Iterative Course Development and the Creation of the User Story Approximation Model

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Abstract

Continuing Education course development can be a complex environment requiring rapid response to change and development of multiple projects at once. This paper describes the development of an instructional design model based on a series of decisions made during the design of an array of six pregnancy and postpartum fitness courses for different sets of learners with specific identities and learning goals and objectives. The collected data of the projects from task logs, project management documents, communications, and project reflections of the natural work setting were interpreted and generalized to make causal inferences. In this context, behavior patterns of the instructional designers emerged. This design case presents the action-oriented process of inquiry employing Soft Systems Methodology (SSM) to structure discussion about the situation and identify the repetitive procedural decisions to develop an instructional design model for higher education that could systematically guide instructional designers through rapid iterative development that employs user stories and Weick's sensemaking. The precedent is revealed in the User Story Approximation Model (USAM), which when replicated will result in newly designed outcomes in drastically reduced production time.

Introduction

Seeking knowledge to develop new competencies is no longer a sporadic activity in our professional lives. Shifting trends in skill acquisition to increase employability have created a demand for high quality continuing education courses and programs at colleges and universities. The instructional designers working at small institutions often have the unfortunate task of serving two masters: degree programs and continuing education programs. Further, course development can be especially chaotic in the continuing education environment where the potential for development is endless, and where any number of stakeholders and their requests can create challenges in managing priorities. The result is time constraints on the design and development process that ask instructional design units to find ways to shorten the time of course development. For continuing education programs to be successful, learning design must be structured to allow for flexibility and entrepreneurial thinking. Because of the need for design methodologies which are more efficient, while maintaining or enhancing effectiveness, rapid prototyping (RP) was evaluated as an instructional design strategy in the 1990's and numerous studies since that time have indicated that rapid prototyping improves instructional project quality and customer satisfaction while reducing production time.

In the discussion of RP, the use of reusable learning objects (RLOs) in course design usually reflects a conversation about reusable content. Learning objects that are made agnostic in such a way as to make the learning object viable in more than one course or program involving an interdisciplinary thought. The idea behind this approach is that the viability of the learning object is extended by the design decisions made in the development of the object which reduced the time to production. These decisions when formalized can be replicated to create RLOs. This approach to reusability focuses on "filling the closet" with a myriad of choices to use in each newly designed course. Unfortunately, this approach "fills the closet" or RLO repository with objects that need to be ordered, organized, and maintained, which may not produce the reduced production times some instructional design units require.

With the acceptance of our need to work faster, we sought a development model and a technique that would increase our production. Torrence's *Agile for Instructional Designers* (2019) borrows heavily from the AGILE approach developed by Sutherland and Schwaber, which relies on a philosophy, or "Manifesto" as Sutherland and Schwaber call it, and which Torrence modifies for use in instructional design. This manifesto guides all decision making. AGILE instructional design represents a form of development where design teams apply project management methodologies originating from software development to the practices of instructional design to rapidly develop courses. Emphasized in these practices is an iterative process which provides the opportunity to use collaboration, feedback, and iterations (versions) to reduce time while producing a more successful and valued product.

Course development is framed from the perspective of the learner. The course plan addresses the needs of the learner and how they will engage and interact with the course. The creation of the course is divided into modular elements or chunks. The individual modules are designed, and these portions are reviewed early on by the collaborators to produce a higher quality course more quickly while reducing the need for last minute revisions.

Most instructional design models devise the design of learning objects as new designs from the "blank page". We propose the implementation of a rapid prototyping approach through the construction of course modules from reusable component templates. This concept of

reusability was first introduced in instructional design processes with an object-orientation where a system of best practices and design principles guide the development of reusable objects (Boyle, 2009). We proposed a further modification of the design principles based on Atomic Design (Frost, 2016) that allows atomic construction of design templates for use in course development which creates course prototypes within days of initial meeting with SMEs rather than weeks and full production to launch to occur within weeks.

Once a course has been constructed, an iterative cycle may begin to create successive versions of the course for other programs and other users. This process begins with a reconsideration of the "user story" and provides an opportunity to employ Weick's sensemaking (Mills, et al, 2010), which "is about understanding how different meanings are assigned to the same event," to revise the course. Weick's sensemaking guides the revision and how collective decisions are made at each stage of sensemaking to re-envision the course for a new user story—a new set of learners. Through these critical design decisions an array of courses that address different sets of learners may be rapidly constructed.

The purpose of this design case was to describe the development of an instructional design model to guide designers systematically and effectively throughout the design and implementation process of modular design with reusable design objects (RDOs) employing AGILE decision-making principles and Weick's sensemaking to rapidly produce courses. This user story design model is intended to result in an array of rapidly created continuing education courses with an appropriate blend of individualized content and learning activities that coherently provide meaningful learning experiences for multiple user stories and contexts.

> "Models make possible a systemic approach to design in that they intentionally lead designers to balance considerations of varied critical factors. Models incorporate both theoretical and empirical research in related fields. Further, the iterative process of evaluation and modification leads to improvement of practice, pointing to the potential design to stimulate continued progress in a larger context" (Lee, et al, 2017).

The design model was developed interrogatively. It questions who, why, and how particular reusable design objects (RDOs) should be designed, selected, or modified in a learning arrangement. Until now, no prior instructional design models have investigated the identification of user stories to develop multiple variations or versions of courses in succession through modular design and sensemaking. The process for constructing a user story design model reported in this design case, and its implications for improvement of continuing education course-level development and instructional design practice are considered to contribute to the growing literature of learning design.

Conceptual Modelling

Conceptual modelling may be defined in the simplest terms as the process of developing a graphical representation that provides an understanding of collaborative problem solving within a system for the different stakeholders involved. Conceptual modelling requires decision making to identify the scope and level of detail, aspects to include and exclude, and the objectives, inputs, outputs, content, assumptions, and appropriate simplifications to be contained

within the model. A well-designed conceptual model establishes a common language among stakeholders that facilitates planning, design, and evaluation.

What is a conceptual model?

According to Powell-Morse (2017), "a conceptual model is a representation of a system that uses concepts and ideas to form said representation, [and] is used as a way to describe the physical or social aspects of the world in an abstract way." Since a conceptual model may incorporate representation of both behavior and data at the same time, it should fulfill four fundamental objectives in its construction:

- Enhancement of understanding of the representative system,
- Promotion of efficient conveyance of system details between stakeholders, including the key entities of the system (person, place, concept, event, and relationships),
- Provision of a point of reference for designers to gather concepts and sub-concepts, and
- Documentation of the system for future reference.

Conceptual models may serve to regulate behavior within a process and establish entities and concepts that help eliminate unsuspected outcomes. They define scope which aids in time management and scheduling, and serve as high-level understanding for managers and executives who may not be familiar with the minutiae of the design process (Powell-Morse, 2017).

Development of a Conceptual Model

Though there are many approaches to the development of conceptual models, Soft Systems Methodology (SSM) provides a systems thinking approach to operationalizing conceptual modelling. SSM is an action-oriented process of inquiry for addressing multiple views of reality in a situation to derive purpose from actions to inform processes (Checkland & Poulter, 2020). Kotiadis and Robinson (2008) derived a three-stage process and accompanying sub-processes for the creation of conceptual models from SSM. When employed, these processes create the interactions necessary for conceptual model construction. The stages included in the processes are knowledge acquisition, model abstraction, and arbitration. Knowledge acquisition (KA) may be divided into two parts and their resulting sub-processes. KA begins with constructing a rich picture that is a holistic representation of the situation under scrutiny. Key elements include descriptions of the processes, procedures, and stakeholders.

The second part of KA may include three analyses: role analysis, social system analysis and political system analysis. These analyses provide information about decisions made and what part behavior played in the success of the process described in the model. Role analysis requires consideration and exploration of "the role of the client (who has caused the study to take place), the role of the 'would be problem solver' (who wants to do something about the situation) and the role of the problem owner [who would like the process to be documented for future use]. All or some of these roles may overlap" (Kotiadis & Robinson, 2008). The goal is to answer the key question--why is this model necessary to the stakeholders. Once roles are determined, social system analysis should take place. Social system analysis considers "the changing interactions of roles, norms, and values". The goal is to answer what affect, actions, and outcomes has each role provided.

Finally, political system analysis enables an understanding of "how power is expressed in a particular problematic situation." Who made key decisions and from where did decision

making derive? Where were the points of review, evaluation, and approval within the mapped process? "Understanding the roles within a problem situation, typical behavior of the stakeholders and the allocation of power can mean that the modeler can manage the stakeholders during the conceptual modelling process and arrive at a conceptual model that is agreeable to all, desirable and feasible" (Kotiadis & Robinson, 2008).

Once KA is complete, abstraction, the process of simplification to identify purposeful actions, may be made from the collected data. When a resulting origination of workflow of purposeful actions is identified, an initial iteration of the conceptual model is created and serves as a partial representation of the system description. Simplification is achieved by reducing the level of detail to behaviors that may be categorized according to scope. The difficulty in abstraction remains developing a balance to provide an accurate portrayal of the situation and model objectives.

The final stage in conceptual modelling is arbitration. The subject matter experts debate the situation, using the draft models to provide changes which may improve the process and are desirable and feasible, and accommodations between conflicting interests are made, which will enable improvement in the process. Once a consensus is reached, the modeler may draw the final rendering of the model to be conceptualized.

Results

Research on instructional design models may be classified into three different types: model development, model validation, and model use. This design case was concerned with model development and followed the process methodology designed by Kotiadis and Robinson (2008) from SSM and utilizing criteria to establish validity defined by Richey & Klein (2014) who noted that ID models may be developed from practical means, utilizing real-life design projects. The user story design model in this design case was developed from real-life design project data.

Participants

The conceptual modelling involved participants composed of the members of the ID team (one subject matter expert, two instructional designers, and one administrator). The SME was a graduate student and fitness professional with 15 years' experience in the fitness industry. The first instructional designer had 10 years' experience as an instructional designer and 5 years' experience as an instructor in higher education. The second instructional designer had 20-years' teaching and curricular design experience and 10 years' experience as an instructional designer. The administrator previously completed instructional design work as a 20-year faculty member.

Knowledge Acquisition, Part 1: Holistic Representation

The collected design projects of an array of six pregnancy and postpartum fitness courses were profiled in scope, resources, and roles. Records of key project data including work logs, project management documents, and in progress communications were collected. Extracted from the resultant data were timelines of tasks completed, decisions made, people consulted, resources used and the extent to which instructional design and institutional standards were addressed and met. Problems in the development cycle such as confusion over processes, directions, and

language were described including constraints, conflicting information, failures, and miscommunications.

Knowledge Acquisition, Part 2: Analyses of Culture and Disposition of Power

Roles were explicitly defined from the perspective of expectations, job descriptions, prescribed actions, and actual performance. The key roles were identified: role of the client (the SME), the role of the problem solver (the ID), and the role of the problem owner (the administration). Reactions and opinions from all roles including the amount of time spent in problem analysis, how problems and design decisions were addressed through the development process, and the combination of decisions and interventions to solve performance problems were mapped in the workflow.

Social system analysis identified interactions between roles and the extent to which roles, behavioral norms, and values shifted. The effect that the disposition of power through the implementation of AGILE communication processes was defined and how these processes affected communication and decision making in development were explored. The influences of organizational climate and the impact of the role supervisors had in the development process were also explored. Cyclical behaviors were typified including the design, development, and review of iterations and versions, and the design behaviors were described through sensemaking of successive iterations, and the language of all interactions was clarified.

Noting that "data triangulation is especially critical in design and development studies based upon participants' recollections of already completed projects" (Jones & Richey, 2014), a design case paper describing the workflow was written as a reflective exercise to understand the implications of the findings and situate the learning for conceptualization. The design case served as a confirming process for the researchers to validate the work completed during knowledge acquisition.

Abstraction

The scope and level of detail identified in the system description provided by the subject matter experts was simplified to task categories often found in instructional design models. A textual outline of processes was created. To consider graphical representation of tasks, a set of questions was developed to guide the mapping of specific design details as presented in Table 1.

Table 1

Interrogative Framework to guide mapping of purposeful actions
1. *What should students learn about this topic?*
2. *Who are the students for this information (career orientation)?*
3. *What are the desired results for each user story?*
4. *How will the content be developed?*
5. *How will learning objects be modified for each user story?*
6. *How will each user's learning be accessed?*
7. *What is the order of course development?*
8. *How does rapid prototyping occur?*

The base design was created by mapping the specific design details on the Successive Approximation Model (Figure 1), which served as a base model for graphic design and a starting point for arbitration. The graphical representation of the base model is shown in Figure 2.

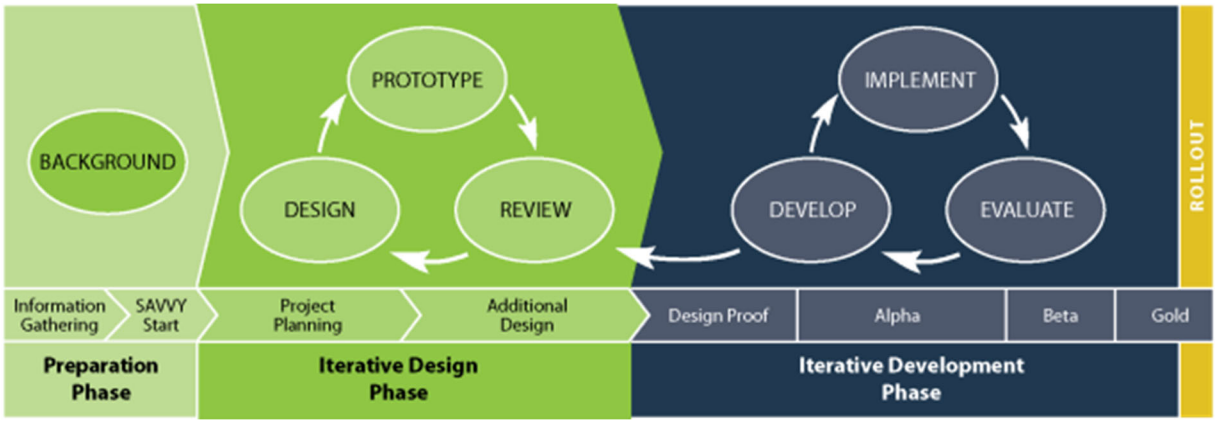

Figure 1. Successive approximation model version 2 (SAM2) process diagram. Adapted from Leaving ADDIE for SAM: An Agile Model for Developing the Best Learning Experience (p.40), by M. Allen, 2014, Alexandria, VA: American Society for Training & Development. ©2014 by the American society for Training & Development.

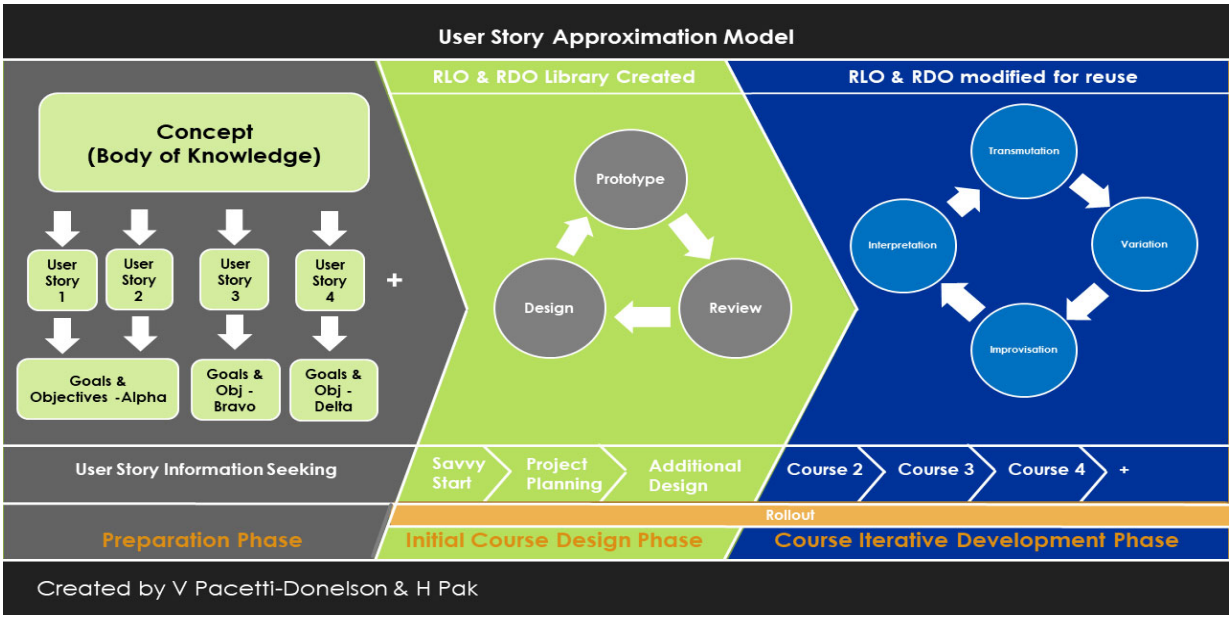

Figure 2. Base model draft to be used for Arbitration.

Arbitration

The ID team conducted a retrospective meeting to evaluate the base model draft in comparison to the design case. The instructional designers debated the situation as compared to the draft model to provide changes which would more accurately reflect the process as it was

completed. The discussion included recognition that not all process elements are cyclical and not all process elements are linear, but a combination of both. A consensus was reached, and a final rendering of the model was made, as seen in Figure 3.

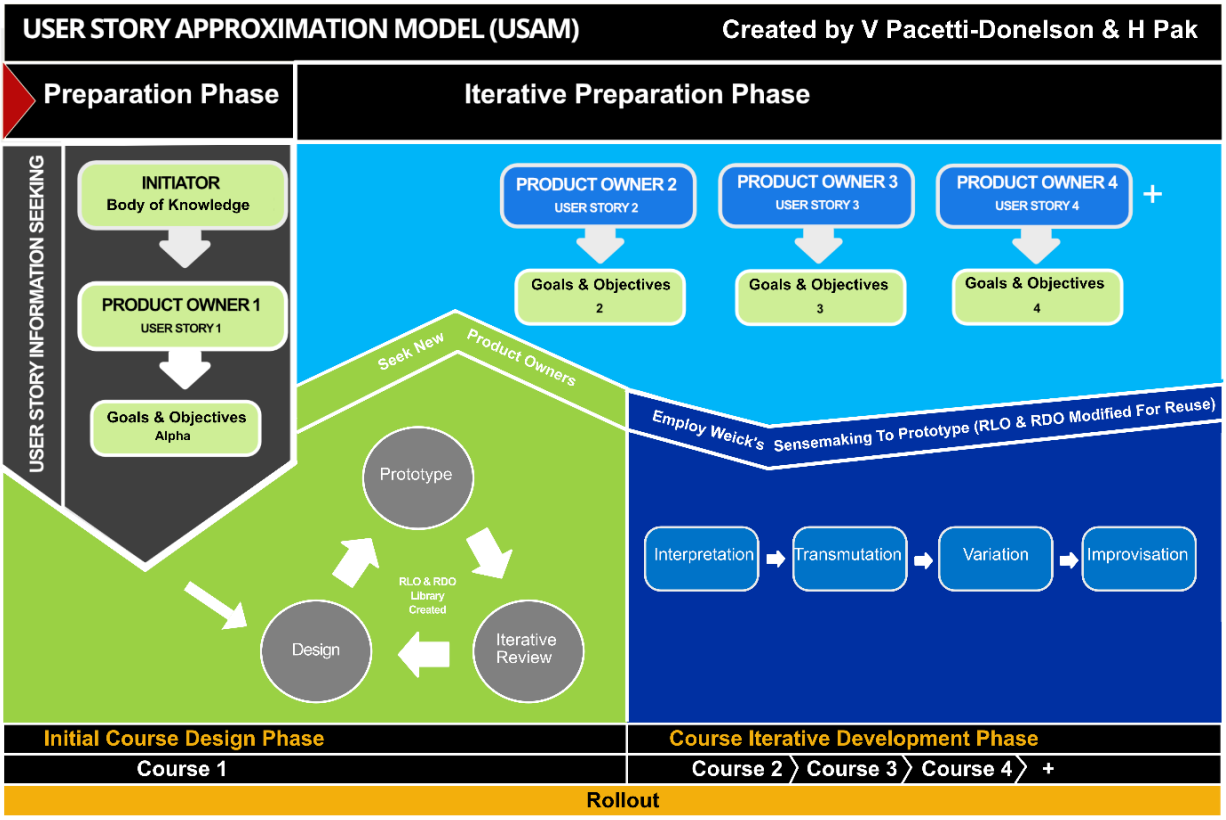

Figure 3. Final rendering of the User Story Approximation Model (USAM).

Discussion

Design and development processes are particularly difficult to navigate and manage, especially in environments coping with scarcity of resources and other limitations. These processes may be more effectively understood, improved and supported through the development of conceptual models. As this model demonstrates, design and development processes involve significant amounts of novelty, complexity, and iterations. The model is described in Figure 4.

The assumptions of the model

- The users of this model are an instructional design team (SME, instructional designers, and an administrator) for continuing education courses.
- Courses are designed in 5 modular units with rapid prototyping techniques through AGILE instructional design processes.
- In the context of the model, "Goals" refer to what students need to achieve in their real-world context after completing the course. "Objectives" refer to what skills and knowledge students will acquire after completing the course.

Description of the Model	
1. Preparation Phase 1.1 Initiator delivers a Body of Knowledge. The SME provides course idea and core knowledge and works with instructional designer to develop course name and description.	1.2 Product Owner provides relevant information to construct user story, which includes contractual obligations set by partner institution and their cultural context. 1.3 Goals & Objectives Instructional designer constructs overall goals for the course, which should address what skills students should exhibit in career performance.
2. Initial Course Design Phase 2.1 Course design Instructional Designer analyzes content and creates course outline by distributing topics into modules. The overall structure of the course is determined. Time plan, instructional methods, multimedia assets, feasible learning activities, and formative and summative assessments are planned. 2.2 Prototype Development Instructional Designer develops prototype, including syllabus, course layout and modular design, reflecting ID team and institutional standards, and the contractual obligations. Instructional designer decides on specific learning content to be delivered and through what means. Various materials including lectures, presentations, images, tables, and figures are developed. Instructional designer works with SME to produce video assets and prepares them for embedding in the course.	Instructional Designer and SME work to develop formative and summative assessments that relate to career orientation of the course, and they are placed within the prototype. 2.3 Iterative Review Prototype is reviewed by stakeholders and after discussing appropriateness with ID team, revision occurs. Process is repeated until the ID team and institutional standards have been met, contractual obligations have been met, and the SME has verified all course content is appropriate and accurate. 2.4 Alpha Course is completed. Course is delivered to stakeholders. Upon successful implementation, course review survey data is reviewed by ID team for future improvements and/or course developments.
3. Iterative Preparation Phase (repeated phase) 3.1 Seek new product owners. The administrator reviews the course and attempts to identify other partners for course implementation. 3.2 Product owners provides relevant information to construct user story, which includes contractual obligations set by partner institution and their cultural context.	3.3 Goals & Objectives Instructional designer reviews goals and objectives from Alpha course and revises overall goals for the iterative course, which should address what skills students should exhibit in career performance.
4. Course Iterative Development Phase (repeated phase) 4.1 Alpha Course is duplicated. At this phase, the Alpha course prototype is reviewed in terms of achieving new learning goals and objectives. 4.2 Weick's sensemaking is applied. Instructional designer and SME check to confirm if course materials will cover new learning objective, if there are new objectives to consider, items to remove, new items to develop, and items to modify.	4.3 Iterative Review Prototype is reviewed by stakeholders and after discussing appropriateness with ID team, revision occurs. Process is repeated until the ID team and institutional standards have been met, contractual obligations have been met, and the SME has verified all course content is appropriate and accurate. 4.4 Successive Courses are completed. Course is delivered to stakeholders. Upon successful implementation, course review survey data is reviewed by ID team for future improvements and/or course developments.

Figure 4. Description of the Final User Story Approximation Model

Conclusion

Conceptual models define scope and aid in time management in the design and development process. Conceptual Modelling activities utilizing the actual task logs kept by designers, developers, and even clients and SMEs are invaluable as they provide a record of the purposeful actions and decisions made and allow modelers to conceptualize a workflow more reflective of documented practice. The final USAM created in this design case evolved gradually from the reflective practices associated with AGILE project management communications. The target users, scope, and design context were revealed in the model assumptions and description.

Model development is an iterative process. This model may be limited in that it was developed from a single case at a small regionally accredited institution with one instructional design unit serving degree and continuing education course development needs. Also, since the design case specifically focused on the development of an array of continuing education courses at a special focus university, the model may include some features that are specific to the career context of sport and working with regional, national, and international partners, stakeholders, and SMEs.

Further, every design and development process involves a degree of uncertainty. Validation of this model may reveal new activities typically discovered during implementation. New complexities may be revealed and should be considered, which will generate and communicate new conceptual insights into the design and development process, which may contribute to a better depiction of best practices and contribute to new knowledge in the growing body of conceptual models for instructional design.

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