

Tag-based Experiences for Supporting Collaboration at the Workplace

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Abstract. Nowadays, mobile devices and applications offer new possibilities to learn anytime and anywhere. These technologies caused a disruption in traditional learning, opening up a new range of opportunities for learning at the workplace. Quick Response (QR) codes are one example of technology popularized with the adoption of mobile devices. When attached to an object or location, QR codes add a digital layer of information that transform and extend the way workers interact in their daily routines. This paper presents an illustrative scenario in which QR codes are used to support collaboration at the workplace. These QR codes are generated with etiquetAR, an authoring tool that allows creating personalized QR codes that users can access and contribute to with comments. In this scenario, QR codes act as the element for triggering interactions, opening a new communication space that promotes collaboration, sharing and discussion among workers while enhancing reflection and facilitating decision making processes.

Keywords: mobile learning, QR codes, informal learning, collaboration, workplace.

1 Introduction

Traditional learning practices are changing led by the advance of Internet, mobile devices and the evolution of Web 2.0 applications and other software tools [1, 2, 3]. Nowadays we have the opportunity to learn anywhere and anytime through our mobile devices, moving and changing our learning context continuously. Also, mobile technologies open up a new range of situated learning scenarios that combine activities taking place at several locations. In these scenarios learning occurs through conversations across multiple contexts (workplace, home...) and among people using their personal devices [4]. Moreover, when integrated as a support into people's daily work routines, mobile technologies act as facilitators to mediate in the interactions between workers and the workspace, offering new possibilities for collaborating at the workplace.

Augmented reality and tag-based technologies such as QR (Quick Response) codes or Near Field Communication (NFC) are example technologies that can be easily integrated as a support for daily work routines. This type of technologies enable new

forms of interaction with the environment, adding layers of digital information over physical spaces to augment users' experiences in context [5, 6]. When these layers contain information and resources related with people interests, workspaces become digitally augmented physical environments able of encompassing engaging situated learning experiences [7, 8].

In this paper, we focus on the potential of QR code technologies for supporting collaboration at the workplace. Particularly, this work presents an illustrative scenario in which a research institute is augmented using QR codes generated with etiquetAR¹⁰. etiquetAR is a mobile and web-based authoring tool designed for learning purposes that allows creating personalized QR codes that users can access and contribute to with comments [9]. The illustrative scenario aims at enhancing and promoting collaboration among workers in the research institute in order to improve and facilitate decision-making processes. QR codes are proposed as an element for triggering interactions in this scenario by opening a new communication space to promote sharing and discussions among researchers.

Before presenting the scenario, Section 2 introduces a small review of QR code technology and its context of application found in the literature. Section 3 provides a glimpse into the main functionalities of etiquetAR and the characteristics of the QR codes generated with this tool. Section 4 describes the aforementioned illustrative scenario, which takes advantage of all the functionalities enabled by the QR codes generated with etiquetAR, using them as elements, not only for providing information, but also for workers to bind content and contributing with information and maintaining conversations. Section 5 details the experimental design, the research questions addressed, and the evaluation methodologies that will be employed for analyzing the data extracted. Finally, Section 6 highlights other research avenues that could be derived from the scenario.

2 QR codes & contexts of application

QR codes are gaining traction in Europe and its use is becoming extensive [8, 9, 10, 11]. Currently, QR codes are used mainly in store windows, posters, TV commercials, offices or CV cards as a marketing technique for providing information to the consumers and also for capturing their interests. However, in the last few years QR codes have been applied in other several contexts apart from the commercial, mainly due to their lower cost and easier production as compared with other similar technologies such as NFC. Further, QR codes can be read with most smartphones using multiple applications in any operating system, this being one of the main advantages over other technologies in more cultural and educational contexts. In Ashford words: “QR codes are a low-threshold technology. Low-cost, easy to implement, and easy to use, they are a technology that provides a lot of bang for the buck, when implemented wisely” [6].

Libraries, University Campus or cities in Europe have been exploring the potential of QR codes as a link between physical and virtual worlds [11, 12, 13, 14]. The results of these studies show that QR codes are a good mechanism to add the virtual

¹⁰ <http://etiquetar.com.es>

to the physical for providing useful situated content [11]. For instance, the work by Schultz, which researched the usage and adoption of QR codes in a library and in a museum, concludes three key aspects about this technology [13]. First, although the usage of QR codes was low, young people and smartphones' owners use them. Second, QR codes are only used for providing one-way information but not for starting a conversation. And third, QR codes have a great potential for personalizing a visit to an institution.

In this paper we present a scenario that advances on the research of QR codes in two ways: its usage and its context of appliance. First, and related with Schultz's second finding, we propose using QR codes as mechanism not only for facilitating information, but also as situated-crowdsourcing elements to share ideas. Second, we want to apply QR codes as a support at the workplace. Up to now, and to the best of our knowledge, QR codes have been mainly applied in non-formal educational contexts for delivering contextualized information. The scenario proposed here aims at understanding the benefits of using QR codes in a more informal context and, specifically, learning at the workplace.

3 etiquetAR: creating dynamic QR codes

In the scenario that we propose in this paper, we use a particular kind of QR codes generated with etiquetAR (Fig 1). etiquetAR is a mobile and web-based authoring tool for supporting the design and enactment of learning experiences based on QR codes. With etiquetAR, any user can create their personal QR codes with three main particularities.

First, QR codes generated with etiquetAR can contain a link to more than one resource. This is managed using profiles, which allow assigning a label to each of the resources in the tag so as to enable the user, when reading the tag, to select the most appropriate content according to his/her interests (profile).

Second, tags can be dynamically changed once they are created. That is, the image of the QR code is always maintained and users can use the web application to change its content whenever they like.

Third, the different resources in a tag can be commented. When a user scans a tag and selects the content, s/he can add comments related to each of the resources and read the observations posted by other users. Finally, QR codes generated with etiquetAR do not require any special application to be read, so that people can use any QR reader to access their content.

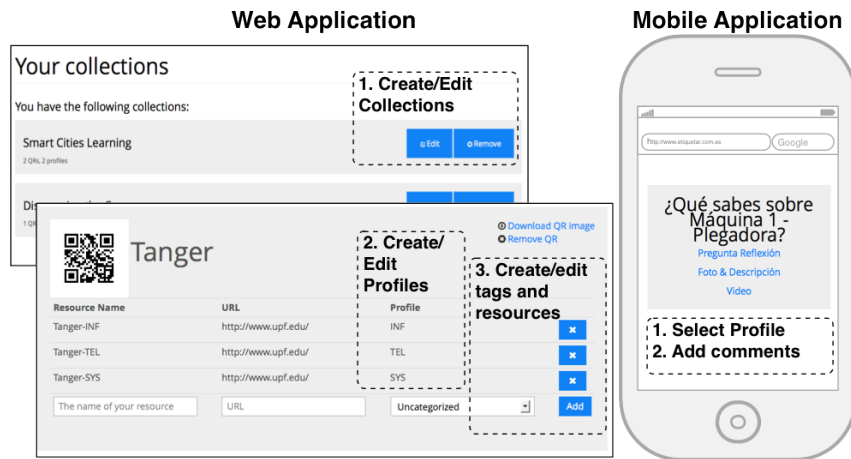


Fig. 1. EtiketAR (<http://etiquetar.com.es>) Web and Mobile application interfaces.

4 The scenario: tag-based experiences supporting collaboration at the workplace

This summer, the Center for Technology in Learning (CTL) of the Stanford Research Institute (SRI) starts an initiative that aims at augmenting the visibility of their research work with the rest of the centers of the institute. At the same time, this initiative wants to promote collaboration among CTL members to facilitate decision-making processes related to their current research advances.

One of the activities proposed for this initiative consists in using QR codes generated with etiquetar to augment the center with information about the running projects. For this activity, each member or group of members of the CTL working in the same research project registers to etiquetar and generates a QR code containing two links: (1) a text or a web page explaining the objectives of the projects currently running in the center and (2) open questions that the team members working in this project need to revolve to advance in the project. The first link is associated to the link (or profile) “About the project” and the second one to the link “Open Questions to Explore”. In this way, anyone reading the tag could select one of the two links.

The QR codes generated will be printed three times and attached to different locations at the research center. One tag will be located at the dining room so that members of other research centers can read them and learn about the running projects. A second tag will be attached at the entrance of the building so that people from surrounding research centers and universities can see what is going on in the CTL. The third one will be situated at the entrance of the research member offices, so that anyone of the CTL can read what the different team members are working on.

QR codes are going to be placed in their locations for 3 to 4 weeks. During this period, researchers of the institute are expected to use their mobile devices to read the tags distributed along the different locations. Researchers could also contribute to the open questions posed by their colleagues by adding comments or suggestions on the

tags. Every week, the team members would meet and discuss the contributions to the tags to see whether they can use these proposals to advance on their research.

5 Experimental design and evaluation methodology

In the scenario proposed in Section 4, QR codes are expected to become a new communication channel among researchers for discussing and exchanging ideas and suggestions to advance in their projects. In order to analyze the validity of this hypothesis, we propose an experimental design that addresses the following research questions:

- (1) Are QR codes generated with etiquetAR (which support dynamic changes and comments) a good mechanism for triggering conversations among researchers at the CTL and facilitating collaboration?
- (2) What is the adoption of QR codes at the CTL?
- (3) What are the usage of QR codes and the communication patterns among researchers at the CTL?

A total of 57 researchers of the CTL at the SRI are expected to participate in the experiment. In order to evaluate and analyze the results we propose an experimental design divided into 3 phases (Fig 2).

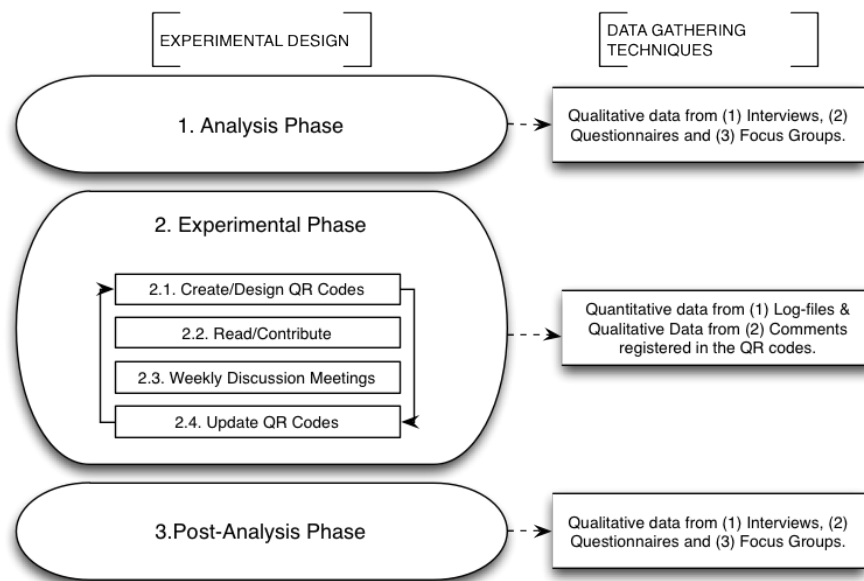


Fig. 2. Experimental design schema and data gathering techniques.

- (1) **Analysis of the current collaboration patterns:** This phase will consist in analyzing what the current collaboration patterns established between CTL researchers are. Aspects such as how often they collaborate and the type of collaboration mechanisms they usually employ are the type of information that we expect to collect in this phase.
- (2) **Experimentation:** During 3 to 4 weeks, the researchers will be asked to create and design their QR codes (2.1), read and contribute to others' content (2.2), make weekly discussions for sharing ideas about others' contributions (2.3) and update their QR codes if necessary. This process will be repeated weekly during the experimentation period.
- (3) **Post-analysis of the collaboration patterns with QR codes:** In the same way that in the first phase, the idea is to analyze the impact of using QR codes based on researchers' interactions and opinion about the experience.

As shown in the left side of Fig 2 we will use different data gathering techniques depending on the phase of the experiment. In the first and third phases, we will conduct tests with open and closed questions, interviews and focus groups. In the second phase we plan to register the interaction with the tags using log-files as well as the comments left by the participants. This combination of data gathering techniques will allow us to obtain both qualitative and quantitative data from different sources.

For the data analysis we will follow a mixed evaluation method [15] combining both the qualitative and quantitative data obtained. Then, we will triangulate the evidences extracted from the different data sources for extracting the partial results that will allow us to answer the three above-mentioned research questions.

6 Conclusions and future work

This paper proposes a scenario that employs QR codes as the basic elements for supporting collaboration at the workplace. These QR codes are created with etiquetAR in order to provide more than one unique link from the same QR code image and to enable other researchers to contribute to the tags with comments. The QR codes generated are used in this scenario as communication and collaboration channels where researchers can contribute with ideas and suggestions for their colleagues.

The scenario presented here is going to be carried out from October 2013 to January 2014 in order to understand whether QR codes are a useful mechanism for supporting informal situated collaborative learning at the workplace. Specifically, the three aforementioned research questions are going to be explored in this experiment.

However, this scenario also opens other research avenues. For example, it would be interesting to analyze how QR codes can be used in other similar contexts to transform any object into an augmented research object to support learning. Another idea would be to understand whether adding elements physically located at the workplace, such as screens summarizing the information collected from the tags, could be prompters of informal meetings between members of other centers. Finally, other aspects related to how an idea evolves from the moment that it is tagged to a particular location could be analyzed from the data collected in this study.

These questions, and many others related with the potential of QR codes for supporting situated informal learning scenarios at the workplace can be discussed. This paper only provides a first idea about how a real scenario of these characteristics could be addressed.

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