

# Rapid prototyping: an efficient way to collaboratively design and develop e-learning content.

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## ***Introduction***

Until recently, courseware development was primarily a process that required sponsor endorsement of a design specification before implementation. (Lee, 2003) Instructional designers design and produce learning media with the assistance of skilled human resources, such as programmers, graphic designers, videographers, etc. (Stein, 2007) The major factor underlying the considerable initial costs of e-learning development is the time required of programmers, instructional designers, authors, and subject matter experts. (Lee, 2003)

Based on extensive experience with large e-learning projects, Botturi & al (2007) argue that the rapid prototyping model has a positive impact on e-learning project team communication, and that it provides a good basis for effective management of the design and development process, with specifics stress on human factor management.

The aimed of this paper is to compare rapid prototyping with classic instructional design models and to identify the benefits and drawbacks of this method based on literature on the subject.

## ***Classic Models***

According to Botturi & al (2007), Classic instructional design models, starting from ADDIE (figure 1), up to ASSURE and the Dick, Carey & Carey model, take a linear perspective: they describe the ID process as a structured and orderly step-by-step activity, characterized by a progressive advancement through Analysis, Design, Development, Implementation and Evaluation; the process also includes a cycle of revision for each edition or delivery of the training.



*Figure 1 - Classic ADDIE model*

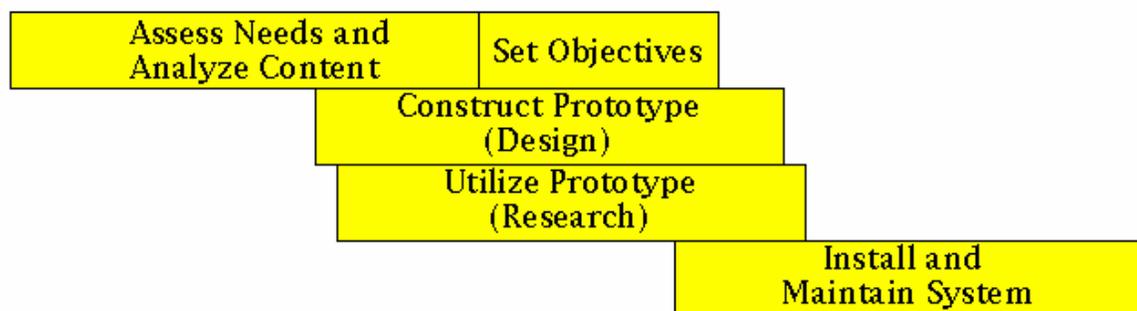
They add that such models, which have behaviourist roots and were mainly developed in the military context, still represent the foundations of instructional design as a discipline, and have provided inspiration for many projects. They offer clear guidance, emphasize the intrinsic logic of design, and rely on two main assumptions:

1. The assumption of quality information: the designer can work on complete information (from the Analysis phase) and the designer can rely on the fact that the instructional context is stable (i.e., there are no unforeseen events)
2. The assumption of expertise: the designer can master the process and will not make errors, and all the team members and stakeholders will give their contributions as required, at the right moment and in a clear and unambiguous manner

For Lee (2003), the subject matter expert occupies a critical role in the success or failure of any instructional design project. Ideally the subject matter expert can save the developers vital production time by providing annotated and structured documentation that captures how concepts and skills fit together in a given piece of curriculum. Although subject area knowledge acquisition has long been recognized as the "long pole in the tent" during development of courseware, the process for collecting the vital content data has been based primarily on unstructured interviews and focus groups which often result in unclearly specified requirements.

### ***Rapid prototyping***

Tripp and Bichelmeyer (1990) define a model (figure 2) that occur in a rapid prototyping environment, when prototyping is specifically used as a method for instructional design. The overlapping boxes are meant to represent the fact that the various processes do not occur in a linear fashion. In other words, the analysis of needs and content depends in part upon the knowledge that is gained by actually building and using a prototype instructional system."



*Figure 2 - Tripp and Bichelmeyer rapid prototyping ISD model*

Note that in the model above, the construct prototype and utilize prototype form a loop in which multiple utilizations of prototypes provide feedback for the construction of ensuing multiple prototypes. (Hoffman and Margerum, 1996)

According to Kruse, with the addition of the rapid prototype phase, the value of the ADDIE model for technology-based training is greatly enhanced. The prototype overcomes the limitations of the traditional ADDIE approach in that it involves all team members earlier in the project cycle, and enables both the client and students to provide early feedback. For Lee (2003), this approach to rapid courseware prototyping can reduce the time required of programmers, instructional designers, authors, and subject matter experts, while making that time spent more focused and useful for the courseware design and development process.

Generally, rapid prototyping models (figure 3) involve learners and/or subject matter experts (SMEs) interacting with prototypes and instructional designers in a continuous review/revision cycle. Developing a prototype is practically the first step, while front-end analysis is generally reduced or converted into an on-going, interactive process between subject-matter, objectives, and materials. (Siemens, 2002)

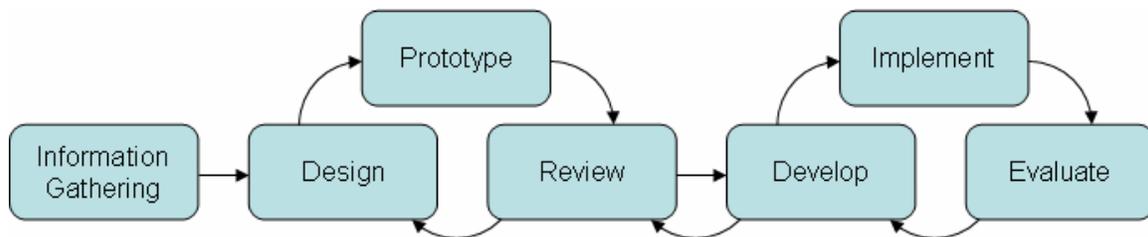


Figure 3 - Typical rapid prototyping model

As mentioned by Berman (2006), with Rapid Prototyping, often called Rapid E-Learning, learners and/or subject matter experts interact with prototypes and instructional designers in a continuous review and revision process. The development of a prototype is the first step and analysis is continuous throughout the process.

This process allows promoting the discussion within the project group in a focused way, by concentrating on the facts and the results, rather than on theories and prejudices against technologies. It also allows building shared understanding among the different professionals involved in the project and builds trust: two important conditions for the success of the project. (Edutech, 2008)

Fournier (2007) mentions that Allen Interactions uses the rapid prototyping process to help establish expectations and solidify stakeholder buy-in early on. According to published accounts, Allen insists that the highest level problem owner attends the initial prototyping session. While it can be difficult to secure executive attendance at a prototyping session, you will find greater success if stakeholders with decision-level authority help sketch out ideas. If your interactions aren't overly complex, this can be

done virtually through an online conference. In fact, some organizations may prefer conducting these sessions virtually so that various team members can focus on different aspects of the solution, driving rapid results during the working session.

Fournier adds that if you're not able to get high-level stakeholders involved in the prototyping session, try to schedule a follow-up demo session with them before you spend time implementing a final solution. As materials produced with rapid e-learning tools become more complex, the cost of rework escalates—just as it does for any project. Getting buy-in early can provide you with the project champion you'll need regardless of the scope of your project. More importantly, it sets expectations for deliverables.

In order to provide the optimum learning experience, instructional designers must evaluate the learning media for usability and effectiveness continually, and as early as possible, with the option of immediately revising, rewriting, recreating, or adding to the learning media in a cyclic pattern. As one cycle proves effective and usable, the next cycle begins, based upon the best-practices of the previous, and so on. (Stein, 2007)

For Kruse, this early review process is critical to software development and can catch actual errors, as well as identify client preferences. Many people without a programming background do not realize the complexity involved with multimedia programming. Sometimes seemingly simple changes, such as moving the location of navigation buttons, adding a new student-tracking feature, or increasing the size of the font, have a tremendous ripple effect throughout the program. Even when there is no apparent link between a requested change and another program feature, there often are connections within the program's source code.

Stein (2007) even mentions that as the learning media goes into production, instructors should receive formative feedback from learners in each lesson. Formative feedback provides instructors with information as to whether or not the students are learning, how efficient that learning is, and whether or not the tools that facilitate the learning are frustrating and over-encumbering. When a learner is over-encumbered by extraneous tasks, such as manipulating the technology, learning is inhibited, if not impossible. Such encumbrances must be eliminated as they are discovered.

Ideally, according to Kruse, four to eight individuals selected from the student audience review the rapid prototype. What often occurs, however, is that three or four training managers or subject matter experts review the prototype. In the latter case, the reviewers must have a clear understanding of the learner population in terms of demographics, culture, and level of technical expertise, to provide an accurate and useful evaluation.

For Kruse, the main purpose of the review is not to evaluate the content or instructional design, but to evaluate the ease of navigation, the screen design and layout, appropriateness of metaphor, and the technical performance. Depending on the results of the prototype evaluation, adjustments may be made in the design document itself and incorporated into the script phase. If there are a lot of negative findings, it is common for the prototype itself to be re-created and evaluated for signs of improvement.

## ***Benefits and pitfalls***

Fast prototyping is particularly helpful in order to provide a shared understanding of what the final e-learning course is likely to be; it offers the development team a common background where many misunderstandings can be avoided. (Botturi & al., 2007)

For Fournier (2007), another key benefit is that producing a rapid prototype lets you better scope the appropriate solution through a low-cost, collaborative approach before committing major funds. You need to plan projects to meet the need; not simply match them to an arbitrary budget. Rapid e-learning as a prototyping platform can help you brainstorm and come to agreement on what that budget should be.

Botturi & al (2007) identify two pitfalls to avoid:

- The 'quick and dirty' effect: A very rapid, but low quality development may negatively affect further developments, hindering understanding, collaboration and commitment.
- The non-fast prototyping case: Here the prototyping phase is extended so much that it only delivers a late contribution, which often has to be accepted as time resources do not allow substantial revisions.

## ***Conclusion***

The rapid prototype creates an early iteration loop that provides valuable feedback on technical issues, creative treatment, and effectiveness of instruction. The design document itself is changed to reflect this feedback, and in some cases, a new prototype module is developed for subsequent testing of the refinements. (Kruse)

This design method makes the design and development process open to new emerging ideas; makes the design open to emerging needs from test and evaluation phases; let's focus on pedagogical design (teaching) instead of course materials preparation and technology; and stimulates discussion with external partners. (Edutech, 2008)

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