
Co-Authoring Patterns to Support Design of Systems to Promote Spread of Sustainability

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Abstract

Rephrasing Silberman et al. [7], we believe “sustainability is a LEARNING process, not an endpoint”. To support that, we bring the concept of co-authoring system development to promote what Knowles et al. [4] called ‘spread the word’ of sustainability. Such concept states educators should be system’s co-designers to define the information to be used by the system’s final users. The concept is supported by design patterns, presented here to support end user development (EUD) for educators to promote meaningful learning on sustainability supported by ICT solutions. The co-authoring patterns emphasize the contextualized and reusable information, allowing designers to develop a system where educators can easily change and adapt its content according to the topic aiming to improve the learner engagement. We believe that this co-authoring approach is necessary for reaching a sustainable future.

Author Keywords

Co-authoring; Education; Educational Systems; Design Patterns; Sustainability.

ACM Classification Keywords

H.5.2. User Interfaces (e.g., HCI);

<p>Name: Co-authoring option</p> <p>Context: Co-author needs to identify the possibility of inserting information to be displayed at system.</p> <p>Problem: How can co-author know of co-authoring option in the beginning of interaction?</p> <p>Force: Co-author does not insert the information if s/he could not identify this possibility.</p> <p>Solution: Display co-authoring option in the beginning of interaction, with an indicative sentence. In this sentence, there is an infinitive verb, which expresses co-authoring action, and the words that express what can be done. Describe a <u>Synthesis</u> of the goal of the system on the same interface where the Co-authoring option is. Clicking in co-authoring option, co-author chooses to insert information to be displayed on system through <u>Steps</u>.</p> <p>Rationale: Co-author does not use co-authoring when s/he does not realize this option. Co-author is a user of systems who inserts information to be displayed on their interfaces. Inserting information, each co-author can create many different instances of the system. An instance means a co-authoring system with information inserted by co-author. For example, a co-authoring system like a Quiz game, with clues to guess a secret word, allows co-author insert clues and secret word as many as s/he can, e.g., clues and secret word related to environment, sex, biology, among others topics.</p> <p>Examples:</p> <div> <div>Create a game</div> <div>Start a new action learning</div> </div>
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Figure 1. Pattern ‘Co-authoring Option’.

Introduction

According to Knowles et al. [4] the sustainability can be achieved in two ways: i) change our life style guided by the principles defended by Smart Cities researches with a strong management of our activities to, essentially, reduce the energy consumption (called Plan A); ii) change our life style to adequate ourselves to the new planet reality, that we can’t get sustainable (called Plan B).

In both situations citizens have to adapt themselves and change their behavior according to the new scenario, leading naturally to education for citizenship. In this context, providing computational solutions to support education for behaviour change aiming at sustainability or adaptation to a non-sustainable planet is important, where the learning process could or should be guided by experts on sustainability.

Knowles also defends the End User Development (EUD) principle to use Information and Communication Technology (ICT) to bring citizenship awareness for the necessary behaviour change. EUD aims to facilitate end-user empowerment and could be used by citizens to further ‘spread the word’ of sustainability [4].

Design interactive systems that can be adapted is the strategy that has been used to support the use of those systems by a diversity of people with different profile [2]. The fact that educators can adequate the content of those systems considering their characteristics and needs makes this strategy useful in many areas such as business, health, entertainment, education, sustainability, etc [6,8].

On the other hand, designing a system that allows co-authorship so that it can be adapted for different groups of final users is a complex task. Interfaces must provide awareness so middle users, educators, can realize this possibility and know how to easily change the system or its content for the final users, the learners. There is a lack of strategies to support the design of such systems [2,6,8].

Design patterns called here as co-authoring design patterns are presented to support co-authoring systems development, pedagogically suited to the targeted learners, citizens, to achieve a sustainable life style.

Such patterns were validated through case studies with undergraduate students and professors using the prototypes created based on these patterns.

We discuss the adaptation of the systems considering the educational area and how it can be used to explore the concepts of sustainability related in [7].

Co-Authoring Patterns

Considering the design cycle of system for co-authoring, there are three kinds of stakeholders: authors (designers), co-authors (middle users or educators) and final users (learners).

Authors can be any person involved with design, i.e, who develop the system that allow the co-authoring. They are responsible to define the three parts of that co-authoring system: I) Colors, system name and things related to the layout; II) to allow and support the co-authors to define desired information related to content and navigation for the system; III) to create the mechanism of the system to use or display the

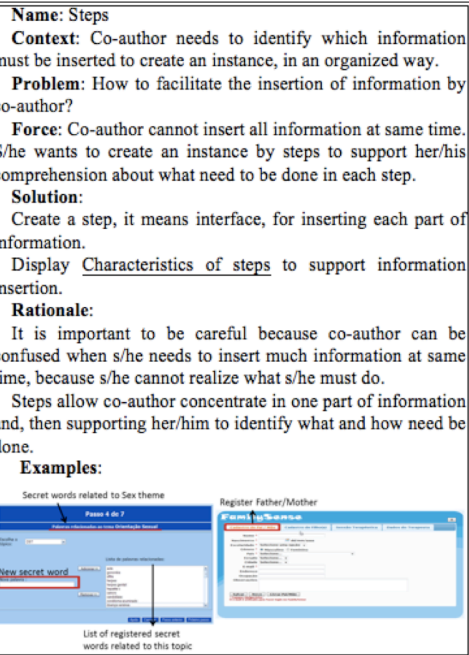


Figure 2. Pattern 'Steps'.

navigational model as well as the content inserted in the system.

The co-authors are people as educators who will manage the system to insert information on it or adapt it and its content according to their goals for the final users. In a classroom scenario, the co-authors would be the educators and they can adapt the system and use it in order to explore the sustainability theme like the pollution or energy with the learners.

The final users will use the instance of the system already adapted. In the same class scenario, the final users would be the students.

Investigating the patterns found in the literature [1,2,3,5,6] and other design patterns, we notice that they do not describe solutions related to co-authoring. After some years working on software development for co-authoring [9,10,11] and the lack of bibliography, we formalized co-authoring patterns [8] using a pattern language to describe patterns [3].

Each pattern we created has seven elements: i) name: expresses the main idea of the pattern; ii) problem: specifies the problem that the pattern is meant to solve; iii) context: enlist the problems the pattern can be applied to solve; iv) forces: considerations that require solution; v) solution: main message of the pattern; vi) rationale: explanations about the solution; vii) examples: images to illustrate and facilitate the solution understanding [2,8].

All the information about each pattern can be found in ¹, and some patterns are illustrated by figure 1 and 2, but their names and a brief description are described below:

1. Co-authoring Option: The co-author has to be able to identify the possibility of inserting information to be used and displayed in the system. (Figure 1)
2. Synthesis: The co-author has to be able to see a tip related to co-authoring system utility.
3. Goal: The co-author has to be able to know more details about the co-authoring system utility.
4. Information: The co-author has to be able to insert information to create instances of the co-authoring system.
5. User: The co-author has to be able to identify who created or accessed the instance of the system.
6. Steps: The co-author has to be able to identify which information must be inserted to create an instance in an organized way.
7. Characteristics of steps: The co-author must be guided while inserting information in each step.
8. What need to be done: The co-author must be informed about what can be done at each step.
9. Reuse of information: The co-author has to be able to use information from previous instances created by him/her or others.

Case studies

Case studies were done in order to observe the read and the use of the co-authoring patterns to make

¹ http://lia.dc.ufscar.br/coautoria/padroes_coautoria.pdf

prototypes and then use them. One of the studies is described into three parts.

First part

In the first part of the study, 25 students filled a pre-questionnaire related to their experience and knowledge about Software Engineering, HCI and computer system development. This part showed that the participants had some experience with computer systems, prototyping and designing.

Second part

In the second part, the design patterns concept was explained for the participants and some examples of patterns for social network, desktop systems, etc. were presented. Their work in this part was to design a prototype using co-authoring patterns. These patterns were not presented before in order to observe participant's comprehension through reading. Then the participants filled a post-session questionnaire (based on Likert Scale) to report their opinion about the difficulties and facilities to design interfaces using the patterns.

Third part

In this step the prototypes created were used for professors of public schools during class. The opinion of the professors who used the prototypes were also collected in order to evaluate the results.

Discussion

As mentioned before, it is a hard task creating a system that allows adaptation of its content or navigation model. We need to formalize knowledge, methods and strategies to support such tasks. In this context we presented the co-authoring patterns

intended to support educators to design education process and content to be used on ICT solutions to support meaningful learning.

Analyzing the questionnaire results of all parts during the case studies, we notice evidences that the co-authoring design patterns could be easily understood, considering the number of positive answers. The participants reinforced the facility in understanding the patterns as most of them reported positive aspects. Also, with the patterns' adoption, the participants were able to identify and solve more problems during the prototyping stage, inspiring the participants to use them.

In this context, there are evidences that co-authoring patterns can be considered a potential strategy to support designing educational suited systems.

Also, the co-authoring in educational computational solutions brings the specialist in sustainability to the role of educator, developing the final design for the educational tool based in a meta-design initially proposed, supporting the principle of EUD, as defended by Knowles [4].

We highlight that co-authoring patterns emphasize the reuse of information, allowing designers to develop a system where educators can easily change and adapt the information according to their pedagogical goals for Knowles' Plan A or Plan B, as well as the citizens' context approaching questions to improve the awareness on sustainability.

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