

Wikis: Do they need usability engineering?

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Abstract

Today, Web 2.0 is one of the most used buzzwords for a conglomerate of technologies within the e-learning community. However, these are a new arrangement of standard technologies, the applications of which are primarily motivated by the slogan “the user is the content”. But are Wikis, Blogs, Podcasting etc. actually the great promise for the learning future? Studies and research work in this area are still too rare for empirical evidence to substantiate these theories. In this paper we present the use of a Wiki system within a particular setting in Higher Education. Based on the model of Atkinson, we determined the influence of possible variables on this type of system.

On the basis of two empirical studies, we are able to conclude that both lack of motivation and lack of usability are the main reasons why learners show so little enthusiasm for using wiki systems, thereby confirming the continued validity of the Atkinson’s model. Summarizing, we consider that the ease-of-use aspect is going to be the crucial factor of the Web 2.0.

1 Introduction

Over the past years, we have been facing a tremendous increase in the spread of wiki-systems; there is literally “a wiki hype”. They are used for knowledge management, online collaboration, and establishing comprehensive encyclopedias both in and out of educational settings.

The concept of wikis was introduced by Bo Leuf and Ward Cunningham in 1995 [11]. The name wiki was derived from the Hawaiian word *wikiwiki* which means quick. A wiki system is an online platform which allows each and every user to create articles and also to edit, revise, extend, or link existing articles. The initial aim was to develop an easy-to-use knowledge management system enabling effective and efficient online collaboration. Wiki systems therefore provide markup languages which are mostly based on HTML elements, basically reducing it to the very basics, or they provide editors enabling the incidental creation of contents. Wikis are generally supposed to be easily usable by all users, experts and novices.

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The first implementation of the wiki principle was *wikiwikiweb* (www.c2.com/cgi/wiki) by Ward Cunningham in 1995. Further implementations were *CoWeb* by Mark Guzdal in 1997 [9] and *Nupedia* in 2000. Nupedia, originally, was a rather traditional approach to establish an online encyclopedia where authors were experts and articles were reviewed in a seven-step editorial process. Due to a lack of participants and the extensive review process, Nupedia failed in the end. Nupedia's successor was *Wikipedia* (www.wikipedia.org) which was established in 2001 by Jimmy Wales. It fully incorporated the described principles of openness and freedom. Today, it is the most successful wiki system. Due to the great success, the possibilities of the wiki principle were also discovered for educational purposes and technology enhanced learning; to communicate, to collaborate, or to contribute to a common pool of knowledge. Research has demonstrated that wikis can successfully be applied in education, for example refer to [10], [3].

Besides the great freedom granted by wikis making a whole community quickly and easily collaborating and sharing knowledge online, wikis do have a number of disadvantages and bear a number of potential risks. First, even if wikis use simplified mark-up languages, some computer skills are required and WYSIWYG editors are implemented sparsely. Second, the freedom and openness makes wikis vulnerable for destructive activities and vandalism. Third, in many wikis an organizing structure is lacking and thus orientating in the system and retrieving certain information might be difficult. Finally forth, points of critique have been expressed concerning accuracy and completeness of contents (because there is generally no review process), unclear expertise of contributors, or a lack of citing resources of information.

2 Wikis, motivation, and usability

Despite tremendous spread and popularity, wikis were subject to usability studies very sparsely in the past. This is remarkable since wikis claim to enable quick (“wikiwiki”) and easy use. Consequently, the usability of wiki editors as well as the wiki itself is crucially important aspects for voluntary and quick contributions. On the one hand, there is a body of research demonstrating that wikis can successfully be applied to a variety of purposes, especially education [10], [5], [4], [14]. On the other hand, however, there is some evidence that active contributions are rather sparse when users are not “forced” to contribute to a wiki. This, for example, is the case in many studies regarding wikis in education where students and pupils are “encouraged” by teachers, e.g. by grades for contributions or because using and contributing to wikis is an obligatory work for the class. In contrast, Ebner [7] found in two studies, carried out along a whole semester, that none of in total 287 students actively wrote an article or edited an existing one. These findings are supported by usage statistics of Wikipedia, which yielded that only 2.5 percent of Wikipedia users actively contribute to the development and refinement of contents [17].

Reasons for the lack of active, voluntary contributions to wikis are likely motivational reasons, mutually interdependent with additional factors like social components or usability. As theoretical background, the motivation to voluntarily contribute to a wiki, either in form of creating new articles or in form of editing existing ones, can be described in terms of achievement motive [1]. Motivation for achievement-oriented behavior is seen as the result of conflicting tendencies of approach and avoidance. Each achievement-oriented behavior is associated with the possibility of success (e.g., the feeling of pride) and the possibility of failure (e.g., the feeling of shame) and thus connected to hope for success and fear of failure. The tendency to strive for success is characterized by the subjective judgment of the probability of success (W_s), the expected incentives (A_s), and an individual disposition (M_s). In turn, the tendency to avoid failure is characterized by the subjective judgment on the probability of failure (W_f), the expected consequences of failure (C_f), and again an individual disposition (M_f). The subjective expected utility (SEU) is considered to be an additive

function of both tendencies. Atkinson & Litwin [2] found evidence for the validity of the model in a ring-toss experiment. In an interesting longitudinal study, McClland & Franz [12] could demonstrate that a person's approximately financial income could be predicted by this model quite well ten years in advance. Weiner [15], [16] extended the model by the component of attribution of cause (internally vs. externally).

This model can be considered as an underlying principle for the impact of expected ease or difficulty of using/contributing to a wiki. In summary, Atkinson's model claims the tendency (T) for an achievement-oriented behavior is given by

$$T = W_s * (M_s * A_s) + W_f * (M_f * C_f).$$

Consequently, the expectation that contributing to a wiki is difficult decreases W_s (the expected probability of success) and increases W_f (the expected probability of failure) at the same time. Because on the one hand, individual dispositions are independent from the usability of a wiki or a wiki editor respectively, M_s and M_f are constant terms. If we hypothesize that the incentives of success (A_s), for example social acknowledgment, and the subjective judgment on the consequences of failure (C_f) are balanced, we recognize that the tendency or motivation to actively contribute to a wiki is tremendously depending on the usability of a wiki and the belonging editor. Very slight changes in the judgment of probability for success or failure can change the behavioral tendency into a positive or negative value. Unfortunately, wikis are not particularly known for their ease of use. Generally, WYSIWYG editors are implemented sparsely, thus, a certain amount of expertise is required to use the mostly simplified markup languages.

Surprisingly, only a very little number of studies focused on the usability of wikis (e.g [6]), in terms of navigation through the body of existing articles as well as regarding the possibilities to create or edit articles. Sometimes it is assumed that the broad range and vast number of contributions to existing wikis might serve as a sufficient indicator for usability (cf. [6]). And sometimes it is argued that usability would be a "nice to have" for wikis. The literature concerning wikis lack an endeavor investigating an improving the usability of wikis. Moreover, specific usability characteristic for evaluating and describing wikis is lacking.

The focus of the present work is based on the theoretical background regarding motivation, as outlined above. As a hypothesis, the achievement motive is significantly determined by a user's estimation of the probability of success in attempting to contribute to a wiki, and by the estimated probability of failure in this attempt. Consequently, a user's expectation of usability might crucially impact the contribution frequency. More evidence for this idea comes, for example, from Fries [8] who found that the label High-End made students learn better with an eLearning system and evaluate it better in contrast to the label Beta-version. This clearly shows the importance of expectancy.

3 Experimental Setting

As a first step in order to clarify the importance and impact of expectancy on user behavior and judgments regarding usability of a wiki we analyzed the results of two studies. The data were collected in the framework of studies regarding the pros and cons of using wikis in higher education settings.

3.1 Experimental Design

The experimental basis for the present data was two studies conducted during a whole semester each at the University of Technology Graz and the University of Applied Science FH Joanneum Graz. In the first study students of both universities were supposed to collaboratively collect knowledge from the subject structural concrete, in the second students from at the University of Technology Graz should collect knowledge from the subject of visual basic for applications (VBA). Students were supposed to use the wiki during a whole semester. As basic motivation students were allowed to use the wiki's content in the written exam. The aim of both studies was to record usage data across the semester and uncovering factors influencing the amount of usage.

At the beginning of the semesters we distributed questionnaires to gather information like the previous knowledge about structural concrete, use of Wiki in general and about teamwork for learning, during the semesters we recorded usage statistics from the wiki systems, and finally at the end of the semester we distributed questionnaires asking for the general use of the wiki. To provide an initial basis of articles, in study 1 we created 30 articles and in study 2, as a tutorial, students were required to create one article at the beginning of the semester.

In total, 287 students from both universities participated in the studies. Due to a limited response rate for questionnaires we analysed the data of 165 students.

3.2 Bauwiki

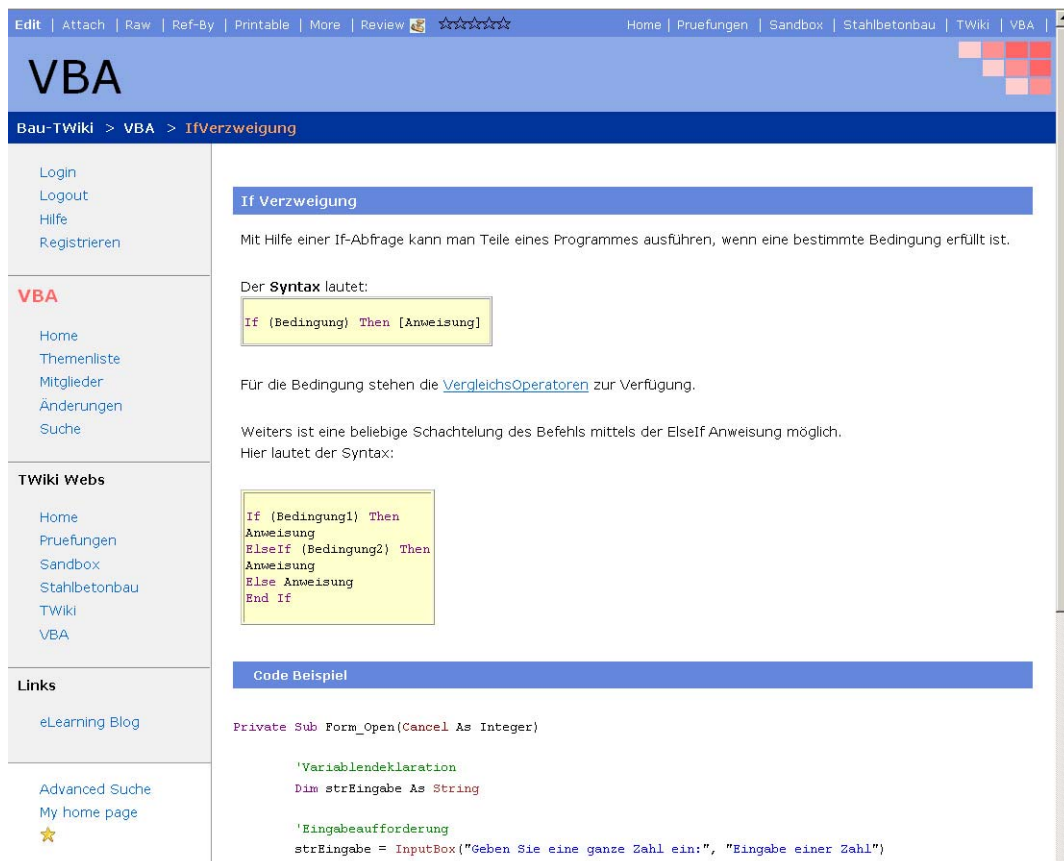


Figure 1 Screenshot of Bauwiki used for both studies.

We used a TWiki system for both studies, which is a freely available system (www.twiki.org) and which is one of the largest and most powerful systems among the approximately 200 existing wiki species. TWiki is based on cgi-bin scripts developed in PERL. PERL (Practical Extraction and Report Language) is a general-purpose programming language, having as its biggest strength,

excellence in the area of string and data processing, since most programs process strings or data or both. It provides access to C library functions for fine-grained control of files, processes, and network sockets, while, at the same time, handling the details of low-level memory management and offering powerful built-in data structures [13]. Moreover, TWiki is driven by the numerous available plug-ins, for example to insert formulas (LaTeX), tables, animations, or java applets. The implementation of Twiki for both studies was called Bauwiki (Figure 1).

3.3 Bauwiki's Markup Language

Editing or writing an article is easily. The TWiki markup language is very similar to usual HTML tags or in other words there are only few describing pattern an editor has to know. For example if a heading is needed only three dashes and a plus (---+) followed by the text have to be entered. Words get bold by enclosing them in asterisks (*), italic by enclosing them in underscores (_). If a list item is necessary the markup language code is therefore: 3 spaces and an asterisk. Unbelievable but with only few tags the whole text will be automatically formatted and each contribution looks the same as each other.

One of the disadvantages as we mentioned above is the lacking of organized structures. But the basic idea was to build a highly hyperlinked system, without a prior structure. The user themselves should organize the content by creating a totally free linked system. Of course this means that implementing a link or even a hyperlink must be a simple as possible. Therefore TWiki uses the CamelCase syntay in the same way as all other famous Wiki clones do. If a word is written in CamelCase style (at least two words written without spacing, but with beginnin Upper Case letter; for example: TwikiWord) an internal link will automatically created. This link points to a page with the same name. If this topic already exists only the link will be installed, if the topic doesn't exist the user is forced to write something.

Further funktioncs of the markup language are the possibilty to implement hyperlinks, tables, lines and so on.

4 Results

Both studies revealed quite surprising results. While 79.22 percent of students in study 1 and 95 percent in study 2 passively accessed articles from the Bauwiki, none of the 152 students of study 1 and the 135 students of study 2 actively added a new article or edited an existing one (refer to figure 2). Although, as in most previous studies, students were not forced to contribute to the wiki, we provided the incentive of allowing the use of the wiki during written exams.

As shown in Figure 2, reasons for not actively contributing to the wiki were in study 1, in summary, related to usability problems or expected usability problems (56 percent) and related to motivational factors (36 percent). Because of additional measures (each student has to write at least one article) in study 2 the arguments "didn't try" and "problems editing articles" get redundant, as Figure 2 show. But the proportion between motivation and usability problems was still the same (42% to 47%).

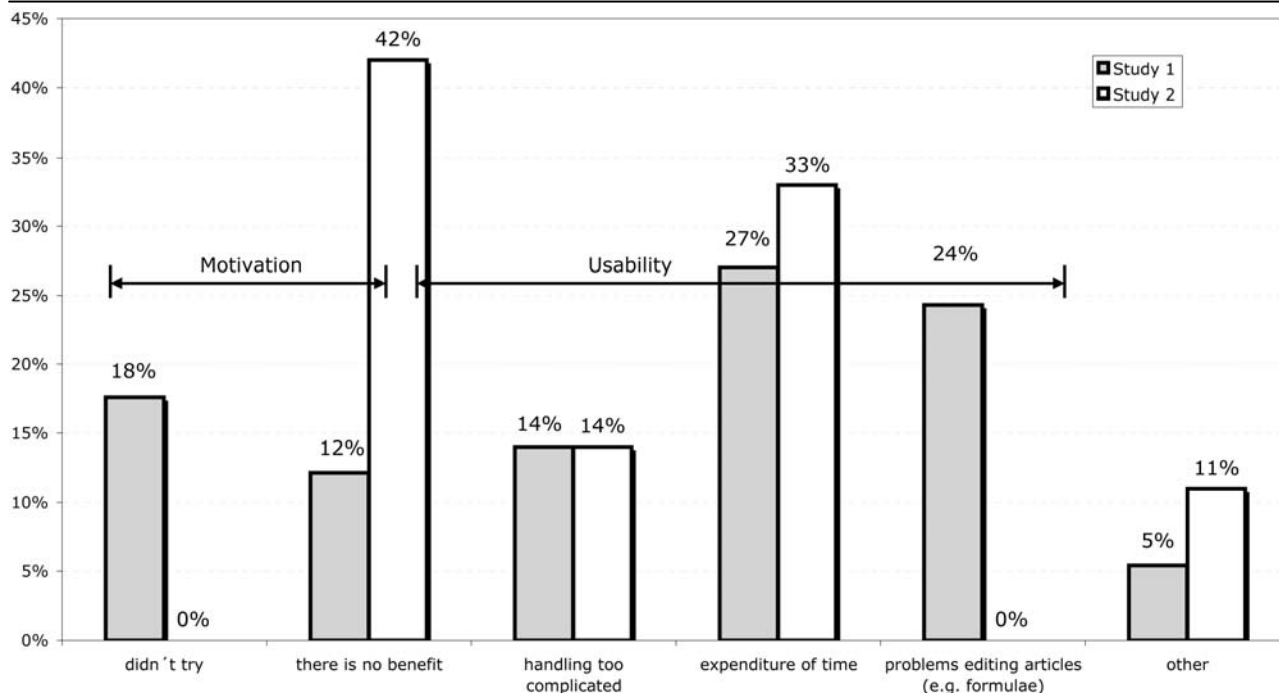


Figure 2 Reasons for not adding or editing articles in Bauwiki

Further analyses concerned the ease-of-use of the wiki and the quality of articles. The data yielded that the average rating was 1.70 (SD = 0.83) on a scale from 1 to 5, where 1 was the best rating and 5 the worst. Additionally, the average quality of articles was rated with 2.63 (SD = 0.78). More interestingly for the aims of the present work is the student's expectation regarding the ease-of-use and the efforts of time required to create and edit articles prior to using the wiki. In total 54.70 percent of students expected to need less than half an hour practicing to get familiar with the system, 11.11 percent expected to need half an hour to an hour, and finally 34.19 percent expected to need more than one hour to get familiar with the wiki. In this respect, we also analysed the relationship between prior experiences with wikis and their use and the estimated time to get familiar with such system. A Spearman-Rho correlation yielded $r = 0.44$, which is significant on the 1 percent level.

5 Discussion

The data of both studies underlying the present work revealed surprising results. Although to ease-of-use of Bauwiki was judged rather positive, and the quality of existing articles on a medium level, none of the in total 287 students actively added a new article or edited an existing one. The reasons reported were closely related to a lack of motivation and a lack of usability.

The aim of this work was to make a first step to focus on the students' expectations regarding usability and possible incentives of contributing. The present results can be incorporated in the achievement motive model of Atkinson [1], introduced initially. Almost the half of the students expected to need more than 30 minutes to get familiar with the wiki. If we interpret these results as a generally high expectation of difficulty, in terms of Atkinson this means a rather high probability of failure and a rather low probability of success. Such interpretation is emphasized by the fact that 56 percent (or 47 percent in study 2) of students reported usability-related reasons for not contributing (Figure 2). In the same way, reported motivational reasons for not contributing can be mapped to the incentives of Atkinson's model. The fact that 36 percent (or 42% in study 2) of students reported such motivational aspects, e.g. 27 percent (in study 2 even 42%) reported that

there no incentives of contributing to the wiki, is a clear indication, that wikis in a limited educational scenario, as in the current studies, are not able to spur students on contributing in an active way. – Even if students could potentially benefit from such contribution in the writing exams. Summarizing, with a high expectation of failure, a low expectation of success, and a low amount of incentives, the model would predict a behavioral tendency to desist from active contribution. – And exactly that's what we found in the present data and what is also indicated by the comparably small percentage of Wikipedia user who actively contribute to the system [17].

These results and interpretations give some evidence for the crucial importance of usability and expected usability of wikis. However, this importance is still underestimated. Some authors [5] argue that increasingly implementing WYSIWYG editors is not necessary. Désilets [6], one of the few who conducted usability studies with wikis, for example, argues that it would be a good result that a class of 15 students could use a wiki after 30 minutes of training to collaboratively web-based stories. At the same time these authors encountered a significant number of usability problems where one third to one half was catastrophic. We argue that these results are alarming, especially because the task in this study was rather simple and students performed this task in the classroom meaning that they were required to do so.

Thus, from our point of view and based on the current results, future work must increasingly address usability of wikis. This is true for wiki editors and markup languages but also for the structure of contents, navigation, or visual presentation formats. To give an example, an interesting approach might be an evaluation or comparison of different markup languages used in wikis. Moreover, the SEU-model of achievement motivation introduced in this work offers an interesting basis to predict user behavior and to empirically investigate the usability of wikis.

6 References

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