Computer-Based Instructional Systems Design Tools: Current State And Implications For The Future

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COMPUTER-BASED INSTRUCTIONAL SYSTEMS DESIGN TOOLS: CURRENT STATE AND IMPLICATIONS FOR THE FUTURE

by

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ABSTRACT

This study examines the current state of computer-based instructional systems design (ISD) tools and outlines its implications for the future. The study utilizes the grounded theory methodology to capture and document modern instructional designers' perspectives regarding the current state of ISD tools, the issues associated with them, and their interrelationships. The study also presents a framework for classifying modern ISD tools and a conceptual prototype of a designer-oriented system of computer-based ISD tools.

I dedicate the current work to all professionals working in the field of instructional technology. As an instructional designer myself, I produced this publication in support of the multiple dimensions defining an instructional designer's profession.

ACKNOWLEDGMENTS

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LIST OF ACRONYMS/ABBREVIATIONS

EPSS	Electronic Performance Support System
ID	Instructional Design/ Instructional Design
ID-CBTCM	Instructional Designer's Computer-Based Tool Classification Matrix
ISD	Instructional Systems Design
KMS	Knowledge Management System
LMS	Learning Management System
LCMS	Learning Content Management System
SCORM	Sharable Content Object Reference Model

CHAPTER ONE : INTRODUCTION

Autobiographical Statement

As a scholar in instructional technology and an instructional designer myself, I have been wondering about the current state and the future of computer-based tools for instructional design. During several years of professional practice in the field of instructional technology, I have found myself and my fellow designers having a constant struggle with various computer-based tools for instructional design ranging from not knowing which tools to use to desperately looking for ways to integrate the new tools with those currently in use. I have also always wanted to see a big picture of a system of tools that a modern instructional designer could benefit from.

During researching this topic out of professional curiosity, I was very disappointed to discover how limited the amount of theoretical or practical literature on the matter of instructional design tools was. Most instructional technology books and peer-reviewed publications I have reviewed over the years appear to focus on the issues associated with the process of instructional systems design (ISD) and the effectiveness of various instructional strategies and media. Articles and dissertations have been written on various aspects of the ISD process as well as the end-user perspectives on different types of training. Traditional ISD models have been extensively reviewed, critiqued, and adapted to fit multiple faces of ISD. Interestingly to me, I have yet not found much written on the day-to-day professional needs of instructional designers or any support mechanisms that might assist them in carrying on the multi-dimensional role of instructional designer. Having reviewed volumes of research, I have failed to distinguish the designers' voice among the vast body of instructional technology literature.

In informal conversations with fellow designers in the workplace and professional conferences, I have noted the frequently emerging theme of the lack of designer-oriented approach when it comes to new technology development. As a designer, I am interested in finding ISD support mechanisms developed with designers in mind. As a scholar, I volunteer myself to gather designers' voices into a phenomenological perspective that could serve as both theoretical and practical foundation for designer-oriented approach to instructional technology.

To begin with, I am specifically interested in looking at the phenomenon of computer-based instructional design tools due to the fact that designers' work today relies heavily on them, although there have been no systematic attempts to study the essence of the designers' experience with them. I am interested in producing a study that would be both theoretically and practically valuable in terms of discussing the current state of ISD tools and its implications for the future. I would like this study to be a piece of action research that would open up a dialogue between instructional design practitioners and tool developers. I believe it is critically important to give modern instructional designers an opportunity to describe their professional practices and formulate their needs of supportive technologies. I hope that this study reflects the designers' voice as openly and truthfully as possible.

Operational Definitions

Instructional Systems Design (ISD)

ISD is a systematic process of designing instruction whose sole purpose is to help people learn. There is a variety of approaches to designing instruction ranging from a traditional ADDIE model (analysis, design, development, implementation, evaluation) to more complex non-linear approaches such as Kemp's Instructional Design Plan or utilizing Gagne's rationale of the conditions of learning and events of instruction in relation to the design of instructional systems.

Instructional Design Practitioner

ISD profession has many faces ranging from designing instruction for a small-scale classroom application to large-scale professional development training programs. The term of Instructional Design Practitioner defines a professional engaged in the design of instructional systems. This term may embrace a variety of job titles such as Instructional Designer (ID), Training Systems Specialist, Course Developer, Education Specialist, Professional Development Specialist, Training Analyst, and others.

Instructional Design Tools

Instructional design tools, or ISD tools, are conceptual or computer-based instruments intended to help instructional designers and educators throughout various phases of instructional design process. Examples of ISD tools may include style guides, templates, storyboard design programs, learning management systems, and others. In the context of this study, this term is limited to computer-based tools for instructional design, which are generally software packages intended to assist instructional design practitioners.

Instructional Design (ID) Tool Set

An ID tool set represents a group of integrated tools that interact regularly throughout the ISD process.

Learning Management System (LMS)

LMS is a software suite designed to deliver and manage the learning content, track and report on the student progress and student interactions. The term 'LMS' can be applied to simple course management systems or highly complex company-wide distributed learning environments.

Learning Content Management System (LCMS)

LCMS is an environment that allows instructional developers to create, store, reuse, manage and deliver learning content from a central object repository, or locator.

Learning Objects

Learning objects are an application of object-oriented view on the world of learning. They represent reusable chunks of instructional content used as standalone pieces of instruction or combined to form learning paths. Learning objects may include video demonstrations, tutorials, procedures, stories, assessments, simulations, case studies, etc.

Courseware

Courseware is a generic term that defines a variety of computer-based instructional systems.

Sharable Content Object Reference Model (SCORM)

SCORM stands for a collection of specifications adapted from multiple sources to provide a comprehensive suite of Web-based learning capabilities.

Model

The term ‘model’ defines a physical or conceptual logical representation of a system, phenomenon or process.

Prototype

The term ‘prototype’ identifies a physical example of a logical system.

The Use of Metaphors in This Study

The present study involves the use of metaphors as a representational mechanism to describe the following concepts that are essential to this study:

1) Instructional Designer as an Artist
2) Instructional Systems Design Tools as a Color Palette

This section describes the rationale for using these metaphors that is both theoretical and practical in nature.

Merriam-Webster Online Dictionary (2006) provides two major meanings for the term ‘metaphor’ as presented in Table 1.1 below.

Table 1.1

Definition of “Metaphor” (Merriam-Webster Online Dictionary, 2006)

Definition of “Metaphor”	
1 : a figure of speech in which a word or phrase literally denoting one kind of object or idea is used in place of another to suggest a likeness or analogy between them**:** figurative language	**2 :** an object, activity, or idea treated as a metaphor **:** symbol (something that stands for or suggests something else by reason of relationship, association, convention, or accidental resemblance)

The use of metaphors in literature goes back to ancient times and has been extensively used in literature for the purpose of understanding and explaining a particular phenomenon. For example, the metaphor of the writer as 'architect' is prominent in Neo-classical literary theory, emphasizing conscious planning and design. Although the use of a metaphor for comparing meanings and constructing realities has ancient roots, it remains somewhat underrepresented in academic writing. At the same time, there are many instances of qualitative research studies that exemplify the use of metaphors, or comparative systems, for idea presentation purposes. A brilliant example of that is the G.

J. van Schalkwyk's (2002) qualitative report on using metaphors for representing ideas within a dissertation or a thesis. She points out that it requires ingenuity and creativity to create comprehensive yet parsimonious academic writing that will be plausible and user friendly, and the use of metaphors is a good communication mechanism for this purpose. Chenail (1995) points out that a qualitative researcher often faces a challenge of finding ways to share his or her work and materials in an effective way and calls for looking for creative ways to convey your ideas.

As an instructional systems designer and educator, I assign a special meaning to metaphors as they help me and my learners visualize a process or an event and the relationships between their various components. The metaphors used in this study emerged as a result of the researcher's collaboration with the research participants during the conceptualization phase of the study. During the topic area discussions, the pilot study participants identified a close association between their profession and that of an artist due to their creative and inventive nature. They also evoked the use of the metaphor of ISD tools as an artist's 'color palette', based on the functional resemblance between the two notions.

Instructional systems design as a creative process is one of the recurring themes of instructional technology literature (Gagne, 1992; Merrill, 2001). There seems to be an agreement between the ISD literature and practitioners' perspectives regarding the ISD process, which, at least in its ideal form, should be creative and driven by innovation as opposed to merely a mechanical set of steps to create instruction. The latter unfortunately does take place in the ISD field too, although often not considered to be pure ISD, and not many instructional designers would prefer to associate with the "mechanical" scenario as the essence of their career.

Although using the 'artist' metaphor during this study may unintentionally overemphasize the importance of the creative aspect of ISD, this study does not pretend to diminish the importance of accuracy, precision, and rationality, which are key to sound ISD practices.

Problem Overview

Today's global, information-driven society with its diverse learners requires education to be both effective and efficient, which often appears to be at odds with its conventional structure and delivery. Striving to meet these societal changes, Instructional Systems Design (ISD) represents a systematic process of planning and developing instruction to ensure successful learning and performance. The term 'instructional design' may mean different things to different people. There is a variety of approaches to designing instruction ranging from a traditional ADDIE model (analysis, design, development, implementation, evaluation) to more complex non-linear approaches such as Kemp's Instructional Design Plan and Gagne's rationale of the conditions of learning and events of instruction in relation to the design of instructional systems. Some instructional systems are built following a specific ISD model to the core, whereas others may utilize certain elements of approaches proposed by a variety of instructional theorists.

Instructional systems design is a time and labor consuming process. Its complexity can be attributed to the fact that ISD activities, such as scope, sequence and media strategies, depend on a wide array of factors. Instructional designers' experience in the field, subject matter knowledge, and creativity may significantly influence their choices during the ISD process too. Traditionally, instructional designers have been relying on the support of ISD models, job aids, colleague mentoring activities, and professional development outlets. To date, there is a variety of computer-based tools intended to assist modern instructional design practitioners during this process. However, practice shows that many existing tools have not gained much of the expected popularity among ISD professionals for a variety of reasons. Some of these reasons (e.g. difficulty to use, limited features, and networking issues, etc.) have been touched upon but not fully explored in the instructional technology literature. Yet there appears to be a conflict between "the existing" and "the desired" state of tools for instructional systems design purposes.

During the last several years instructional technology literature has voiced a serious concern regarding the current state of the ID tools showing the low user popularity and seemingly poor effectiveness as designer support tools. Seeing the importance and the need for ID tools, Simons, van der Linden, & Duffy (2000) and Merrienboer and Martens (2002) assertively called for rethinking the future of instructional design tools. McKenney & Nieveen (2003) pointed out that a well-structured tool can encourage a more structured approach to a particular task, and therefore improve coherence in the way that task is carried out. Considering the fact that instructional design professionals could definitely benefit from having useful and helpful tools at hand, rethinking the current state and the future of the ID tools became one of the latest trends in the instructional technology research, still in need of thorough examination and analysis.

The present study examines the current state of the instructional design tools and their underlying issues from the perspectives of instructional designers. This study also aims to grasp the ISD practitioners' perceptions of an effective system of tools for ISD that could be beneficial for them in the workplace. The study collects qualitative data from a wide sample of instructional design professionals via face-to-face collaborative interviews, on-the-job observations, and concept mapping procedures regarding the following areas:

1) Designers' experience with the types of tools available to them at present,
2) Identifying the critical issues associated with the current state of the available tools
3) Conceptualizing a model for an effective system of computer-based ID tools.

Qualitative data is analyzed according to the grounded theory methodology: meaningful categories are derived from the data and interconnected by axial and selective coding schemes to identify the meaningful relationships between the categories. A theoretical model of a system of instructional design tools is derived from the textual data analysis as well as the concept mapping data.

Purpose and Significance

An increasing number of researchers believe that computer-based ID tools can play an important role in supporting various aspects of the very complex ID process (Reiser, 2001; van den Akker et al, 1999). I would like to learn and describe what types of computer-based instructional design tools are currently available for designers, what their challenges and the underlying issues are based on the participants' experience with them, and what would constitute an effective palette of tools from designers' perspectives. The designers' vision for an effective system of tools is important to document. A conceptual model that would serve as a representation mechanism to describe the types of tools the instructional designers of today use and could benefit from would contribute to the body of knowledge in the field of instructional technology.

Most importantly, to my mind, this study aims to give instructional designers a voice to express their opinions about the current state of the ID tools, reflect on the instructional design processes that would benefit from having helpful tools, and participate in defining a conceptual model of an effective system of instructional design tools. The value of this project is both theoretical and practical. A conceptual model/prototype of an effective system of computer-based instructional design tools is derived and presented during this study grounded in the instructional designers' perspectives. In practice, the study aims to sketch the potential directions for the innovations within the development of user-centered computer-based instructional design tools.

Conceptual Framework

Considering that the present study entails theory development and the conceptualization of a model for understanding, explaining, and describing an effective system of computer-based instructional design tools, the researcher developed a framework to integrate the major elements of my study into a coherent whole. Figure 1.1 illustrates the phenomena under investigation, the research purpose and strategy.

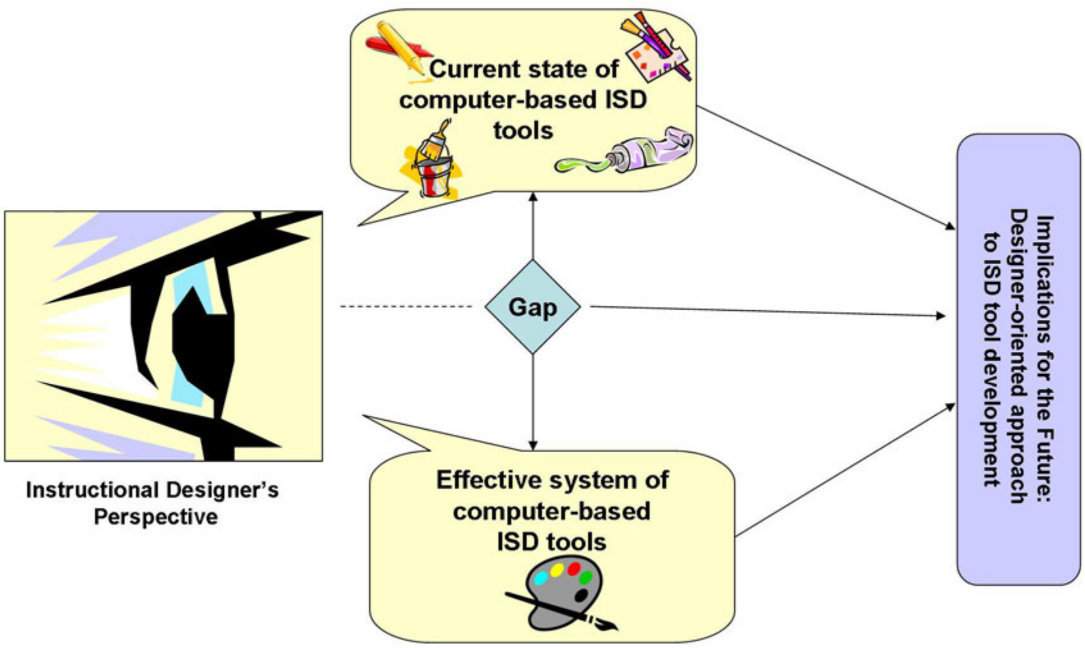

Figure 1.1 Conceptual Framework

Research Design and Methodology

This study was conceptualized within the qualitative grounded theory tradition of inquiry. The intent of this grounded theory study is to analyze the current state of ISD tools and generate or discover a theory, an abstract analytical schema of an effective system of ISD tools based on the perspectives of modern instructional designers. The study incorporates the grounded theory research design and methods, which will be presented in detail in Chapter 3 of this dissertation.

Research Questions

1) What is the nature of the current state of computer-based instructional design tools from the practitioner's perspective?

2) What is the nature of an effective computer-based tool or tool set for instructional design from the practitioners' perspective?

3) What are the elements of a model for an effective system of computer-based instructional design tools?

Subject Selection

Instructional design practitioners from the academia and training industry are engaged in this study. The researcher's goals included interviewing over 20 instructional designers and collecting data from a number of online respondents available within the course of the study.

The participants were recruited via personal contacts, at the professional conferences, and online instructional design industry discussion groups. The following professional groups served as the primary vehicles for locating and engaging the participants:

- Society for Applied Learning Technology (SALT)
- National Training Systems Association (NTSA)
- International Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC)
- Multimedia Educational Resource for Learning and Online Teaching (MERLOT)
- The American Center for the Study of Distance Education

Data Collection

Qualitative methods appear to be most appropriate considering the phenomenological nature of the study. Instructional designers from the academia and training industry were interviewed regarding their perceptions of an effective system of instructional design tools. The research fieldwork included a series of qualitative interviews and on-the job observations. The interviews consisted of one formal interview and several informal interviews-conversations, some of which were combined with on-the-job observations, provided the on-the-job observation access was granted by the instructional designer’s employer. The duration of each interview was approximately one hour. The general frame of the interview questions was focused on the following topic areas:

1. Reviewing the computer-based instructional design tools currently used by the participants in the workplace,
2. Identifying types of tools that instructional design practitioners could benefit from
3. Identifying elements of an effective system of instructional design tools as perceived by the participating instructional designers.

Data Analysis

The fieldwork materials were transcribed, coded, analyzed, and subject to data triangulation. During the textual analysis of the data, meaningful concepts and categories were derived to present and interpret the participants' perspectives regarding the current state of the instructional design tools and their vision of what an effective system of tools would look like. In order to trace a potential cultural variation, a comparative analysis was conducted between the data sets obtained from the representatives of academia, training industry, and government organizations.

Potential Limitations

The limited timeframe of the study and the relatively small number of participants pose a potential threat for the generalization of the results. Involving participants via personal contacts can be either beneficial or harmful. On the one hand, it had the potential to enhance the dynamics of the fieldwork and provide for rich data. On the other hand, it may have inhibited the sincerity of the responses due to some external factors such as presence of mutual professional acquaintances. Considering the diverse spectrum of academic institutions and training companies, it was not always logistically feasible or permissible to conduct on-the job observations with all of the participants. The study does not consider the variations in participants' skills, years of experience and the specific type of ISD model (if any) used in his/her workplace.

Ethical Considerations

The participation in this study was strictly voluntary and each participant could withdraw from the study at any time. Each participant was presented with an Informed Consent Form explaining specific protections for the participants' information. Please refer to Appendix B for the Informed Consent Form.

CHAPTER TWO : LITERATURE REVIEW

Rethinking the Current State of Computer-Based ID Tools

Computer-based instructional design (ID) tools are software packages intended to help instructional designers and educators throughout various phases of instructional design process. Due to a variety of reasons, the currently available ID tools have not gained much of the expected popularity among the instructional systems design professionals.

Considering the fact that instructional design is a time and labor-consuming process, the professionals working in the ISD field could definitely benefit from having useful and helpful tools at hand that would automate certain design and development processes and offer more creative opportunities. Acknowledging the importance of such tools and the modern designers' need for them, Simons, van der Linden, & Duffy (2000) and Merrienboer & Martens (2002) called for rethinking the future of instructional design tools. At the same time, they pointed out that before the new useful tools can be developed, the designers need to voice their needs. Those who will take on the task of creating the new tools will need that information. This research area became one of the latest trends in the instructional technology research and played a significant role for conceptualizing this study.

The history of ID tools is closely related to the history of computer-assisted instruction. When the computer was adopted as an instructional medium, its primary use as a delivery tool was expanded towards the production of instructional systems. As a result, most of the research and development work has been dominated and is still dominated by authoring tools for the development and production of computer-based instruction (Merrienboer & Martens, 2002).

Many authoring tools are commercially available as software packages and vary in terms of their complexity of use and feature sophistication. Considering the fact that during the last decade computer-based instruction has become web-oriented, authoring systems dedicated to web-based instruction quite rapidly appear on the market while some of those tools happen to disappear just as fast. The technology development endeavors of the last decade have demonstrated very limited interest in computer-based ID tools that would support the so-called ‘front-end’ ISD phase, which includes analysis and design activities that take place prior to instructional media selection and content development.

The collection of publications in the 2002 Special Issue Vol. 5 (4) of the Educational Technology, Research and Development Journal appears to be one of the strongest recent announcements regarding the today’s critical state of the computer-based ID tools. This issue was a collective effort of a number of very prominent research figures in instructional technology including J. van Merrienboer, S. McKenney, N. Nieveen, J. van den Akker, J.M. Spector, K.Gustavson, and others. In this publication, they argue that there is a critical shortage of ISD tools especially within the ‘design’ phase. They also stress the importance of focusing on the creation of such tools due to the projected increase in demand for these tools within the ISD community. Simons, van der Linden & Duffy (2000) relate this projection to the new view on learning that is actively stimulated by governmental and labor organizations.

The term *new learning* refers to an array of instructional approaches characterized by their focus on rich, multidisciplinary collaborative learning tasks, closely related to real-life tasks. This view contributes to an increased complexity of instructional systems and their design by going beyond just presenting information. Other factors contributing to the changing nature of the ID process include the multidisciplinary character of learning tasks requiring an ID to rely on the expertise of multiple Subject Matter Experts (SMEs) and consider the diversity of stakeholders involved. Another important consideration relates to an increased demand for learner-centered instructional systems that require very thorough and refined learner analysis. The focus on self-directed learning requires the designer to conduct a through analysis of higher-order skills such as self-regulation and self-assessment, and integrate them with domain-specific skills within a given ISD project.

In addition to these factors, Tabbers, Martens, & van Merrienboer (2002) point out the problems and design issues resulting from the increased use of information and communication technology (ICT) in instructional systems, which pose a challenge to the designer in terms of finding an optimal instructional media mix. Figure 2.1 below illustrates the synthesized view of the factors contributing to the growing importance of computer-based ID tools.

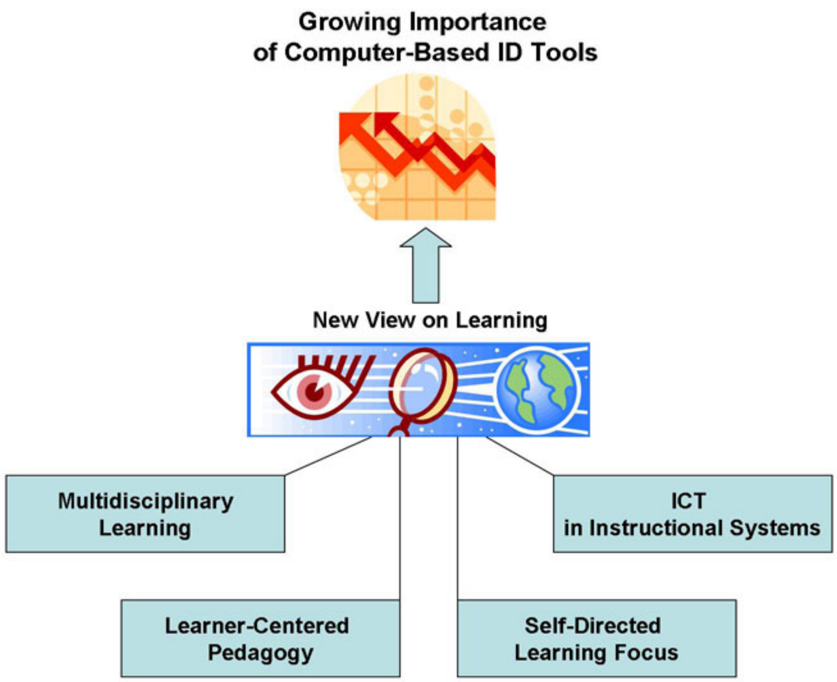

Figure 2.1 Growing Importance of Computer-Based ID Tools

To initiate the research on computer-based tools, Merrienboer and Martens (2002) suggest the following potential avenues to mitigate the complexity of design processes by new learning paradigms:

1) Looking for approaches beyond traditional ISD models, especially in cases of complex training programs. For instance, rapid prototyping approaches have been identified as more apt for the design of new learning environments (Tripp & Bichelmeyer, 1990)

2) Considering that the ISD process relies heavily on collaboration, new communication and information management systems are necessary to ensure that the particular design products and smoothly work together as a complete design and are accessible to all collaborating parties involved.

Paradigms for Classifying Computer-Based ID Tools

Recent publications in the instructional technology literature indicate that there is an agreement between the ISD researchers and practitioners regarding the important role that computer-based ID tools can play in resolving challenges and supporting various aspects of modern ISD (Reiser, 2001; van den Akker, Branch, Gustavson, Nieveen & Plomp, 1999). At the same time, most of the literature about the ISD tools is limited to describing the tools that are specific to a particular aspect of ISD ranging from the needs assessment and evaluation tools to tools for automating the creation of advanced organizers. Experts tend to agree that the two major reasons for this include research publications as a marketing technique for tool vendors and the lack of an effective framework, or paradigm, to describe ISD tools.

Trying to understand and describe the complexity of thought, philosophers have used the concept of "paradigm" to capture ideas, complex ways of seeing things, assumptions, and worldviews (Rossman & Rallis, 2003). Merriam-Webster Online Dictionary (2006) defines paradigm as "*a philosophical and theoretical framework of a scientific school or discipline within which theories, laws, and generalizations and the experiments performed in support of them are formulated; broadly*: *a philosophical or* *theoretical framework of any kind"*. In my review of instructional design tools, I will also use the concept of "paradigm" to capture my vision of the subject matter based on my literature review and the professional involvement with this topic area.

There are several paradigms that can be applied to classifying computer-based ID tools. Wang (2001) attempted to classify the ID tools according to the specific phase of the ID process they supported. Simons, van der Linden, & Duffy (2000) addressed the issue of the ID tool types based on the general purpose as well as the intended user perspective. To address the need to examine and evaluate the ID tools, Nieveen and Gustavson (1999) developed a conceptual framework with the following five dimensions:

1) Type of output
2) Purpose and evidence of benefits
3) Type of development process supported and any underlying theory
4) Task support
5) Intended user group

Although this framework does not intend to be a scientifically valid taxonomy, it provides a multi-dimensional view of ID tools and can serve as a schema for examining, comparing, and selecting computer-based ID tools.

Gustafson (2001) in his review of most recently developed tools expressed his concern about the absence of up-to-date guiding mechanisms and classification frameworks for ID tools leaving an instructional designer to their own devices in terms of applying the newly discovered tools to their contexts. He also points out that many ID tools lack user performance data and states that in the future it will be essential to the credibility of the entire ID tools movement that such data be systematically collected by all tool developers.

Instructional Designer's Computer-Based Tool Classification Matrix (ID-CBTCM)

As part of this study, the researcher developed an original matrix for examining and classifying computer-based ID tools, named ID-CBTCM. ID-CBTCM stands for Instructional Designer's Computer-Based Tool Classification Matrix. The purpose of creating this matrix was twofold:

1. Considering the isolated nature of publications on computer-based ID tools, the matrix provides the mechanism for analyzing the literature review conducted during this study.
2. A mechanism is needed to assist instructional designers in identifying and classifying computer-based ID tools.

This matrix is designed to describe computer-based ID tools according to the following two elements:

1) The functional dimensions of ISD tools
2) The major families of ISD tools

This matrix incorporates a modified version of Nieveen and Gustafson's framework to define the basic dimensions for classifying the instructional design tools of today. The modifications to the schema and format of Nieveen and Gustafson's framework were introduced for the purpose of creating an updated and user-friendly tool classification mechanism.

Based on the research and industrial literature review, a content analysis of the ID tools currently utilized in the ISD field was performed. The tools were classified into families according to their purposes as this dimension captures the general essence of each tool type and provides for the most variability within the spectrum of ID tools. Then the functional comparisons between these families of the ID tools were drawn across the following dimensions:

1. General Purpose
2. ISD Phase
3. Intended Output
4. Performance Support
5. Intended Users

Table 2.9 at the end of this chapter presents the complete view of ID-CBTCM.

General Purpose

This dimension identifies the main purpose of a tool. This dimension examines the primary roles of a computer-based ID tool in terms of assisting an instructional designer through the ID process, which may include

1) Reducing the costs for a given ID task or activity by way of automation or unique features
2) ISD product improvement
3) Instructional designer's task performance improvement.

ISD Phase

This dimension classifies computer-based ID tools according to the ISD phase they are designed to support. Considering that the basic ISD processes (analysis, design, development, implementation, and evaluation) exist in the ISD practice regardless of a particular ISD model being used, this dimension is not limited to any particular ISD model either. This dimension plays an important role in helping an instructional designer determine the specific time of the design process any given tool would be best suited for.

Intended Output

The Intended Output dimension describes the specific results that a given tool is designed to produce. The computer-based ID tool outputs may vary considerably depending on their purpose and user practices. For instance, lesson templates, blueprints, instructional modules, concept maps, evaluation plans, instructional graphics, and many other types of ID product components may be the intended outputs of one tool or a particular group of tools.

Performance Support

In general, all computer-based ID tools are designed to provide task support mechanisms for a broad range of ISD-related tasks and activities. Bastiaens, Martens, & Jochems (2002) compared ISD tools to the features of a hypothetical Electronic Performance Support System (EPSS) based on the fact that they all are intended to provide on-the-job on demand support to facilitate task performance or product development. They distinguish four basic types of support that computer-based ID tools can provide:

1) Library and information support by providing useful resources and databases
2) Standardization support by providing rules, regulations, and directions for performing particular tasks
3) Varying degrees of task automation by providing automated features, expert systems, and wizards
4) Instruction by providing ISD practitioners with just-in-time learning materials to help with a particular task or activity

The means of support may include checklists, examples, references, intelligent agents, how-to procedures, etc.

Intended Users

The dimension of Intended Users pertains to the target audience in terms of on-the-job roles and the scope of intended user group. As it was mentioned earlier, the designers' roles and the scopes of their assignments may vary considerably across different types of organizations. This dimension also examines the user requirements such as professional expertise and computer skills necessary for using a particular ISD tool.

Instructional Design Tools Review

Most computer-based tools for instructional design intend to address some kind of a problem or a challenge a designer faces when developing instruction. During the research literature review and content analysis of professional publications, the following major families of ISD tools were identified based on their intended general purpose and functionalities:

1) Pre-production/Design Tools
2) ISD Production/Authoring Tools
3) Project Management Tools
4) Learning Management Systems (LMS)
5) Specialized Auxiliary Tools
6) Knowledge Management Systems (KMS)
7) Electronic Performance Support Systems (EPSS)

The next few sections will review the characteristics of each of these tool families in detail.

Pre-production/Design Tools

The family of pre-production/design tools includes software packages intended to support the front-end activities of the ISD process and may assist with needs assessment, learner analysis, objectives, learning architectures, and other design events. For instance, for the design and analysis phase, the tools most commonly used by IDs are various programs with flowcharting and storyboarding capabilities. The needs assessment activities and learner analysis activities can be supported by the tools offering qualitative and quantitative data analysis capabilities.

This family of tools Merrienboer & Martens (2003) point out that this group of tools has received very little attention among the tool developers, which leaves the instructional designers with limited choices for the pre-production portion of ISD. To date, there has been limited availability in computer-based ID tools intended to support the designer during the actual conceptualization and design phases of ISD, which take place before the final medium selection is made and the production process is launched.

The intended audience varies within this family of tools depending on the complexity and the specifications of a particular tool. For example, *Designer's Edge*™ is intended for professional IDs, whereas *Inspiration*™ can be used by instructional designers, teachers, or learners. Table 2.1 describes pre-production/design tools according to the ID-CBTCM framework.

Table 2.1

ID-CBTCM Detailed Excerpt: Pre-production/Design Tools

Pre-production/Design Tools	
General Purpose	Support the pre-production events such as needs assessment, learner analysis, task analysis, architecture conceptualization and design.
ISD Phase	Pre-production phase**:** problem analysis, needs assessment, learner analysis, instructional objectives, etc.
Intended Output	Design flowcharts, storyboards, conceptual maps, project plans, needs assessment reports, instructional objectives hierarchies, learning architecture outlines.
Performance Support	Creative outlets, organization, visualization (performance support methods vary within the family of tools), instruction for novice designers.
Intended User	Varies depending on the complexity and the specifications of a particular tool ranging from novice to experienced instructional designers.
Industry Examples	Inspiration ™, Advisor P.I ™, Advanced Instructional Design Advisor (AIDA™), Designer's Edge™, Langevin Instructional DesignWare™, Computer Support for Curriculum Developers (CASCADE™)

ISD Production/Authoring Tools

The family of production/authoring tools largely represents the ID tools development efforts of the last decade. As Gustafson (2002) pointed out, the production tools family received the most emphasis in terms of research and development due to a variety of reasons such as high popularity of computer-based instruction and the need to automate the time and labor-consuming production phase of ISD.

The ISD production tools range from programs like *Authorware*™ offering a variety of advanced features for creating instructional conditions and behaviors to full production suites like *ToolBook* ™ and *Instructor* ™, which, in addition to robust production capabilities, attempt to support project management, learner evaluation to varying degrees.

The advantages of authoring tools are associated with cost reduction of the content development process by way of robust task automation capabilities. This group of tools is accompanied by a vast body of evidence to support its cost reduction capabilities. One of the key disadvantages of this group of tools is primarily limited to the production cycle. Although the authoring tools made it possible for a designer with limited ISD background to produce content via content templates and standardized content formats, these tools do not usually provide any ISD support beyond that point. Table 2.2 describes production/authoring tools according to the ID-CBTCM framework.

Table 2.2

ID-CBTCM Detailed Excerpt: ID Production/Authoring Tools

ID Production/Authoring Tools	
General Purpose	Support the development and production of instructional content
ISD Phase	Production phase: content development, content editing, formatting, sequencing, content delivery preparation
Intended Output	Various forms of instructional content: instructional modules, e-packs, learning objects, training videos, lessons, instructional units, animations, instructional resources, courseware, etc.
Performance Support	Robust automation, standardization, creative outlets, customization, content sequencing
Intended User	Instructional designers, curriculum developers, content developers, teachers
Industry Examples	Authorware™ , ToolBook ™, Instructor ™, Macromedia Director ™, Outstart Evolution ™, Dreamweaver ™ with Coursebuilder, Lectora ™, Captivate ™

Project Management Tools

Instructional design projects vary in complexity and may range from creating a simple job aid to developing an organization-wide training program. Computer-based project management tools provide project planning and organizational support allowing monitoring the progress of different aspects of the project during the ISD process.

Morrison, Ross & Kemp (2001) point out the importance of the following two aspects of project management: the planning aspect and the product management. The planning of an ISD project includes defining the scope of work, timelines, and budgeting. The product management part involves progress tracking, managing resources, and coordinating work assignments.

Computer-based project management tools offer valuable solutions that can help instructional designers manage an ISD project (Morisson, Ross & Kemp, 2001; van den Akker, Kuiper & Hameyer, 2003). These tools can be effective in terms of managing the project events as well as the project components assigned to various members of the production team. At the same time, the spectrum of this group of tools is not very large. Thus, each computer-based project management tool may require a certain amount of customization to satisfy the specific practices of a particular organization. Gustafson (2003) also notes that project management tools are often isolated from the rest of the ISD activities and are often used by the project management personnel, occasionally leaving the instructional designer insufficiently informed regarding the ID project cycle. Table 2.3 describes project management tools according to the ID-CBTCM framework.

Table 2.3

ID-CBTCM Detailed Excerpt: Project Management Tools

Project Management Tools	
General Purpose	Support organizational aspect of the ISD process by assisting in project planning, managing the resources, team assignments, and overall progress
ISD Phase	Embrace all phases of the ISD process
Intended Output	Project plans, project reports, production timelines, team progress reviews, organizational reports, budget and expense reports, memos regarding changes of plan, etc.
Performance Support	Organization, information support, communication, planning
Intended User	Project managers, lead instructional designers, ID team members, SMEs
Industry Examples	Microsoft Project™, Infowit Creative Manager™, ManagePro™, 123 Smooth Projects™, 3 Olive Solutions Portfolio™, IGrafx Process™

Learning Management Systems

A Learning Managements System (LMS) is a software suite designed to deliver and manage the courseware, track and report on the student progress and student interactions. The term LMS can be applied to the tools ranging very simple course management systems to highly complex organization-wide distributed learning environments. These tools provide certain production capabilities along with some collaboration mechanisms and database functions. These tools have gained high popularity in the academic setting and other institutions with large student populations due to their advanced learner assessment, learner progress management, and statistical capabilities. The standard set of LMS functions and services is presented in Figure 2.2.

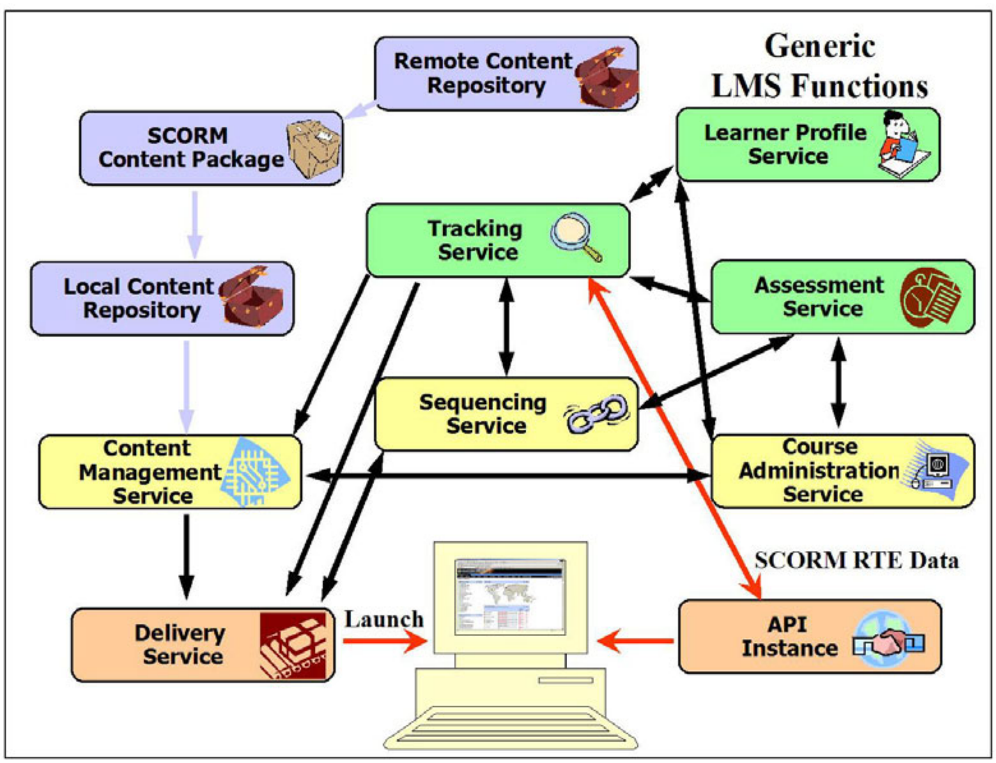

Figure 2.2 LMS Functions and Service

Learning Content Management System (LCMS) is an environment that allows developers to create, store, reuse, manage, and deliver learning content from a central object repository. LMS and LCMS acronyms often appear to be confusing because, although the systems are different, they do share many common features. According to Brandon-Hall report (2006), over two thirds of LCMS systems include most of the LMS functionalities. The differences and similarities between LMS and LCMS systems are reviewed in Table 2.4.

Table 2.4

LMS and LCMS Differences and Overlaps

Capabilities	**LMS**	**LCMS**
Primary Focus	Learners	Content
Learner Progress Tracking	Yes	Yes
Content Authoring	No	Yes
Performance Support Tools	No	Optional
Courseware Customization	No	Yes
Learner Profile	Yes	No

Learning Management Systems effectively provide learner management and course delivery services via their robust database and networking capabilities. Table 2.5 describes the family of LMS tools according to the ID-CBTCM framework.

Table 2.5

ID-CBTCM Detailed Excerpt: Learning Management Systems (LMS and LCMS)

Learning Management Systems (LMS and LCMS)	
General Purpose	Support courseware management and delivery of learning content, instructional activities, and learner management. LCMS tools often offer certain production capabilities.
ISD Phase	Support the development and delivery of instructional content, learner analysis, and evaluation.
Intended Output	Instructional content presentation, learner progress reports, content and learner data handling. Some authoring and content aggregation in case of LCMS.
Performance Support	Standardization, information sharing, automation, communication, content management
Intended User	Teachers, curriculum developers, instructional designers, learners, SMEs
Industry Examples	SABA™, THINQ™, Meridian KSI™, Plateau™, WebCT™, Blackboard™, GeoLearning™, ILIAS, CourseWork

Specialized Auxiliary Tools

Specialized auxiliary tools family represents software tools that are used by instructional designers to accomplish a specialized task during the ID process. For instance, if a new instructional system requires the use of reusable simulation objects, specialized rapid prototyping software may be selected by the production team to create these objects and incorporate them into training. Another scenario might involve new software plug-ins, which can be incorporated into the existing tool set to extend its course development capabilities or simply automate certain processes.

This family of tools has the largest variability within its own spectrum and implies more freedom of choice for an instructional designer along with increased budget costs for the project management side. The tools in this category may either be commercially available, open source, or internally developed within an education or training institution. The use of the auxiliary tools is often accompanied by networking issues, cost, and the issue of designer’s adaptability to the use of a tool. Gustafson (2003) noted that simply creating a wider array of tools is not sufficient. Greater emphasis needs to be placed on creating user-friendly tools aimed at necessary tasks that would function in a reliable and predictable fashion. Table 2.6 describes specialized auxiliary tools according to the ID-CBTCM framework.

Table 2.6

ID-CBTCM Detailed Excerpt: Specialized Auxiliary Tools

Specialized Auxiliary Tools	
General Purpose	Offer specialized software solutions for particular tasks and activities during the ISD process
ISD Phase	May be utilized during any of the phases as applicable
Intended Output	A specialized product component to be embedded within an instructional system (e.g. simulation object, an interactive survey, etc.) or ISD practice (Post-It note plug-in, version tracker, etc)
Performance Support	Creative outlets, innovation, task automation
Intended User	A wide audience including instructional designers, content developers, teachers, web designers, graphic artists.
Industry Examples	GL Studio™, Jasc PaintShop Pro™, Reload Editor 2004, DeltaLearn, HotDocs

Knowledge Management Systems (KMS)

A Knowledge Management System (KMS) can be generally viewed as an integrated collection of tools. Originating from information management systems, KMS systems were created to facilitate software development processes. The technology, commonly referred to as Computer-Supported Collaborative Work (CSCW), provided a way to create environments and processes that support instructional design activities in a distributed setting (Spector, 2002) via the following capabilities:

1) Communication (email, bulletin boards, group messaging, etc.)
2) Coordination (sharable calendars, group tasks, workload division, etc.)
3) Collaboration (sharable work spaces, documentation, etc.)
4) Control (configuration management, product version auditing, content locking, etc.)

One of the major advantages of this tool is its capability to support groups working on complex tasks (Olson, Malone & Smith, 2001). Thus, the research literature acknowledges the potential of KMS systems to significantly impact the work of instructional design teams. Usually, this category of tools is not commercially available to public and frequently represents customized ID software suites designed to serve the specific needs of a particular institution. Due to the specialized nature of many training companies and insufficient capabilities of the commercially available ID tools, specialized KMS tools tend to be a frequently chosen solution.

At the same time, J. Spector (2002) points out that to date the potential of KMS systems has still not been sufficiently realized by the instructional technology community due to the following reasons:

1) Competing instructional design firms may not be willing to openly share learning objects and corporate knowledge
2) Instructional designers tend to believe that instructional decision making is best left to human experts
3) Advocates of open-ended learning and discovery environments oppose the use of instructional design methodologies

Table 2.7 describes KMS tools according to the ID-CBTCM framework.

Table 2.7

ID-CBTCM Detailed Excerpt: Knowledge Management Systems (KMS)

Knowledge Management Systems (KMS)	
General Purpose	• Supports instructional design processes and activities by robust communication and collaboration mechanisms • Provides organization-specific solutions within an ID setting
ISD Phase	Supports all the phases of ISD process followed within a particular organization regardless of a particular ISD model
Intended Output	Task calendars, content tracking reports, teamwork reports, messages, memos, project deliverables for each ISD phase (highly dependent on the organization's profile) as well as other specialized project management solutions.
Performance Support	Customization, standardization, automation, information sharing, collaboration.
Intended User	All the employees engaged in the ISD process: instructional designers, graphic artists, programmers, SMEs, project administration.
Industry Examples	Lotus Notes™, DocuShare™, SevenMountains 7M Enterprise™, CamberWare™

Electronic Performance Support Systems (EPSS)

Electronic Performance Support Systems (EPSS) are computer programs that assist in the execution of usually complex tasks. EPSS systems are traditionally composed of the following elements:

1) Job aids (online help systems, reference systems, etc.)
2) Communication aids (email, news groups, conferencing tools and shared work spaces)
3) Learning facilities (drills, tutorials, simulations)

Advocates of EPSS systems point out that improved task performance, organizational learning and increased task-related knowledge are significant advantages of using these systems (McKenney & Nieveen, 2003). EPSS systems can also save time by automating tasks and providing adaptable examples on demand. Some of the downsides of EPSS systems are cost-related and user-related. The cost-related risks are usually associated with conducting the analysis to identify and implement the appropriate type of system, which may also require the computer literacy improvement expenses. The user-related risks include the difficulty of measuring the effectiveness of these systems and user motivation factors.

One of the recent trends within the EPSS class of tools has been focused on the Performance-Centered Design (PCD). With the user performance support as its goal (Winslow & Bramer, 1994), PCD can potentially maximize the benefits of EPSS and

KMS types of systems (McKenney & Nieveen, 2003). Table 2.8 describes EPSS tools according to the ID-CBTCM framework.

Table 2.8

ID-CBTCM Detailed Excerpt: Electronic Performance Support Systems (EPSS)

Electronic Performance Support Systems (EPSS)	
General Purpose	Provide on-demand performance-centered support
ISD Phase	Extends to all phases of ISD process
Intended Output	Online help, glossaries, libraries, quick links, memos, messaging, tutorials, drills, examples, tips, job aids, references, checklists, walk-troughs, simulations, etc
Performance Support	Library and information support, instruction, coaching
Intended User	All ISD team members: instructional designers (novice or expert), SMEs, instructors, team leads etc.
Industry Examples	EPSS Designer, CoachWare, JAM™, Assistware

Table 2.9

Instructional Designer's Computer-Based Tool Classification Matrix (ID-CBTCM)

Pre-Production/ Design Tools	**ISD Production/ Authoring Tools**	**Project Management Tools**	**Learning Management Systems (LMS and LCMS)**	**Specialized Auxiliary Tools**	**Knowledge Management Systems (KMS)**	**Electronic Performance Support Systems (EPSS)**
General Purpose						
Support the pre-production events such as needs assessment, learner analysis, task analysis, architecture conceptualization and design.	Support the development and production of instructional content	Support organizational aspect of the ISD process by assisting in project planning, managing the resources, team assignments, and overall progress	Support courseware management and delivery of learning content, instructional activities, and learner management. LCMS tools often offer certain production capabilities.	Offer specialized software solutions for particular tasks and activities during the ISD process	Supports instructional design processes and activities by robust communication and collaboration mechanisms Provides organization-specific solutions within an ID setting	Provide on-demand performance-centered support

Pre-Production/ Design Tools	ISD Production/ Authoring Tools	Project Management Tools	Learning Management Systems (LMS and LCMS)	Specialized Auxiliary Tools	Knowledge Management Systems (KMS)	Electronic Performance Support Systems (EPSS)
Instructional Systems Design Phase						
Pre-production phase**:** problem analysis, needs assessment, learner analysis, instructional objectives, etc.	Production phase: content development, content editing, formatting, sequencing, content delivery preparation	Embrace all phases of the ISD process	Support the development and delivery of instructional content, learner analysis, and evaluation.	May be utilized during any of the phases as applicable	Supports all the phases of ISD process followed within a particular organization regardless of a particular ISD model	Extends to all phases of ISD process
Intended Output						
Design flowcharts, storyboards, conceptual maps, project plans, needs assessment reports, instructional objectives hierarchies, learning architecture outlines.	Various forms of instructional content: instructional modules, e-packs, learning objects, training videos, lessons, instructional units, animations, instructional resources, courseware, etc.	Project plans, project reports, production timelines, team progress reviews, organizational reports, budget and expense reports, memos regarding changes of plan, etc.	Instructional content presentation, learner progress reports, content and learner data handling. Some authoring and content aggregation in case of LCMS.	A specialized product component to be embedded within an instructional system (e.g. simulation object, an interactive survey, etc.) or ISD practice	Task calendars, content tracking reports, teamwork reports, messages, memos, project deliverables for each ISD phase as well as other specialized project management solutions.	Online help, glossaries, libraries, quick links, memos, messaging, tutorials, drills, examples, tips, job aids, references, checklists, walk-troughs, simulations, etc

Pre-Production/ Design Tools	ISD Production/ Authoring Tools	Project Management Tools	Learning Management Systems (LMS and LCMS)	Specialized Auxiliary Tools	Knowledge Management Systems (KMS)	Electronic Performance Support Systems (EPSS)
Intended Users						
Varies depending on the complexity and the specifications of a particular tool ranging from novice to experienced instructional designers.	Instructional designers, curriculum developers, content developers, teachers	Project managers, lead instructional designers, ID team members, SMEs	Teachers, curriculum developers, instructional designers, learners, SMEs	A wide audience including instructional designers, content developers, teachers, web designers, graphic artists.	All the employees engaged in the ISD process: instructional designers, graphic artists, programmers, SMEs, project administration.	All ISD team members: instructional designers (novice or expert), SMEs, instructors, team leads etc.
Performance Support						
Creative outlets, organization, visualization (performance support methods vary within the family of tools), instruction for novice designers.	Robust automation, standardization, creative outlets, customization, content sequencing	Organization, information support, communication, planning	Standardization, information sharing, automation, communication, content management	Creative outlets, innovation, task automation	Customization, standardization, automation, information sharing, collaboration.	Library and information support, instruction, coaching

Pre-Production/ Design Tools	ISD Production/ Authoring Tools	Project Management Tools	Learning Management Systems (LMS and LCMS)	Specialized Auxiliary Tools	Knowledge Management Systems (KMS)	Electronic Performance Support Systems (EPSS)
Industry Examples						
Inspiration ™, Advisor P.I ™, Advanced Instructional Design Advisor (AIDA™), Designer's Edge™, Langevin Instructional DesignWare™, Computer Support for Curriculum Developers (CASCADE™)	Authorware™ , ToolBook ™, Instructor ™, Macromedia Director ™, Outstart Evolution ™, Dreamweaver ™ with Coursebuilder, Lectora ™, Captivate ™, Flash™	Microsoft Project™, Infowit Creative Manager™, ManagePro™, 123 Smooth Projects™, 3 Olive Solutions Portfolio™, IGrafx Process™	SABA™, THINQ™, Meridian KSI™, Plateau™, WebCT™, Blackboard™, GeoLearning™, ILIAS, CourseWork	GL Studio™, Jasc PaintShop Pro™, Reload Editor 2004, DeltaLearn, HotDocs	Lotus Notes™, DocuShare™, SevenMountains 7M Enterprise™, CamberWare™	EPSS Designer, CoachWare, JAM™, Assistware

Chapter Summary and Conclusions

During the last several years instructional technology literature has voiced a serious concern regarding the current state of the ID tools associated with the low user popularity and seemingly poor effectiveness in terms of designer support. The current spectrum of the ID tools appears to be a reflection of the ISD tool development endeavors of the last decade or so. Instructional technology literature arguments indicate the unsatisfactory state of the current ISD tools as their capabilities do not appear to meet the creative and professional needs of instructional designers and educators of today.

There is an agreement in the instructional technology literature regarding the potential benefits of computer-based ID tools for a modern instructional designer. Creating a wider array of tools is desirable but not sufficient. A greater emphasis needs to be put on creating user-friendly tools that would function in a reliable and predictable fashion and provide necessary support for both novice and expert developers.

This literature review describes the Instructional Designer's Computer-Based Tool Matrix (ID_CBTCM), which is a framework for identifying and classifying ID tools. The following major families of ID tools are reviewed in detail:

1. Pre-production/Design Tools
2. ISD Production/Authoring Tools
3. Project Management Tools
4. Learning Management Systems (LMS)
5. Specialized Auxiliary Tools

6. Knowledge Management Systems (KMS)
7. Electronic Performance Support Systems (EPSS)

The survey of the current spectrum of ID tools shows that there is currently no balance in terms of the numbers of tools across each tool family. For instance, there is a significant shortage of effective tools that would support the design and evaluation phases whereas most of the tool development efforts have been focused on authoring tools.

It is also interesting to note that most of the publications and research contributions addressing the issues of computer-based ID tools have been undertaken by the European community of ISD practice. It is even more peculiar to see that the related research efforts carried by the U.S. ISD gurus tend to find publication outlets for their studies outside the U.S. Finding the answers for these questions are worth of future investigations but remain outside the scope of this study.

CHAPTER THREE : METHODOLOGY

Chapter Overview

Computer-based instructional design tools in existing research are viewed as task-oriented specialized and thus inflexible computer programs that often do stand up to the complexities of multiple faces of instructional design. Interestingly enough, instructional design tools are relatively unexplored within the field of instructional technology, especially from the viewpoint of the instructional designers who are the end users of these tools.

The purpose of this grounded theory study is to understand the modern instructional designers' needs for computer-based ID tools and discover the elements of an effective system of ID tools based on the designers' perceptions. In order to understand the designers' perspectives on the current state, typology, and critical issues associated with these tools, it is necessary to gain an insight into their experiences, reasoning, beliefs, and intentions. The qualitative methods appear to be most appropriate for accomplishing these tasks as qualitative inquiry allows for greater opportunity to understand the complexities of this phenomenon.

This chapter describes the methodology of this study in full detail in the following order:

1. Theoretical foundations of this study
2. Research questions and design

3. Study population and sampling procedures
4. Data collection methods
5. Data analysis
6. Trustworthiness and theory verification
7. Ethical issues

Theoretical Foundations

Qualitative Inquiry

As a broad approach to the study of social phenomena, qualitative research draws on multiple methods of inquiry (Denzin & Lincoln, 1994) and focuses on the context that helps explain the emergent knowledge. It is conducted in natural settings and relies on a variety of data collection techniques. Historically associated with social science disciplines, qualitative research is fundamentally interpretive and primarily relates to the postpositivist epistemological doctrine based on the assumption of multiple realities constructed as individual interpretations. Qualitative researcher builds a complex holistic picture of a phenomenon by analyzing detailed respondents' information obtained in a natural setting. Qualitative inquiry relies on the researcher acts as the principal instrument of inquiry and the research methods that include personal experiences, life stories, introspective, interviews, observations, visuals, historical memorabilia and so forth. Within the rich spectrum of qualitative research approaches, Creswell (1998) identifies the following five key traditions whose variants have merged into numerous subfields:

1. Biography
2. Phenomenology
3. Grounded Theory
4. Ethnography
5. Case Study

The grounded theory tradition has been chosen as a foundation for this study due to its intent to generate or discover a theory that could explain the user perceptions of modern computer-based tools for instructional design. The grounded theory approach allows for developing an abstract analytical schema of an effective system of instructional design tools.

Grounded Theory Tradition

Grounded theory is a qualitative approach that helps generate a theory of a phenomenon that relates to a particular situation, in which people interact and react to this phenomenon (Strauss & Corbin, 1994). The grounded theory methodology was initially developed as a means for theory development in clinical medicine, but more recently it has been widely applied in educational settings (Glaser & Strauss, 1967; Strauss & Corbin, 1994). One of the key aspects of grounded theory is the generation of good ideas (Glaser, 1978).

In grounded theory, the investigator assumes an inductive stance and tries to derive meanings from the data. Given its emphasis on new discoveries, this approach is frequently used to generate theory in the areas where little is already known, or to provide a fresh slant on existing knowledge about a particular social phenomenon. According to Strauss and Corbin (1994) a theory is a set of relationships that offers a plausible explanation of the phenomenon under study. Morse (1994) extends this interpretation by defining a theory as the best comprehensive, coherent, and simplest model for linking diverse and unrelated facts in a useful and pragmatic way. O'Callaghan (1996) stresses that grounded theory studies should focus on the search for *meaning* and *understanding* to build innovative theory and *not universal laws*.

Grounded Theory Methodology

Grounded theory methods consist of flexible strategies for focusing and expediting qualitative data collection and analysis. These methods provide a set of inductive steps that lead the researcher from studying concrete realities to rendering a conceptual understanding of them (Charmaz, 2003). The founders of the grounded theory aimed to develop middle-range theories from qualitative data by demonstrating relations between conceptual categories and specifying the conditions, under which these theoretical relationships exist.

Grounded theory methods consist of collecting data and analyzing it simultaneously from the initial phases of research allowing the researcher to focus on an area of interest and form preliminary interviewing questions to explore those areas. Further questions are then developed based on the participants' initial responses. This sequence was repeated several times during this research project. Grounded theory methods appear to be most appropriate for this study as they provide a tight fit between the collected data and the analysis of that data. Grounded theory methodology includes the following strategies:

1) Simultaneous data collection and analysis
2) Pursuit of emergent themes through early data analysis
3) Discovery of basic processes within the data
4) Inductive construction of abstract categories that explain and synthesize these processes
5) Sampling to refine the categories through comparative processes
6) Integration of categories into a theoretical framework that specifies causes, conditions, and consequences of the studied processes

Grounded theory methods require that researcher takes control of data collection and analysis and in turn these methods give researchers more analytic control over their materials.

Table 3.1

Grounded Theory Essentials (adapted from Creswell, 2003)

Dimension	**Characteristics**
Focus	Developing a theory grounded in data from the field
Discipline Origin	Sociology
Data Collection	Interviews with 20+ individuals to “saturate” categories and detail a theory
Data Analysis	• Open coding • Axial coding • Selective coding • Conditional matrix
Narrative Form	Theory of theoretical model

Constructivist Paradigm

Grounded theory methods may take different forms based on the research paradigm, or approach, they relate to. Objectivist approach focuses on the viewing of data as an external reality waiting to be discovered by an unbiased researcher. The researcher’s role is to be a collector and conductor of bare facts. Constructivist approach, on the other hand, emphasizes the phenomena of the study and focuses on creating data and analysis from the shared experiences and relationships between researcher and participants as well as reflects the researcher’s thinking. My approach to this study primarily builds upon the constructivist perspective. In this study, I make the following assumptions:

1) Multiple realities exist
2) The researcher is affected by his/her prior background, experiences, and the participants’ responses
3) The data reflects the participants’ and the researcher’s collective constructions

Research Design

Based on the grounded theory tradition of qualitative inquiry, the present study utilizes the grounded theory research design and methodological approaches. The researcher primarily relied on the theoretical supports for grounded theory research design developed by Strauss & Corbin (1990), Creswell (1998), and Charmaz (2006). Figure 3.1 illustrates the research design components of this study and the relationships between them.

Figure 3.1 Research design based on the grounded theory essentials (Charmaz, 2006, Creswell, 1998)

Research Questions

The research questions for this study were formulated according to the guiding works by Creswell (1994) and Miles & Huberman (1994). The entire study has been focused around the following types of research questions: a central question, issue subquestions, and topical subquestions. The central question is the overarching question embracing the breadth of the study (Creswell, 1994). The issue subquestions address the major concerns and perplexities to be resolved (Stake, 1995). The topical subquestions cover the anticipated needs for information and reflect the procedures the researcher plans to use in their tradition of inquiry (Creswell, 1994; Stake 1995). Thus the study poses the following questions:

Central Question: *What is the theory that explains the instructional designers' perspectives on an effective system of computer-based instructional design tools?*

Issue Questions

- *What is the current state of computer-based ID tools from instructional designers' perspectives?*
- *What are the major gaps within the current spectrum of computer-based tools for instructional design?*
- *What are the modern instructional designers' needs for computer-based ID tools?*
- *What are the elements of an effective system of computer-based ID tools as perceived by instructional designers?*

Topical Questions

- *What are the general categories to emerge in a first review of data (open coding)?*
- *Given the phenomenon of interest, what caused it?*
- *What contextual and intervening conditions influenced it?*
- *What strategies or outcomes resulted from it?*
- *What are the consequences of these strategies? (axial coding)*

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Pilot Study

Although the term 'pilot study' is traditionally applied to quantitative research studies to describe a preliminary study aimed at providing an initial set of data, it was determined by the researcher that a similar procedure would be beneficial for the present study too. The pilot study, in this case, not only provided an initial set of qualitative data, but also assisted in refining the research questions and helped focusing the study to compensate for considerable gaps within the literature on computer-based ID tools.

The sample of the pilot study corresponded to the researcher's interest in a broad study and involved instructional design practitioners from the following three fields: academia, government, and training industry. It was primarily a convenience sample due to the fact that the researcher needed to obtain an easy access to sufficient qualitative information during the conceptualization phase of the study. The pilot study involved seven respondents (academia = 3, government = 2, training industry = 2) who contributed significantly to formulating the research questions and defining the current set of issues within their professional practices.

The major role that the pilot study participants played in this study was to support its purpose and acknowledge the significance of doing this study. They embraced the idea of providing their perspectives on the current state and future of computer-based tools for instructional design. The participants of the pilot study also expressed their support for the use of the 'designers as artists' and 'ID tools as a color palette' metaphors throughout the study.

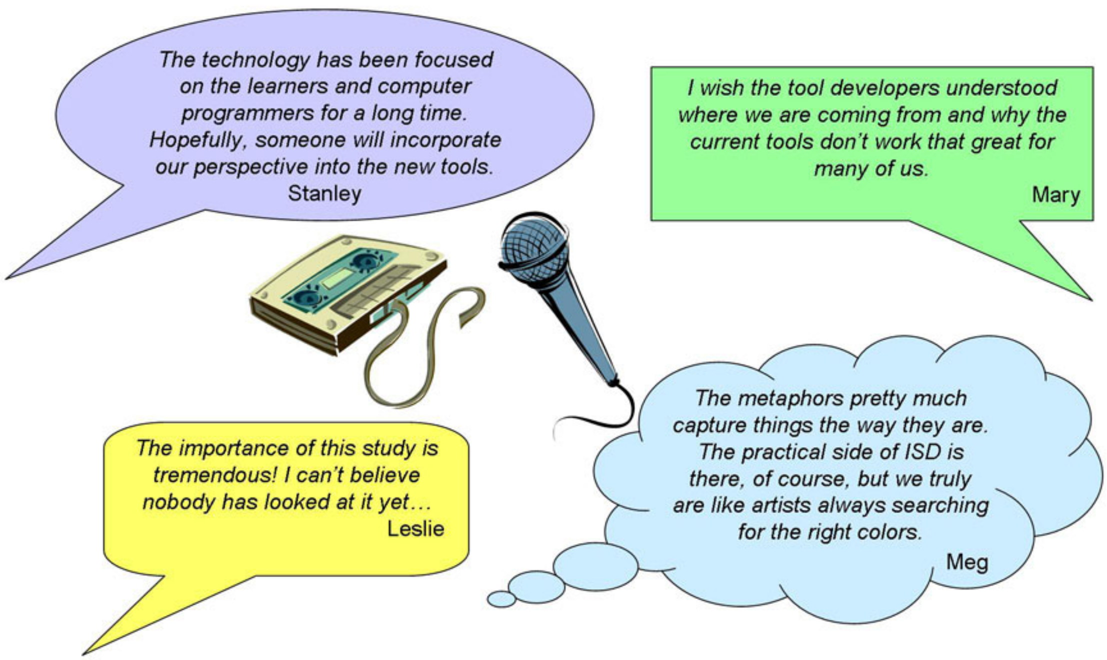

Figure 3.2 Pilot Study Data Samples

Study Population and Sampling Procedures

The study population included instructional design practitioners from a variety of programs and settings. The sampling decisions and procedures were driven by the theoretical sampling method described by Strauss and Corbin (1998). Theoretical sampling is a method of data collection where the decisions on sample types are made based on the concepts that emerge from on-going analysis of the gathered data. The aim of theoretical sampling is to maximize the opportunities for discovering variations among concepts and to saturate conceptual categories.

According to Strauss and Corbin (1998), theoretical sampling cannot be planned before the study commences and specific sampling decisions need to be made during the course of the study. Additional data from participants can be obtained until theoretical saturation was reached. Theoretical saturation refers to the point when a category becomes fully developed and no new or relevant data can be collected to add to the category (Strauss and Corbin, 1998, p.212). A further feature of the method relates to the sampling of informants. Sampling is not determined in the very beginning of the study, but is directed by the emerging theory. During the pilot study, the researcher went to the most obvious places and the most likely informants in search of information. However, as the concepts were identified and the theory started to develop, more individuals and further discussions needed to be incorporated in order to strengthen the findings. This is known as 'theoretical sampling' which is "the process of data collection for generating theory whereby the analyst jointly collects, codes and analyzes the data and decides what data to collect next and where to find it, in order to develop the theory as it emerges.

This process of data collection is 'controlled' by the emerging theory" (Glaser, 1978 p.36).

Based on the information obtained during the pilot study, the theoretical sample was determined. Although the sample was designed to be homogeneous in terms of the profession, its entry limitations were kept down to a minimum to provide for maximum variation within designers' perspectives. The participants for the study were selected on the basis of their ability to meet the following three basic criteria:

1. A degree in ISD or related field and at least one year of full-time work experience at an ISD institution
2. Current employment as an instructional designer (or related title) for an ISD project within an academic institution, a government organization, or a corporate training company
3. Availability for continuous contact with the researcher during the course of the study

The first criterion was introduced to enable the researcher to gather the perspectives of instructional designers ranging from novice to experienced designers. The minimum one-year experience limit was determined as sufficient exposure within the ISD field based on the pilot study feedback. The second criterion was included to ensure that the participants possessed the most up-to-date perspectives on the current state of events inside the ISD field. This criterion also specified the wide organizational spectrum, from which ID perspectives were to be drawn. The third criterion was introduced to satisfy the requirement for a continuous contact with the participant in order to allow the researcher to gain additional insight into the participant's perspective. This requirement was especially critical due to the grounded theory approach used in this study.

Participants' Demographics

The total of 25 instructional design practitioners agreed to participate in this study. Twenty of them committed themselves to the full cycle of data collection, which lasted for four months. Among those who completed a full cycle of data collection, twelve participants had undergraduate degrees in ISD or related fields. Eight participants had master's degrees and working towards their doctoral credentials. Their years of ISD experience in ranged from two to over fifteen years. The participants were between the ages of 24 and 53. Seven participants were male, and thirteen were female. All were native speakers of English.

There was a relatively even distribution of participants across the academic, government, and corporate types of organizations. The academic institutions included several state universities, a private university, and a community college. The government institutions were represented by both the defense and civilian-oriented training programs. The corporate perspective was contributed by a wide spectrum of companies providing a variety of ISD solutions ranging from small-scale ISD projects to costly and complex training solutions. Figure 3.3 presents the organizations where the participants who contributed to this study are currently employed.

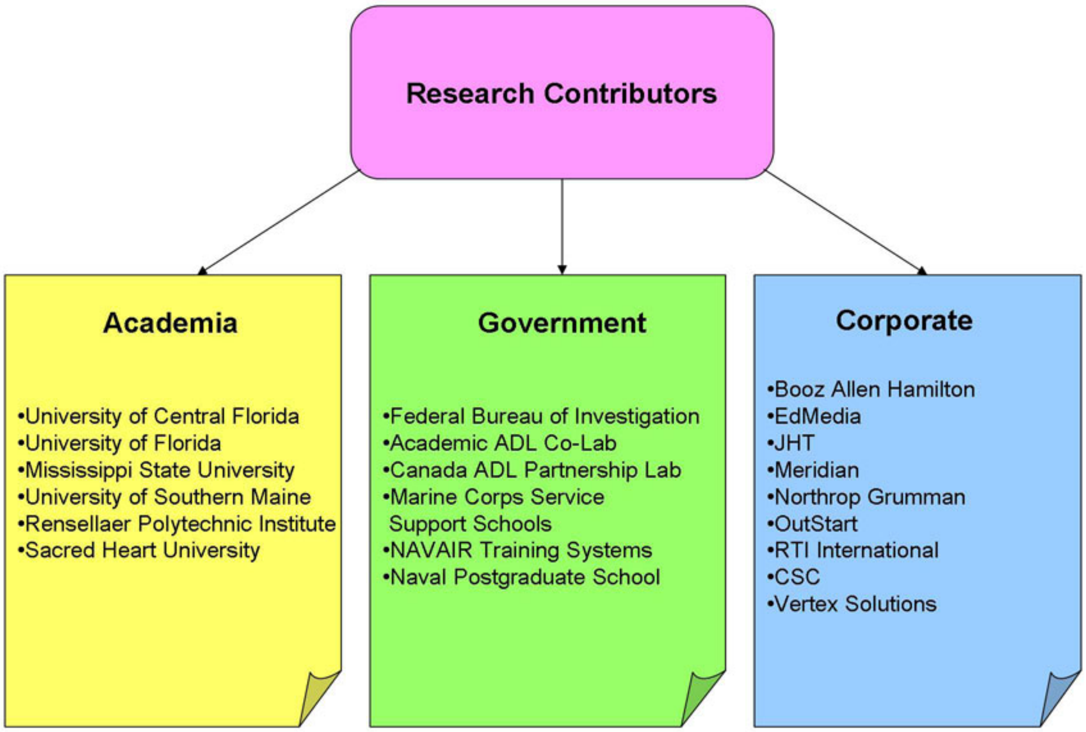

Figure 3.3 Research Contributors

Research Sites

The research sites were purposefully selected according to the sampling methods and served to represent a variety of organizations that employ instructional designers ranging from academia to government, and corporate types of employers. Figure 3.4 represents the three types of research sites were utilized during this study.

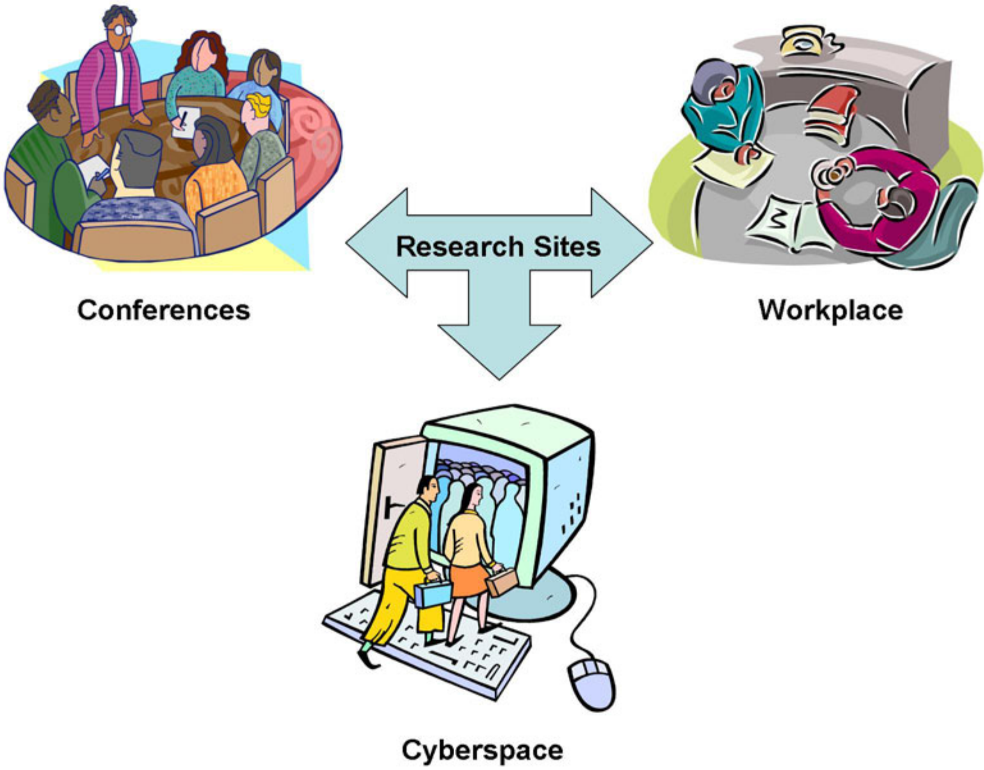

Figure 3.4 Research Sites

Conference Sites

Based on the researcher's prior experience with education conferences and after reviewing conferences agendas and themes of some of them, the site selection was narrowed down to the following two research sites: The Society for Applied Learning Technology (SALT) Conference and Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC).

The Society for Applied Learning Technology (SALT) Conference

This conference is sponsored by the Society for Applied Learning Technology® and is oriented to professionals working in the field of instructional technology. This conference is educational in nature and covers a wide range of application areas such as distance learning, interactive multimedia in education and training, development of interactive instruction materials, performance support systems applications in education and training, interactive instruction delivery, and information literacy. The SALT conferences provide attendees with an opportunity to become familiar with the latest technical information on application possibilities, technologies, and methodologies for implementation. In addition, they provide a venue for interaction with other professionals in this field.

Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC)

This conference promotes cooperation among the armed services, training industry, academia, and various government agencies to improve training and education programs, identify trends and issues of training, and develop multiservice programs. This conference successfully brings together researchers, educators, business people, and government representatives for open discussions facing the fields of instructional technology, modeling and simulation, and software development.

Due to their nature, these conferences appear to be ideal research sites for this study for the following reasons:

1) The diversity of attendees satisfies the sampling requirements of this study. Both of these conferences provided a sufficient number of instructional technology specialists representing different types of organizations.
2) Due to their purpose and informal atmosphere, these conference sites promote interactivity between participants. Participating in this study was viewed by the respondents as an opportunity to contribute their voice towards research within their field. They were excited to share their experiences, construct their views of the field and brainstorm ideas. (*"What a wonderful opportunity! Someone is finally asking these questions!"* - Sarah, Meridian Corporation)

Workplace Sites

The workplace sites included the specific work locations of the participants of this study. In order to protect the respondents' privacy and ensure confidentiality, the researcher will not disclose the names and descriptions of the work sites that were accessible during the course of the study. The total of three workplace sites was available for the researcher's access during this study. The arrangement of the access to these sites was based on convenience and respondents' ability to accommodate for it. According to Strauss and Corbin (1998), such sampling on the basis of convenience, where the researcher studies the available respondents does not compromise the quality of the data.

Although comparisons can still be made on the basis of concepts, the researcher "must accept the data that he or she gets rather than being able to make choices of to whom or where to go next" (Strauss and Corbin, 1998, p.208). All in all, the workplace sites provided for to be extremely valuable data based on on-the-job observations, dyadic interviews, and informal conversations with the participants.

Cyberspace Sites

By 'cyberspace sites' the researcher views the media that provided for the sources of digitally obtained data including email and online discussion boards. Due to their high accessibility and popularity, these sites proved to be essential during data analysis and theory verification phases of this study as they delivered fast responses from the participants and provided for collaboration between the participants towards generating new ideas. The primary communication mechanism used for this project was NICENET (www.nicenet.org), a free web-based system for academic and professional communication and collaboration.

Data Collection Methods

The grounded theory approach of simultaneous data collection and analysis helped this study determine a set of data collection methods to inform the emerging analysis. The first classic grounded theory question (Glaser, 1978) "What's happening here?" poses a need for qualitative interviewing. Interviews play a central role in the data collection of a grounded theory study (Creswell, 1998). The interview approach is particularly good for gaining an understanding of feelings, thoughts, intentions, and past experiences of participants (Patton, 1990).

According to Charmaz (2003), interactive qualitative interviewing fits grounded theory particularly well by allowing the researcher to assume more direct control over the construction of data. Other effective data collection methods appropriate for a grounded theory study include participant observation, researcher reflection, and focus group (Creswell, 1998; Miles & Huberman 1994). The researcher's decision to incorporate multiple data sources in this study was based on the following rationale:

- The use of three or more different data sources would allow for triangulation of findings and maintain the credibility and dependability of the study.
- The presence of conflicting evidence produced by the different methods would indicate the need to pursue a further investigation.
- The use of multiple methods would provide a greater access to more comprehensive meanings held by the participants and allow for achieving a better understanding of the phenomena.
- A variety within the data collection methods method would compensate for the strengths and weaknesses of individual methods.

Figure 3.5 illustrates the data collection methods applied for this study.

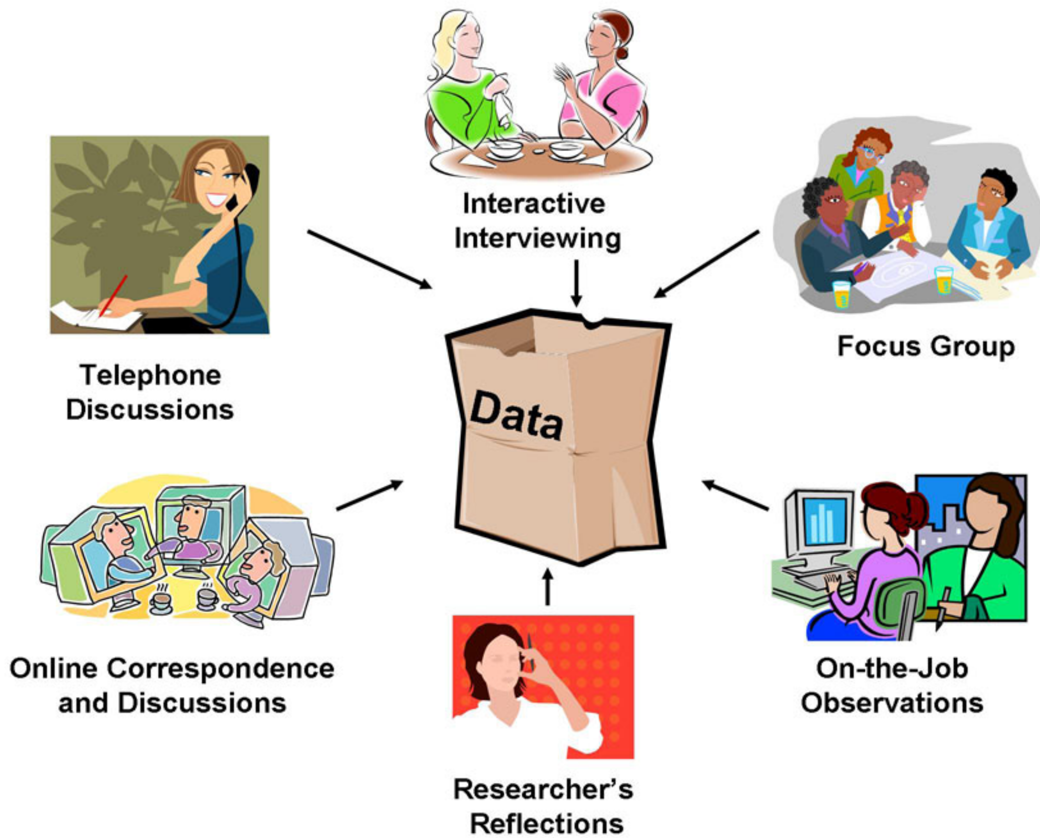

Figure 3.5 Data Collection Methods

Interactive Interviewing

Qualitative inquiry relies heavily on having researchers acknowledge their personal, political, and professional interests. Instead of a rigid separation of a researcher and a respondent, qualitative inquiry views an interview as an active relationship occurring in a context permeated by issues of power, emotionality, and interpersonal process (Holstein and Gubrium 1995).

Vast volumes of literature draw attention to the relational aspects of the interview and the interactional construction of meaning in the interview context (Holstein &

Gubrium 1995; Langellier & Hall 1989). This interaction resides in the context of an ongoing relationship where the personal and social identities of the researcher and the respondent are important factors (Collins, 1986). In this interactive context, respondents become narrators who improvise stories in response to questions, probes, and personal stories of the interviewer (Turner & Bruner 1986; Chase and Bell 1994). Interactive interviews offer opportunities for self-conscious reflection by researchers as well as respondents. Today's interactive interviewing process is less a conduit of information from informants to researchers that represents how things are, and more a process of meaning making, during which researchers and participants connect their own experiences.

Qualitative interviewing provides an open-ended in-depth exploration of an aspect of life about which the participant has considerable experience and insight. Based on the qualitative interviewing data of the pilot study, the researcher sketched the outline of the respondents' views by delineating the topics and drafting the questions. Considering that grounded theory methods heavily rely on data verification, the researcher used multiple opportunities to return to the field to obtain clarifications to analytic questions and fill conceptual gaps.

Reflexive Dyadic Interviewing

The reflexive dyadic interviewing method is chosen for conducting the interviews with individual respondents. As a type of collaborative interviewing, reflexive dyadic interviews follow the typical protocol of the interviewer asking questions and the interviewee answering them, but the interviewer usually shares personal experience with the topic at hand or reflects on the communicative process of the interview. The interview is conducted more as a conversation between two equals than as a distinctly hierarchical, question-and-answer exchange. The rationale for choosing this interviewing method can be explained by the following assumptions:

1) The interview should be conducted as a conversation between two equals because the interviewer is a part of the studied community herself.
2) The interviewer's professional experiences and shared background with the participants is likely to elicit more specific answers and increase the participants' comfort level during the interview. ("One of the guys" effect)

The interviews were audiotaped and transcribed in order to consider all the words of the participants. The face-to-face interactive interviews lasted for a little over one hour and were followed up by a series of additional interactive contacts with the participants for data clarification and verification purposes. In addition to the interviews, the researcher held interactive discussions with the participants during the workplace observation sessions. These discussions focused on the reasons and significance behind the actions of the instructional designers during the everyday ISD activities. These discussions served as an effective tool to elicit insights and accurate explanations regarding their work practices. The interview transcripts were given to the participants to be checked and verified. The participants had the freedom to elaborate, refine, modify or alter their transcript until they were satisfied that the views presented in the transcripts were an accurate reflection of their perspectives.

To help keep the interviews focused, the researcher developed an aide memoire, which was revised and refined during the study based on the additional data that emerged. An aide memoire is a non-standardized interview guide containing a list of issues, topics, problems, or ideas, which the researcher would like to cover during the interactive interviewing sessions (Minichiello et al, 1990). The copies of the aide memoir and the interview protocols for the interactive interviews and the focus group are included in Appendix C and Appendix D respectively.

Participant Observations

Participant observation offers possibilities for the researcher on a continuum from being a complete outsider to being a complete insider (Jorgensen, 1989). Within the boundaries of this study, observations were deemed to be an effective data collection method due to the limited amount of information about the studied phenomena. Participant observations were conducted during face-to-face interviews, on-the-job visits, and a focus group. One of the major benefits of the participant observations was their ability to support and facilitate the analysis of data obtained from the interactive interviews.

Tremendous value can be attributed to the on-the-job observations as they provided ‘insider insight’ into the everyday practices and struggles of an instructional designer. The on-the-job observations gave the researcher an opportunity to elicit explanations regarding the designers' perspectives while the designers are performing their ID activities. This data collection method allowed the participants to demonstrate to the researcher what their experiences with the computer-based ID tools were like and describe in detail the obstacles, workarounds, and wishes of their everyday life. The observations of the participants in action were audiotaped, provided a permission was given for it. In addition to the audio recordings or in cases when the recording was not possible, the researcher took field notes trying to describe as closely as possible what was being said and the actions that took place at the designer's work station.

Online Correspondence and Discussions

Online correspondence and message board discussions supplied the textual data in the form of emails and digital message postings. This data collection method provided the researcher with an opportunity to elicit explanations regarding the participants' perspectives and proved to be an excellent tool to saturate the data categories. It also allowed the researcher to observe the process of brainstorming of ideas between the participants, which provided further insight into the studied phenomena. The data obtained from his method was also critical in terms of providing a basis for a comparative analysis between all forms of data obtained in this study. The online correspondence and discussion materials were recorded, analyzed, compared across the other data sets, and archived for further analysis.

Telephone Discussions

Telephone discussions provided the researcher with additional opportunities for data clarification, follow up, and comparative analysis of the data. Considering the long-distance relationship with many of the participants, the researcher used this method sparingly, only as an alterative to the online discussion board and email. This method produced field notes and contributed to the researcher's analytic memos.

Focus Group

The focus group method produced the discussion transcripts, observation field notes, analytic memos, and concept maps. The focus group participants received the same set of questions that were used during the individual face-to-face interactive interviews. Additionally, the respondents were requested to participate in the same type of concept mapping activity as the individual ID interviewees. The concept mapping activity during the focus group, however, was a collaborative effort of all participants.

Considering that the focus group took place as one of the last data collection efforts of this study, by which point the previously collected data had been subject to initial coding and category formation, it was decided by the researcher to present this information at the end of the focus group. This activity was designed to serve as a data verification tool and an assessment tool for determining the participants' impressions of the categories being formed.

Researcher's Reflections

Considering the qualitative nature of this study and the researcher's involvement in the instructional design community, the researcher's presence added an extra dimension to each data collection activity. The researcher's presence in the field is inseparable from the outcome or product of data gathering (Rossman & Rallis, 2003). Including the researcher's impressions and reactions as an observer and interviewer comments in the field notes was an important source of data and a way to document the processes and decisions of the study. The researcher reflections have produced analytic memos, research diary, and follow-up discussions.

Concept Mapping Activity

A concept mapping activity was conducted during the interactive interviews and the focus group and produced concept maps, or participants' idea illustrations. As a technique for visualizing the relationship between concepts, concept mapping proved to be very effective in terms of assisting the respondents in generating the conceptual categories, graphically representing the relationships between them, pointing out the issues, and making notes regarding the possible solutions to those issues. Originating from the constructivist movement, the concept mapping technique has been popular both in qualitative and quantitative research as a way to stimulate idea generation, aid creativity, communicate complex ideas, and represent formal arguments.

In this study, the concept map technique proved to be useful not only as an aid for the participants in terms of formulating ideas, but also as a data verification method aimed at encouraging the participants to graphically reiterate and confirm the information provided during the interview. This method significantly contributed to the rigor and trustworthiness of the data. An example of the concept mapping activity is available in Apendix E. Figure 3.6 below illustrates the forms of data colleted in the course of this study.

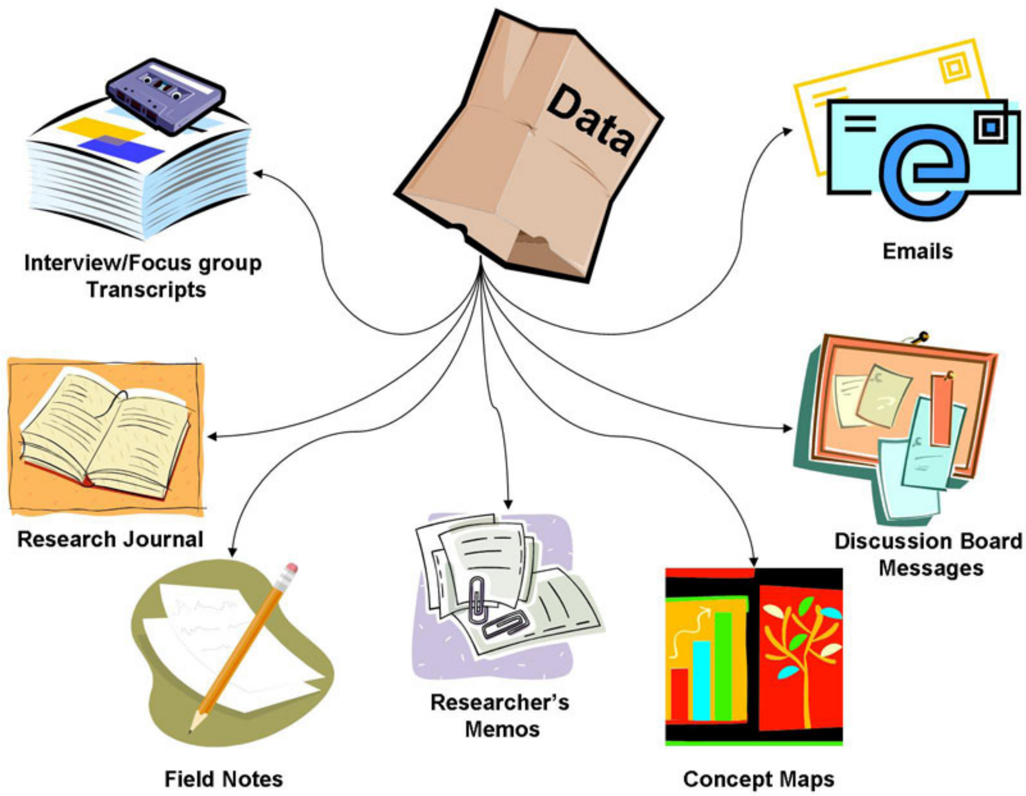

Figure 3.6 Forms of Data

Data Management

Considering that data coding was conducted simultaneously with data gathering, data management required ensuring accessibility of data, documentation of analyses, and keeping of the used materials. To assist with these matters, the researcher relied on Levine's (1985) principles for management of qualitative data summarized in Table 3.2 below.

Table 3.2

Levine's (1985) Principles for Storage and Retrieval of Qualitative Data

Levine's (1985) Principles for Storage and Retrieval of Qualitative Data	
Principles	**Specifications**
1. Formatting	• Structured formatting and layouts for fieldwork notes • Overall file structure is a map of the data
2. Cross-referral	Information in one file indicates where information in another file can be found
3. Indexing ("Coding")	• Defining clear categories • Organizing the categories into an explicit structure • Pairing of the codes with appropriate places in the database
4. Abstracting	A condensed summary of longer materials
5. Pagination	Using unique numbers/letters as locators of specific materials in the field notes

The physical data consisted of tapes, and a variety of documents that included field notes, concept map diagrams, and electronic information. The interviews and focus group discussions were transcribed, digitized, and electronically stored. The hard copies of documents were labeled, referenced, and filed together with other documents relating to each participant. The diagrams produced during the concept mapping activity were also scanned and turned into a digital format.

Data Analysis

The analysis of data was carried out using the grounded theory methods as explained by Strauss and Corbin (1998). The three data analysis methods used in this study included open coding, axial coding, and selective coding. Coding is the process of analyzing data, during which multiple codes may emerge and offer potential meaning and relevance. The two fundamental features of grounded theory data analysis include concept and category development and comparative analysis. Combining the three data analysis methods within a grounded theory study is aimed at reducing data into concepts further grouped into meaningful categories as a result of constant data comparison. Grounded theory provides a procedure for developing categories of information (open coding), interconnecting the categories (axial coding), building a story that connects the categories (selective coding), and ending with a discursive set of theoretical propositions (Strauss & Corbin 1990).

Codes are the building blocks of theory. The grounded theory coding methods allowed the researcher to turn the data into analytical pieces that were later raised to a conceptual level. The questions that were addressed at every coding stage of this study included (O'Callaghan, 1996):

- What is happening in this data?
- What is the basic socio-psychological problem?
- What accounts for it?
- What patterns are occurring here?

In addition to coding, the data analysis of this study relied on the use of memos, which were written immediately after the data collection as a means of documenting the impressions of the researcher and describing the situation. The use of memos appeared to be vital for this study as it created a bank of ideas, which could be continuously revisited in order to map out the emerging theory.

Concept and Category Development

Grounded theory relies on the appreciation of concepts in terms of their dynamic interrelationships as they form the basis for the construction of the theory. "Abstract concepts encompass a number of more concrete instances found in the data. The theoretical significance of a concept springs from its relationship to other concepts or its connection to a broader gestalt of an individual's experience" (Spiggle,1994 p. 494). Once a concept has been identified, its attributes and characteristics may be explored in greater depth, or dimensionalized in terms of their intensity or weakness. A core category that serves as a basis for emergent theory pulls together all other concepts and categories providing an explanation of the phenomenon under study and has a major theoretical significance.

Concepts are a progression from describing the data themes and patterns to explaining the relationship between and across the data incidents involving the process of abstraction onto a theoretical level (Glaser & Strauss, 1967). The development of concepts and categories was clearly traceable through the data.

Comparative Analysis

In addition to category development, a fundamental feature of grounded theory data analysis is the application of the 'constant' comparative method in order to look for emerging patterns and themes. "Comparison explores differences and similarities across incidents within the data currently collected and provides guidelines for collecting additional data. Analysis explicitly compares each incident in the data with other incidents appearing to belong to the same category, exploring their similarities and differences," (Spiggle, 1994 pp. 493-4). The constant comparative analysis approach facilitates the identification of concepts and is an important element of ensuring the trustworthiness and confirmability of data analysis.

Open Coding

Open coding constitutes the basic level of data analysis when initial data are sorted and placed into conceptual categories. This step was accomplished by breaking down the raw data elements, such as observations, sentences, or paragraphs, into discrete ideas or events. These concepts were further labeled and grouped together into named categories.

Coding procedures traditionally begin with an *open* rule, starting with a full transcription of an interview that is followed by the line-by-line analysis of text so as to identify the key words or phrases explaining the respondent's ideas. This activity constitutes early concept development defined as "identifying a chunk or unit of data (a passage of text of any length) as belonging to, representing, or being an example of some more general phenomenon" (Spiggle, 1994, p. 493). Within the course of this study, the open coding strategy was applied starting with the transcription of the first interview and continued throughout the entirety of data collection efforts.

In this phase, the researcher examined the textual data for salient categories of information supported by the text. Analysis on this level was achieved by grouping and constantly comparing the open codes while simultaneously looking for possible interpretations in order to generate a conceptual code. Although the researcher attempted to code interviews on a line-by-line basis, it became very obvious early in the study that the data provided for richer meanings when kept within it own context in which they occurred. As a result, the researcher resorted to a context-based coding strategy, which allowed for sufficient data reduction without weakening or misleading the emerging concepts. At this stage, the concepts, or chunks of meaning, were highlighted using various colors and then labeled at the side of the page. Each page also included a concise multicolored table with the summary of the concepts and categories.

Using the constant comparative approach, which is essential to saturate the categories (Creswell, 1998), the researcher looked for instances representing these categories. Categories derived from open coding are considered to be first-order concepts and serve as a theoretical foundation for building a grounded theory.

Axial Coding

Axial coding is the process of determining the more abstract second-order concepts. The purpose of axial coding is to get a more precise and complete explanation of a phenomenon through reassembling the data that were fractured during open coding (Strauss and Corbin, 1998). In axial coding, the researcher examined the open categories and identified the relationships between them. The search for the logical links between the open categories included evaluating the possibilities for cause-and-effect relationships, comparisons, and contrasts, hierarchies, differing viewpoints, and other logical links. Based on the emergent logical links, the open categories were grouped into broader, more abstract categories. The relationships between the categories were used as a foundation for the development of propositions.

The axial coding process involves the following basic tasks (Strauss, 1987):

- Reexamining the properties of a category and its dimensions,
- Identifying the conditions, actions, interactions, and consequences associated with the phenomenon,

- Relating the categories with their sub-categories,

- Looking for clues on how the major categories might be related to each other.

During the axial coding process, the researcher relied on a combination of inductive and deductive reasoning approaches as a means to constructing the core categories. To explain the concepts and their relationships that have emerged during the data analysis, the researcher thoroughly reviewed all of the data forms and documented the participants' views on the current state of ISD tools and an effective system of computer-based tools for instructional design. In this phase of analysis, the researcher developed a theoretical model that visually portrays the interrelationship of the categories of information that emerged during axial coding. This model encapsulates the built theory and is discussed in detail in Chapter 4 of this dissertation. This visual model helped the analysis move from idiosyncratic details to theoretic understanding by drawing out specific system elements and user recommendations for tool developers. The use of models, or visual diagrams, in qualitative research have been acknowledged as effective rhetorical devices for presenting qualitative work (Richardson 1990, Charmaz, 2004) due to their open-ended nature.

Selective Coding and Development of Propositions

In selective coding, the researcher integrated the categories in the theoretical model, identified a "story line", and presented conditional propositions, or hypotheses, regarding the studied phenomenon and its causal conditions. Analytic induction was used to formulate the propositions. The inductive logic drove the process of generating broad abstract categories, whereas the deductive method served to form the hypotheses about the relationships between categories and subcategories. These hypotheses were then tested by reevaluating the earlier data and conducting a comparative analysis of earlier and newer data sets. The explanatory propositions were thoroughly evaluated and progressively redefined in order to find a perfect relationship between them and the data.

Standards of Quality and Verification

The quality of the present study is assessed according to several sets of criteria for evaluating qualitative research in general and grounded theory studies in particular. To establish the trustworthiness of this study, the researcher relied on Lincoln and Guba's (1985) evaluation criteria, which included credibility, transferability, dependability, and confirmability.

In addition to the general criteria for evaluating qualitative research, the researcher applied the following two sets of criteria for judging this study in terms of the grounded theory tradition:

- The general research process criteria (Strauss & Corbin, 1990)
- The empirical grounding of the study (Strauss & Corbin, 1990)

The specific details of the quality assessment efforts of this study are described in Chapter 5 of this dissertation.

Ethical Issues

The research and reporting methods of this study have been thoughtfully chosen and evaluated by the researcher in order to protect the participants' rights and treat them with care and justice. Prior to the beginning of the study, the researcher submitted the study proposal for consideration by the UCF Institutional Review Board (IRB) at the Office of Research and Commercialization and provided a detailed outline of the research design, sampling procedures, and data collection methods. The proposal included an Informed Consent Form that introduced the study and the researcher to the potential research participant. The form also described the participant's rights and protections. Both the research proposal and the Informed Consent Form were approved by the UCF IRB.

Gaining the informed consent of participants was crucial for the ethical conduct of this study. All participants received a clear description of the nature of the study and the participant requirements. The participants were also informed that they could withdraw at any time and notify the researcher about their wish regarding the future use of their data materials.

Confidentiality was ensured through the use of pseudonyms and nondisclosure of the locations of certain research sites. During the study, the researcher thoroughly followed the procedures stated in the Informed Consent Form. Copies of the UCF IRB Approval and the Informed Consent Form are included in Appendix A and Appendix B respectively.

Chapter Summary

Starting with the theoretical foundations for this study, the present chapter described the research design, data collection, and data analysis methods, as well as the standards of quality applied by the researcher to evaluate her work. The chapter described the study focusing on the grounded theory tradition of qualitative inquiry. This chapter serves as an explanation of the "nuts and bolts" behind the qualitative results presented and discussed in the chapters to follow.

CHAPTER FOUR : FINDINGS

Chapter Overview

The purpose of this chapter is to present and describe the findings of this study. The primary focus of this part of the dissertation is the data analysis outcomes, theory generation, and theory verification. The findings of this study are described in the order they were derived from the data to allow the reader to trace the development of the emergent theory. The primary sections of this chapter include

- Open coding categories
- Central category
- Axial coding categories
- Theoretical model development
- Selective coding and theory verification
- The "story line" and proposition development

The researcher makes references to the literature to show its connections to the emergent theoretical model. Segments of the qualitative data in the form of vignettes and direct quotes are included in this chapter as explanatory material to demonstrate how the theory is grounded in the data. Special attention is also paid to the theory verification and comparative analysis of the data. To enhance the clarity and effectiveness of the researcher's descriptions, most of the presented data analysis findings are accompanied by visual supports such as figures and graphs.

Open Coding

The open coding phase of data analysis presented a number of conceptual categories that were derived from the thorough comparative analysis of the data forms used in this study. The researcher drew these comparisons via the multiple reviews of interview and focus group transcripts, field notes, analytic memos, and other forms of data described in the Chapter 3 of this dissertation.

The emerged categories were named according to the textual analysis of the recorded data and refined based on the data verification procedures such as online discussions, phone consultations, and email exchanges with the research participants. Selected category names include *in vivo* subtitles to demonstrate their tight relationship with the data.

Each category was continuously revisited during the research until it became apparent to the researcher that it became saturated with descriptive information and its properties and relationships with other categories were clearly identified. Figure 4.1 presents the major categories that emerged during the open coding analysis. Each category description is accompanied by direct quotes from participants carefully selected to present the reader with a comprehensive sample of the participants' responses shaping up one particular category. Most of the included quotes are presented verbatim from the data sources, except for the occasional editing of direct quotes performed by the researcher to ensure the clarity of expression and minimize the context interference.

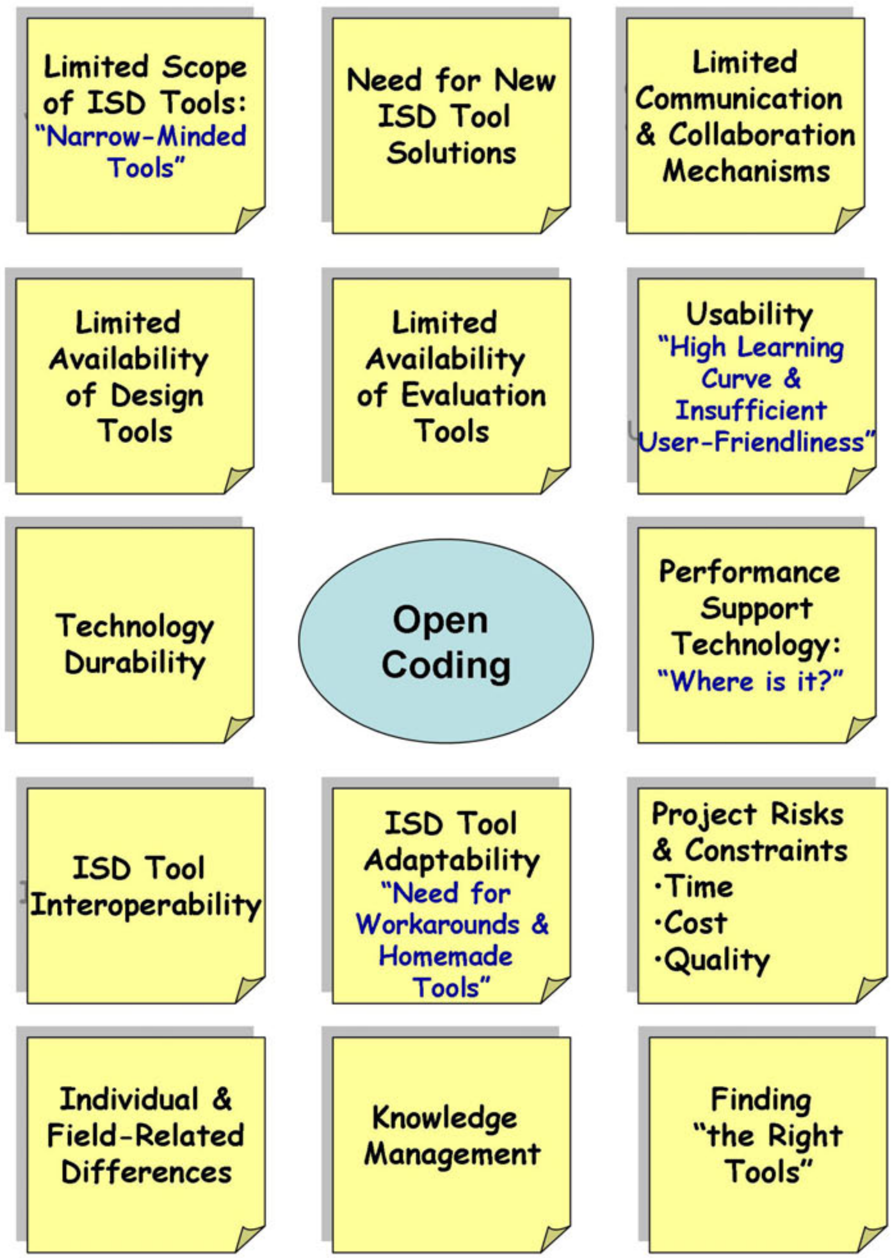

Figure 4.1 Open Coding

Limited Nature of ISD Tools: "Narrow-Minded Tools"

The "Narrow-Minded Tools" appears to be one of the most critical categories pointed out by the instructional designers. This category has the following characteristics, or properties:

- The ISD tools do not provide a wide enough array of features within a single tool to satisfy the creative needs of a modern instructional designer.
- The features offered by these tools appear to have insufficient customizability. Although most production tools provide for a certain degree of automation during the development process, it is usually achieved by standardizing the production outputs, which, in its turn, limits the general adaptability of the tool to the specific needs of the project or the creative aspirations of the user.
- The ID tools that are currently available to instructional designers appear to be very specialized in their purpose, intended audience, and intended output.

Figure 4.2 provides a qualitative data sample regarding this conceptual category.

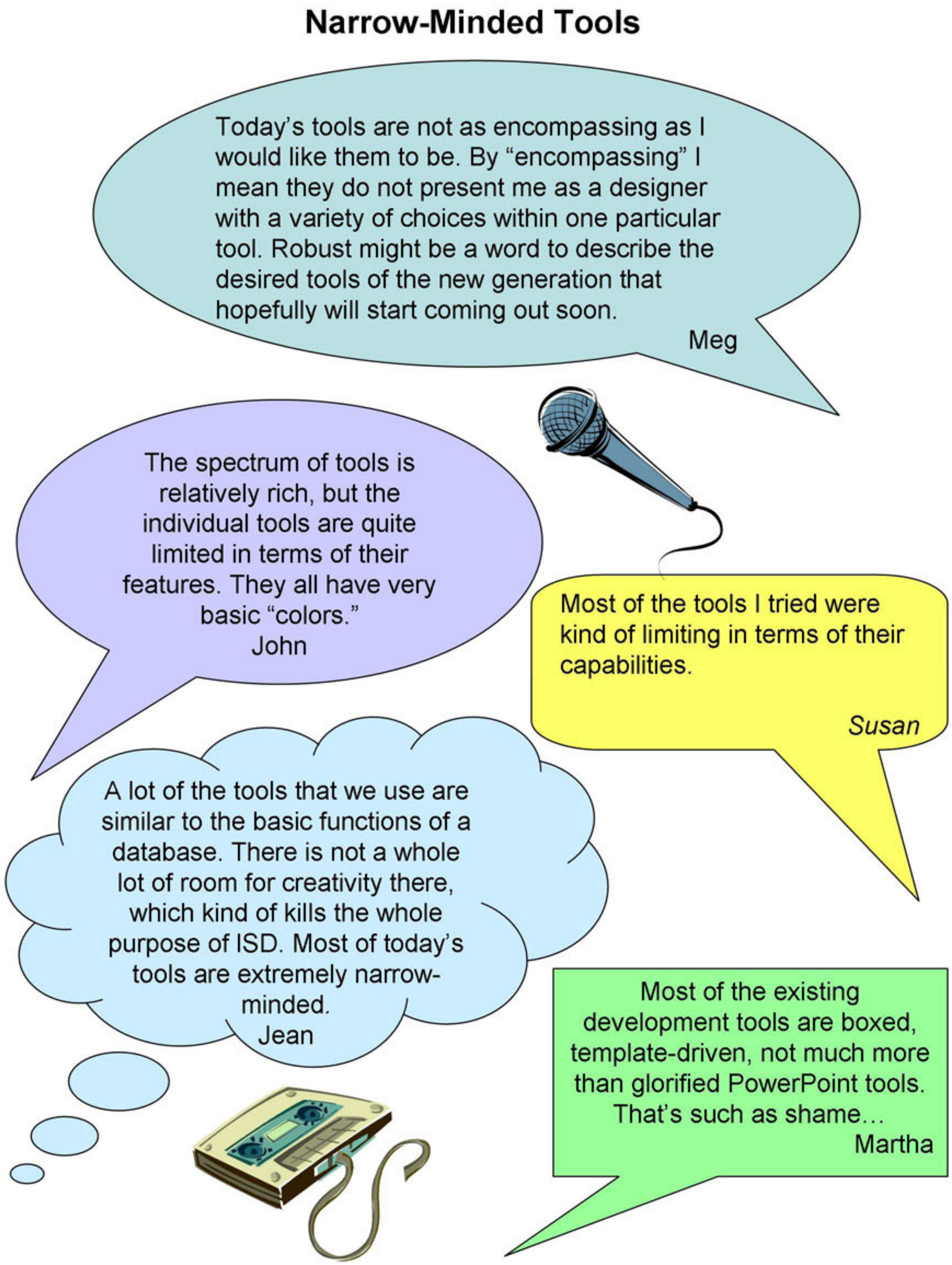

Figure 4.2 Qualitative Data Sample: Narrow-Minded Tools

Limited Availability of Design Tools

This category was formulated based on participants' comments regarding the low emphasis on the design tools within the current spectrum of modern ISD tools. The participants attribute this phenomenon to the general absence of designer-oriented approach to ISD tool development, which has been a recurrent observation during the participants' discussions of other categories during the open coding phase of data analysis. Most of the participants, regardless of the degree of emphasis placed on the design phase within their organizations, came to a consensus regarding the importance of these types of tools for an instructional designer, the theme that is frequently discussed in the instructional technology literature.

During the in-depth discussions of this category, the following properties have emerged:

- Today's design tools do not provide sufficient collaboration mechanisms.
- Most design tools are quite limiting in terms of providing a designer with means to conceptualize and analyze different aspects of the design process, ranging from experimenting with different instructional scenarios to visualizing the complete design.
- Instructional designers resort to familiar though inefficient ways of performing the design phase activities.

In addition, the participants frequently pointed out the need to relate the design phase with the evaluation phase of a given project in order to ensure the tight fit between analysis, objectives, design, and the results of the instructional treatment. Figure 4.3 provides a qualitative data sample for this conceptual category.

Figure 4.3 Qualitative Data Sample: Limited Availability of Design Tools

Limited Availability of Evaluation Tools

Similarly to the design tools, the evaluation tools appear to be another underrepresented group of computer-based tools for instructional design. Based on the recurrent theme of the limited availability of evaluation tools within the participants' responses, a conceptual category was derived. The issues within this category have been addressed by the instructional technology literature, although they have not been fully explored in terms of the essence of this phenomenon, its contributing factors, and effects. According to the data obtained during this study, the major properties of this category include

- Absence of designer-oriented approach within the currently available tools
- Isolated nature of evaluation tools
- Insufficient adaptability of the current evaluation tools to ISD purposes
- Due to the limited availability of effective evaluation tools, the designers frequently resort to performing evaluation activities via inefficient but familiar methods

It is important to note that the participants came to the agreement regarding the need for evaluation tools even in the cases where the evaluation phase is not a required part of a project. Most designers see the evaluation as an important part of determining the effectiveness of instructional treatment and would like to have effective tools to help them perform pre- and post-instructional learner assessments, as well as broad evaluations of the instructional solutions they create. Figure 4.4 presents a number of qualitative data samples belonging to this category.

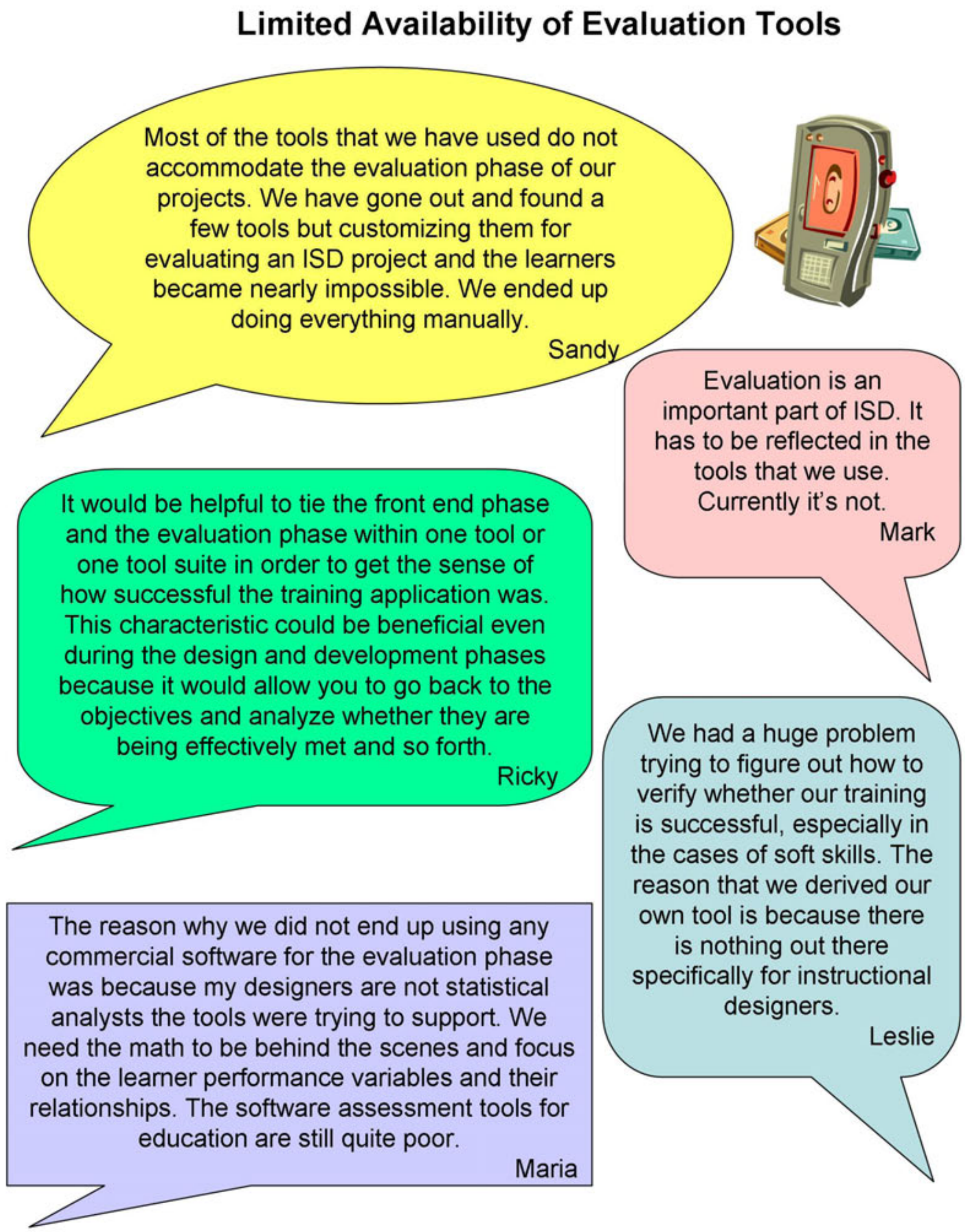

Figure 4.4 Qualitative Data Sample: Limited Availability of Evaluation Tools

Limited Communication and Collaboration Mechanisms

The issue of limited communication and collaboration mechanisms within the current spectrum of ISD tools has been reflected across all of the data forms collected during the study. The participants continuously stressed the importance of communication and collaboration in the field of ISD as they strongly feel that it is impossible to ensure the success of the project without collaborating with the team members, instructors, SMEs, and stakeholders. This issue becomes more even critical in large-scale projects when it becomes necessary to coordinate the efforts of multiple team players within one particular ISD project. The primary properties of this conceptual category include

- The importance of having the ISD tools with effective communication and collaboration mechanisms for an instructional designer
- The traditional set of computer-based office tools does not satisfy the requirements of modern ISD projects
- The desired collaboration mechanisms need to have information processing capabilities ranging from recording collaborators' input during product discussions to SME interview data processing

It is also important to note that the participants' views of effective communication and collaboration mechanisms cannot be narrowed down to an external standalone tool. Instead, the participants believe that each individual tool must provide avenues for collaboration, which may eventually be organized into a customized system for a particular project. Figure 4.5 presents qualitative data samples for this category.

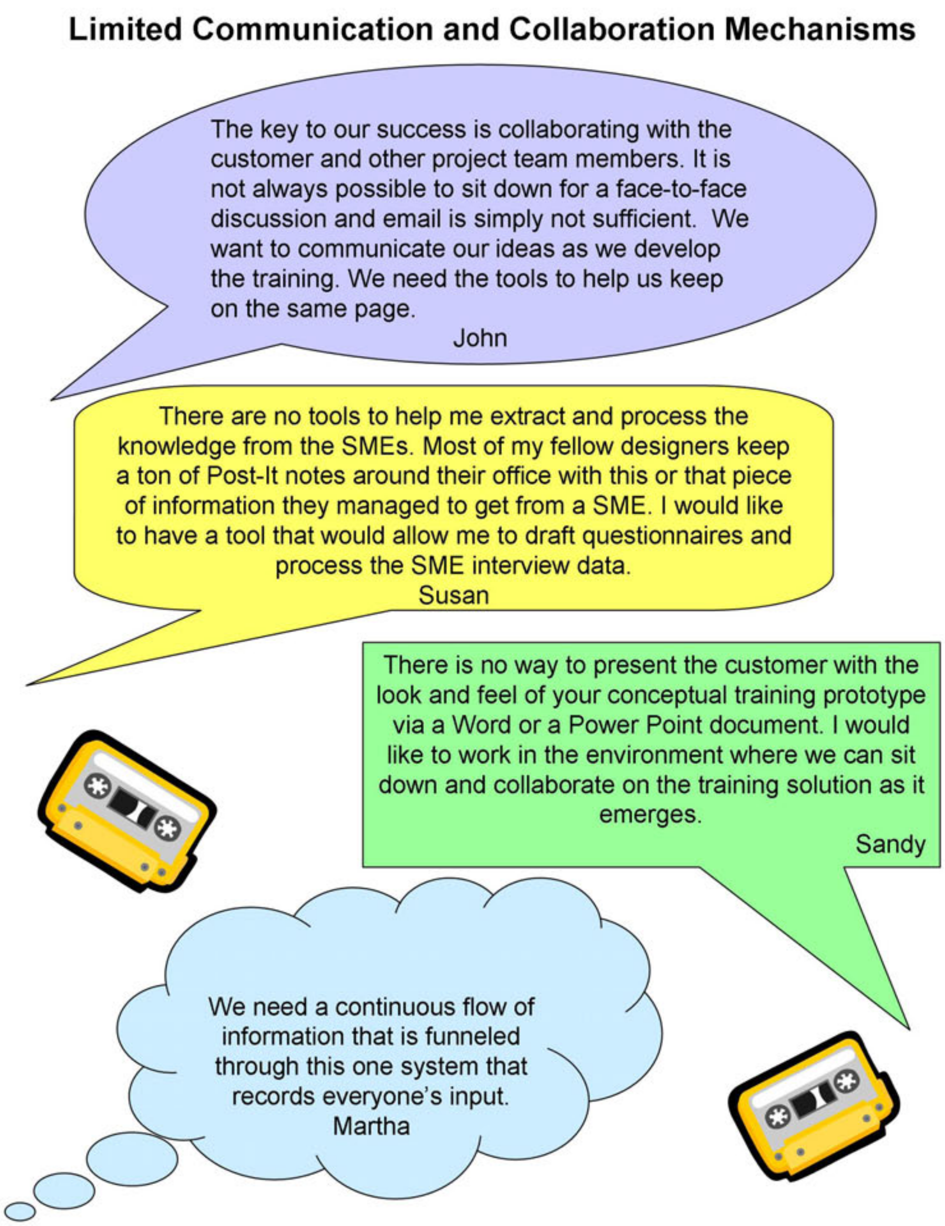

Figure 4.5 Qualitative Data Sample: Limited Communication and Collaboration Mechanisms.

Technology Durability

Technology durability is an important aspect of modern ISD tools. According to the participants, a majority of modern tools cannot satisfy the durability requirements. Considering that the designers tend to feel responsible for protecting their instructional content from aging, the participants' responses reflect their concern regarding the durability characteristics of the current ISD tools. These concerns can also be attributed to the designers' understanding of the risks of "growing into a tool" resulting from a prolonged use of familiar tools.

It is interesting to note that the designers consider the aging of technology to be a phenomenon that is impossible to control, although possible to mitigate by the wide adoption of durable technologies and standardization efforts. For instance, the Sharable Content Object Reference Model (SCORM) has attracted a lot of attention in the instructional technology community during the last few years due to the fact that the designers perceived it as an opportunity to address the issues of content durability and reusability. At the same time, many designers still feel uncertain about the effectiveness of the standardization efforts like SCORM simply because these efforts have not yet established a body of knowledge and success stories to demonstrate their effectiveness and true value. Based on the open coding analysis, the primary properties of this conceptual category include

- Limited durability potential of modern tools
- Importance of protecting instructional content from aging

- Risks of “growing into a tool”
- Standardization promises and uncertainties

Figure 4.6 provides a sample of qualitative responses pertaining to this category.

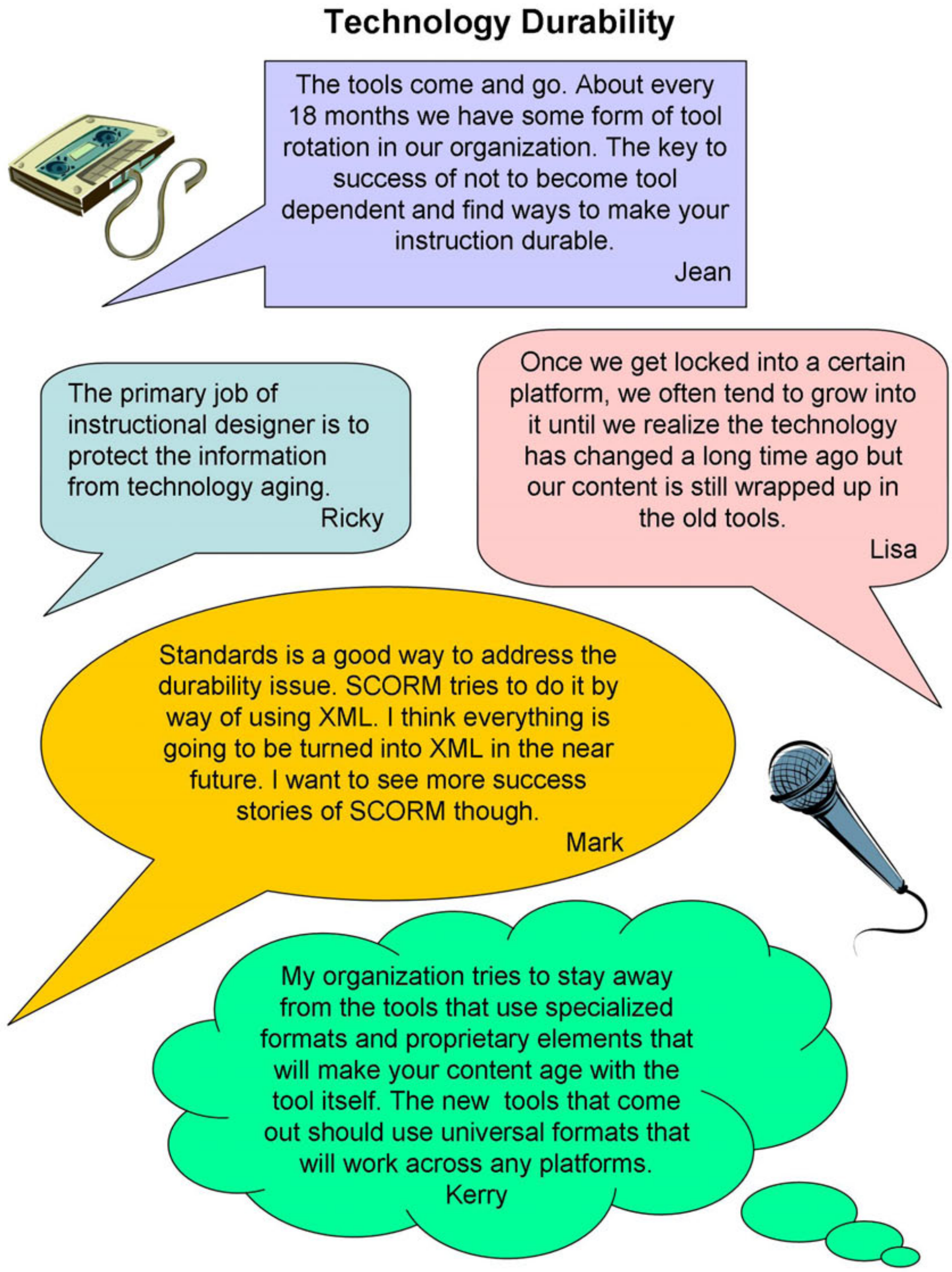

Figure 4.6 Qualitative Data Sample: Technology Durability

Performance Support Technology: "Where is it?"

The conceptual category of performance support technology was derived based on the participants' observations regarding the lack of such mechanisms within the current spectrum of ISD tools and the perceived benefits of such systems for instructional design practitioners. The respondents pointed out that although most ISD tools offer some basic user support mechanisms, they do not provide any ISD-specific guidance. The perceived benefits of ISD-specific guidance via computer-based performance support mechanisms seem to be equally important both to the novice and experienced designers.

The respondents demonstrated a certain degree of perplexity regarding the fact that the standalone electronic performance support systems (EPSS), which have been successfully implemented outside of ISD field, have not yet made their way into their everyday life. As for the participants' views of the forms computer-based performance support technology should take, the responses indicated the need for a standalone designer-oriented EPSS and designer-oriented performance support mechanisms to be embedded within individual ISD tools. The properties of this conceptual category include

- Insufficient performance support mechanisms within the current spectrum of tools
- Significant potential benefits both for novice and expert designers
- The means to convey organizational models, practices, guidelines to IDs
- Decision-making support

Figure 4.7 presents a qualitative data sample pertaining to the category of performance support technology.

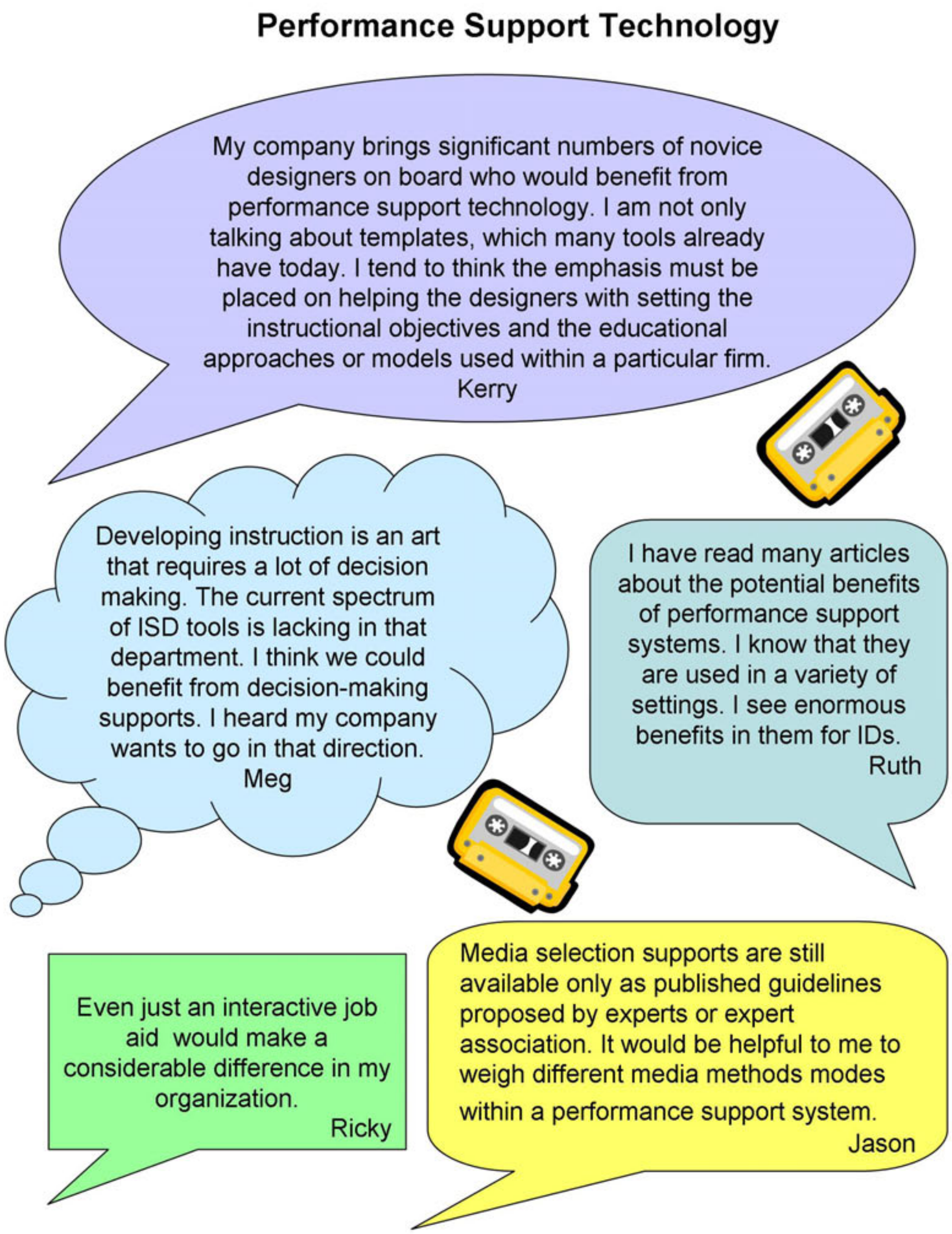

Figure 4.7 Qualitative Data Sample: Performance Support Technology

Adaptability Challenges of ISD Tools:

"Need for Workarounds and Homemade Tools"

Another significant conceptual category that emerged during the open coding phase of the data analysis pertains to the adaptability challenges of modern ISD tools. Considering that the need for customized instructional solutions is at the heart of modern ISD projects, the designers feel that their tools must be capable of supporting this requirement. At this time, however, the participants tend to agree that the current spectrum of tools fails to support adaptability requirements. As a result, the instructional designers are left to look for various "workarounds" and "homemade tools" to make up for the adaptability gaps of modern ISD software applications. The need for workarounds and in-house tool development is viewed by the participants as a time-consuming, distracting, and costly obstacle for their creative practice.

To improve the current state of the ISD tools, the participants pointed out a need to make the ISD tools more flexible and adaptable to the ever-changing requirements of ISD projects instead of making the designers continuously discard the used tools and look for the new ones. The properties of this conceptual category include

- Customized instructional requirement pose the need for flexible tools
- Insufficient flexibility of the current spectrum of ISD tools
- New tools must stand up to the adaptability requirement

Figure 4.8 provides an illustration of participants' responses defining this conceptual category.

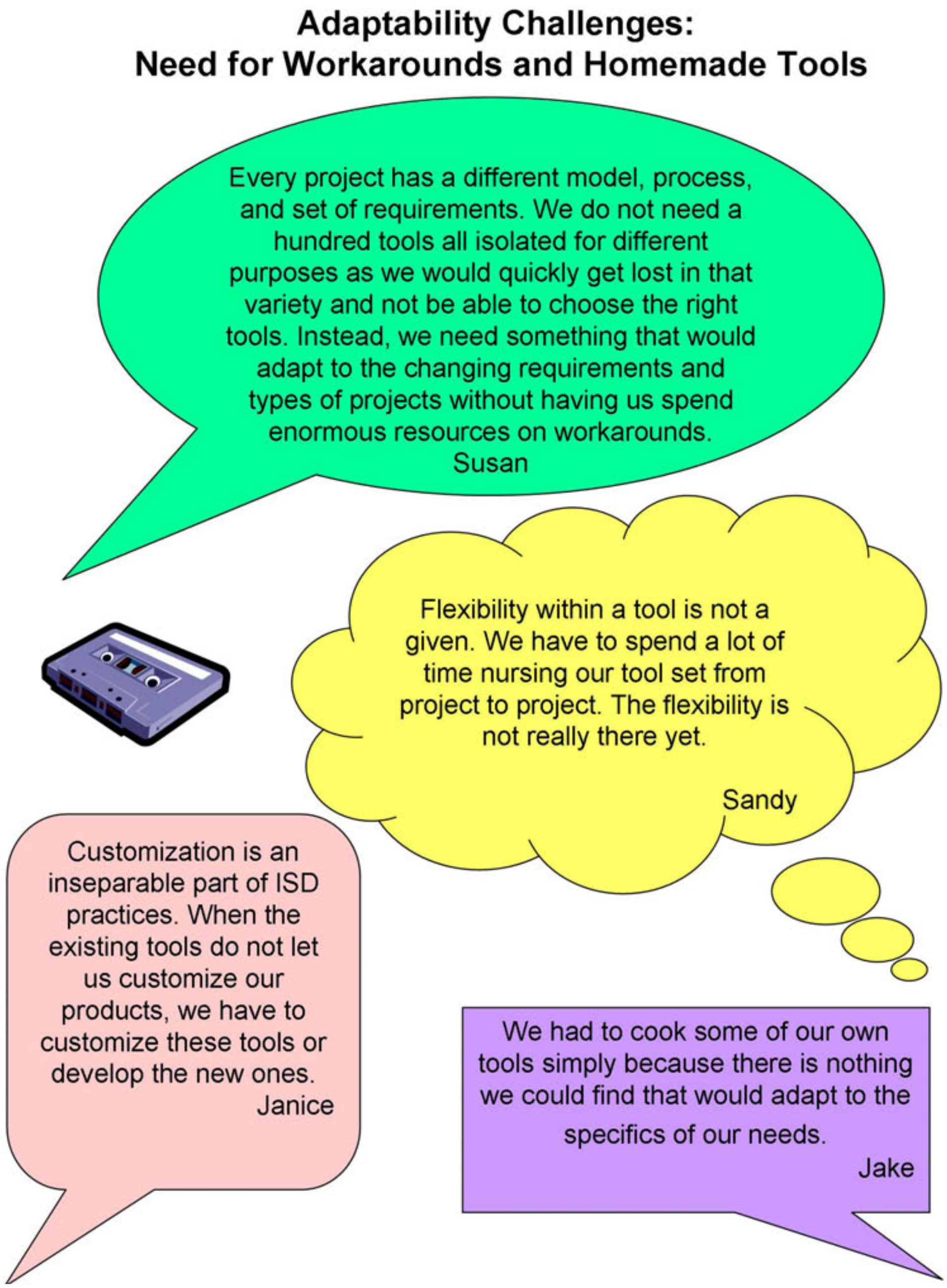

Figure 4.8 Qualitative Data Sample: Adaptability Challenges of ISD Tools.

Tool Interoperability Challenges

The tool interoperability issue has been reflected within all of the forms of participants' data and appears to be one of the most critical issues a modern instructional designer has to face in the workplace. Tool interoperability is considered to be a mandatory condition for "bridging all of the colors" of the instructional designer's palette. Making the selected tools properly work together, or "connecting the colors on the designer's palette", is viewed as a challenging activity by most of the participants of the study due to the generally limited networking potential of the current spectrum of the ISD tools.

The primary sources of the tool networking issues include incompatible tool technologies, mainly due to proprietary elements, and low emphasis on standards. Similarly to the technology durability category, the participants consider the modern standardization efforts to offer potential solutions for interoperability challenges of current ISD tools. Another perspective the participants strongly manifested during tool interoperability discussions included the need to view ISD tools as a system where all the elements have to be compatible and properly linked. Manifesting itself during the open coding and axial coding phases of the data analysis, this perspective became a foundation for the participants' theoretical strategy discussed later in this chapter. The properties of this conceptual category include

- Critical importance of tool interoperability
- Limited interoperability capabilities of the current ISD tools

- Standardization as a potential solution
- Systematic view of ISD tools

Figure 4.9 illustrates the participants' responses regarding the tool interoperability challenges.

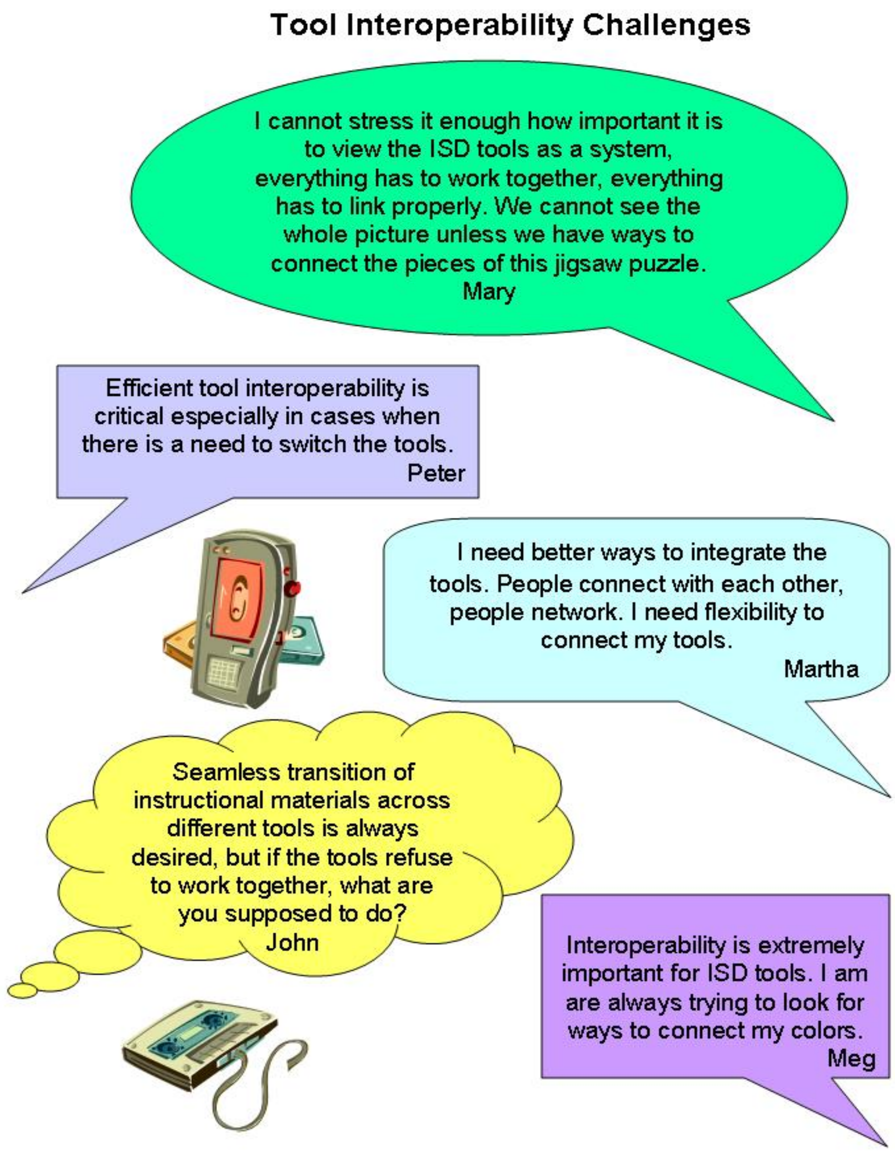

Figure 4.9 Tool Interoperability Challenges

Usability of ISD Tools

This category of tools emerged as a result of the participants' intense discussions regarding the importance of usability for ISD tools. Many participants pointed out the relatively poor usability of many ISD tools they have had experience with during the last decade. In fact, most of the participants attributed the low popularity of large numbers of ISD tools specifically to the usability issues.

The tools that are neither user friendly, nor designer oriented, are viewed by the participants as significant obstacles for their effective job performance and distracters from the creative process. The high learning curve of a particular tool presents a potential threat for the designer's ability to utilize that tool to the fullest advantage and poses a productivity risk for the whole project.

Another observation that was expressed by the participants during the tool usability discussions is the absence of designer-oriented emphasis within the current spectrum of ISD tools. The absence of the designer-oriented approach to tool development was identified to be the primary usability risk for ISD tools. This theme was also frequently recorded during the in-depth discussions of other conceptual categories and was further explored during the axial coding phase of the data analysis. The key properties of this conceptual category include

- The importance of user-friendly tools
- Limited usability as an obstacle to designers' job performance and creativity
- The need for the designer-oriented approach to the new tool development

Figure 4.10 presents a qualitative data sample pertaining to this conceptual category.

Figure 4.10 Qualitative Data Sample: Usability of ISD Tools

Project Risks and Constraints: Time, Cost, and Quality

The conceptual category of project risks includes time, cost, and quality as it key dimensions. It is one of the most complex conceptual categories because it encompasses the whole continuum of cause and effect. For instance, the tools used in an ISD project may pose risks for its time, cost, quality, and overall success of the project. On the other hand, the time, cost, and other project specifications including the ISD tool selection may pose their own risks to the product quality and overall success of the project. The balancing relationship of the dimensions of time, cost, and quality can be compared to an equilateral triangle. Distorting one side of this triangle would mean the loss of balance between all of its sides.

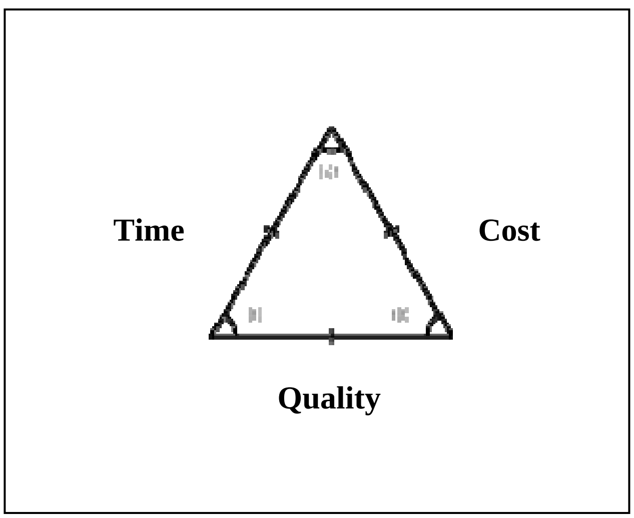

Figure 4.11 Project Risks and Constraints: Time, Cost, and Quality

Considering the scope of the present study, the researcher's analysis was focused on examining these project risks in terms of ISD tools. The issue of cost affects the designers' freedom to obtain the desired ISD tools. At the same time, the participants' responses indicate a direct relationship between an effective set of tools available to the instructional designers and overall project outcomes including the quality of instructional content, and efficiency of the design and development process. Figure 4.12 presents a qualitative data sample pertaining to this conceptual category.

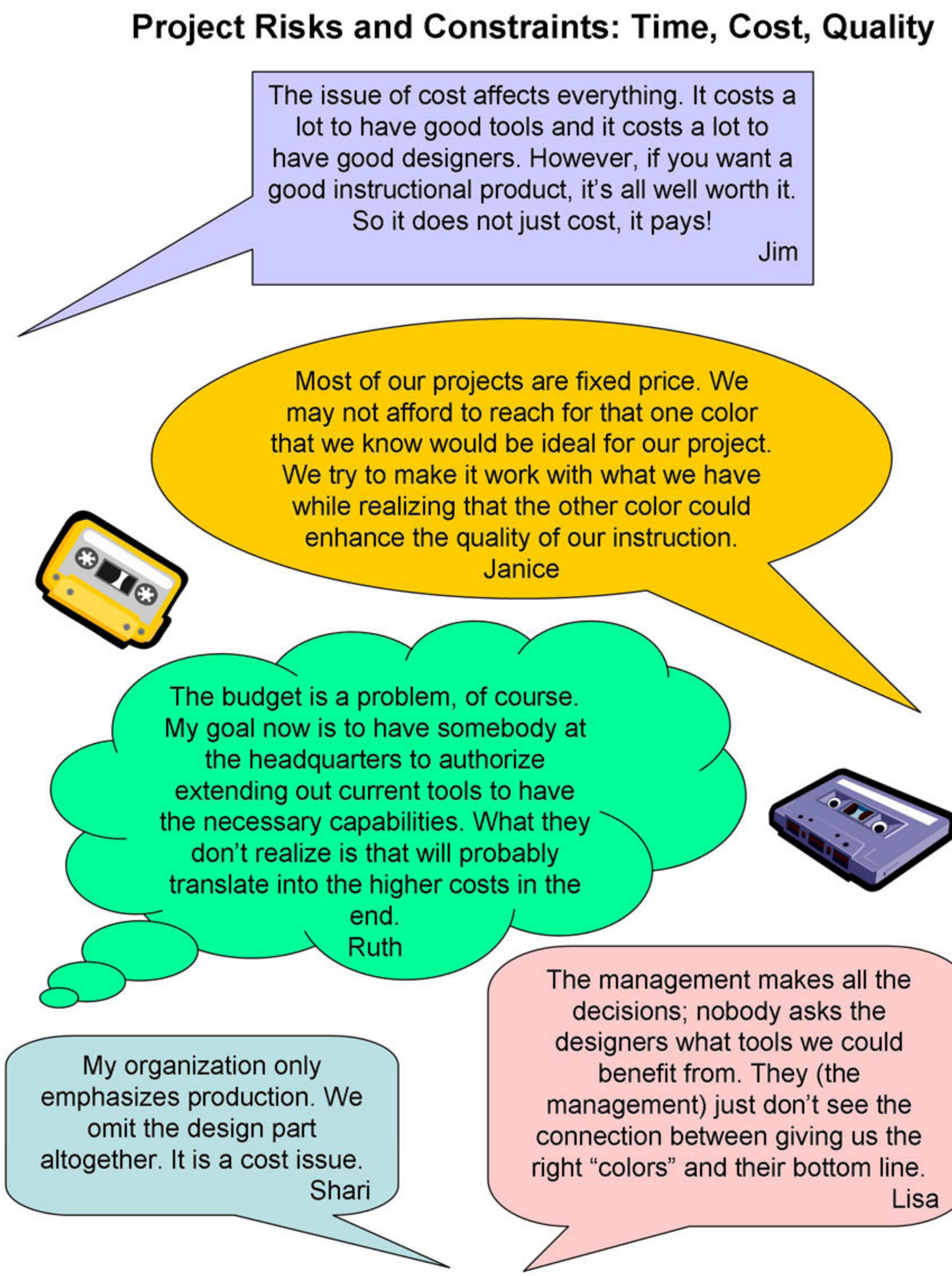

Figure 4.12 Qualitative Data Sample: Time, Cost, and Quality Risks

Individual and Field-Related Differences of Instructional Designers

Although the findings of this study were derived based on the consensus among the participants' responses, it is important to recognize the individual and field-related differences of instructional designers who contributed to this study. The individual differences of instructional designers can be attributed to the following variables:

- Educational background
- Years of ISD experience
- Computer skills
- Creative inclinations

The field-related differences may be explained by the specifics of a particular type of ISD field, from which the instructional designers draw their experiences. The types of fields fall into three broad categories:

- Academia
- Training industry
- Government

The researcher believes that both of these types of differences may have influenced the participants' perspectives regarding the current state of computer-based ISD tools and their implications for the future of the ISD field. Although examining the relationships between the individual and field-related differences of ISD practitioners and their perspectives regarding their practices is beyond the scope of this study, without a doubt, it is an important avenue for future studies. Figure 4.13 presents a qualitative data sample showing the variability within the conceptual category.

Figure 4.13 Qualitative Data Sample: Individual and Field-Related Differences of Instructional Designers

Need for New ISD Tool Solutions

The need for new ISD tool solutions is the conceptual category that received the most attention during the phases of data collection and data analysis. The respondents formulated this category within the first few minutes of the interactive interviews and it quickly became one of the main topics of discussions. This category also received the most resonance during the data verification through the cyberspace discussions with the participants.

It is important to note that the notion of "solutions" does not only imply the need for new ISD tools (quantitative value), but also the need for new approaches to tool development (qualitative value). Although the participants expressed their interest in having more new computer-based ISD tools available to them in the future, they also stressed the importance of the designer-oriented approach to the development of the new tools. The main properties of this conceptual category include

- The critical state of modern ISD tools
- Designer-oriented approach to ISD tool development
- The need for new types of ISD tools to support new learning paradigms

The issues united under this conceptual category largely correspond to the issues voiced by the recent instructional technology literature that were discussed in detail in Chapter 2 of this dissertation. Figure 4.14 presents a qualitative data sample pertaining to this conceptual category.

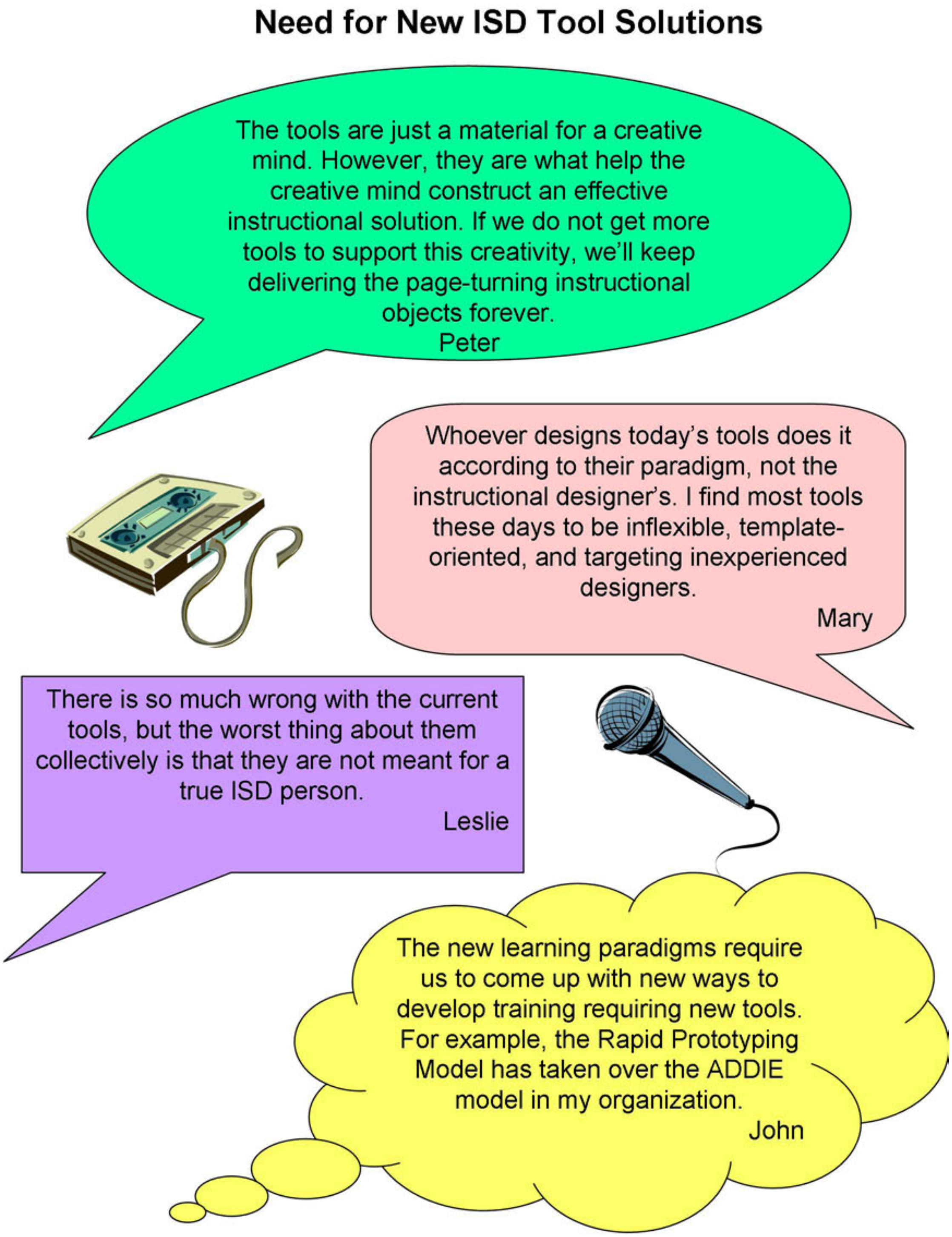

Figure 4.14 Qualitative Data Sample: Need for New ISD Tool Solutions

Knowledge Management

The conceptual category of knowledge management was derived during the heated discussions regarding the workflow obstacles experienced by the respondents as a result of limited knowledge management capabilities of modern ISD tools. Under this conceptual category, the respondents unite the requirements for team information management, workflow tracking, and content management.

The respondents point out that the current tools provide very limited knowledge management support due to the interoperability issues and disassociated nature of ISD tools. As for the project management tools that are currently available, the respondents tend to agree that they possess limited value for instructional designers due to their intended audience of project managers.

The respondents indicate that the desired knowledge management mechanisms cannot be standalone, but must practically relate to the ISD tool set used by instructional designers within a given organization. Thus, the key properties of this conceptual category include

- Need for information management, team workflow tracking, and content management mechanisms.
- Mismatch between the designer audience's needs and the current project management tools
- Necessary links between the knowledge management mechanisms and the ISD tool set

Figure 4.15 presents a qualitative data sample pertaining to the conceptual category of knowledge management.

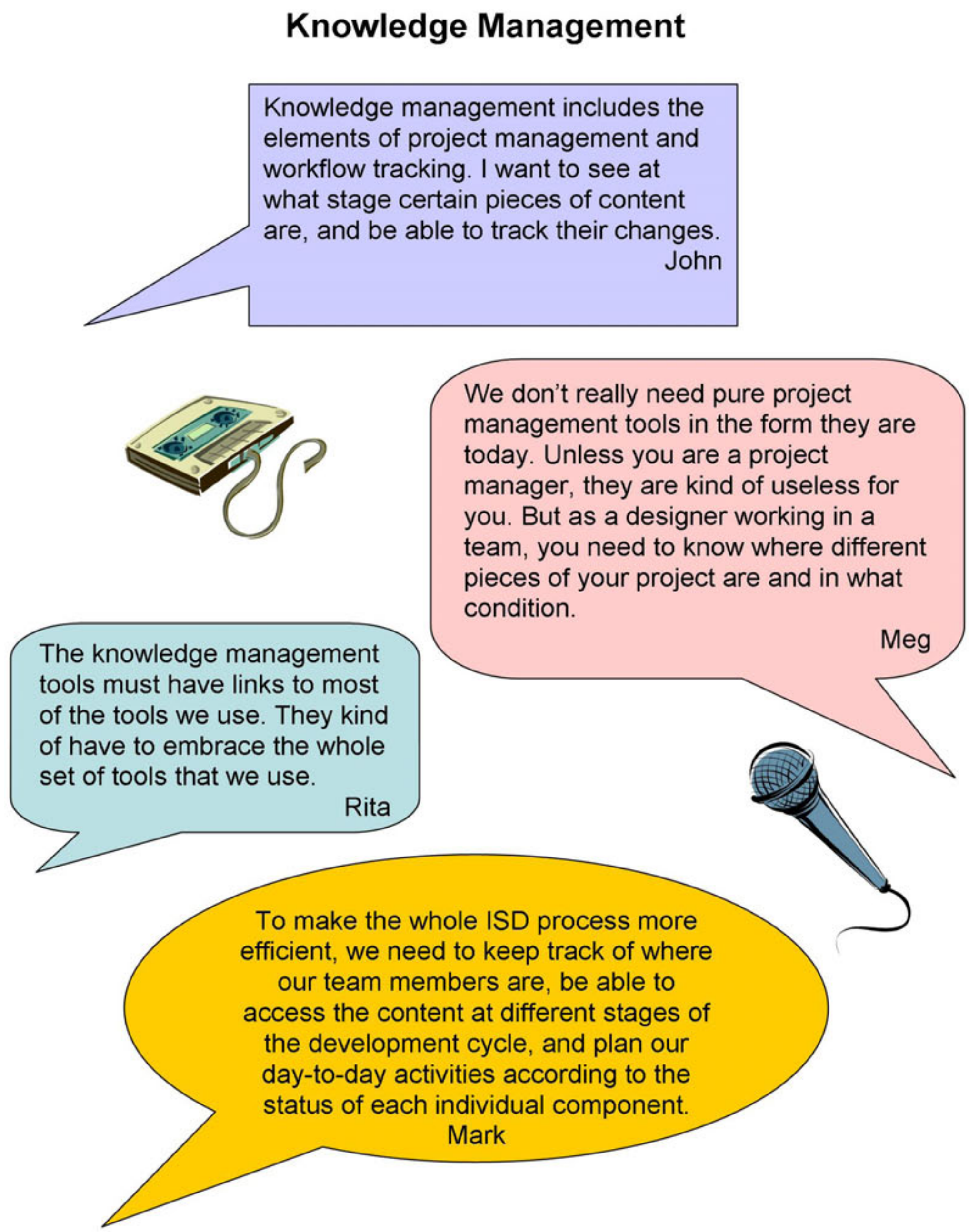

Figure 4.15 Qualitative Data Sample: Knowledge Management

Finding "the Right Tools"

Finding effective ISD tools appears to be another challenge instructional designers have to face on a regular basis. The underlying issues of this category pertain to the isolated nature of modern ISD tools, theoretical gaps, and management decisions of a particular project. Considering that most of the modern ISD tools are very specialized for their purpose and are quite disassociated across the ISD tool families, the participants indicated the challenges of identifying the appropriate selection of tools to satisfy their program/project requirements not only from the technical side but also from the conceptual side.

The participants pointed out the lack of theoretical supports to help them identify the ISD tools and match these tools to the project requirements. The participants expressed an interest in having an access to a taxonomy of ISD tools or any form of comparative paradigm of ISD tool families. In response to these discussions, the researcher took the liberty of presenting the participants with the Instructional Designer's Computer-Based Tool Classification Matrix (ID-CBTCM) that was developed by the researcher during the literature review phase of this study. The ID-CBTCM received excellent feedback from the participants, many of whom asked for permission to distribute the copies of the matrix within their organizations.

Another important factor influencing designers' opportunity to identify and access an effective ISD tool combination rests with the fixed decisions made by project managers and stakeholders. Figure 4.16 presents a qualitative data sample pertaining to this conceptual category.

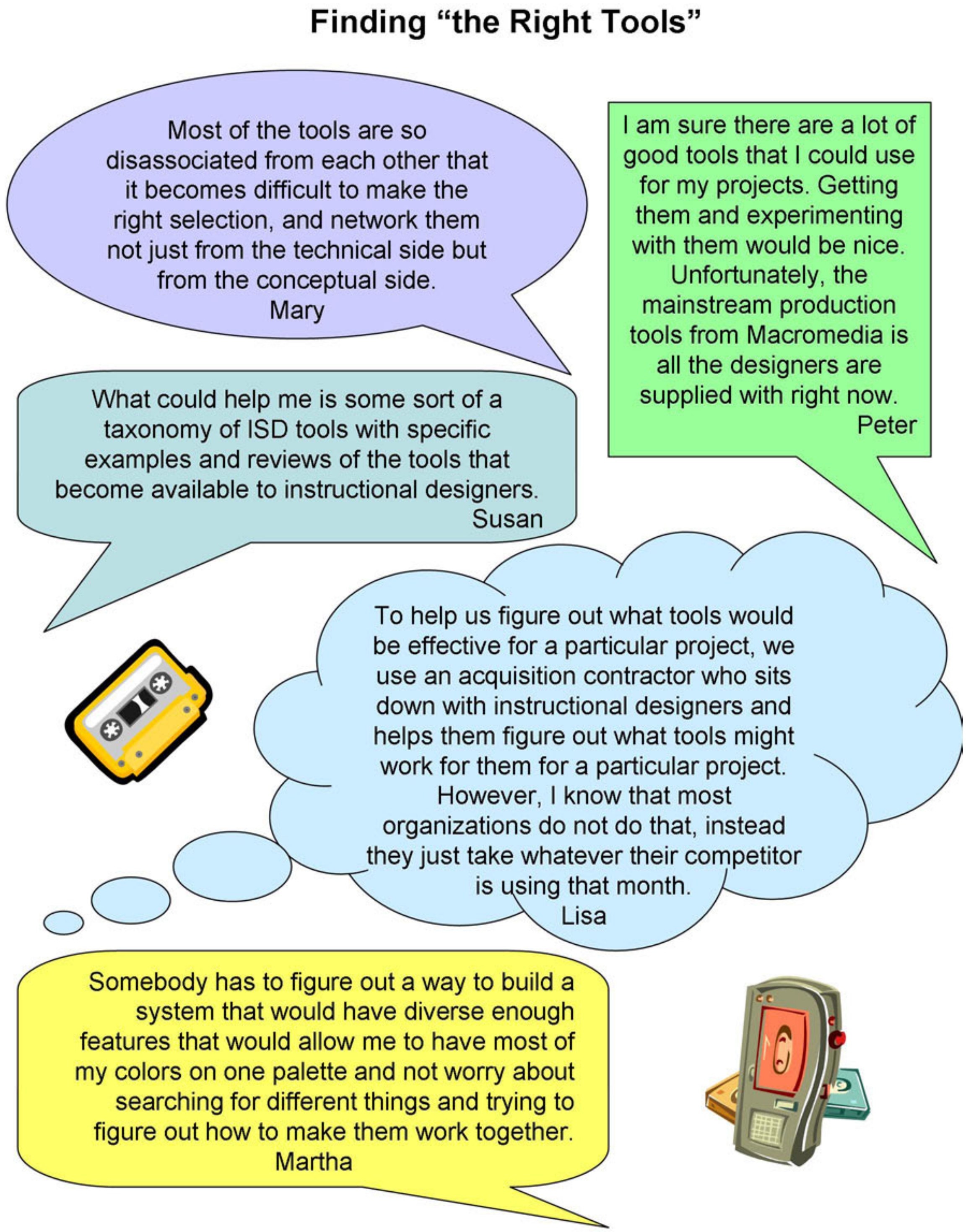

Figure 4.16 Qualitative Data Sample: Finding “the Right Tools"

The Central Phenomenon

The central phenomenon is an aspect of axial coding, which constitutes the foundation of the theoretical model of this study. After thorough examination of the conceptual categories that emerged during the open coding phase of the data analysis, the researcher identified the need for new ISD tool solutions as the central category, or central phenomenon of interest, around which to develop the theory. This decision was based on the research questions of the study and the evident magnitude of the above-mentioned conceptual category grounded within the data.

The need for new ISD tool solutions is the conceptually category that is most frequently discussed by the participants in the study. As a result, it tends to be most saturated with information and appears to be appropriately placed at the center of the researcher's grounded theory model, which will be presented later in this chapter.

The axial coding phase of the data analysis has reinforced the importance of this category as the central phenomenon by pointing out the direct links between the central category and the other existing categories.

Axial Coding

During the axial coding phase of the data analysis, all of the conceptual categories were revisited by the researcher and thoroughly examined for interrelationships that included

- The causal conditions influencing the central phenomenon,

- The strategies the participants employed in response to it,
- The context and intervening conditions influencing the strategy
- The consequences that resulted from the strategy

Figure 4.17 graphically illustrates the initial axial coding procedure of identifying the relationships between the conceptual categories.

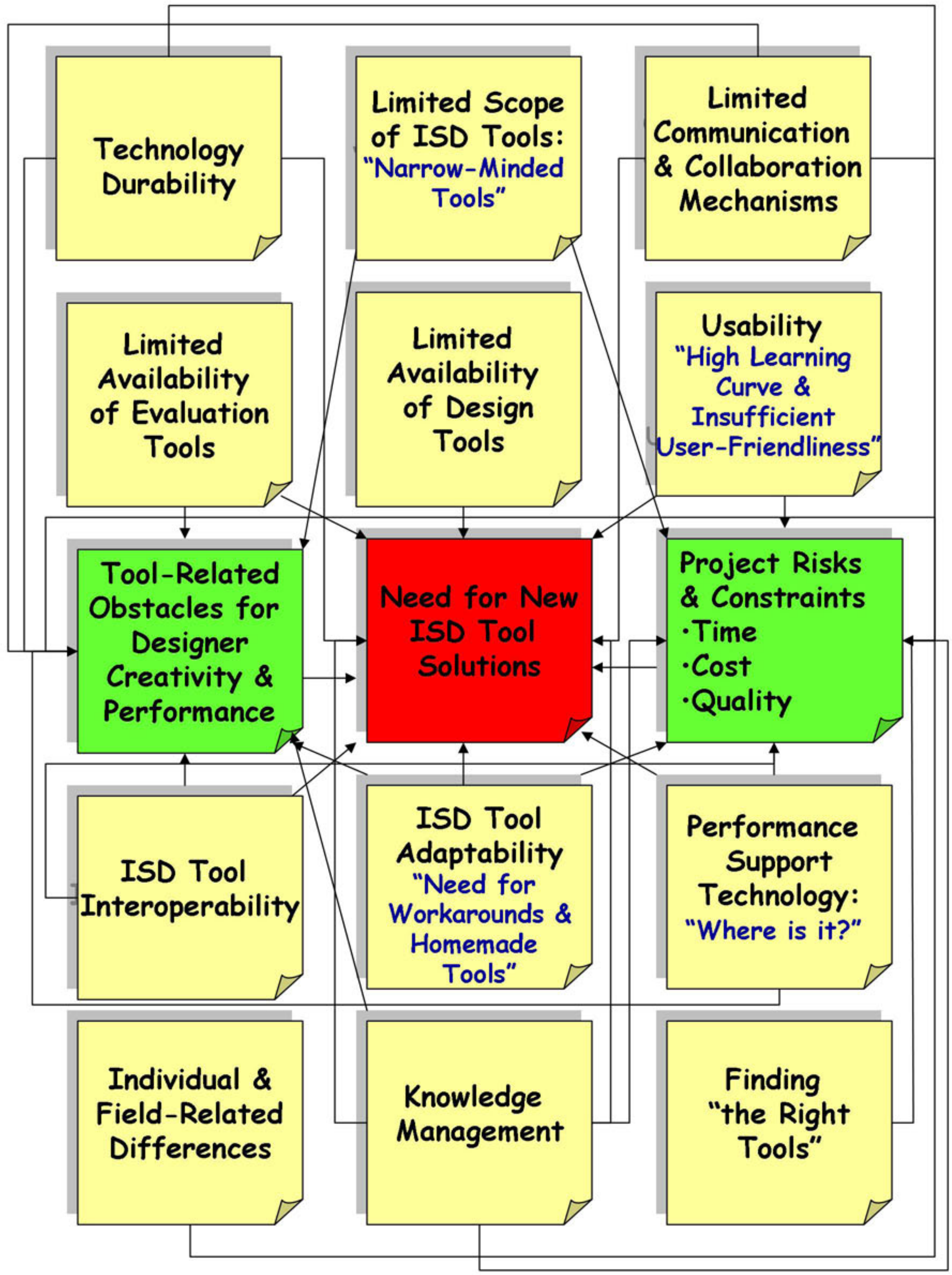

Figure 4.17 Axial Coding: Interrelationships of Conceptual Categories

As presented in Figure 4.17, during the initial stage of axial coding analysis, the researcher created an additional conceptual category labeled "Tool-Related Obstacles for Designer Creativity and Performance", which is intended to serve as a broad umbrella, or a meta-category, for uniting the following conceptual categories:

- Limited Scope of ISD Tools: Narrow-Minded Tools
- Limited Availability of Design Tools
- Limited Availability of Evaluation Tools
- Technology Durability
- Performance Support Technology
- Limited Communication and Collaboration Mechanisms
- ISD Tool Adaptability
- Usability
- ISD Tool Interoperability

Causal Conditions

The meta-category of tool-related obstacles unites the above-mentioned conceptual categories as a consolidated set of causal conditions influencing the central phenomenon. The tool-related obstacles for designer creativity and performance can be viewed as an internal causal condition as it pertains to designer's perspectives.

Another causal condition that was identified during the analysis pertains to the external project constraints and risks influencing the need for new ISD tool solutions. Figure 4.18 illustrates these causal conditions in relation to the central phenomenon.

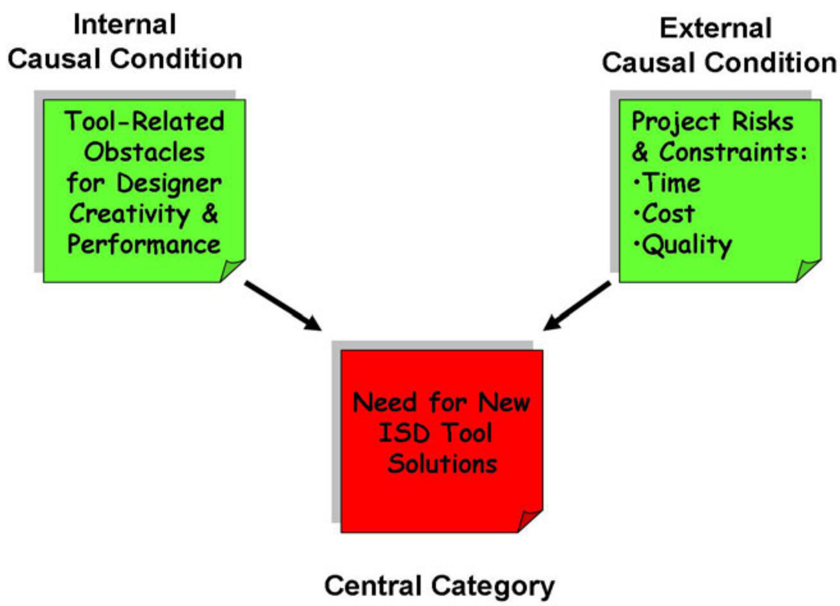

Figure 4.18 Central Category and Its Causal Conditions

Theoretical Model

During the axial coding phase of the data analysis, the central phenomenon, its causal conditions, strategy, context, intervening conditions, and consequences were portrayed in a visual diagram. Figure 4.19 represents the theoretical model developed in this grounded theory study. The remaining elements of the theoretical model will be discussed in detail further in this chapter.

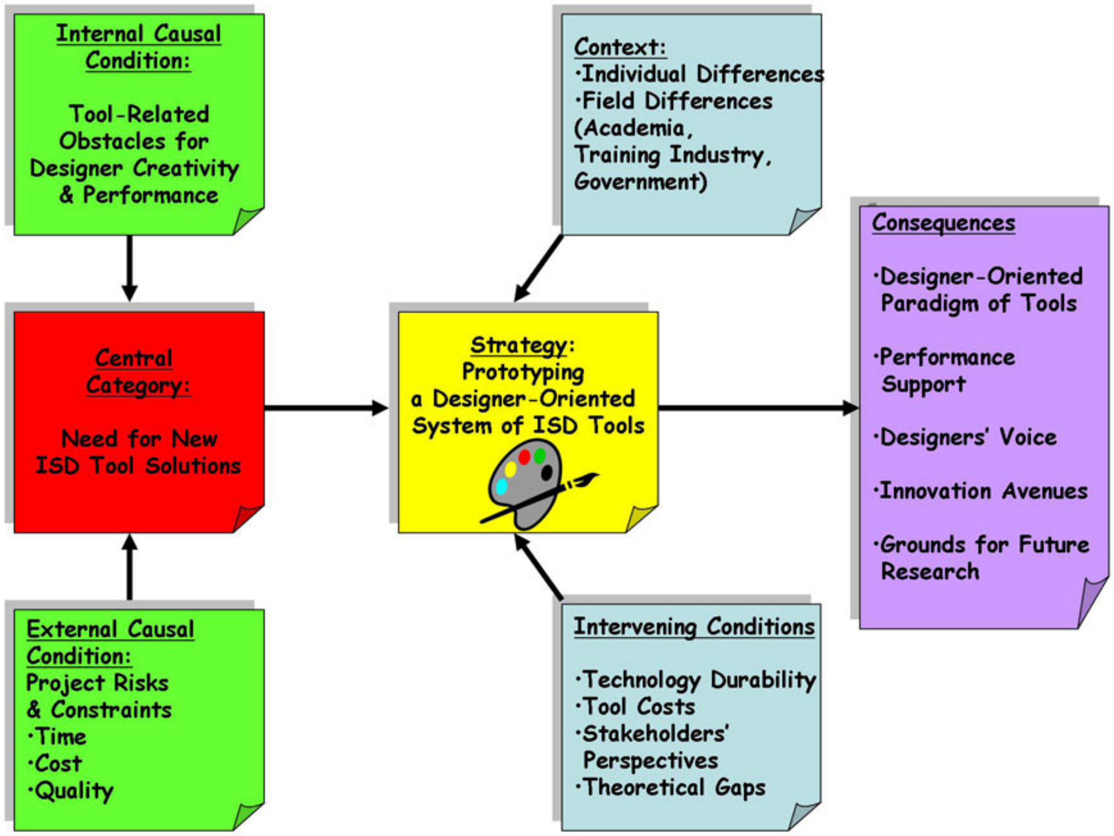

Figure 4.19 Theoretical model for the development of new computer-based ISD tool solutions

The Strategy

To address the central phenomenon, the participants proposed the strategy of designing an effective system of computer-based ISD tools. This strategy is based on their perspectives of the designer-oriented approach to ISD tool development and represents a conceptual prototype of an effective system of ISD tools as seen by modern instructional designers. The challenges of the current state of ISD tools unified under the meta-category of tool-related designer obstacles were mapped into the conceptual prototype of the proposed system as a set of specific requirements to be satisfied by the new system.

In addition to the conceptual categories that were mapped into the conceptual prototype, the participants included a Learning Content Management System (LCMS) as a useful element of the proposed system. The role of the LCMS element is to perform the delivery of instructional content, conduct learner tracking, and serve as a repository of instructional content.

The conceptual prototype of a designer-oriented system of computer-based ISD tools was envisioned during the qualitative interviews, drafted during the participants' concept mapping activity, and refined and verified via the follow-up communication between the researcher and the participants. Figure 4.20 illustrates the participants' strategy for prototyping a designer-oriented system of ISD tools.

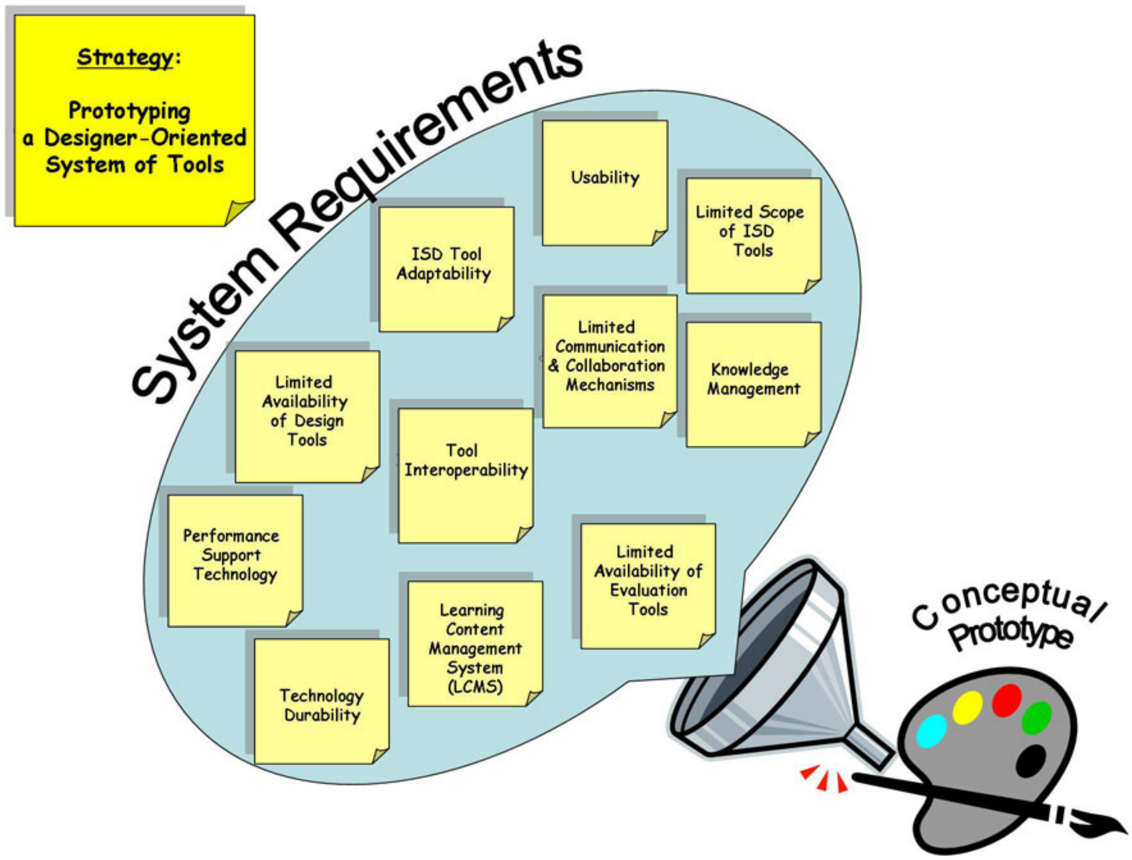

Figure 4.20 Participants' Strategy for Prototyping a Designer-Oriented System of Computer-Based ISD Tools.

The conceptual prototype of a designer-oriented system of ISD tools is represented as an artist's color palette, where the color slots are allocated for the specific types of ISD tools, or system elements, that a modern instructional designer needs. The system also reflects the importance of communication, collaboration, and knowledge management mechanisms as well as the interoperability of tools. Figure 4.21 presents a graphical rendering of this conceptual prototype.

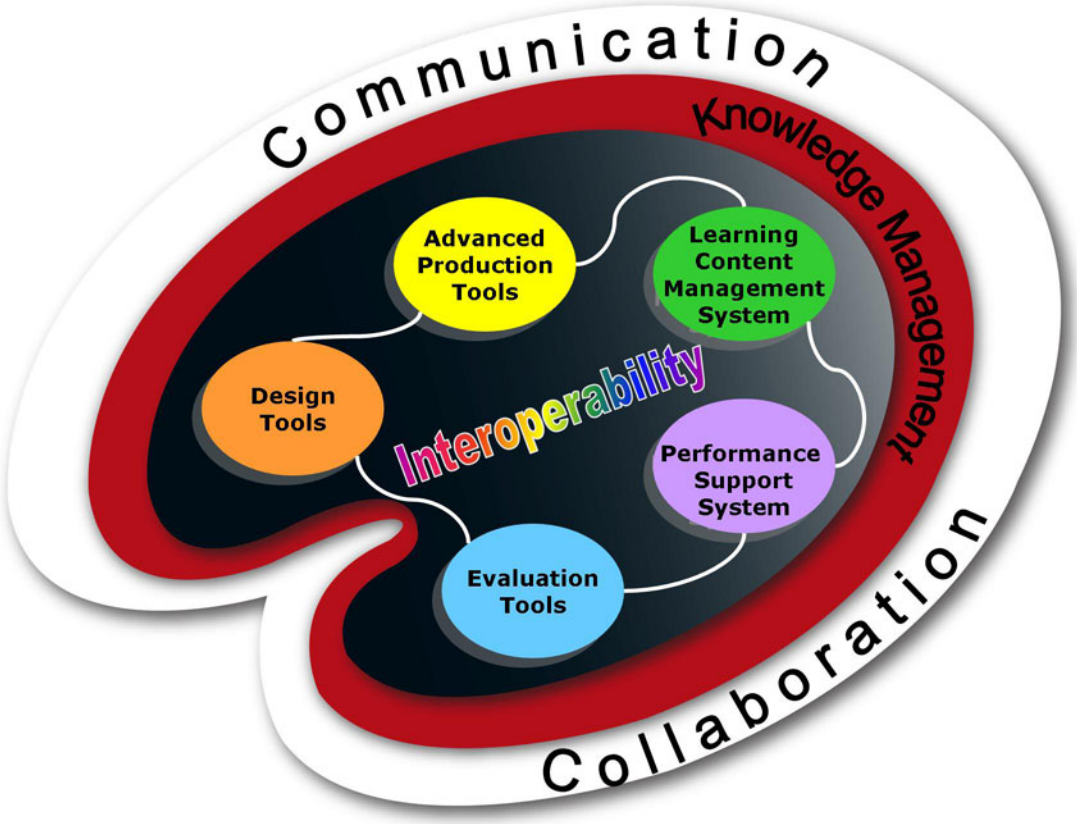

Figure 4.21 Conceptual Prototype of a Designer-Oriented System of Computer-Based ISD Tools.

The respondents' opinions regarding the conceptual prototype indicate their strong belief in the importance of the designer-oriented approach to future ISD tool development. They came to an agreement that the proposed conceptual prototype includes the necessary elements of an effective system of ISD tools. Nevertheless, a certain degree of concern is present during the discussions of the practical implementation of this conceptual prototype.

Most of these concerns can be attributed to the participants' desire to equip their voice with enough power to ensure taking this conceptual prototype to the next level. The respondents are interested in finding ways to convince the tool development community in adopting their approach and creating a technical prototype of the proposed system. Figure 4.22 presents a qualitative sample of the participants' comments regarding the conceptual prototype.

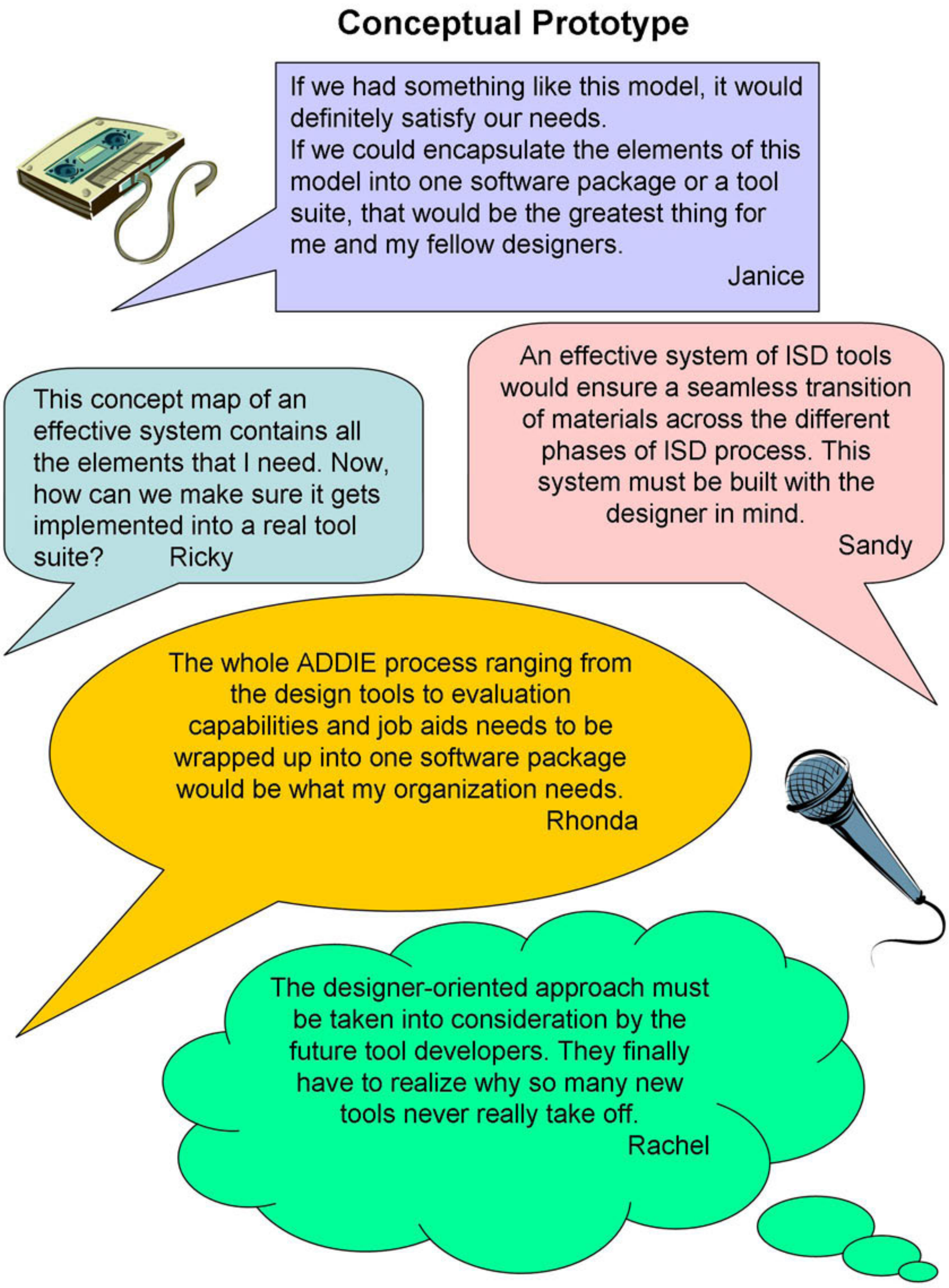

Figure 4.22 Qualitative Data Sample: Conceptual Prototype

The respondents' perspectives regarding whether the proposed system should be implemented as a unified advanced tool or a set of interoperable tools varied. Nevertheless, this question does not seem to raise a significant concern among the participants' responses provided the designer-oriented approach requirement is met within the new spectrum of ISD tools. Figure 4.23 presents a sample of the participants' perspectives on this matter.

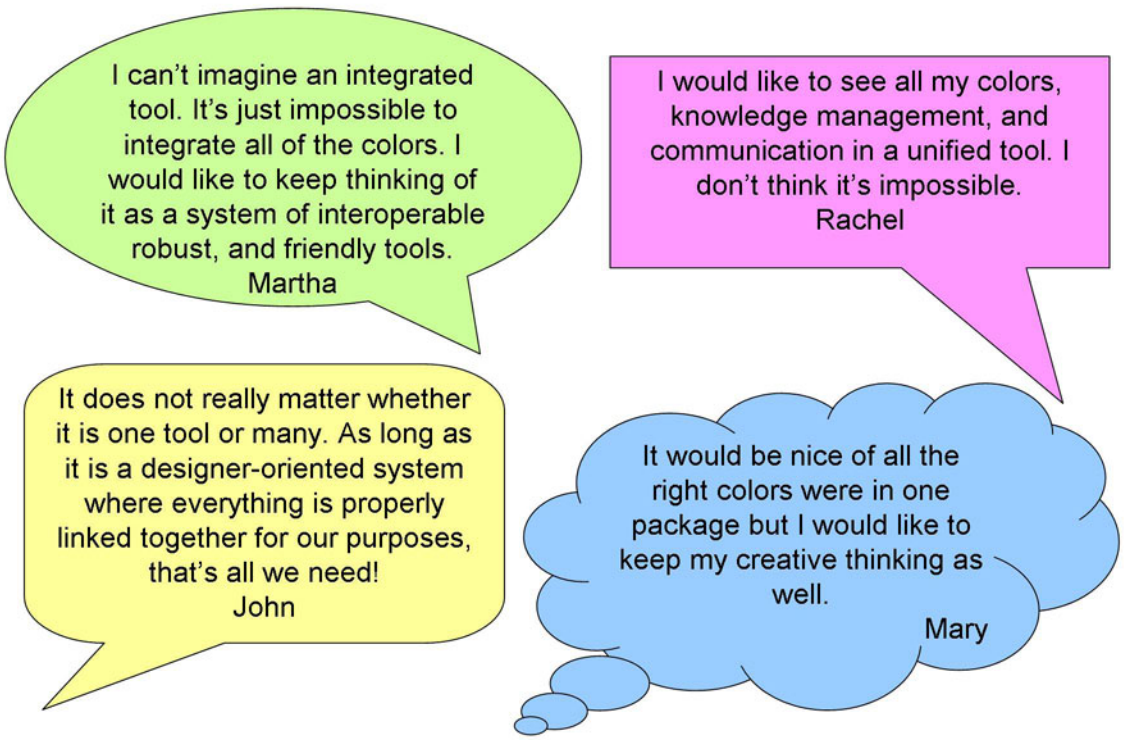

Figure 4.23 Qualitative Data Sample: A Unified Tool or a Tool Set?

Validating the Prototype

The prototype validation was performed as a collaborative activity of the researcher and the participants. The conceptual prototype was validated using Software Engineering Traceability Matrix. In a software development process, a traceability matrix is a table that correlates any two documents to determine the completeness of the relationship between their elements. This technique is often used with high-level requirements, sometimes known as marketing requirements, and detailed requirements of the software product.

It is important to note that since the proposed prototype exists only in its conceptual form, only the practical material requirements could be traced by using the traceability matrix. The more abstract requirements, such as usability and adaptability of ISD tools, can only be examined upon the technical implementation of this conceptual prototype. Figure 4.24 illustrates the system requirements traceability procedure for validating the proposed conceptual prototype.

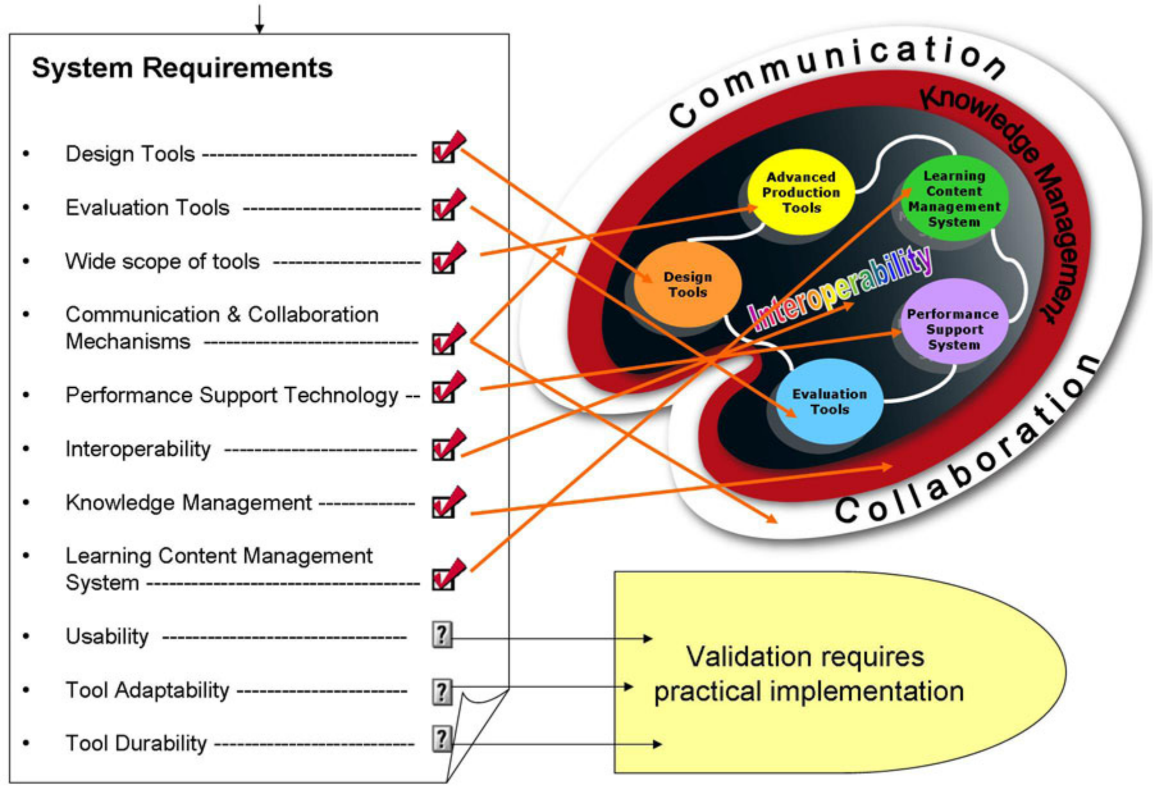

Figure 4.24 System Requirements Traceability Procedure

Context

The context of this grounded theory study is formed by a specific set of conditions, within which the strategy occurred. The researcher distinguished the following two conditions that make up the context of this study:

- Designers' individual differences
- Filed-related differences

The designers' individual differences are important in shaping their professional perspectives and can be attributed to their educational background, experience, individual creative inclinations, computer literacy levels and other characteristics. Although the detailed examination of designers' individual differences in relation to their professional practices and field perspectives is beyond the scope of this study, the researcher believes in the importance of this aspect and views it as a possible direction for a future study.

The field-related differences are based on the involvement of the three instructional design fields (academia, training industry, and government) that contributed to shaping the participants' perspectives. Although the findings of the study are based on the consenting responses and subject to continuous comparative analysis, the researcher noticed a certain degree of contextual variability within the responses that can be based on the field-related differences. Similarly to the individual differences, a further investigation of the field-related differences is required to gain insight into the effects of each type of ISD field on the designers' perspectives.

Intervening Conditions

The broader set of conditions, within which the strategy occurs, include

- Technology durability
- Tool costs
- Stakeholders' perspectives

- Theoretical gaps

The issue of technology durability was discussed in detail earlier in this chapter. It can be viewed as a condition that influences the strategy proposed by the participants due to the ever-changing nature of technology.

The tool affordability issue and stakeholder perspectives serve as a set of economic conditions influencing the strategy of this grounded theory considering that it is the project costs and the stakeholders' decisions that determine the resources available for instructional designers within a given project.

The theoretical gaps within the field of instructional technology also represent an intervening condition that influences the strategy in a broad sense. Considering that the computer-based ISD tools still reside on the level of "issue recognition" within the instructional technology literature, a significant amount of research is required to develop a substantial body of knowledge about these tools.

Consequences

The outcomes of the strategy taken by the participants of the study include

- Designer-oriented paradigm of computer-based ISD tools
- ISD performance support
- Designers' voice
- Innovation avenues

- Grounds for future research

These outcomes hold both theoretical and practical value. The conceptual prototype of a system of computer-based ISD tools proposed by the participants can serve as a theoretical paradigm for identifying a set of important tools that a modern instructional designer needs. This prototype may serve as a performance support tool that would provide tool selection guidance for instructional designers, managers, and stakeholders.

According to the research participants, the most desired outcomes of this strategy include an opportunity to present their voice to the multidisciplinary fields of instructional technology and software engineering and paving the innovation avenues for the development of new computer-based ISD tool solutions. Considering that the strategy is an attempt to theorize a designer-oriented approach to ISD tool development, the researcher views the strategy as an important foundation for future research studies.

Selective Coding

The following narrative represents the final phase of coding the information. The researcher makes an attempt to develop a " story" that narrates the essence of the conceptual categories and their relationships within the grounded theory model. To keep the story line reader friendly, the researcher elected to refrain from using the word 'participants' and refer to the participants of the study as instructional designers.

Built into the story line, the theoretical propositions are italicized for easy recognition. As described in Chapter 3 of this dissertation, each proposition was successfully tested by reevaluating the earlier data and conducting comparative analyses between earlier and newer data sets.

Story Line

This grounded theory study presents modern instructional designers' perspectives on the current state of ISD tools and their vision of an effective system of ISD tools. During the examination of the current state of computer-based ISD tools, a group of instructional design practitioners from academia, training industry and government organizations identified a the following set of interrelated issues pertaining to the modern ISD tools:

- Technology durability
- Limited scope f ISD tools
- Limited communication and collaboration mechanisms
- Limited availability of design tools
- Limited availability of evaluation tools
- ISD tool interoperability
- ISD tool adaptability
- Performance support technology
- Usability
- Knowledge Management

The instructional designers' discussions provided insight into the specifics of these issues and allowed the researcher to draw a series of theoretical propositions, or hypotheses, that were successfully tested within the qualitative data sets. The designers' insights pointed out that ***the "design" and "evaluation" families of tools***, which are essential components of instructional designer's tool palette, ***are largely underrepresented within the current spectrum of the ISD tools***. Speaking about the available tools, instructional designers confirm that the ***tools with a limited scope cannot satisfy the adaptability requirements.*** The examples of the current spectrum of computer-based ISD tools are very specialized in their purpose, intended audience, and intended output, thus, they frequently cannot stand up to the adaptability requirements of the constantly changing project specifications. Although learning management systems attempt to expand the types of features to include content development and delivery, learner management and evaluation mechanisms, the level of sophistication of these features is still limited in many ways (Gustafson, 2002).

Considering that team work is impossible without collaboration, instructional designers agree that the ***new ISD tool solutions must incorporate communication and collaboration mechanisms.*** Knowledge Management Systems represent a significant move in this direction by providing explicit communication, coordination, collaboration, and control capabilities for groups working on complex tasks (Spector, 2002).

Usability is also high on the designers' list of tool requirements. ***User satisfaction and project efficiency are affected by the usability of selected tools.*** The users may suspend an ISD software application in favor of a traditional manual or

PowerPoint flowcharting procedures due to a variety of reasons, such as overall complexity of the software use, perception of the software as insufficiently user friendly, and overly high learning curve. Complex tools that require extensive computer skills and high cognitive overload may be elegant but are not likely to be widely welcomed in either business or educational communities (Nieveen and Gustafson, 1999).

Due to the isolated nature of ID tools, the issue of tool interoperability is of a special concern. In the creative ISD environment, a designer often faces the challenge of trying to mix different "colors" on his/her "palette". Although this issue has been addressed by a number of standard development initiatives such as SCORM, networking issues may still play a significant role in the user's tool selection. In addition, ***ISD tool interoperability is an important precursor of technology durability and adaptability.*** Modern instructional designers regularly encounter the requirements to create reusable learning objects. Creating reusable learning objects requires tools that allow for integrating pedagogy and reusable content (Wiley, 2001).

The instructional designers note that the above-mentioned ***tool-related issues must be viewed as significant risk factors to the instructional designers' creativity and overall job performance***. Thus, the tool-related issues were united under the meta-category of tool-related obstacles for designer performance. In addition to inhibiting designer creativity and performance, ***tool-related obstacles pose project risks in terms of time, cost, and product quality.***

Some of the identified issues have been highlighted by the recent efforts of instructional technology literature calling for rethinking of the current state of computer-based ISD tools. This task was willingly accepted by instructional designers who were eager to provide first-hand information about bridging the gap between "the current" and "the desired". To bridge this gap and overcome the tool-related obstacles, instructional designers identified a need for new ISD tool solutions, which were required to be based on designer-oriented approach to ISD tool development. The ever-changing project requirements and time and cost constraints have been identified as another cause increasing the need for more effective tool solutions.

In response to the need of designer-oriented ISD tool solutions, instructional designers developed a conceptual prototype of an effective system of computer-based ISD tools. The issues earlier identified as designer obstacles were translated into a set of specific requirements for the new system. Intended to mitigate the tool-related obstacles and project risks and constraints, the new system represents an attempt to integrate the most important "colors" on the instructional designer's palette. Although ***individual and field-related differences influence instructional designers' perspectives regarding their professional practice and needs for tools***, most designers came to a consensus that ***the success of the future of computer-based ISD tools is dependent on the designer-oriented approach to tool development***.

Although the proposed system cannot be secured from the intervening issues of the tool costs, the ever-changing nature of technology, and ISD business practice models, it represents a theoretical foundation for the designer-oriented approach to ISD tool development. The proposed conceptual prototype provides innovation grounds for its technical implementation. It may also serve as a performance support tool for instructional designers looking for guidance to compose an effective system from the tools that are currently available. Finally, and most importantly, this grounded theory effort reflects the voice of the instructional designer community.

Chapter Summary

This chapter presented the findings of this grounded theory study. It described the conceptual categories that emerged during the open coding phase of the data analysis and the interrelationships of these categories that were determined during the axial coding of the data analysis. Particular attention was devoted to the discussion of the conceptual prototype of a designer-oriented system of computer-based ISD tools. The chapter also described the central phenomenon, its causal and intervening conditions, the context, and the consequences of the respondents' strategy. The chapter was concluded by the "story line" that included a number of theoretical propositions.

CHAPTER FIVE : CONCLUSIONS

Chapter Overview

The present chapter discusses the relationship of this grounded theory study to other existing knowledge and its implications for future research and practice. The researcher discusses the theoretical and practical outcomes of this project and identifies grounds for future research. Special attention is paid to evaluating the quality of this study in terms of its methodology and representation.

Study Accomplishments

The major accomplishment of this study, as seen by the researcher, is documenting and presenting the voice of modern instructional designers. As it was discussed in Chapter 2, the designer perspectives have effectively been overlooked by both the instructional technology literature and the tool development community. Fortunately, the most recent literature efforts are now ready to address this issue, and the present study can be considered to be a pioneer effort in that respect. The qualitative data obtained during the present study provides strong support for the need to rethink the current state of computer-based ISD tools voiced by the recent instructional technology literature efforts. The researcher believes that the study has successfully fulfilled its goals in terms of describing the types of computer-based ISD tools are available to modern instructional designers, evaluating the current state of these tools based on the designers' perspectives, and documenting the designers' vision of an effective system of ISD tools.

At the present time, however, it is impossible to predict if the study becomes as successful at fulfilling its "action" goals as it has been in meeting its theoretical and practical goals. The researcher believes the ability of this study to fulfill its action goals depends on the extent of its exposure to the relevant communities of practice and positive resonance about its theoretical and practical outcomes. The researcher also believes that the chances for the successful accomplishment of the action goals will increase with expanding the scope of the study and investigating a number of theoretical gaps identified during the present study.

Study Outcomes: the Unity of Theory and Practice

The most notable outcomes that have resulted from this study include the Instructional Designer's Computer-Based Tool Classification Matrix (ID-CBTCM), the Theoretical Model for the Development of New ISD Tool Solutions, and the Conceptual Prototype of a Designer-Oriented System of Computer-Based ISD Tools. Considering that this grounded theory provided insight not only as to "why" but also "how", each of these outcomes contains a theoretical and practical component. The most important link between theory and practice resides in the direct application of theoretical knowledge to real-life problems and opportunities as well as incorporating lessons of practice into theoretical knowledge. The researcher believes that this unity of theory and practice is one of the most important and distinctive characteristics of this study. Table 5.1 below describes the outcomes of this study in terms of their theoretical and practical value.

Table 5.1

Theoretical and Practical Outcomes of the Study

Theoretical Outcomes	**Practical Outcomes**
Instructional Designer's Computer-Based Tool Classification Matrix (ID-CBTCM)	
Theoretical framework for classifying computer-based ISD tools in terms of • General purpose • ISD phase • Intended output • Performance support • Intended users	Instructional designer's performance support tool for identifying and evaluating computer-based ISD tools

Theoretical Outcomes	Practical Outcomes
Theoretical Model for the Development of New ISD Tool Solutions	
• Theoretical representation of instructional designers' perspectives regarding the current state of computer-based ISD tools and the need for new ISD tool solutions as the central phenomenon. The model takes into account the causal and intervening conditions, the context, the strategy, and its consequences. • Designers' voice as a contribution to instructional technology literature • Grounds for future research	• Represents a "bigger picture" of the commonly identified need for new ISD tool solutions • Analysis support tool for ISD tool developers and stakeholders • Innovation avenues
Conceptual Prototype of a Designer-Oriented System of Computer-Based ISD Tools	
• Theoretical representation of designer-oriented approach to ISD tool development • Grounds for future research	• Analysis and performance support tool for tool developers, instructional designers, project managers, and stakeholders. • Innovation avenues • Designers' voice as an active participant of future ISD tool development efforts

Standards of Quality and Verification

Multiple perspectives exist regarding the standards of quality in qualitative research. Trustworthiness appears to be the major dimension for evaluating the quality of interpretivist studies. Trustworthiness is that quality of an investigation and its findings that make the study noteworthy to audiences (Schwandt, 1997). To establish the trustworthiness of a study, the researcher must satisfy the following criteria (Lincoln and Guba, 1985):

- Credibility – truthfulness of the data
- Transferability – generalizability of the findings
- Dependability - rigor associated with the process of inquiry
- Confirmability – the degree, to which the researcher's findings and interpretations are grounded in the data

Table 3.3 describes the methodological strategies applied during this study to meet these criteria.

Table 5.2

Trustworthiness of the study according to Lincoln and Guba's (1985) criteria

Criteria	**Strategies applied within the context of this study**
Credibility	• Prolonged engagement ("being there") • Triangulation of multiple data collection methods • Participant validation ("member checks") Community of Practice
Transferability	Cross-analysis with literature review Working hypotheses during data analysis
Dependability	Audit trial: detailed description of methods, data collection, analysis, and other research events to ensure the transparency of the process and conclusions of the study.
Confirmability	Quality Assurance Questions: • Are the findings grounded in data? • Are the data-derived inferences logical? • Do the categories have explanatory power and do they fit the data?

In addition to the general standards for qualitative research, the researcher of this study followed a set of specific guidelines to establish the quality of this grounded theory study. The quality of this grounded theory was largely ensured by theory verification. Verification in grounded theory research is an active part of the process of the research and becomes part of the standards for judging the quality of the study (Creswell, 1998). Grounded theory has a built-in mandate for theory verification that is achieved via comparative analysis and category saturation until the point when no further insight is available.

Another theory verification strategy applied during this study was accomplished by creating links to established theory. Many theorists have emphasized the role of existing theory and its importance in sensitizing the researcher to the conceptual significance of emerging concepts and categories. Knowledge and theory are inextricably interlinked and should be used as if they were another informant. Without the grounding in extant knowledge, pattern recognition would be limited to the obvious and the superficial, depriving the analyst of the conceptual leverage from which to develop theory (Glaser, 1978). Both of these types of theory verification strategies were applied throughout the course of this research project.

The quality of the present grounded theory is judged by the researcher based on the two sets of criteria, which relate to the general research process and the empirical grounding of a study (Strauss & Corbin, 1990). Table 5.2 describes the assessment of this study in terms of the general research process criteria whereas Table 5.3 presents the evaluation of the study based on the empirical grounding criteria.

Table 5.3

General Research Process Criteria for Evaluating a Grounded Theory Study (Strauss & Corbin, 1990)

General Research Process Criteria	**In the course of this study…**
1. How was the original sample selected? What grounds?	The theoretical sampling method was applied based on the research purposes of this study aiming to gather the perspectives of instructional designers from a variety of backgrounds.
2. What major categories emerged?	The major conceptual categories that emerged include: • Tool-related obstacles for designer creativity and performance (meta-category) • Need for new ISD tool solutions • Project risks and constraints
3. What were the indicators that pointed to some of these major categories?	Grounded within the data, the indicators that pointed to these categories included the frequency of the topic, its level of detail, and its strong links with other topics.

General Research Process Criteria	In the course of this study…
4. On the basis of what categories did theoretical sampling proceed? Guide data collection? Was it representative of the categories?	The theoretical sampling mainly proceeded on the basis of the need to rethink the current state of computer-based ISD tools and sketch out a number of potential implications for the future. The pilot study helped during the focusing of the theoretical sampling to include the participants from a variety of ISD professional fields, set the participant entry requirements, and identify the participant recruitment/research sites.
5. What were some of the hypotheses pertaining to conceptual relations among the categories and on what grounds were they formulated and tested?	Based on the conceptual relations among the categories that were identified during the axial coding phase of the data analysis, the researcher formulated a set of propositions that were tested during the selective coding phase of the data analysis by revisiting the earlier and newer sets of data and performed a comparative analysis of the propositions and the qualitative data. Examples of propositions: • *Tools with a limited scope cannot satisfy adaptability requirements.* • *User satisfaction and project efficiency are affected by the usability of the selected tools.*

General Research Process Criteria	In the course of this study…
6. Were there instance when hypotheses did not hold up against what was actually seen? How were these discrepancies accounted for? How did they affect the hypotheses?	There were no such instances.
7. How and why the core category selected? On what grounds?	The core category ("the need for new ISD tool solutions") was identified based on the magnitude of the participants' responses pertaining to this conceptual category and the comparative analysis of this category and the background literature on this topic.

Table 5.4

Empirical Grounding Criteria for Evaluating a Grounded Theory Study (Strauss & Corbin, 1990)

Empirical Grounding Criteria	**In the course of this study…**
1. Are concepts generated?	A number of concepts were generated during the open coding phase of data analysis of this study.
2. Are the concepts systematically related?	The concepts were systematically related and verified by collecting additional information from the participants in order to "saturate" each category and performing constant comparative analysis between data sets.
3. Are there many conceptual linkages, and are the categories well developed, with density?	There are many conceptual linkages between the categories, which were well developed and verified by the participants to the point of consensus.
4. Is much variation built into the theory?	The researcher acknowledges the influence of the context of the theory and considers the contextual variations to be an important extension of this study.

Empirical Grounding Criteria	In the course of this study…
5. Are the broaden conditions built into the explanation of theory?	Although the sets of causal and intervening conditions are thoroughly described to explain the theory, the researcher opted not to present a conditional matrix for this study.
6. Has process (change or movement) been taken into account?	The study takes the "process aspect" into account by demonstrating the participants' movement from evaluating the current state of ISD tools, identifying a need of change, and proposing a conceptual prototype of a designer-oriented system of computer-based ISD tools.

Study Limitations

During the conceptualization phase of this study, the researcher identified a number of potential threats to the transferability of the findings. These threats were discussed in Chapter 1 of this dissertation and relate to the limited amount of time and resources of this study available to the researcher to reach a sample larger than what is commonly considered to be “sufficient” for a grounded theory study.

Another set of potential limitations identified early in the study relates to the factors influencing the dynamics of the data collection efforts, such as the presence of mutual acquaintances between the researcher and the participants. In addition, due to the specifics of the research sites, it has not always proved to be possible or permissible to enter certain job sites for conducting observations.

Although the researcher identified a set of minimal entry requirements necessary for the instructional designers to participate in this study in order to get a more comprehensive set of designer perspectives, the participants’ individual differences, such as educational background, computer literacy, years of experience in the ISD field, the type of ISD field, etc., were originally set to be beyond the scope of the present study. In the course of the study, however, the researcher identified these individual differences as part of the context of the emergent grounded theory and determined a need for a further investigation of the nature and effects of these differences.

Grounds for Future Research

One of the most valuable outcomes of the present study was providing grounds for future research. Some of the avenues for future research identified during this study include:

- Examining the individual differences of instructional designers (educational background, years of experience, creative inclinations, computer literacy, etc.) and work-related differences between instructional designers practicing in academic, corporate, and government organizations
- Continuing to examine the relationship between the project constraints and designer creativity
- Examining the relationship between modern ISD business practices, designer creativity and performance, and the evolving nature of ISD profession

The researcher is also interested in continuing to assess the performance support value of the ID-CBTCM for modern instructional designers. The initial set of feedback received from instructional designers regarding the ID-CBTCM has been very positive but the true value can be discussed only upon a wider application of this matrix.

The conceptual prototype of the designer-oriented system of computer-based ISD tools is another area that requires further investigation. Both the researcher and the participants are eager to see a technical version of the conceptual prototype. However, in order to create an effective technical prototype, each initial characteristic of the conceptual prototype must be taken to the level of determining its detailed specifications. Considering that this step is a part of the traditional software engineering process, the researcher believes that it should be a joint effort between instructional designers and tool developers.

All in all, exploring the above-mentioned research and innovation avenues would provide tremendous support for this grounded theory and serve as a foundation for the body of designer-oriented instructional technology literature.

APPENDIX A : UCF IRB APPROVAL FORM

Revised 8/04

THE UNIVERSITY OF CENTRAL FLORIDA
INSTITUTIONAL REVIEW BOARD (IRB)

IRB Committee Approval Form

PRINCIPAL INVESTIGATOR(S): Anna Andrews **IRB #: 04-2067**

PROJECT TITLE: Computer-based Instructional Design Tools: Current State and Implications for the Future

Full Board
[ ] Contingent Approval
Dated: ___________

[ ] Final Approval
Dated: ___________

[ ] Expiration
Date: ___________

Committee Members:

Dr. Theodore Angelopoulos: ___________
Ms. Sandra Browdy: ___________
Dr. Jacqui Byers: ___________
Dr. Rama Chakrabarti: ___________
Dr. Karen Dennis: ___________
Dr. Barbara Fritzsche: ___________
Dr. Robert Kennedy: ___________
Dr. Gene Lee: ___________
Ms. Gail McKinney: ___________
Dr. Debra Reinhart: ___________
Dr. Valerie Sims: ___________

Chair
[x] Expedited Approval
Dated: 5 Sept 2004

[ ] Exempt
Dated: ___________

[x] Expiration
Date: 4 Sept 2005

IRB Co-Chairs:

Signed: ___________
Dr. Sophia Dziegielewski

Signed: ___________
Dr. Jacqueline Byers

Figure A-1 UCF IRB Approval Form

APPENDIX B : CONSENT FORM FOR INSTRUCTIONAL DESIGNERS

Computer-Based Instructional Systems Design Tools

Dear Instructional Designer,
You are invited to participate in a study of the current state and the future of instructional design tools.

My name is Anna Andrews. I am a PhD student in the College of Education at the University of Central Florida. **Instructional Systems Design** (ISD) is a time and labor consuming process. There is a variety of ISD development tools (software packages) intended to assist instructional designers during this process. For various reasons, these tools have not gained expected popularity among the IDS professionals. This phenomenon needs to be understood beyond rhetoric and vague impressions. Although there is no compensation to you as the participant of this study, your input will add to the body of literature on the future of instructional design as well as sketching potential trends for future ISD tools development.

I would like to conduct a formal interview and an informal interview with an on-the-job observation (time and location permitting). The general frame of my questions will include reviewing the computer-based instructional design tools currently used by the participants in the workplace, identifying types of tools that instructional design practitioners could benefit from, and identifying elements of an effective system of computer-based instructional design tools as perceived by the participating instructional designers.

Aside from some typical discomfort with being recorded, there is no potential risk to the participants. At the same time, participants' confidentiality will be assured by the use of pseudonyms, if requested, and by the elimination of identifying details. Any information that is obtained in connection with this study that can be identified with you will remain confidential and will be disclosed only with your permission. All materials will be stored in a locked filing cabinet. These materials will not be labeled with your name or other prominent descriptive, identifying information. The audio tapes will be destroyed by the end of the data analysis stage of the study (August, 2005).Your decision whether or not to participate will not affect your future relations with the University of Central Florida. If you decide to participate, you are free to discontinue participation at any time.

Information regarding your rights as a research volunteer may be obtained from UCF Institutional Review Board (IRB), University of Central Florida (UCF), 4000 Central Florida Boulevard, Administration Building, Suite No. 350, Orlando, FL 32816-0015, phone: (407) 823-2482

Your signature below indicates that you have read the information provided above and have agreed to participate. You may withdraw at any time after signing this form, should you decide to discontinue participation in this study. If you have any questions now or later, you can reach me at:

Anna Andrews, Ph.D student. Graduate Studies and Research, College of Education University of Central Florida Orlando, FL 32816-1250 (407) 673-3657 aandrews@mail.ucf.edu My faculty supervisor is Dr.Gary Orwig (407) 823-5179.You may keep a copy of this form for your records. The original copy with signature will remain in my files.

____

Signature of Participant /Date

____ Signature of Investigator /Date

APPENDIX C : INTERACTIVE INTERVIEW PROTOCOL FOR INSTRUCTIONAL DESIGNERS

Hello, my name is Anna Andrews, and I would like to thank you for your willingness to participate in this study. Please take a few minutes to read the Informed Consent Form and let me know if you have any questions or concerns regarding your participation in this project. Let me assure you that there are no right or wrong answers during this interview. This study focuses on finding out about your perspectives, as an instructional designer, regarding the current state of computer-based ISD tools and possibly outlining a number of avenues for the future development of these tools. Please feel free to express your opinions regarding the topics that we will discuss

Questioning Period <Turn the recorder on>

Question 1: *What computer-based ISD tools do you use in your workplace?*

Probes

What kinds of tools, if any, do you use for:

- Design phase
- Production phase
- Evaluation phase
- Project management
- Any other specialized purposes?

Question 2: *How effective are the modern ISD tools in terms of supporting your job requirements?*

Probes

- What are the strengths and weaknesses of these tools?
- How do these strengths and weaknesses affect your job performance?
- Is there anything that you would like to change about the ISD tools? Why? Please specify.

Question 3: *What is your vision of an effective system of computer-based ISD tools?*

Probes

- What kinds of elements should it consist of?
- What types of tools must be included in this system?
- What are the relationships between its key elements?
- Can you graphically represent the elements of the system and their relationships on a piece of paper?

Closing: Summarize response themes **<Turn the recorder off>**

APPENDIX D : FOCUS GROUP PROTOCOL FOR INSTRUCTIONAL DESIGNERS

Hello! My name is Anna Andrews and I would like to welcome you to this focus group!

Purpose

Good morning! I really appreciate your participation in this focus group and that you have taken time out of your busy schedule to discuss your use of computer-based instructional design tools. I know that you are experienced instructional designers and I would like to hear your opinions about the current state of computer-based tools for instructional design and the implications for the future. I have asked for your input today because, as an instructional designer myself, I would like us to share our experiences with today's instructional design tools. Through the iterative process of today's discussion, I would like us to identify the impact today's tools have on our work performance and I would also like us to come up with some ideas regarding what kinds of tools we, as designers, could benefit from.

There are no right or wrong, desirable or undesirable answers. Please feel free to express your opinions, whether they are positive or negative. You are welcome to disagree with each other, and you can change your mind. I just want you to be honest saying what you really think and feel. Please try to relax and be comfortable.

Procedure

I will be taking notes and tape recording the discussion so that we do not miss anything you have to say. I will only be using the recording to verify that I have not missed anything. When we are finished with the tape then I will erase it. Your responses will be kept confidential and no one will know who said what. I want this to be a group discussion, so feel free to respond to me and to the other members in the group without waiting to be called on. However, it would be helpful if only one person talked at a time. This discussion will last approximately 60-90 minutes. There is a lot that we want to discuss in great detail, so at times I may move the discussion along. During our discussion, we will do a concept mapping activity to help us visualize our ideas.

Participant Introductions

Now, let’s start by having you introduce yourself. Just give your first name, the type of organization you work for (you do not have to disclose the name), and briefly describe the types of programs you work on as an instructional designer. ------ OK, thank you. Let’s get started.

Questioning Period <Turn the recorder on>

Question 1: *What computer-based ISD tools do you use in your workplace?*

Probes

What kinds of tools, if any, do you use for:

- Design phase
- Production phase
- Evaluation phase
- Project management
- Any other specialized purposes?

Question 2: *How effective are the modern ISD tools in terms of supporting your job requirements?*

Probes

- What are the strengths and weaknesses of these tools?
- How do these strengths and weaknesses affect your job performance?
- Is there anything that you would like to change about the ISD tools? Why? Please specify.

Question 3: *What is your vision of an effective system of computer-based ISD tools?*

<u>Game</u>: If you could write a check for any sum of money to a tool development company who could create a desired set of tools for you, what kind of requirements for this tool, or system of tools, would you specify?

Probes

- What kinds of elements should it consist of?
- What types of tools must be included in this system?
- What are the relationships between its key elements?
- Can you graphically represent the elements of the system and their relationships on a piece of paper?

<u>Closing</u>: Summarize response themes **<Turn the recorder off>**

APPENDIX E : CONCEPT MAPPING ACTIVITY EXAMPLE

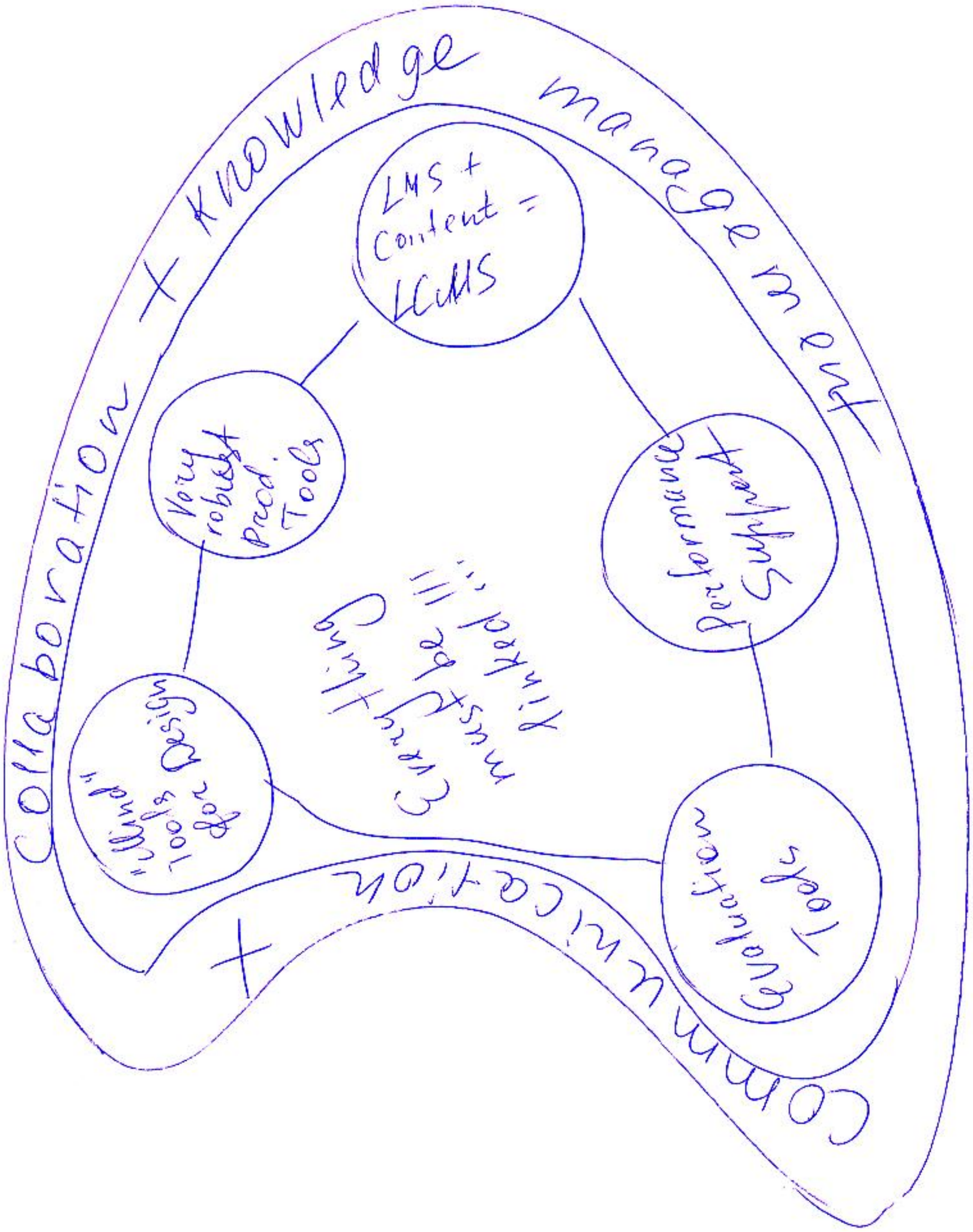

Figure E-1 Concept Mapping Activity Example

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