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# Usability and Elearning

## Introduction

This paper aims to present some general points about the idea of usability in a context where computers are used in a learning situation. Though many basic usability precepts - guidelines for creating an "easy to use" human computer interface - can be applied to any human-computer interface, an effort will be made to draw attention to the specific case of elearning.

Individual topics are presented as the following questions:

1. What is usability?
2. Where does usability apply to elearning?
3. Why does elearning material need to be usable?
4. How can we integrate usability into elearning?
5. What factors can affect usability?
6. What are some specific ways to make elearning more usable?

A conclusion will follow these 6 sections. References to printed and online literature are provided at the end.

## 1. What is usability?

Whoever has spent hours figuring out how to set a VCR clock already has a good idea of what usability is not. Usability can be simply defined as ease of use, the facility with which one can get something doing what it is intended to do. It can apply to practically any object that gets put to use for some purpose.

Consider one example of a hall with several doors. Faced with the first door in the hallway, we recognize the **familiar**: a structure in the wall with spaces around most of it and a handle that we already know allows us to open it and walk through. We reach for the doorknob and push. If that doesn't open the door, we try again, this time pulling. After opening and continuing down the hallway, the next few doors appear with the same appearance, or user interface: the same type of doorknob is located in the same place on each door. We can open each one without having to spend **time** reflecting on how the door works. If we are then faced with a door that has a different knob located somewhere else than they were on the previous doors, and that opens by pushing instead of by pulling, we are **forced to think** again about how we get to the other side of the door. What was initially a quite user-friendly hallway lost some of its usability by having a door that operated in an unfamiliar manner. (Kruse, A)

Extending this simple example to our experience with using computers, we can think of the various actions we carry out (clicking on a button with the mouse, entering our name in a text field, etc.) as opening the doors as we walk down the hallway. An object's user interface consists of the elements used to interact with that object. The user interface of a computer can include the keyboard, the mouse, the software that appears on the monitor and perhaps headphones or a microphone. Included as part of the software viewed on the screen, other interface elements are the visual objects that together form the graphical user interface (GUI) of a computer program.

A usable computer program then, is one that we can interact with to accomplish a certain task without wasting any thought on the steps necessary to get the program to work. Some authors refer to this as a **positive user experience**.

A broader definition of usability often includes the notion of accessibility. This refers to designing user interfaces in such a way that the program can be used by people that have limited options to interact with the computer interface (for example, people who have visual impairments and use special text-to-speech software, or who have physical impairments and use only the keyboard to interact with the computer).

## 2. Where does usability apply to elearning?

Defining elearning in a very general sense as any learning situation that happens with the help of a computer, then situations where usability come into play are the those where someone sits in front of a computer to interact with learning material. The obvious case is when the learner herself starts an online course and begins to execute the steps required to "take the course". In this case the course material itself would be that which should be usable. Not necessarily the course itself, nor the individual modules it is made up of, but the individual "pages" or screens constituting a module are the smallest units where one would begin to apply usability principles (to be discussed in more detail in the last section). They would of course be applied consistently over the entire course. Discussions of usability in this paper, and in the literature on which this paper is based, refer most often to this level: the actual learning material.

A step up from a single online course one may encounter a learning management system (LMS), offering the administrative functions related to taking and offering online courses. If such a system is present, the student is required to log on to it before accessing course material. Here too is an elearning situation where usability cannot be forgotten.

Other categories of users also come into contact with an LMS: teachers, system administrators, course developers and designers. Considering the variety of tasks that all these users need to accomplish, ease of use of the LMS is again essential. Unfortunately, this type of elearning software is often

difficult to use. (See for example, 2 LMS evaluations taking usability into account: Edutech, 2003 and Pigué and Pareya, 2000 )

Changing scale from a detailed to a more general level of course organisation, one may ask whether usability can be applied at the course design level. If one admits that the user interface is a reflection of overall course design (main menu items representing course chapters, for example) the dividing line between interface design and course design begins to blur. Questions concerning user interface usability, such as "does the user easily understand which buttons to click in order to complete a certain task?" have parallels where course design is concerned, for example: "does the learner quickly understand what a certain task will help her learn?". Referred to as "learnability", this is indeed the principle goal of any online educational material.

The last section of this paper will offer more practical tips about the details to keep in mind when designing usable online courses. It is interesting to note here, however, how course design and usability design considerations both appear on a checklist for usable elearning. Richard Miller's checklist for usability in elearning sites lists criteria in seven different groups. (Miller, 2002) Three of these groups, module design, content organisation and sequencing, could just as easily be on a checklist for course design.

The importance of achieving both usability and pedagogical goals is clear. Jesse James Garret, author of *The Elements of User Experience*, emphasizes that a truly positive user experience results when a site satisfies both the needs of the organisation offering the product, in this case the educational institution, and those of the user of that product, thus the learner. He contends that "usability is one attribute of a successful user experience, but usability alone does not make an experience positive for the user." (Garrett, 2003) Following Garret's view, only if the learner can use the content to actually acquire knowledge is the user experience indeed successful.

Applying usability at the course design level is also consistent with the view that learnability is the main measure of usability for elearning. Don Norman, an expert in design and usability issues, has been quoted as saying that, where elearning is concerned, "usability is not the major issue; learnability is." (Feldstein) Michael Feldstein tends to combine the two ideas with his compelling definition: "a 'usable' course is one that teaches in the ways that the students need in order to get the value that they were looking for when they signed up." (Feldstein)

Those responsible for producing elearning material can therefore take usability into consideration when designing individual pages and, at a more general level, when designing an overall online course program. The investment required may initially seem considerable, but can have worthwhile returns on the ultimate success of an online program, for reasons outlined in the next section.

### 3. Why does elearning material need to be usable?

Whether the concepts of usability and learnability are considered to be two sides of the same coin or two separate coins, it is clear that they are both necessary attributes of a successful elearning program.

With an approach that differs slightly from that of Feldstein and Norman, others consider usability as a precursor to learnability. Glowalla uses the terms usability and utility, where utility refers to an online course's usefulness for learning - similar to learnability - and usability is the extent to which one can realize that potential utility. (Glowalla, 2003) Returning to his analogy of a hallway full of doors, Kruse gives a similar ordering of usability before learnability: "a program's interface is the door between the student and the instruction." (Kruse, A)

Indeed, if a learner is quickly confused about how to navigate around course material to the extent that he's not able to take advantage of whatever learning opportunity he might have found, the chance to target the intended educational goal is missed. Imagine a scene by a serene lake in the mountains: here, we equate acquiring knowledge with the ability to sit calmly by the water and absorb the sights, sounds, smells and textures of the surroundings - this is the learning place. In contrast, imagine a different scene in a traffic jam in the city: sitting in a cramped car, frustrated by confusing road signs and a bad map, distracted by noise and stressed by uncertainty. This learner, trying to find his way to the mountain lake, the learning place, is blocked by the obstacle of poor usability - no learning can happen.

Dave Smulders outlines the need to consider the elearning consumer as a kind of double persona, the learner-user. A distinction is made between form, the user interface, and content, the learning material, where the user part of the persona is concerned with the form and the learner is interested in the content. "By navigating their way through the form of your Web-based environment, users can access the content, at which point they can do their learner's cap..." (Smulders) The learner-user operates differently depending on which persona is called upon: "using" an elearning site means making functional connections, whereas "learning" at that site means making cognitive connections. Clearly, doing this cognitive work of learning requires mental energy on the part of the learner. The thinking budget is better spent on the content than wasted on the navigation, as suggested by Steve Krug's "first law of usability: don't make me think!". (Krug, 2000) If making functional connections can be cognitively effortless, those cognitive resources are made available for the real work: learning.

In a learning situation where usability has not been made a priority, the resulting frustration can only dampen a student's motivation. Given that motivation is a significant factor in determining the success of any learning endeavor, creating usable elearning can avoid the drop in motivation caused by a loss of orientation. As Kevin Kruse puts it, "the success of any training

program is largely dependent on the student's own motivation and attitude. If a poorly designed interface has them feeling lost, confused or frustrated, it will become a barrier to effective learning and information retention." (Kruse) Jakob Nielsen points out that it is easy to lag behind in an online course or be distracted by other more immediate circumstances, reducing motivation to continue. "Online courses are inherently not very motivational and not as effective as traditional courses. Hence, there is all the more reason for you to keep the user experience good and engaging...". (Elearningpost, 2001)

There are also other practical reasons why designing usable elearning makes sense. A negative user experience can have an effect on the long-term success of elearning programs by increasing the number of unsatisfied learners. A student may complete a course she signed up for in spite of her dissatisfaction with the interface, but is very unlikely to sign up for another course afterwards. Referring again to his double learner-user persona, Smulders states, "Online courses that are designed for learners without any thought to users invariably results in frustrated students", and further, "...as online courses from institutes of higher education have flooded the marketplace and become a constant source of criticism for their poor design and high drop-out rates, it is clear that the rarely made distinction between learners and users is problematic." (Smulders)

The level of acceptance of online education on the part of learners and teachers will determine, in part, the economic sustainability of elearning. If the potential benefits of computer assisted learning are buried by dissatisfaction with unwieldy LMS and course interfaces, efforts to market such new forms of learning will be in vain. Given the high cost of preparing online material, higher education institutions cannot afford to ignore the various users' requirements for learning tools that are simple to understand and enjoyable to use.

#### **4. How can we integrate usability into elearning?**

Usability experts generally agree on the answer to this question: test early and test often. Even with attempts to incorporate usability guidelines into elearning design, testing is still highly recommended. The reason for this is that the people involved in designing online courses, or any product to be used by others, are themselves already too familiar with how it is intended to work and lack the distance necessary to pinpoint problem areas. Only test users who have not yet had any contact with the product can give an accurate idea of how easy or difficult it is to use.

Usability testing has not as yet become a standard step in the online course development process. A common assumption is that usability testing is an expensive undertaking carried out only by specialized groups of experts. Though this can be true, it need not be the case, as will be shown by other less expensive options mentioned below.

The point of testing for usability is to expose prototypes to test users

unfamiliar with it. Their experiences are valuable and essential to finding out just how well a program "works" in very practical terms. They can address questions such as: Is it easy to find one's way through an activity or site? Are there places where the user didn't understand where they were or what they could do? or, Is the organisation and purpose of the material clear? Testing for learnability could be applied as well by asking slightly different questions of the test learners, for example: Was the goal of a certain learning activity evident? What is being taught on the site? How should a learner proceed through the course material? Michael Feldstein insists on the importance of elearning specific testing: "If we are serious about making our e-learning usable, we in the field must make a concerted effort to define usability questions that are related to the learners' cognitive goals..." (Feldstein)

There are several ways to arrange user testing. In an ideal situation with a substantial budget, one would hire usability experts to set up an optimal test situation with large groups of carefully selected test users. If funds are available, then it certainly makes sense to opt for high budget testing; if not, however, simpler and still quite effective options are available that provide very reliable results. The basic model is common to most approaches: a test user is faced with a program and left to her own devices to figure out how it works. She will be asked questions about her experience and encouraged to think aloud during the testing to give as much feedback as possible about how quick and easy (or not) the program is to use.

Some of the more costly testing scenarios may include hand picking a large group of test users who represent the profile of the intended user audience. Testing sessions can be recorded for viewing synchronously or after the session. Special hardware and software may track the user's eye movements to record the visual paths that they followed. Mouse movements can be recorded and later analyzed by screen recording software.

Some of these options may only be affordable in a research setting however. In the day to day work of producing online educational courses it is more common that financing is not abundant, yet this does not preclude carrying out viable user testing. Steve Krug's highly recommendable book, "Don't Make Me Think" (Krug, 2000) provides excellent advice on how to conduct usability testing at low cost and still obtain high returns. The subtitle of the chapter on testing emphasizes a crucial point: "keeping testing simple - so you do enough of it". His advice is to do simple testing early, and repeat the process as often as possible. The simplest approach could consist of just sitting next to individual test persons while each one makes his way through the learning material, taking notes and asking questions where appropriate. Because the goal of testing is to inform - not, as is often the belief, to do a scientific experiment - a test with one single user will give valid results. Showing that 2 tests with 3 users reveals more problems than 1 test with 8 users, Krug insists on conducting several simple tests during development.

Heuristic testing is another approach that doesn't require recruiting real test

persons. Here a small team of experts would be asked to examine online content for usability. Another proponent of low cost usability testing, Michael Feldstein calls for research in order to determine best practices specific to elearning. These would then be applied by experts during heuristic testing. (Feldstein, 2002).

Paper prototyping is another even lower cost option. Applied very early in the development phase of a project, this testing is carried out using simple paper printouts of storyboard screens. (Nielsen, 2003) Significant development cost can be saved for two reasons. First, no time is lost developing a prototype that will require modification after the paper prototypes are tested. Second, user feedback is incorporated into development at the earliest possible stage of development, providing essential information that eliminates development time that would have been spent modifying initial working prototypes.

Developing for so-called personas, a process incorporating usability during the entire design period, is an approach suggested by usability expert Alan Cooper. Rather than testing on real people, the project team invents a detailed persona closely representing a typical user for their site. Any design questions that emerge during development would be addressed specifically with this persona in mind. An effort is made to create as realistic a virtual test person as possible, including minute details like name, job, family, hobbies as well as their computer habits, whom they can "question" about their preferences.

Every university campus is teeming with potential test users: students. Attracting students to become test users doesn't need to be difficult. With fair monetary compensation for an hour or two of work, short-term commitment to abide class scheduling and the extra satisfaction of contributing to actual course development can be convincing factors. It's imaginable that a pool of willing and available testers could be formed during the academic term, and later called upon as needed during development.

Whatever the type of testing that is decided upon, it is important to remember that the process is iterative. Each round of testing will reveal the obvious points that somehow got overlooked. After testing the project goes back to development to resolve the problems uncovered in the test. Then another round of testing should be scheduled, followed by further development, and so on. Each testing session helps to clarify uncertainties encountered by the learner, allowing the team to produce ever more effective elearning materials.

## **5. What factors can affect usability?**

Following usability principles does not consist of simply following a fixed set of rules. Where learning content is concerned, the specific cognitive goals of a single module or exercise would determine the questions used to judge the usability or learnability of the content. Usability is a dynamic concept, evolving and differing over time and place.



The characteristics of any software that are perceived as adding to its ease of use are in fact the product of our collective habits over time. What we are used to is what we understand easily and quickly, it is what we have come to expect and is therefore intuitive to us. Habits change over time however, so that what we are used to today does not resemble what we were used to in the past. Computer technology and interfaces change quickly - what was new and strange to us just months ago may today seem quite familiar. As an example, consider the use of tabs (that mimic paper file folder tabs) as navigational interface elements. Not long ago they were novel, and perhaps took a little time to get used to; today they are common features of user interfaces. The look of buttons has evolved as well, where today we can recognize more than one visual representation of the places where we can expect to be able to click and make something happen. As Colin Mook puts it so well, "'usable' isn't inherent in a technology, it's a correspondence between a tool and the habits of the person that uses the tool." (Mook, 2003)

Not only is the concept of what is usable dynamic, differing from one time period to the next, it is also variable depending on cultural context. This relates to a rule that is basic to designing usable online courses or any online content: know your user. This means that it is indispensable that that cultural context of the expected users be taken into account. A difficult challenge of those producing elearning content is how to create a positive user and learner experience for different cultures. Issues that need to be addressed include language, reading habits, visual metaphors, age, etc. Dealing with language differences often involves more than simple translations, as learners from different language groups come to an online course with different histories and perspectives that go beyond simple choice of language.

Reading habits are also an expression of our cultural environments. A clear example of this is the assumption about how western cultures read in a Z pattern, left to right and top to bottom. (Kruse, A) Based on this, design for western users would incorporate that assumption into decisions about content placement on a page. In cultures where text is read from right to left, however, not only would the language need to be adapted but the relative location of the text on the screen.

Visual metaphors are often used as navigational aids. In addition, graphical content can play a major role in elearning content due to its powerful effect on information retention. What one associates with any given visual representation is strongly related to cultural heritage; choosing an inappropriate image for a target culture could at best reduce learning effectiveness - at worst, it may actually insult the learner.

When following the "know your user" rule, the user's cultural background is just the beginning of the picture. In addition to recognizing who they are, it is necessary to find out what equipment they will be using, the speed of their internet connection and their computer skills. In order to avoid forcing the user to wait while content downloads, it might be necessary to eliminate heavy

image files, for example, or to offer more than one option and let the user decide which to view. Dave Smulders offers an excellent example with a case of promoting collaborative work among students. Depending on the students' technological surroundings and experience, the necessary activities might be well suited or completely off base. He describes possible scenarios thus: "are they spread across a city or state in three or four high-tech labs with video conferencing facilities, or are they employees of an international non-profit agency with field offices in multiple time zones and equipped with unreliable technology?" (Smulders) It would also be necessary to know whether the users are familiar with the software and equipment or if the experience would be entirely new. Knowing the difference in the design phase makes all the difference during the learning phase.

## 6. What are some specific ways to make elearning more usable?

Many sources of usability advice, both printed and on the web, are readily available either as a checklist of items or discussed at greater length. It is impossible to provide a definitive list of concrete steps to take that are applicable to every case; each learning situation's specific goals determine the questions used to judge whether learners have achieved them. In addition to basic interface factors, specific questions about what has been learned and how it was learned would need to be formulated for each unit of content.

Because general usability guidelines do apply as well to elearning content, first some overall usability considerations will be presented below. Then several authors' advice about improving elearning interfaces in particular will follow. Finally, sources of several usability checklists available for use with educational content will be provided.

### General Usability Guidelines

The following universally applicable usability tips are taken from Steve Krug's "Don't Make Me Think - A Common Sense Approach to Web Usability". (Krug, 2000)

- **Don't make me think.** The main title of the book is his first rule of usability. This applies to elements that are not core content (navigation, layout, etc.) which should be self-evident, obvious and self-explanatory.
- **Provide a clear visual hierarchy.** This is crucial because we don't really read computer screens, we scan them. Especially, users rarely read instructions.
- **Design a simple and quiet layout with clearly defined areas, using conventional elements.** Conventions become conventional because they work and are therefore commonly accepted.
- **Make clickable items obvious and the result of clicking a button an**

**unambiguous choice.** Time should not be lost figuring out whether a button is a button, and what happens if one clicks on it.

- **Minimize text.** Krug's advice is actually to remove 50% of the text, then remove half of what's left.

- **Provide navigation that substitutes for instructions.** Well designed navigation should be all that a user needs to know where to begin and what her options are.

- **Use vivid, saturated colors.** One out of 200 women and one out of 12 men have trouble detecting some color distinctions.

- **Provide a clear starting point.** Whether the path is linear or in the form of a mind map, starting point(s) should be obvious.

- **Path type should be obvious.** The user should be able to tell if she is expected to follow a linear path or a flexible path of her choice.

- **Use Flash wisely.** Content in Flash format should be included only if it is presented in small well thought out units that add useful functionality.

### **Elearning-specific Usability Guidelines**

Jakob Nielsen confirms that general usability principles apply to elearning, and adds the following advice specific to elearning. (Elearningpost, 2001)

- **Pay attention to response time.** Since it is necessary to keep content fresh in the learner's mind, it is all the more important not to force the learner to wait for slow downloads or other delays.

- **Provide experience based learning.** Nielsen suggests using computers to offer that which a good book cannot: simulation systems, problem based learning, case studies or calculation exercises. Allow learners to try out and discover things themselves in well planned situations.

- **Make discussion forums easy to understand.** Though this form of interaction among students can offer the contact that so enhances learning, difficult interfaces for discussion groups may prevent some students from even discovering the option.

Kevin Kruse organizes usability advice for elearning producers into 4 categories: assist user memory, put the user in control, design logical and consistent screen elements and provide user guidance. (Kruse, A)

From Kruse's first category, assisting user control:

- **Chunk information into meaningful blocks, organize the menu structure.** Some specifics include limiting menus to 7 items and matching the placement order of menu items with the structure of tasks.

- **Use mental models or visual metaphors.** A mental model should contain

no more than 3 layers or paths.

- **Don't overload the sensory system.** Too much stimulation can quickly overload the human sensory system.

- **Use multiple access points.** Provide several ways to get to content, for example, via the main menu, bookmarks, an index, the search option and a site map.

From Kruse's second category, put the user in control:

- **Provide status messages.** If the computer is busy doing something, a status message gives the user the impression of being in control.

- **Allow reversible actions.** An undo or back button conveys the idea of forgiving software, reducing the learner's anxiety and increasing his confidence.

- **Allow both mouse and keyboard input.** For different types of users, the ability to use either the mouse or the keyboard increases productivity as well as accessibility.

- **Provide access to Help, Menus and Exit with one click.** These are frequently used functions that require instant access.

From Kruse's third category, logical and consistent screen design:

- **Use logical screen layouts.** This includes taking reading patterns into account, such as western readers' Z path across and down the screen.

- **Be consistent with media choices.** The use of audio narration or video based feedback should be provided consistently after being introduced so students don't wait in vain for something that doesn't happen.

- **Have menus behave predictably.** If menu items open a submenu or lead to a learning activity, they should do only that and not mix action types.

From Kruse's last category, provide user guidance:

- **Include page counters.** Learners need to know which page they're on and the total number of pages.

- **Give appropriate warnings.** Before sending log in data, taking a test or exiting a program, users should be presented with a confirmation screen.

Dave Smulders' article (Smulders) on designing for learner-users gives one specific tip that cannot be forgotten:

- **Know your users.** As mentioned above, this includes cultural and technical aspects as well as where they stand academically.

Based on tests conducted by Frontend (Frontend, 2001), two additional tips emerge:

- **Allow comparison tasks.** For example, using mouse-over events to display item descriptions prevents viewing two descriptions at once.
- **Allow resizable text.** Most browsers let the user increase text size - this has become expected and should be incorporated into elearning programs for accessibility reasons also.

In his article on usable elearning, Michael Feldstein wisely emphasizes the cognitive goals of elearning content. His suggestions are not actually usability tips, but rather a series of questions that must be addressed by research into this area of elearning. They are presented here as such, as they may also serve as a basis for reflecting on usability for elearning.

- To what extent do **navigation elements help learners internalize and remember the structure** of the content?
- To what extent do **navigation elements help learners find key concepts** for later review?
- Does **audio narration** doubling of text presentation **affect the learner's ability to remember key facts and concepts, or to process complex concepts**?
- Does a **threaded discussion board interface** affect the frequency with which **learners collect particular ideas or facts**?
- Does a **threaded discussion board interface** affect the frequency with which **learners synthesize various viewpoints in a conversation**?

## Checklists

Several checklists of what to be aware of when developing elearning courses were found. Some interesting sources are provided here - many more are certainly available.

The Usability Special Interest Group of the Society for Technical Communication has a link to download Richard H. Millers checklist conceived specifically for elearning content. (Miller, 2002) His list is separated into categories of criteria, many of which are directly applicable to overall course design as well as individual screens.

<http://www.stcsig.org/usability/resources/toolkit/e-learning-checklist.doc>

Kevin Kruse of e-LearningGuru.com follows up an excellent article on interface design with a checklist of 32 points. (Kruse, B) Each is a question that, if answered with a yes, ensure a more user friendly experience for online learners. [http://www.e-learningguru.com/articles/art4\\_6.htm](http://www.e-learningguru.com/articles/art4_6.htm)

A list of 10 Best Practices for Successful Online Learning Environments was produced at a LearningWare Symposium organised by the Virginia Community College System. (Schultz, 2001) About half of the 10 items can be considered

to be usability issues. A related document, VCS Quality Assurance Plan for Asynchronous Distance Learning, is linked to the list.

[http://vccslitonline.cc.va.us/LearningWare/10\\_best\\_practices.htm](http://vccslitonline.cc.va.us/LearningWare/10_best_practices.htm)

Macromedia Flash is a popular format used to produce animated and interactive elearning material. Though the following 2 lists of usability advice are conceived for Flash in any context, they are certainly quite helpful for designing online course content as well. Macromedia publishes a list of 10 tips here:

<http://www.macromedia.com/software/flash/productinfo/usability/tips/> .

The report Flash Usability published by the Norman Nielsen Group contains a list of 117 points to take into account when designing with Flash. A large number of these are directly applicable to elearning. The report can be ordered at <http://www.nngroup.com/reports> .

## Conclusion

Although it may seem an obvious need, usability is not always incorporated into the design and development process of elearning content. This paper has attempted to discuss usability in the context of elearning, providing resources to allow producers of online educational material the information necessary to include user interface and course design considerations in the course creation process. Basic applications of usability principles can positively impact the learner experience, rendering the experience more enjoyable and allowing more cognitive energy to be spent on the intended part of the course, the core content. Educational institutions offering learning resources to students who will access them using their computers can thus come nearer to some ultimate goals of elearning: increased motivation and more effective learning.

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