# Cultural adaptation of content for ICTs considering different levels of literacy and textual equivalents

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**Abstract.** This work aims to generate culturally contextualized hyperdocuments in the web, adapted and made available according to the level of literacy of segments of the dairy, so they have access and understand information and knowledge in technology to improve their individual development. This study focuses on the promotion of inclusive learning and continuing education, using approaches of HCI, literacy, processing based on common sense and natural language. Hyperdocuments generation intended primarily for users who have special learning needs such as reading difficulty and access to information. As a result, it is expected that users can get the understanding of technical knowledge digital available.

**Keywords:** Accessibility, literacy, simplification textual, textual equivalents, W3C Recommendation, Common Sense.

## 1   Introduction

The use of the web, media and other information and communication technologies (ICTs) have served as tools for work, study and entertainment, as they are also a means of expression and communication between people of different ages, special needs, skills, abilities and interests.

Although the use of ICTs is clearly something we realize that there is still a large contingent of people who have no access to these technologies and hence to information, knowledge and technologies that can be disseminated and transferred by it. Among several possible reasons to explain this reality it can be said that the social, cultural, educational, perceptual, cognitive and motor differences that exist among people are one of them.

Analyzing these differences to try to understand how these factors influence the form of access to and use of ICTs by the people can be one way to help us identify friendlier and easier ways these technologies are used by all people regardless of their socioeconomic, cultural, educational and cognitive conditions. Aware of these issues that disadvantage the use of ICTs by all people, researchers Brazilian Computer Society - SBC [6] defined as one of five challenges for their use the "Universal Participatory Access to the Brazilian Citizen" [6] whose goal is to create digital content that enables anyone to access, understand and learn with ICTs.

From this reality, this article describes how to develop a research project to generate hyperdocuments for milk producers. The proposal is to use ICTs as an educational tool aiming at the dissemination and transfer of information and expertise at the various levels of schooling, literacy and culture of the public. The survey assumes that the use of cultural knowledge, levels of literacy and textual equivalents are main elements in the elaboration of hyperdocuments to create digital content with a more familiar language to the culture and literacy level of milk producers. It is stated that by adapting digital content to create such features, it will be created more conditions for people to learn and take ownership of information and knowledge that will help them improve / change their reality.

A search is under development at Advanced Interaction Laboratory at the Federal University of São Carlos (LIA / UFSCar). Use as the basis of information and knowledge to be disseminated and transferred to Normative Instruction 51 (NI 51) from the Ministry of Agriculture, Livestock and Supply (MAPA) of the Federal Government of Brazil. The idea is to disseminate and transfer information and knowledge contained in this normative instruction for the extension (which will have the role of agents) and for rural milk producers using the web as a communication tool. The NI 51 is a technical regulation that has specific scientific objective to establish minimum requirements to be observed in production, identity and quality of milk A, B and C. It is valid to emphasize that the main research challenge is to generate digital content for the web considering the peculiarities and specificities of the target audience since the information contained therein are full of terms difficult to be understood by them.

Relying on this introduction the article has five topics. The second topic discusses the importance of milk for the Brazilian agribusiness and the difficulty of disseminating information and transferring technology to the target audience of the project, there still is the issue and the research objectives. The third present the theoretical foundation needed to develop digital contextualized culturally content and accessible to farmers. The fourth section provides the methodology to develop the research proposal. In the fifth and last topic is recorded some final thoughts on the study highlights the expected results.

## 2 Agribusiness and milk in Brazil

The Brazilian agribusiness is one of the most relevant industries to the economic sector because it accounts for 25% of Gross Domestic Product (GDP), 30.3% of exports and 37% of jobs in Brazil. The sector's GDP reached U.S. $ 741.1 billion in 2008, surpassing the $ 592.9 billion achieved in 2007. Between 1998 and 2008 the growth rate of agricultural GDP was 4.4% per year [1] placing agriculture as the mainstay of the national trade balance, making Brazil one the most powerful agricultural producers on the planet. Milk is among the top six most important products of Brazilian agriculture, with about 27 billion liters [9]. To highlight the economic and social importance of the dairy sector, it is estimated that in Brazil there are one million three hundred thousand milk-producing farms, occupying approximately 3.6 million people who move about $ 64.78 billion annually [2].

Given this scenario, the NI 51 created by the MAPA supports the increase of productivity and milk quality that also contributes to improve and modernize the federal health legislation on this important product of Brazilian agribusiness. Developing new ways

to disseminate and transfer information and knowledge contained in it from the continuing education and inclusive for multipliers and milk producers is an innovative option that increases the chances of milk producers to adopt their techniques and procedures. The proposal of using continuing education and inclusive as a guideline for dissemination and transfer of information from the NI 51 is extremely important because it enables effective work of awareness of the producers. The idea is to start this education process with the training of multipliers that would use adapted content and technological resources to bring the milk producers to know modern techniques and / or information that would improve the quality and productivity of the milk produced in Brazil. The need to bring specialized knowledge to farmers and multipliers to improve the quality of raw milk produced in Brazil enters the challenge that characterizes the motivation of this research project is to provide means to facilitate the dissemination of expertise from different areas of knowledge, to people who have difficulty to access information and present reading disability.

Due to the fact that the leading question of the research is: How Information Technology and Communication - ICTs could contribute to the milk producers of low or no level of schooling and learning disabilities have access to technical information to enable them to improve productivity milk quality and considering the conceptions of common sense, analogies and textual simplification? Given that the research seeks to answer how ICTs help to provide access and understanding of information in a group of milk producers, it has as the objective of the research: Developing adapted contextualized culturally hyperdocuments and made available according to the level of literacy of dairy farmers an multipliers, enabling the access and the understanding of the information and expertise that can enhance the productivity and quality of milk.


# 3   Theoretical Foundation

## 3.1. Accessibility

Accessibility is a basic condition for social inclusion of people with disabilities or special needs. Accessibility concerns the possibility of reaching physical spaces, information work, tools and studies, services and products. It is therefore essential feature of the inclusion of people with disabilities or special learning needs in their daily lives - in your neighborhood, school, university, workplace and in society.

The term web accessibility is associated with the effective provision of information to all people, regardless of platform and technology used and the sensory and functional capabilities of the user. It is therefore an important feature to overcome the initial barriers of difficulty reading and understanding of digital content, in particular, this research aims to develop hyperdocuments concerning the NI 51 to allow dairy farmers to have access to their instructions.

### 3.2. W3C Recommendations

The Web Accessibility Initiative (WAI) is a set of recommendations guides whose main objective is to promote / ensure web accessibility [10]. These recommendations make web content accessible to people with visual, auditory, motor disabilities, among others being intended for all web content creators and programmers of tools for content generation.

Building digital content capable of allowing access to all the people implies that the main information associated with them should be available in order to respect the special learning needs and skills of people beyond the limitations of equipment they have. Within these recommendations for accessibility guidelines 1 and 14 Web Content Accessibility Guidelines (WCAG 1.0) and 3.1 of the (WCAG 2.0) guidelines that describe characteristics related to way as the hyperdocument content in the web should be developed to improve public access and will be the most considered within the range of this research.

### 3.3 Literacy

The National Indicator of Functional Illiteracy in Brazil (INAF) ranked the skills of reading/writing of the Brazilian population in four levels of literacy, as follows [3].

The absolute illiteracy corresponds to the condition of those who can not perform simple tasks that involve decoding words and sentences. Literacy rudimentary level corresponds to the ability to locate explicit information in short, familiar texts and, an advertisement, a short letter and handle small amounts of money. The literacy basic level corresponds to the ability to locate information in little longer texts, and may make minor inferences, and can be considered functionally literate. The full literacy level corresponds to people whose lack of some skills no longer impose reading and understanding restrictions to texts in usual situations. Table 1 shows the trend of this index of literacy in Brazil between 2002 to 2009 relative to the age of the population between 15 and 64 years.

**Table 1 – INAF BRASIL -** Evolution indicator of literacy - (population 15 and 64 years)

|  | 2001 2002 | 2002 2003 | 2003 2004 | 2004 2005 | 2007 | 2009 |
|---|---|---|---|---|---|---|
| ILLITERACY | 12% | 13% | 12% | 11% | 9% | 7% |
| RUDIMENTARY | 27% | 26% | 26% | 26% | 25% | 21% |
| BASIC | 34% | 36% | 37% | 38% | 38% | 47% |
| FULL | 26% | 25% | 25% | 26% | 28% | 25% |

It is important highlight that both the rudimentary level of literacy, as well as the base level, which total 68% of the population as shown in Table 1 above, have difficulty with activities involving reading and comprehension of texts depending on their size and complexity.

### 3.4 Common Sense

Common sense is defined as the set of facts known by most people who live in a determined culture, "covering a large part of human experience, knowledge about the spatial aspects, physical, social, psychological and time of the daily life of human beings "[4]. One can understand common sense as the knowledge accepted as true by most people who have a similar profile and are inserted into the same cultural context which can be defined based on parameters such as age, education level and geographic location.

To put into practice those aspects related to culture in computing systems, few projects have emerged with the objective to collect and apply information collected as common sense to the reality of this public. The collaborative construction of knowledge base is founded on the belief that anyone can 'feed' the database with common sense [4]. One of these projects is the OMCS-Br, whose goal is to register the common-sense facts of Brazilian taxpayers taking into consideration that any person has the common sense that can be transferred to machines [5]. The idea is to construct, from a collaborative work involving the site feeding by Brazilian volunteers, a knowledge base that can be used for various purposes. To facilitate the collaboration of volunteers in the collection of common sense was created for the project site OMCS-Br, which has been available since 2005 and can be accessed by anyone. To contribute to this project is necessary where the previous registration information is collected from users, such as age, education, region.

The site now has nine themes and twenty activities that were created according to the need for research that are ongoing today. This collection of common sense is done through templates (see Fig. 2), sentences have simple structures, accordance with the profile of target audience (underlined in red) and gaps (in blue) to be filled by volunteers and are composed of a static (underlined in yellow) and a dynamic part (in green). The dynamic part changes with each user interaction harnessing the knowledge already collected in other interactions, and thus constitutes a database that feeds itself. To begin with the words collected are stored in the OMCS database in a natural language. Because the computer does not deal with natural language, processing has been done which generates a semantic network that is called ConceptNet, based on concepts and on the twenty Minsky relations. Minsky was a researcher in the artificial intelligence area that researched on the mapping of the human knowledge to the computational [7]. The Conceptnet communication from a set of functions, a the API, that was developed for this purpose. Fig. 1 shows the simplified architecture of the project OMCS-Br.
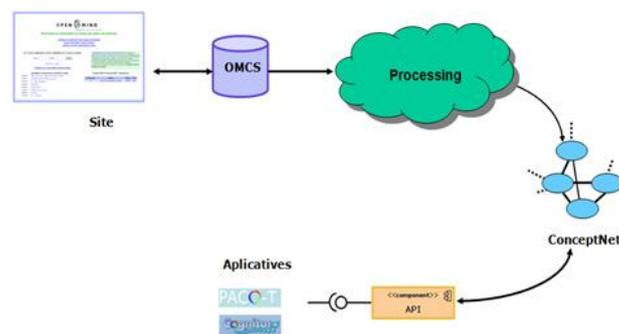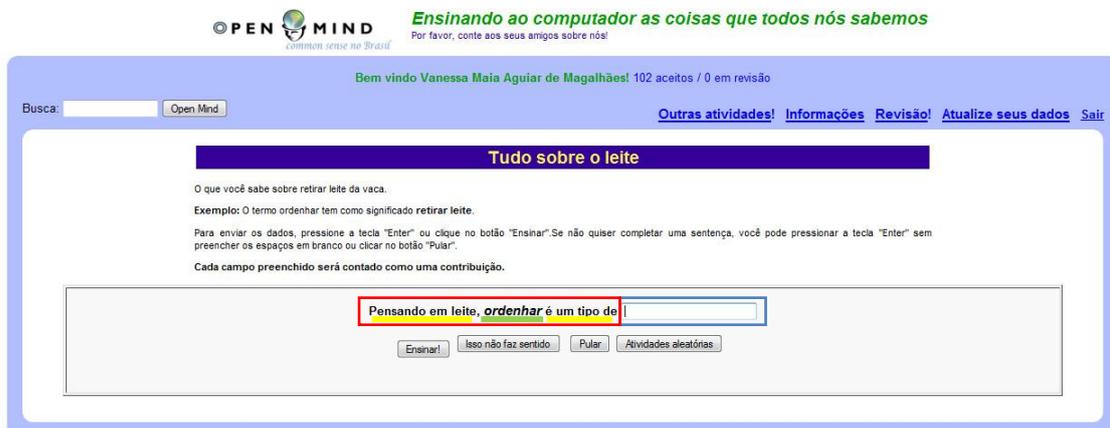


**Fig. 1 -** Architecture project OMCS-Br

**Fig. 2** - Templates OCMS-Br

## 4  Research Methodology

In order to achieve the proposed objectives for the research, we took advantage of a range of possibilities provided by technological advances which have the capacity to promote different types of access to information, using specific media for each case, with the possibility of creating hyperdocuments prepared at different levels of literacy, culturally contextualized to meet the producers of milk with special learning needs, cultural and social differences, providing information in an accessible way to understanding in various means of communication. These hyperdocuments will be built based on the use of tools, such as: PACO-T, Simplifica and Cognitor, aligned with pedagogical methodologies, based on educational theories, such as: Gagne, Freine and Asubel. In the translation of a more familiar vocabulary (Common Sense); in computational methodologies (see Fig. 3), and technologies for the development of hyperdocuments.

Fig. 3 shows the steps to be followed for the construction and provision of hyperdocuments. The first step is to identify the user profile, such as: age, region and gender. Through this information we will set the target audience profile that will be used in the query of the knowledge base of common sense. There is a mechanism in the base, called filter, which allows consultation considering a particular profile. For example, you can see only the common sense of men with age between 18-29 years, from the SP state, with particular schooling. In step two, content topics will be organized that will be approached in the learning actions (AA) with the support of common sense, also defining what will be covered and the detailing level.
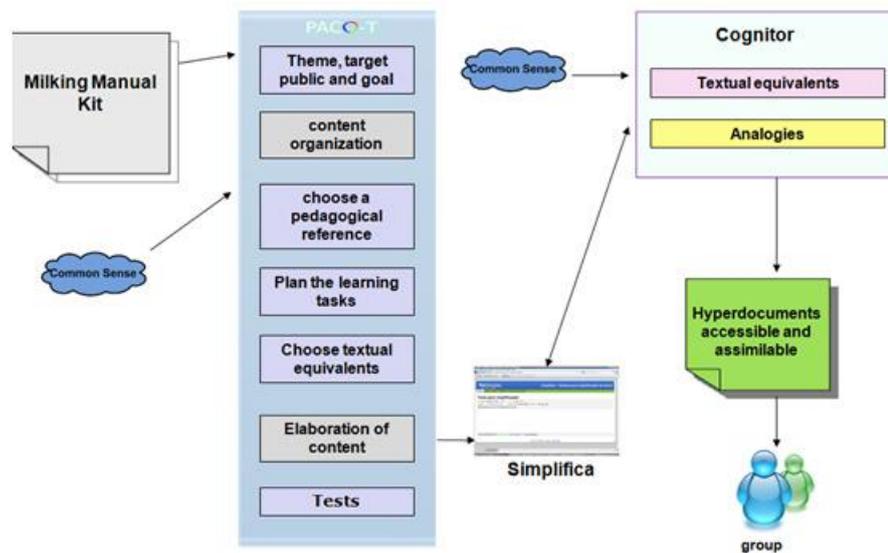
**Fig. 3 - Architecture project**

According to [8] this way to organize the content can produce, as an artifact, the syllabus of the course. In step three is given the choice of the pedagogical methodology and reference. In step four, the AA will be planned effectively in accordance with the pedagogic and methodological choice. In step five, we will define the computational tools and media to be used in the AAs. This choice should consider the profile of the target audience, pedagogical objectives of the activities, technology issues, familiarity with digital artifacts and the time available for the target audience to perform the planned AAs. The sixth step is the preparation of the material. For this step is necessary to use other applications, for example, Simplifica and Cognitor. First tool to be used is Simplifica, which was developed at the Institute of Mathematics and Computer Science of the University of São Paulo, in São Carlos (ICMC-USP). Its goal is to simplify lexically and syntactically a text for people of rudimentary and basic level of literacy. The second is the Cognitor developed in the Advanced Interaction Laboratory (LIA), Federal University of São Carlos (UFSCar), which aims to support teachers in the task of designing and editing quality educational materials for of Distance Education in the form of Hyperdocuments with the support of analogies and media. In the seventh step, the whole environment will be tested and the material analyzed to verify whether they are in accordance with the defined pedagogical objectives. In the eighth and final step, aspects related to the case study will be analyzed in the current research, evaluating the work performed with the producers of milk. For this last step, the following instruments for data collection will be adopted: interviews and questionnaires for assessment; the AAs monitoring reports performed with the milk producers, application of potentials of performance indicators, evaluation reports and recommendations for improvements.

## 4.1. Example of adapted hypermedia

We conducted a pilot example with technical content, referring to the Manual milking kit of Brazilian Agricultural Research Corporation (Embrapa), in two levels of literacy: full (Fig. 4) and rudimentary (Fig. 6) literate levels.
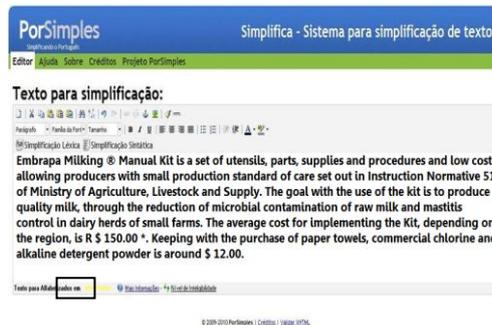


**Fig. 4 -** Tool Simplifica full level



**Fig. 5 -** Tool Simplifica basic level

It is Important to highlight, mainly at the rudimentary level, some words that could generate misunderstanding by the milk producers were extracted from the text, for example, the words Normative Instruction 51, clinical mastitis and mycobacterium contamination. Such words were replaced by terms or meanings familiar to this level of literacy, coming from the database of common sense (OMCS-Br). The process for building hyperdocuments in the rudimentary level of literacy happened after the definition of the target audience. We developed the design of AA, by building the syllabus of the course, choosing the pedagogical presupposition of Gagne, planned the activities to be undertaken, as well as, the media to be used according to each activity and target audience. After these steps, the content has been lexically simplified by the Simplifica applicative, removing from the text some words considered complex. From the removed words, whose synonyms could not be found, a database of common sense was used. After this lexical simplification, it was syntactically simplified again by Simplifica, remaining in the basic level of readability, as shown in Fig. 5. Having completed all these steps, the text was sent to Cognitor applicative for the construction of hyperdocument. The complex words were replaced by synonyms

found in the database of the OMCS-Br, as well as aggregated textual equivalents (media) and analogies were made to illustrate and explain some terms such as:

• A cow can produce milk, milk is a drink and serves to feed
• Milk is able to produce yogurt, yogurt is a drink and serves to feed.

In this experiment were introduced text equivalents, such as images, serves text narration and video of the procedure. Fig. 6 illustrates another example with the same content in Fig. 4, created by Cognitor and Simplifica, but considering the rudimentary level. We performed the translation of vocabulary and meanings, using common sense, syntactic, lexical simplification and we eliminated the unnecessary terms, underlined in blue. For better understanding and sedimentation, it is believed that there is still a need to use culturally contextualized textual equivalents, such as images, video and textual narrative, underlined in green. It is important to highlight that analogies were also used to illustrate or clarify some terms, underlined in red. Fig. 7 illustrates the text Cognitor submitted to Simplifica to the level of readability evaluation, which is now at the rudimentary level.
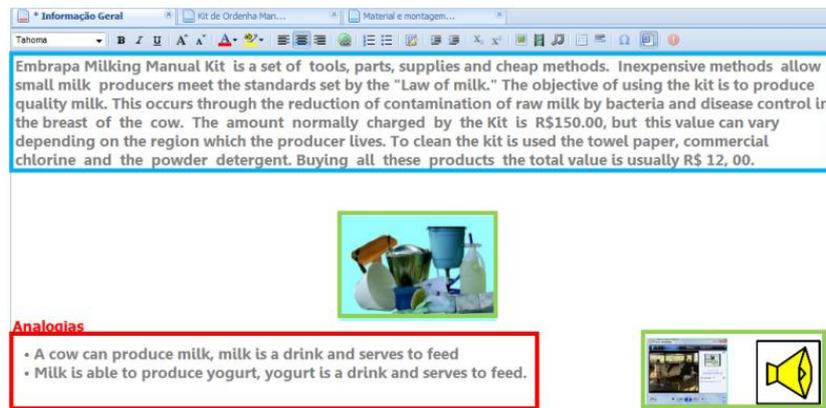


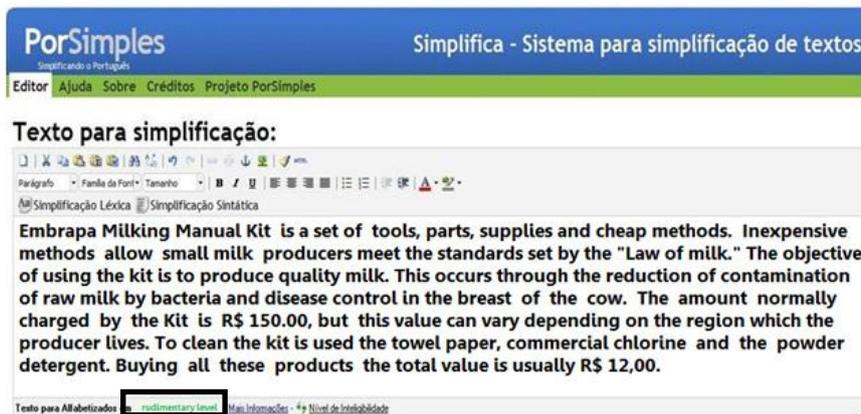**Fig. 6 -** Tool Cognitor rudimentary level



**Fig. 7 -** Tool Simplifica rudimentary level

## 5. Final considerations and expected results

Developing hyperdocuments for users with different levels of literacy, cultural differences, requires special care in preparing their content, for example, the degree of difficulty of the text, the familiar language used and the text equivalents to replace, complement and provide better understanding. The implementation of a inclusive learning environment, culturally contextualized, that makes hyperdocuments available at major research institutions, is presented as a possible solution, affordable, capable of approximate and interrelate experienced participants who are the keepers of knowledge, to those less favored ones in a significantly bigger number, for whom most of the actions outlined by this project seeks to answer. Although the problem domain is the transfer of knowledge about the NI 51, it is considered that the results are promising for other domains, within which it has as objective to disseminate knowledge and provide inclusive and continuous learning on the web. The hyperdocuments both contribute to the development of technological research and for social inclusion and identification of content that allows access and understanding of the information made available by the web users, functional illiterate and full literate people.

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