates online shopping websites and awards a stamp classification based on consumer satisfaction.

now engage in online activity more than previous generations. The same study found that 9% of consumers who said they had been influenced by any social network at the time of a given purchase were between 50 and 64 years old. This may be because older consumers can avoid strenuous, stressful, or physically taxing situations by shopping online. As per Brazilian population projections, these numbers are expected to continue to grow over the next decade.

In this context, understanding how certain users interact with digital spaces becomes increasingly important. The field of Human Computer Interaction (HCI) examines the relationships between elements such as design, technology, and product design with human elements such as personal needs and well-being. The end goal of most HCI studies is to tailor technology to human factors, thereby diminishing the distance between technology and users. This area is also linked to issues of user experience (UX) and usability, as many usability problems that hinder user interaction with interactive systems originate with ergonomics and interface. Interface usability failures can delay or completely impede task completion, potentially leading to user dissatisfaction and disengagement from the interface.

2   Objective

This study aims to investigate and measure the experience of "older users" (people aged 50 and over) of online shopping websites (also known as e-commerce). Specifically, it empirically evaluates how e-commerce user interfaces meet the needs of older users, and how such users perceive their online shopping experiences.

3   Theoretical Foundation

3.1   HCI and Older Users

The number of older Internet users is growing, especially in light of recent advances in broadband, computer, notebook, and tablet technologies. According to an article by Perez [5], older generations are increasingly active on the Internet. Salgado [6] observed that older people use the Internet to access social networks like Facebook, search for information, read emails, and even shop online. Additionally, Alban et al. [7] reported that older users do not only access the Internet through computers, citing a survey by the QualiBest Institute that found that 37% of Internet users over 60 in Brazil access the web through mobile devices. The same study found that digital inclusion can help older users achieve improved social and emotional integration and, consequently, mental health [7].

Over the years, the Web has undergone several phases of interface design. These phases can be roughly classified into Web 1.0 and Web 2.0. Websites in the Web 1.0 phase were more static, relying largely on Flash to create animated or moving elements. In contrast, the current phase, Web 2.0, is characterized by dynamic pages with a strong emphasis on interaction, data sharing communities, and user contribution. Researchers like Lunn and Harper [8] have suggested that dynamic

design attracts more user attention than static design; however, users may have difficulty dividing their attention among different types of content, potentially hindering efficient task completion. The same study found that, unlike younger users, older users have a more varied pattern of interaction with dynamic content; often such users do not know what to expect of such content, often presenting signs of hesitation and uncertainty when completing tasks.

In light of the fact that Internet use among older people is booming, new technologies and artifacts will comprise an increasingly important part of these users' daily lives. As such, the importance of understanding and improving this population's user experience cannot be underestimated, particularly with regard to users' understanding of these artifacts, their expectations of interactive products, and their overall satisfaction with the experience. Garrett [9] asserted that user experience is even more important for websites because, unlike other products, websites are complex artifacts that come with no instruction manual. When their website experience is not satisfactory, users tend to blame themselves, feeling that they must have done something wrong, or did not pay enough attention. However, according to Garrett, the fault is generally not with the user, but the website itself.

3.2   User Experience

Analyzing user experience facilitates understanding the whole process of product use: the anticipation of use, actual use, and the completion of use. Garrett [9] claimed that the user experience must consider every possible user action and expectation at every step of the process. User experience has therefore become a key element of sustainable competitive advantage for all products and services, as user experience differentiates a company from its competitors and determines whether the customer will return [9].

In the context of this challenge, Paschoarelli and Silva [12] focused on ergonomic design, which applies ergonomics to the development of technological artifacts in order to achieve products and systems that are safer, more comfortable, efficient and acceptable. Ergonomics criteria concern adapting the built environment to satisfy users' needs and desires. In turn, to effectively adapt a design to users, it is necessary to understand the user experience—that is, how the built environment and its artifacts, expectations, quality of use (usability) and impressions (satisfaction) are perceived during the process of using the product or service. The design then uses this information in an aesthetic-functional configuration to deliver a satisfactory solution. Garrett [9] argues that features and functions always matter, but that user experience has a much greater effect on user loyalty. Ergonomic design can therefore be said to concern the interrelationship of design, ergonomics, usability, and, ultimately, user experience.

Albert et al. [10] found that the best way to account for user experience in a design is to conduct a usability test. Usability tests are intended to identify ways in which the design can be improved to more closely suit its objective. The great challenge of designing human interfaces is to align functionality (what the product or service can do) with usability (how the product or service performs).

Therefore, assessments of human-computer interaction are important to confirm that the designer's objective fulfills users' wants and needs [12]. Such assessments can employ various metrics, both qualitative and quantitative, based on tasks such as successful completion, time, efficiency measures, user-reported data (e.g., self-rated performance and feedback), and post-session survey ratings of various interface features (e.g., visual elements, navigation, search, load time, etc.) to evaluate user satisfaction. Some usability assessment models employ standardized questionnaires, such as the System Usability Scale (SUS), Questionnaire for User Interaction Satisfaction (QUIS), Software Usability Measurement Inventory (SUMI), and Website Analysis and Measurement Inventory (WAMMI) [12].

4   Materials and Methods

This study seeks to understand how older users experience online shopping websites by asking study participants to buy three products within a set price range from two websites: Compra Fácil (Figure 1) and Ponto Frio (Figure 2). To analyze and evaluate user experience, this study employs methodological procedures previously established by Fernandes and Paschiarelli [1]: an inspection method examining ergonomic interface criteria, and an empirical method consisting of two analyses of user experience.

4.1   Inspection Method

This study uses ergonomic criteria from the "Checklist for Evaluating Web Accessibility for Elderly Users" developed by de Sales and Cybis [13] and presented in accordance with Bastien and Scapin's ergonomic criteria [14]. The criteria are as follows: compatibility, flexibility, readability, user control, grouping/distinction, meanings of codes and names, promptness, minimum actions, consistency, and informational density.

These ergonomic criteria were evaluated using a checklist of ergonomic criteria for elderly users [14], [15] containing 41 questions relating to 10 criteria. The questions could be rated as follows: "does not apply in this context," "no" (the interface does not meet this criterion), "partially" (interface partially meets this criterion), and "yes" (interface fully meets this criterion). To quantitatively analyze the result, answers were assigned to a three-point scale: 0 when the criterion is not met, 1 when the criterion is partially met, and 2 when the criterion is completely met (Table 1). ("Does not apply in this context" was not assigned a quantitative rating.) The maximum total score of 70 points indicates ergonomic criteria have been 100% satisfied.

4.2   Empirical Method

To assess user experience, 15 subjects were recruited from Sacred Heart University's Open University of the Third Age (UATI), Bauru, São Paulo, Brazil. Five subjects

were women, 10 were men, and all were between 53 and 72 years old, with a mean age of 60.07 years (SD 6.65). Of the original 15 subjects, protocols from nine subjects were not delivered or completed, yielding a total of six protocols for analysis.

Table 1. Ergonomic criteria rating scale

Ergonomic Criteria		
No	Partially	Yes
0	1	2

Data Collection. Data collection occurred after two protocols were completed. First, participants emailed their completed TCLE (Term of Free and Informed Consent) forms. After the forms were received, participants completed interaction protocol with two online shopping websites: "Compra Fácil" and "Ponto Frio." All completed online protocols were e-mailed to the researcher stamped with the date and time of completion and the participant's IP (Internet Protocol) number (the identification number of the network or the computer from which the information it was sent).

Source: Webpage screenshot

Fig. 1. Compra Fácil homepage

Source: Webpage screenshot

Fig. 2. Ponto Frio homepage

The Task

The purchase task at both sites consisted of seven subtasks:

- Buy a pen drive priced up to R$80.00;
- Buy an air humidifier up to R$220.00;
- Buy a multifunction printer up to R$450.00.
- Complete the order;
- Enter registration information as stated in the research protocol (volunteers had already been registered with the website by the laboratory);
- Choose the "bank transfer" payment method. (As confirmed with the customer service departments of both websites, this option ensured that users could view a payment confirmation screen without actually paying for the purchase as, using this method, the purchase expires in three days if not paid.);
- Show order confirmation.

Data Analysis. Empirical user experience data were analyzed based on statistical inference [16]. User ratings were divided into and scored using the following scale defined by Bangor et al. [17]: exceptional (over 90%), good (80-89%), and acceptable (70-79%). Any score below 70% indicates usability problems and should be viewed with concern. The final data were calculated as percentages based on the SUS scale score used by Tullis and Albert [16], as applied to Fernandes and Paschoarelli's [1] previous research on user experience.

Evaluation of user experience was divided into three stages: before use (expectations), during use (quality of use as measured by efficacy and efficiency) and after use (final impressions and satisfaction).

Before use: positive initial impressions

Participants' initial impressions of the websites were evaluated using a five-item questionnaire, the first item of which asked if the participant had prior knowledge of the websites in question, and did not affect evaluation scoring. The remaining four items concerned positive initial impressions with the initial user screen (homepage) interface after a brief "paced" by this screen, and were scored on a five-point Likert[2] scale (0-4) as described in Table 2. The maximum total score of 16

Table 2. First impressions rating scale (before use)

Ratings scale - affirmative (initial impressions)				
Description	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
score	0	1	2	3	4

[2] Developed by Rensis Likert in the early 1930s.

points (maximum p) equals a 100% positive impression. The result is expressed as a percentage, using a formula inserted in Excel: (average = [sum of each participant's score] * 6.25 / 100), which averages in percentage points (average = average percentage points 100 / maximum p / 100).

During use: efficacy
Efficacy was calculated based on successful task completion: that is, purchasing the three specified products (pen drive, air humidifier and multifunctional printer), providing login and password (registration), completing the payment process, and viewing the purchase confirmation. For this analysis, a two-point scale was used, with "could not do" equivalent to a score of 0, and "can do" equivalent to a score of 1 (Table 3). The final maximum score of 6 points (maximum p) equals 100% efficacy. The result is expressed as a percentage, using a formula inserted in Excel (average = [sum of each participant's score] * 16.666666667 / 100).

Table 3. Efficacy rating scale

Score (Efficacy)							
		Selection		Registration	Payment	Confirmation	Total
Sub-tasks:	Pen drive	Air humidifier	Multifunctional printer				
Could do	1	1	1	1	1	1	100%
Couldn't do	0	0	0	0	0	0	0%

During use: efficiency
Efficiency was calculated by measuring the degree of difficulty with which each sub-task was successfully completed, as rated on a five-point scale (Table 4), as follows: "couldn't do" (0), "did with great difficulty" (1), "did with difficulty" (2), "did easily" (3), and "did very easily" (4). The maximum total score of 24 points (maximum p) equals 100% efficiency. The result is expressed as a percentage, using a formula inserted in Excel (average = [sum of each participant's score] * 4.1666666667 / 100).

Table 4. Efficiency rating scale

Score (Efficiency)					
Legend:	Couldn't do	Did with great difficulty	Did with difficulty	Did easily	Did very easily
Score:	0	1	2	3	4

After use: final impressions and satisfaction

The after use questionnaire contained 14 questions. Questions 1-4, used a two-point scale, with 0 for "no" and 1 for "yes." The remaining 10 items were SUS questions [16]; these items alternated between positive and negative statements and were rated on a five-point Likert scale (1-5). The maximum total score of 44 points (maximum p) equals 100% user satisfaction (Table 5). The result is expressed as a percentage, using a formula inserted in Excel (average = [sum of each participant's score] * 2.2727272727 / 100).

Table 5. Satisfaction rating scale

Part 1		Part 2				
Questions 1-4		SUS - Affirmatives 1-10				
No	Yes	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
0	1	1	2	3	4	5
Score - SUS (+)		0	1	2	3	4
Score - SUS (-)		4	3	2	1	0

5   Results and Discussion

5.1   Inspection Method

The results (Table 6) indicate that Ponto Frio better satisfies the selected ergonomic criteria (82.86%) than does Compra Fácil (52.86%). Out of 41 questions, 35 questions were analyzed and 6 were not applied.

Table 6. Results of ergonomic criteria evaluation

Check-list of Ergonomics Criteria	Q1 CF	Q1 PF	Q2 CF	Q2 PF	Q3 CF	Q3 PF	Q4 CF	Q4 PF	Q5 CF	Q5 PF	Q6 CF	Q6 PF	Q7 CF	Q7 PF	Q8 CF	Q8 PF	Q9 CF	Q9 PF	Q10 CF	Q10 PF
1. Compatibility:	1	2	0	1	1	2	2	2	1	2	1	0	0	0	1	2				
2. Flexibility:	1	1																		
3. Readability:	0	2	1	2	2	2	2	2	2	2	0	2	2	2	0	0	2	2	0	1
4. User control	1	2	1	1																
5. Grouping / Distinction	2	2	2	2	2	2	0	2												
6. Meaning of the codes and names	1	2	0	2																
7. Promptitude	2	2	2	2	1	2	0	2												
8. Minimum actions	2	2																		
9. Consistency	2	2																		
10. Informational density	0	1																		
TOTAL	CF - Compra Fácil 37 points = 52.86%										PF - Ponto Frio 58 points = 82.86%									

5.2   Empirical Method

Before Use: First Impressions. When it came to initial impressions, users rated Compra Fácil at 61.25% (SD 2.14) and Ponto Frio at 72.5% (SD 2.38) (Table 7). These scores indicate Ponto Frio was perceived as "acceptable" (70-79%), while Compra Fácil fell short of basic standards.

Table 7. Results of before use evaluation (first impressions)

Before use: first impressions																													
Websites:	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF
	P1		P2		P3		P4		P5		P6		P7		P8		P9		P10		P11		P12		P13		P14		P15	
know website	n	n	n	n	n	n	y	y	n	n	n	y	y	y	y	y	n	y	n	n	n	n	y	n	n	n	y	y	n	n
apparent safety	3	4	3	4	2	4	3	3	3	3	2	3	3	2	4	0	3	3	2	3	4	4	3	2	3	3	3	3	1	1
easy to find products	4	4	3	3	1	4	3	3	3	4	3	3	3	2	3	4	1	3	3	3	4	3	3	3	2	3	2	3	3	3
easy to buy	3	4	3	3	3	4	2	3	3	4	1	3	3	2	3	4	1	3	3	3	3	3	1	3	2	3	3	3	1	1
I identify with this website	1	3	2	2	3	4	2	2	2	3	1	3	3	2	3	2	1	2	1	1	3	3	2	3	2	3	2	3	2	2
TOTAL	CF - Compra Fácil 61.25%								PF - Ponto Frio 72.5%																					

During Use: Efficacy. The efficacy rating for Compra Fácil was 85.56% (SD 1.92), and 81.11% (SD 1.35) for Ponto Frio (Table 8), both of which fall within the "good" range (80-89%).

Table 8. Results of during use evaluation (efficacy)

During use: efficacy																													
Websites:	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF
	P1		P2		P3		P4		P5		P6		P7		P8		P9		P10		P11		P12		P13		P14		P15	
selection: pen drive	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
selection: air humidifier	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	1	0
selection: multifuncional printer	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	0	1	0	1	0	1	1	0	1	1	1	1	0
cadastre	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	0	0	1	1	1	1	1
payment	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	0	0	1	1	0	1	1
confirmation	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	1	0	1	1
TOTAL	CF - Compra Fácil 85.56%								PF - Ponto Frio 81.11%																					

During Use: Efficiency. The efficiency rating of Compra Fácil was 60.56% (SD 6.20), compared to 60% (SD 5.9) for website Ponto Frio (Table 9), an almost negligible difference. These results place both websites within the range of concern (below 70%).

Table 9. Results of during use evaluation (efficiency)

	P1		P2		P3		P4		P5		P6		P7		P8		P9		P10		P11		P12		P13		P14		P15	
Websites:	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF	CF	PF
selection: pen drive	4	4	2	3	4	4	1	3	3	4	0	3	3	2	4	4	3	3	3	3	2	3	1	2	2	2	4	4	0	3
selection: air humidifier	4	4	3	3	2	4	4	3	3	4	0	3	1	2	4	4	3	3	3	3	4	4	1	2	0	0	3	0	3	0
selection: multifuncional printer	0	4	3	3	3	4	4	3	3	1	0	3	3	2	4	0	3	0	3	0	4	0	1	2	0	3	3	1	3	0
cadastre	2	4	2	2	4	4	3	3	4	4	0	3	4	1	1	0	3	3	3	3	3	3	1	0	0	2	2	2	3	3
payment	3	4	3	3	3	4	3	3	3	4	0	3	1	1	1	0	2	2	3	3	3	3	1	0	0	3	3	0	3	2
confirmation	4	4	3	3	3	4	3	3	4	4	0	3	2	1	4	0	2	1	3	3	3	3	3	0	0	0	3	0	3	3
TOTAL	CF - Compra Fácil 60.56%													PF - Ponto Frio 60%																

After Use: Final Impressions and Satisfaction. User satisfaction with 57.12% (SD 7.47) for Compra Fácil, and 63.03% (SD 7.59) for Ponto Frio (Table 10). Both results are within the range of concern (below 70%).

Table 10. Results of after use evaluation (final impressions/satisfaction)

Questions	good for shopping	would buy again	recommend the use	reached my expectations	Afirmatives (SUS)	simple and easy to use	unorganized	consistent pages	poor contrast	easy to read	irrelevant content	easy to find products	links are not clear	practical category grouping	difficult access - navigation menu	good for shopping	would buy again	recommend the use	reached my expectations	Afirmatives (SUS)	simple and easy to use	unorganized	consistent pages	poor contrast	easy to read	irrelevant content	easy to find products	links are not clear	practical category grouping	difficult access - navigation menu
	Compra Fácil															Ponto Frio														
P1	0	0	0	1		3	1	3	2	3	3	0	1	1	3	1	1	1	1		4	1	4	1	3	4	3	4	4	4
P2	1	1	1	1		3	3	2	2	3	3	2	2	3	3	1	1	1	1		3	3	2	2	3	3	3	2	3	3
P3	1	1	1	1		3	3	3	2	3	2	3	3	3	3	1	1	1	1		4	4	4	0	4	4	4	4	4	4
P4	1	1	1	1		3	3	2	2	3	2	3	2	3	2	1	1	1	1		3	2	2	3	2	3	3	3	3	2
P5	1	1	1	1		3	0	3	1	1	1	1	1	1	1	1	1	1	1		4	0	3	4	3	3	3	3	3	4
P6	0	0	0	0		1	1	1	1	1	1	1	1	1	1	1	1	1	1		3	3	3	3	3	3	3	3	3	3
P7	1	1	1	1		3	3	2	3	2	3	2	3	2	3	1	0	1	0		2	2	2	2	3	2	1	2	2	2
P8	1	1	1	1		4	1	1	4	4	3	4	4	3	0	0	0	0	0		0	4	2	3	3	3	3	2	1	1
P9	0	0	0	0		3	1	3	3	3	0	3	3	3	3	0	1	0	0		1	1	1	3	3	1	1	3	1	1
P10	1	0	0	0		3	2	2	3	3	2	3	2	1	3	0	0	0	0		3	3	2	2	1	2	1	2	3	3
P11	1	1	1	1		3	3	3	3	4	3	2	3	4	4	1	1	1	1		3	1	3	4	2	4	2	4	3	4
P12	0	0	0	0		0	1	1	2	2	2	2	1	1	3	0	0	0	0		0	2	0	2	2	2	2	2	2	2
P13	0	0	1	1		1	2	3	1	3	3	0	2	1	3	1	1	1	1		3	3	3	3	3	2	3	3	3	3
P14	1	1	1	1		3	3	3	3	4	2	3	3	3	3	0	0	1	0		2	3	3	3	3	2	3	3	3	3
P15	1	0	0	0		2	2	3	2	3	1	1	1	3	2	0	0	0	0		1	2	1	2	2	0	4	3	2	2
	Compra Fácil						57.12%									Ponto Frio						63.03%								

6   Final Considerations

The ergonomic criteria evaluation revealed a great difference between the two analyzed websites. Compra Fácil's low rating in this section reflects several problems, including multiple animation effects (moving banners, flashing elements) that lacked proper user control, unfavorable contrast, very small font size (below 12 or 14 point), little spacing, important information un-highlighted and placed below the fold (the part of the screen that is visible without scrolling), and poorly visible "help"

resources. In comparison, Ponto Frio presented only two problems: navigation that relies on pull-down menus (some older users may find this action difficult due to age-related motor loss), and undefined abbreviations found in certain product descriptions.

Although the two websites did not receive significantly different efficacy and efficiency ratings, the website Compra Fácil received the lowest score (0) several times.

Finally, the satisfaction test (SUS), Compra Fácil received the lowest score (0) six times and the second lowest (1) thirty-four times, while Ponto Frio received the lowest score five times and the second lowest score nineteen times.

These results ultimately demonstrate that older users rated Ponto Frio more highly than Compra Fácil for all analyzed usability aspects.

References

1. Fernandes, F.R., Paschoarelli, L.C.: A Method of Evaluating Online Usability Research: ACase Study of the Itaú Bank Site. In: Proceedings of IADIS Interfaces and Human Computer Interaction 2013, vol. 1, pp. 1–5. IADIS Press, Prague (2013)
2. IBGE: Sala de Imprensa:Projeção da População no Brasil (2004), `http://www.ibge.gov.br/home/presidencia/noticias/noticia_visualiza.php?id_noticia=207`
3. IBGE: Perfil dos IdososResponsáveispelosDomicílios (2002), `http://www.ibge.gov.br/home/estatistica/populacao/perfilidoso/perfidosos2000.pdf`
4. Guasti, P.: E-velhiceuma nova realidade virtual. E-bit (2011), `http://ebit1.tempsite.ws`
5. Perez, S.: Who's Online and What Are They Doing There.Readwrite (2009), `http://readwrite.com/2009/01/29/whos_online_and_what_are_they_doing_there#awesm=~oaIpuYvaRfY6jc`
6. Salgado, A.: Pesquisarevelaque 71% dos idosostêmperfilemredessociais e adoram games virtuais. O Dia (2012), `http://odia.ig.com.br/portal/economia/pesquisa-revela-que-71-dos-idosos-t%C3%AAm-perfil-em-redes-sociais-e-adoram-games-virtuais-1.455472`
7. Alban, A., de Marchi, A.C.B., Scortegagna, S.A., Leguisamo, C.P.: Ampliando a usabilidade de Interfaces Web para idososemdispositivosmóveis: umapropostautilizando design responsivo. In: Revista Renote - Novas Tecnologiasna Educação, vol. 10(3), pp. 1–10 (2012)
8. Lunn, D., Harper, S.: Providing assistance to older users of dynamic Web content. Computers in Human Behavior 27, 2098–2107 (2011)
9. Garrett, J.J.: The Elements of User Experience: User-Centered Design for the Web and Beyond, 2nd edn. New Riders Press, Berkley (2011)
10. Paschoarelli, L.C., Silva, J.C.P.: Design Ergonômico: umarevisão dos seusaspectos metodológicos. Conexão – Comunicação e Cultura 5, 1–8 (2006)
11. Albert, B., Tullis, T., Tedesco, D.: Beyond the Usability Lab: Conducting Large-scale Online User Experience Studies. Morgan Kaufmann, San Francisco (2010)

12. Filardi, A.L., Traina, A.J.M.: Montandoquestionários para medir a satisfação do usuário: avaliação de Interface de um sistemaqueutilizatécnicas de recuperação de imagensporconteúdo. In: VIII Brazilian Symposium on Human Factors in Computing Systems, IHC 2008, Porto Alegre, RS, outubro 21-24, pp. 176–185 (2008)
13. Sales, M.B., Cybis, W.A.: Checklist para avaliação da acessibilidade da Web para usuáriosidosos. LabIutil,
    http://www.labiutil.inf.ufsc.br/acessibilidade/index.htm
14. Bastien, C., Scapin, D.: Ergonomic criteria for the evaluation of human-computer interfaces. Tech. Rep. n.156. Rocquencourt, France: Institut National de Recherche en Informatique et en Automatique (1993),
    http://www.labiutil.inf.ufsc.br/CriteriosErgonomicos/
    LabIUtil2003-Crit/100conduc.html
15. Fernandes, F.R.: O uso de dois websites de compras on-line porusuáriosacima de 50 anos (older users): estudo de caso. Dissertação(MestradoemDesign) – Programa de PósGraduaçãoem Design, 144 p. Universidade Estadual Paulista "Júlio de MesquitaFilho", Bauru (2013)
16. Tullis, T., Albert, B.: Measuring the User Experience: Collecting, Analyzing and Presenting Usability Metrics, 1st edn. Morgan Kaufmann, San Francisco (2008)
17. Bangor, A., Kortum, P.T., Miller, J.T.: Determining What Individual SUS Scores Mean: Adding an Adjective Rating Scale. Journal Usability Studies 4, 114–123 (2009)