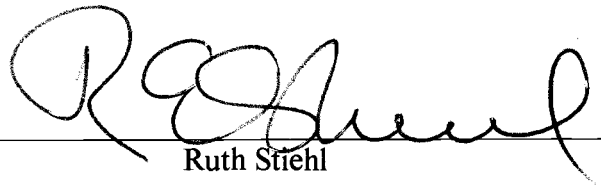
AN ABSTRACT OF THE DISSERTATION OF

Mary C. Beal for the degree of Doctor of Education presented on June 15, 1999.

Title: Predicting Unpredicted Happenings in Complex Instructional Design Projects.

Abstract approved: 

Ruth Stiehl

The purpose of this study was to discern unpredicted, non-linear patterns that may emerge in complex instructional systems design projects. A secondary purpose was to determine how existing models could be redesigned to accommodate emerging factors. The following questions focused the inquiry:

1. In what ways does the actual ISD process, in action, exhibit unpredicted, non-linear patterns?
2. What common happenings are not predicted by the ADDIE process model?
3. What kinds of contextual happenings emerge to disturb the process?
4. If the ISD process cannot be predicted, what events or conditions provide stability and direction?
5. What might an ISD model look like that reflects emerging factors?

In this study, an in-depth investigation examined five designers working in diverse settings on diverse instructional problems. The sites examined were business service corporation, community education agency, high-tech manufacturing, university, and museum.

It was found that the ISD process is an ecological phenomenon and that it cannot be studied outside of the context. "Unpredicted Happenings" are occurrences in an ISD Project that emerge as a result of the context. It was also learned that instructional systems design is an "Unpredictable Process." The ISD process itself is directly influenced by the context and in no case studied was it linear. The process emerges out of the context over time. The ADDIE model was found to be a simplified depiction of general ISD stages that can be anticipated but not necessarily in any particular order. Not every instructional systems design project moves through the general stages from one to the next. Not all of them go through each stage.

Out of the study, the prototype of a three-dimensional animated model was created in digital format and presented on CD-Rom.

PREDICTING UNPREDICTED HAPPENINGS IN COMPLEX INSTRUCTIONAL DESIGN PROJECTS

by

Mary C. Beal

DISSERTATION

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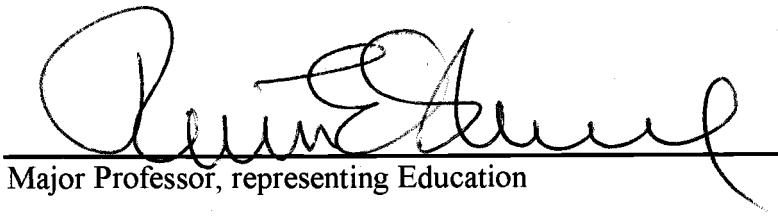

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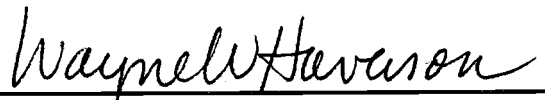

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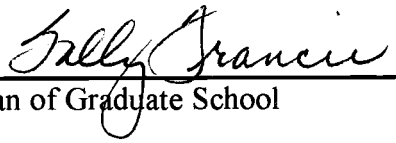

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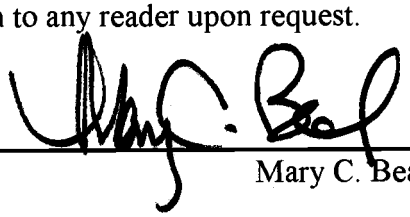

Mary C. Beal, Author

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TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF FIGURES (continued)

LIST OF TABLES

This work is dedicated to the memory of my loving father, Dr. Paul B. Beal who was a professor for almost thirty years. He is still the fire that burns in me when I love learning, classical music, good books, and my garden.

PREDICTING UNPREDICTED HAPPENINGS IN COMPLEX INSTRUCTIONAL DESIGN PROJECTS

Chapter I

Introduction to Instructional Systems Design

Living systems, when confronted with change have the capacity to fall apart so that they can reorganize themselves to be better adapted to their current environment. (Wheatley, 1996).

Instructional systems design is sometimes used synonymously with instructional systems development. Both are referred to in the literature as "ISD," that is a "a set of procedures for systematically designing and developing instructional materials. . . The emphasis is primarily on what to do, rather than on how to do it, or why it works" (Merrill, 1996) or on the environment in which it is taking place. ISD is displayed in a variety of different models, all of which can be reduced to five basic phases or steps: analysis, design, development, implementation, and evaluation (Merrienboer, 1997).

Background

Instructional systems design has roots that stem from 1899 when Edward L. Thorndike developed one of the first theories of learning, establishing a connection between stimulus and response in animals and in humans. In the 1930's Ralph Tyler talked about educational outcomes, which he called objectives. Then in World War II Instructional Design learning theories were used to work toward objectives, and "educational research (was applied) in a systematic way" (Newby et al, 1996) to train thousands of new military personnel. ISD emerged from an obvious need to

teach large groups of people the same material, in a regimented fashion, over and over again.

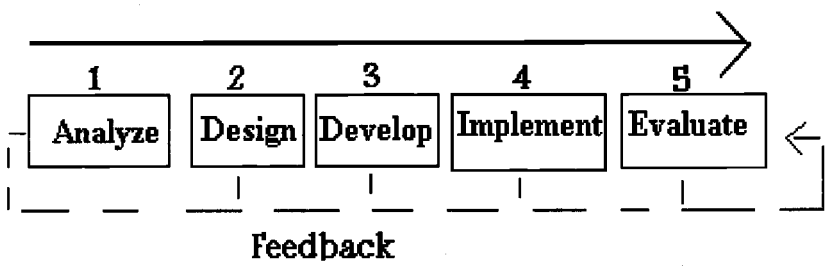
In the 1950's, Benjamin Bloom introduced a "Taxonomy of Educational Objectives" that helped instructors design education/training toward predictable results. In the 50's and 60's B.F. Skinner developed his theories of operant conditioning that were an extension of Thorndike's work and strengthened the role that reinforcement plays in stimulus-response conditioning (Newby et al., 1996). By the 1960's, Robert Gagne began to take into consideration the "instructional conditions necessary for learners to achieve specific outcomes" and focused on understanding more about the mind of the learner. That same decade, Robert Glaser introduced *criterion-referenced measures* to describe tests that would measure student progress toward specific competencies. The term "instructional system" started being used to describe systematic Instructional Design efforts. It became much more widely researched and utilized in the military, business, training, and K-12 teaching when the federal government, during this same decade, started to provide significant support for research and development in the field. By the end of the 1960's, Instructional Design was established as a professional specialty. ISD, and the process, was utilized to develop teaching and training materials on every scale from self-instructional modules to entire curricula.

The pressure to teach and train more learners more effectively began to mount. In 1983, when *A Nation at Risk* was published, Americans were suddenly awakened to the fact that their high school graduates were far undereducated to compete in the 21st century. When American educators read, among other things, that "13% of all 17-year-olds in the United States can be considered functionally illiterate," they were rightly concerned. Over the years, other studies came out like

Naisbitt & Aburdene's (1990) that stated "The Pacific Rim's economic thrust is being reinforced with a commitment to education" and Americans were found to be falling behind. There began a great push to teach more people, young and old, rural and urban. It was thought that information technology could help reach the distances and deal with the diverse disparity of learners. Instructional Design could streamline the process and provide a system whereby input, process, and output could be measured for a more efficient, effective and speedy delivery to more people.

When information technology began to change the face of education, it also affected the workplace. During the 1980's, economic growth and development in the commonwealth forced the U.S. to become more competitive in the work place; a demand for training in business and industry escalated. Ackoff (1974) in *Redesigning the Future*, acknowledged that the growing demands on schools to lower tuition and keep enrollments up, combined with business' need to keep up with the information age, created education's increased interest in quick, efficient "training" programs for the workplace and business setting. The use of instructional systems design in business and industry was more broadly adopted because it was seen as a quick, efficient and effective way to get predictable results from instructional design efforts (Rowland, 1995; Dick, 1993, Richey, 1993).

Instructional design has historically been a prescriptive science (Reigeluth, 1983). Many ISD models would lead one to believe the environment was orderly and simple, as if people were machines working on a production line. The ISD process is meant to bring order, hierarchy, and linear thinking to the planning of human learning. In Dick and Carey's book (1996), these characteristics are illustrated in five general ISD steps (see Figure 1.1).



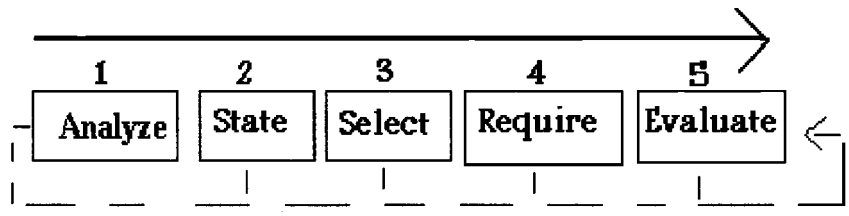
1. Analyze - analyze needs of learners, available resources and equipment; derive measurable objectives of instruction from goals.
2. Design - plan instruction that will lead to predictable results.
3. Develop - produce effective, efficient materials.
4. Implement - put the instruction into action and manage it.
5. Evaluate - evaluate results against criterion standards and modify the system based on observations.

Figure 1.1 The Dick and Carey Model of Instructional Design (Dick,1993).

A similar model, called the ASSURE model (Heinich, et al, 1989), should be mentioned here because the two are perhaps the most common ones referred to in the work of researchers and practitioners. The ASSURE model "template for planning" has six steps. No diagram was given in the book in which the model appears but if diagrammed it might look something like Figure 1.2.

While the ISD process models for developing instruction have been said to reflect "systems thinking" (Richey, 1986; Carr, 1996) that emerged in the 1950's and 1960's, the question in 1999 is whether "systemic thinking" adequately reflects the process as it is becoming known. The word "systematic" is associated with images of linear, generalizable connections in models; "systemic" implies a global conception of the problem and an understanding of the interrelationships and interconnections between elements of the system (Carr, 1996). A hierarchical model that goes from one step to the next may have been effective in what was thought to

be an orderly, hierarchical world view. But today, with the emergence of new theories in science, and the diverse, multi-cultural, more complicated world in which we find ourselves, new theories of learning and instruction are slowly evolving.



1. Analyze Learners	General characteristics. Entry Competencies. Learning Styles.
2. State Objectives	Objectives are the outcomes of learning described.
3. Select Methods, Media, Materials	Determine essential components of the lesson to be delivered.
4. Utilize Materials	Preview. Prepare environment. Prepare learners. Provide the learning experience.
5. Require Learner Participation	Describe activities for instructor and learners
6. Evaluate and Revise	Assess the learner achievement and evaluate instruction.

Figure 1.2 The ASSURE model (Heinich, et al, 1989).

A more "systemic" approach to ISD may be in order in the 21st century. A "systemic" design of instruction would be one that grows naturally from within the organization itself (Carr, 1996). Whereas a systematic design of instruction is one that is somewhat linear, process oriented, and stems from the first step (whatever that may be) to the last.

Some researchers today feel ISD must move from a "systematic" to a systemic process of planning which implies more attention to the context, a recognition of the complexities of teaching and learning, and less focus on predicting

and controlling results. (Banathy, 1991). This stems in part from the movement away from a behaviorist approach to learning toward a constructivist approach to learning. Constructivists assume each learner, their environment, and the organization are all playing a part in the ability of the learner to make meaning of the information. Indeed, it is clearly the case that two people viewing the same lesson will get quite different "take home messages" from it. Constructivists feel this is the case because learners construct their own meaning from their experiences. Hands-on, engaged learning has grown from constructivist research. In some ways, in order to deal with constructivist theories that are emerging Merrill (1996) has come up with a new ISD, referred to as ISD_2, which is based on constructivist theory. However, upon closer inspection, it is apparent that ISD_2 really focuses on "expert systems" and interactive computer-based instruction which reflect only part of the meaning behind constructivist theory.

Putting constructivism in context, Richey (1986) describes "learning theories" (such as behaviorism, cognitivism, and constructivism) as one of the four "bases" upon which ISD has been shaped. The four bases are:

1. Learning theories: explained above, the movement from behaviorist to cognitivist to the constructivist approach, an aspect of which is called "engaged learning."

2. Systems thinking: the world view that was Newtonian and is now emerging as a more holistic view, called a systems view, that takes into account a broader (web-like as opposed to linear) view.

3. Communications theory: information technology has provided a web by which people are able to communicate with one another today that was not there before.

4. Theories of instruction: refers to projects that are time-focused and task-focused, or learner-focused, often (in relation to CBT design) where the learner is able to work at his/her own pace, in his/her own place, and at any chosen time of day.

There have been massive changes in all four of these areas in the last 10-20 years. In spite of these changes, ISD process models continue to reflect a linear, predictable, and reductionistic world view. Research on instructional design and ISD models lags severely behind what's being actually followed in the field (Dick, 1996; Zemke, 1985; Wedman & Tessmer, 1993; Lange & Grovdahl, 1989; Saari, McLaughlin & Zimmerle, 1988). Practices have changed, yet the models still look the same.

One of the most widely taught ISD models in academe, the Dick and Carey ISD model (1996) still implies a strongly predictable, linear process (Figure 1.3).

Walter Dick (1996), in his article, "The Dick and Carey Model: Will it Survive the Decade?" says:

> "The most rapid demise of the Dick and Carey model would be the emergence of a constructivist model that was adopted by a majority of the design community as a desirable paradigm shift. Although recent literature contains numerous constructivist articles that describe what is wrong with objectivist models, there have been almost no articles in which explicit alternative models are presented."

Rita Richey (1986) introduces a more thorough model that emerged out of practice (see Figure 2.1). This model is a training consultant firm's representation and is clearly more explicit than previous models. The Richey model demonstrates emergence wherein the whole process is displayed, not simply a representation

reduced to its segments or parts. The training consultant firm's entire program development system looks quite complicated in representation.

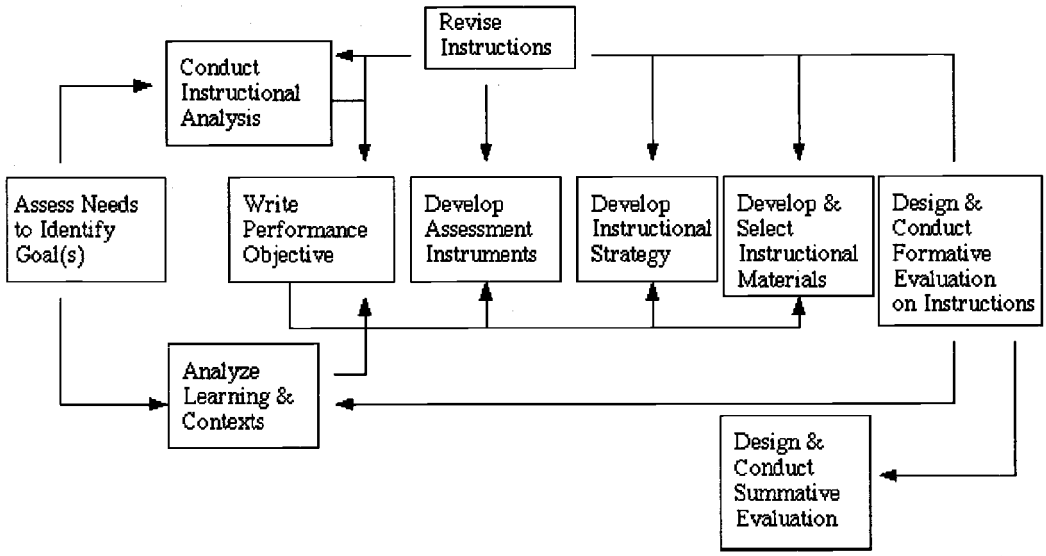


Figure 1.3 Dick & Carey's Model of Instructional Design (Dick & Carey, 1996).

While most Instructional Design models appear to proceed in a step-by-step fashion, there is increasing evidence that "the ID process is not necessarily linear and may be quite dynamic, recursive and never-ending" (Gustafson & Branch, 1997).

In another study, (Cennamo, et al, 1996), the authors point to the need for a "Layers of Negotiation" process whereby designers would revisit the same material in different contexts in order to have a broader perspective and a more flexible approach. They recommend a spiral cycle of design rather than distinct stages. Indeed, Volk (1995) contends that there are patterns of the universe "that are so widely-flung they appear throughout the spectrum of reality - in clouds, rivers, and plants; in cells, organisms, and ecosystems; and in art, architecture and politics

(representing all of human creativity)." A new model of Instructional Design might take on a more organic form in the future emanating from patterns that exist in the natural universe and look as "messy" as the diagram shown in Figure 1.4.

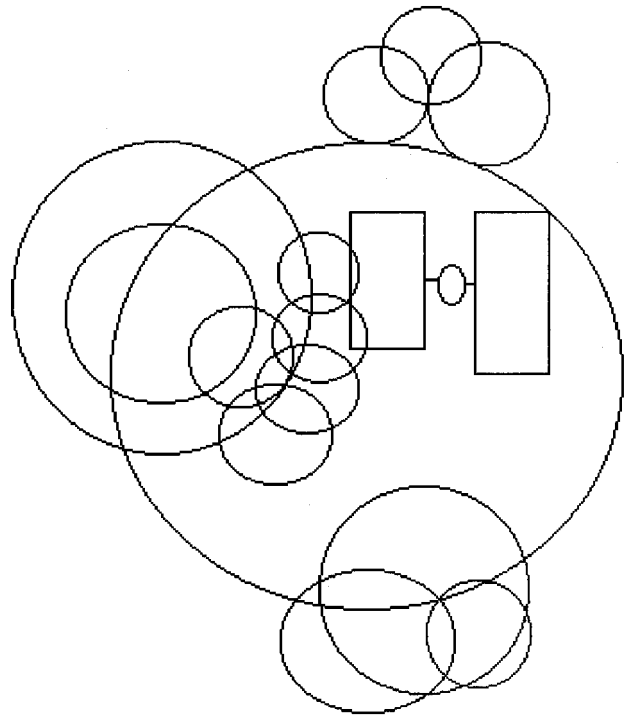


Figure 1.4 Diagram of the wheel-work of the Antikythera Mechanism (Dennet, 1995).

Wedman and Tesmer (1993) conducted a quantitative study to examine the models used by Instructional Designers. Their study "re-established the selective manner in which ID activities are completed; the sequence in which the activities are performed was not directly investigated." They recommend more research of ISD practice to determine the true nature of the ISD process in context. They go on to state that "while the history of instructional design is rife with various ID models, we believe a new model is needed." The study of a few select, successful designers

in their work, the models used or not used, and their methods of performing their job functions may help us arrive at a new model.

Richey (1986) alluded to the need for a new model when she wrote "the facts of the debate pertinent to this discussion focus on whether artistic expressions can be incorporated into a comprehensive explanation of variables affecting the design process." Is a more accommodating model needed that allows for an artistic flair? Are really creative materials desirable, and if so, is a more flexible environment needed, or a more flexible model warranted?

Purpose of the Study

The purpose of this study is to discern unpredicted, non-linear patterns that may emerge in complex instructional systems design projects. A secondary purpose is to determine how existing models can be redesigned to accommodate emerging factors. The following questions will focus the inquiry:

1. In what ways do actual ISD processes, in action, exhibit unpredicted, non-linear patterns?
2. What common happenings are not predicted by the ADDIE process model?
3. What kinds of contextual happenings emerged to disturb the process?
4. If the ISD process cannot be predicted, what events or conditions provide stability and direction?
5. What might an ISD model look like that reflects the emerging factors?

The world view is changing in western culture. The world is increasingly being described as a place of nuances and a more ecological, wholistic view that reflects an underlying order is being accentuated. The behavioral/Skinnerian models of ISD served educators well in the past for military and industrial training purposes during the mechanical, industrial age when linear thinking predominated the world view and the view of business, social, and educational organizations (Wheatley, 1992). But people are entering a knowledge age now (Toffler, 1981). The age is changing, characterized by paradox, disequilibrium, diversity, and a learning environment, learning emerging with the process. At the same time, the linear, predictable models researchers and practitioners use to design instruction for learners have stayed the same. Do the models adequately address the confusion that may come about in a classroom where students all over the globe sit at computers and are the center of their own instruction? Do ISD models serve educators well where teaching is becoming more collaborative and less private?

Importance of the Study

This study is not about theoretical models, but rather real practice. This study will help bring theoretical constructs into alignment with what really happens and provide both instructors and students of instructional systems design with processes that reflect the real complexity of ISD. This study also endeavors to arrive at a model that is more closely representative of what really happens because these findings could better prepare novice designers. For practitioners, it will provide a better way of describing to the administration the process that the work

team goes through in order to complete a project. This will allow budgets to more accurately reflect the amount and kind of work performed.

Limitations of this Study

The primary limitation of this study was the limited sample size. However, according to Wolcott (1990) it is better to study a few subjects in great depth rather than superficially study many subjects. The 1993 quantitative study by Wedman and Tessmer on this issue (mentioned earlier) recommended, though not in so many words, further qualitative study. When a large number of instructional designers are studied, it becomes necessary to develop surveys or questionnaires which in and of themselves are linear and restrictive. In this study, an in-depth investigation examined five designers working in diverse settings on diverse problems. While the results may not be generalizeable, this qualitative study revealed details and rich descriptions of the processes instructional designers go through in their work. Qualitative methodology was essential for this study in order to reveal the details that have otherwise gone unnoticed.

Definitions of Terms

ADDIE Model: A simplified depiction of anticipated stages of the instructional design process (drawn in Figure 1.1) that implies a linear, step-by-step process of Analyzing, then Designing, Developing, Implementing, and Evaluating (Dick & Carey, 1996).

Autopoiesis: *Auto*, means "self" and *poiesis* means "making" and *autopoiesis* means "self-making" – the mathematical model for the simplest autopoietic system is the living cell (Capra,1996). Maturana and Varela (1970) went on to say that the function of each component is to help produce, transform and maintain other components in the overall circularity of the basic "organization of the living."

Behavioral Learning Theory: The theory whereby one learns from conditions created to manipulate behavior in a consistent manner via stimulus-response. Pertaining to ISD, it is believed that behavior can be observed, measured, planned for, and evaluated in reasonably valid and reliable ways (Gustafson & Branch, 1997).

Boundary: A distinction made which marks the difference between an entity that is the *system* and its *environment* (Checkland, 1981).

Ecologies of Knowledge: Trying to understand the systemic properties of science by analogy with an ecosystem, and equally important, all the components that constitute the system. (Star, 1995).

Complex Instructional Design Projects: Projects that take longer than six months to complete. The project time is the period of time from the beginning of a project to completion and delivery, e.g., implementation or distribution (Project Management Institute, 1988)

Constructivist Learning Theory: The school of thought that emphasizes the identifying of learning goals within contexts where knowledge is constructed by learners as they attempt to make sense of their worlds and their experiences.

Context: The organization or agency, players, culture, and resources available like time, money, expected product, and equipment, or the environment that surround the complex instructional design project. The context supports the things that happen during the process.

Creativity: An act, idea, or product that changes an existing field of activity (Csikszentmihalyi, 1996). In instructional design, a creative person is one whose thought or acts change the existing sphere of activity or establishes a new product, form of activity, or way of doing things.

Design: The paper-based planning of the product/project layout.

Development: Production usually done by videographers, graphic artists, photographers, programmers and the like, involving equipment and putting written plans into concrete form.

Ecological: In biology, the inter-relationship between an organism and its environment (Guralnik, 1980).

Efficiency: The ability to produce a desired effect or product with a minimum of effort, expense, or waste (Guralnik, 1980). The optimum method of getting from one point to another (Ritzer, 1996).

Embeddedness: Systems within systems whereby it is best not to make a change in a system without paying attention to the larger system of which it is a part or the smaller systems of which it is made up.

Emergence: The properties that entities exhibit that are meaningful and attributed to the entire whole, not only to its parts. Every model of a human activity system exhibits properties as a whole entity which derive from its component activities and their structure, but cannot be reduced to them (Checkland, 1981).

Environment: In the *formal system model*, what lies outside the system *boundary* (Checkland, 1981). Also, contextual factors surrounding the ISD process.

Equifiniality: The final state is unequivocally determined by the initial conditions. If either the initial conditions or the process is altered, the final state will also be changed (Bertalanffy, 1968).

Experiments: As opposed to field-based research. Heinich (1984) stresses the need to test instructional materials more systematically in the field rather than theorizing because the relevance of research and its credibility comes from the ability to apply conclusions to the work setting (Reiser & Ely, 1997).

Feedback: In instructional systems design, it the best route to optimal performance and a quality product, not because there is an inherent drive toward any predestined goal, but simply by virtue of its inherent non-linear mechanism, which gives the appearance of goal-directedness (Dennet, 1995). It is often perceived as constant formative evaluation.

ISD_1 : The traditional linear, systematic process of instructional systems design (Merrill, 1996) based on behavioral theory.

ISD_2: Systemic instructional systems design approaches that are based on constructivist theory (Merrill, 1996).

Inputs: The amount of money, material, and/or effort invested in a project and process (Guralnik, 1980). In ISD, between the energy that goes into developing a training/educational program and the designed output, there is usually corrective feedback that moves the project forward, or returns it to an earlier stage for correction (Romiszowski, 1981).

Instructional Design Projects: The end products of the process of instructional design in context. Most often the result is training or education in any media (audio tape, text, analog or digital video, multimedia).

Instructional Systems Design (ISD): A set of procedures for systematically designing and developing instructional materials, displayed in a variety of different models. Most of the ISD models involve five basic phases or steps: analysis, design, development, implementation, and evaluation (Merrill, 1996).

Mission: A mission clearly defines the purpose of the business and is handed down, usually by the leaders. It removes any doubt as to what is intended to be accomplished by the business (Boar, 1993).

Model: Within ISD as the broader framework, models offer explanations or guidance on more specific thought and action and also exclude certain types of

thought and action from the process of ISD. A model is judged as good or bad in terms of its usefulness (Dick, 1993).

Unpredicted Happenings: Variables, unknowns, and unforeseen events. It is apparent in emerging ecological theories that components of systems and systems themselves are more interrelated than previously suspected (Davenport, 1997) and therefore more complex and emergent.

Open System: Systems that maintain themselves in a continuous exchange or dynamic interaction of matter or components with their environment. The open system thrives on feedback and incoming information from its environment (Bertalanffy, 1968, p. 40, 156).

Organism: A whole made up of related parts that work together (Barnhart, 1958).

Organization (Context): Entities made from related parts, each having a special duty. Also, the act or process of organizing (Barnhart, 1958).

Positive Feedback: Positive feedback leads to continuous buildup of the output until the system operates at maximal level or is jarred by so much disturbance that it is forced to reconfigure itself at a higher level of complexity (Wheatley, 1992).

Predictable Happenings: A foretold event or state (Guralnik, 1980) that is common to the nature of the creation and production of instructional design products.

Process: A system of operations in the production of something - a series of actions, changes, or functions that bring about an end result (Cleland, 1994).

Project Management: The art of directing and coordinating human and material resources throughout the life of a project (Project Management Institute, 1998).

Random: Impetuous and haphazard movement or course of action. Lacking aim or method; purposeless (Guralnik, 1980).

Real-World Problem: A problem that arises in the everyday world of events and ideas, and may be perceived differently by different people. Such problems are not constructed as are laboratory problems (Checkland, 1981).

Self-Organizing: Where order emerges from unpredictable happenings – offering concepts and ways of viewing interactions that help in managing in turbulent environments (Wheatley, 1992).

Stakeholder: All those who have a stake in the instructional system under design (Reigeluth, 1996).

Systematic: A procedure in instructional design strongly represented in a variety of step-by step models (Carr, 1996).

Systemic: That which arises organically out of the system. A systemic design model may not be linear, sequential, or systematic. Systemic design manifests dynamic interaction between feedback and feed forward, reflection and creation, and divergence and convergence (Carr, 1996).

Systems Approach: A method of developing consistent quality programs in which the stages include some form of front-end analysis and needs analysis, high level design, detailed design specification, low level design, coding, formative evaluation and revisions, final revisions, and implementation. If a step is completed poorly or skipped, it will either result in poor quality work or additional costs and rework later (Costello, 1993).

Systems Thinking: A body of knowledge and tools that have developed over the past fifty years that make rich patterns in the world more clear and help divulge how things may be effectively changed with the least amount of effort (Senge, 1990).

Unpredicted Happenings (UPH): Occurrences or happenings that emerge from the uniqueness of the context (organization or agency, players, culture, and resources available).

Vision: A vision provides a guiding theme that articulates the nature of the project and the intent or purpose for the future. A vision should be informative, shared, competitive, empowering, and worthy of an extended personal commitment (Boar, 1993). A vision is not the same as a mission.

Visioning: The act of seeing something in the mind's eye clearly before it is created.

Weltanschauung: A comprehensive, especially personal, philosophy or conception of the universe and of human life (Guralnik, 1980).

Summary

This chapter has been presented to clarify the conceptual context within which this study was conducted. It is felt that the broader view may be missing from models to date. Therefore, the intent is to examine the real-world ISD process and capture data that supports explication of a model more organic in nature. The following chapter will review the historical atmosphere, via a literature review, surrounding instructional systems design.

Chapter II

Literature Review

A tree is not an object, but an expression of processes, such as photosynthesis, which connect the sun and the earth. The same is true of our bodies, our jobs, our organizations, and ourselves.
(Capra & Steindl-Rast, 1991).

Introduction

The word "paradigm" comes from the Greek word paradeigma, meaning pattern. It was popularized in 1962 by Thomas Kuhn in *The Structure of Scientific Revolutions* when he used it to describe tacit knowledge that was shared by others (Kuhn, 1962). Capra (1991) says, paradigm "means that behind the scientific theory is a certain framework within which science is pursued." The framework, in which the paradigm is formed, ends up constructing the views of many other aspects of society as well. The work of Newton in the 1600's affected religion and the Western view of the world at that time.

Newton's scientific work portrayed an orderly, mechanical universe. From Newton's mechanics came powerful machines opening the door to the Industrial Age. At the end of the twentieth century, science and mathematics is leading us again into a change of age and our world view is changed with it. At the center of this change of age is a more ecological view, as seen in forthcoming books on what is coming to be known as "learning ecologies," *Information Ecology* (Davenport, 1997), and *Ecologies of Knowledge: Work and Politics in Science and Technology* (Star, 1995). The shift from perceiving the universe as a mechanized, predictable, and ordered one to an ecological one with an underlying order, as seen in

ecosystems in nature, have begun to form and influence our understanding of a more wholistic, all encompassing systems view.

A world view affects every facet of our lives. The reductionists of the past took things apart down to their tiniest elements and described them. But the twenty-first century brought forth a time of synergy, when cross-pollination of the fields of computers, biotechnology, deep ecology, and quantum mechanics enriched each other and, at the same time, brought forth a holistic perspective. Alan Wolf, in *The Spiritual Universe: How Quantum Physics Proves the Existence of the Soul*, promises an interesting and quite controversial near-future for us all.

Edmund O. Wilson writes (1998) that all theories will be able to be described by a few basic principles: "there is intrinsically only one class of explanation. It traverses the scales of space, time, and complexity to unite the disparate facts of the disciplines by consilience, the perception of a seamless web of cause and effect." It is this explanation, the complexity, and ultimately the order that underlies it, that provides the framework in which our near-future world view or "weltanschauung" is being formed.

> "Our yearning for simplicity is one we share with natural systems. Scientists now understand that order and conformity and shape are created not by complex controls, but by the presence of a few guiding. . . principles" (Wheatley, 1992).

An ecological view may be more descriptive of the weltanschauung than other views. It has a systems view as part of its perspective. A systems view emphasizes change, self-correction, creativity, and interaction (Betts, 1992). Because the way the world looks is perceived as complex and often times incomprehensible, the deeper wisdom of late is more profoundly portrayed by unity that underlies the appearance of separation (Elgin, 1993). At the same time, an

almost metaphysical faith in specialization and expertise that existed recently (MacIntyre, 1981) is being noticeably upended, by a predominate need for a multidisciplinary view yet overarching and interconnective view (Seels, 1993).

The ecological perspective takes into account the entire system and how the systems themselves are related to one another. As a more interconnected perspective takes shape, an ecological view comprehensively encompasses or explains the world view more closely than the mechanistic views, or even the systematic views, of the past.

In Newton's day, people compared and explained the natural world in relation to machines. In more recent times, United States Navy Lieutenant Matthew Fontaine Maury, who was studying ocean currents at the time, saw the planet as a living being whose breath was wind and the sea its blood. From his stories, and many others like it, building on an old foundation, James Lovelock described the earth as a large organism, or Gaia, of which humans are a part (Weiner, 1990). As the understanding of complex systems grows, so does the realization that humans are elements of a deep ecology, an organic system, not a mechanical system.

Gregory Bateson (1979; 1991) was one of the leaders who attempted to unify many disciplines into one holistic view of the world. He examined "human ecology of the mind and learning from biological, anthropological, and sociological perspective(s) with some interesting commentary" (Carr, 1996) on educational and sociological systems.

Specialization was a large part of the reductionist sciences of the past that is being subsumed beneath the need for knowledge of the interconnectivity of things and knowledge in multiple areas today (Bateson, 1994). The specialist begins to

specialize in a general, broader knowledge in order to survive the information and communication ages.

During the time of the Industrial Revolution when the world was seen to be a clock or a machine, the world was thought to be an ordered, closed system. Businesses were running like machines too. Owners were Gods – all present and all powerful. Employees were treated like machines. The former looked down from above while the latter punched time clocks and worked in assembly lines. Not much attention was paid to issues like worker satisfaction, much less "soul" in the work place. As the information age unfolds, corporations are "reorganizing based on holistic processes rather than fragmented departments" (Hammer & Champy, 1993). Systems thinking vocabulary even started to appear in the management literature. The chief executive officer was sometimes referred to as the ***head***. The ***health*** of a corporation was a concern; a *growth* in a certain area was called *cancerous*; or there could be organizational *paralysis*; the *brain* and ***heart*** of the firm were two CEO's (Ackoff, 1990). Systems thinking is being applied to design, development, and implementation and management of educational processes (Banathy, 1991). Underlying principles of ISD, as the practice took shape in the world of business and of education, may reflect the changing world view.

Looking at ISD within Context - the Big Picture

Recently, researchers and practicioners in building models and describing the ISD process have used broader theories with ecological priciples and general systems theory (GST) as overarching concepts. General systems theory provides many disciplinarians with a way of understanding complex circumstances and their compatibility with their environment (Richey, 1993). Indeed, GST is one of the four theoretical and conceptual "bases" upon which Richey found ISD rested, along with:

1. Communications Theory [e.g., input-output models], and
2. Instructional Theory [e.g., task, time, and learner centered instruction], and
3. Learning Theory [e.g., Skinnerian psychology, Bloom's taxonomy, Gagne's events of instruction, Glaser's criterion-referenced testing, and Robert Mager's instructional objectives] (see also Willis, 1995).

To date, researchers and practitioners alike have refered to aspects of GST to shed light on their work in ISD. One of GST's major tenets is that the whole is greater than the sum of it's parts (Salisbury, 1989). This means that the super/supra system is made up of many sub-systems that are by themselves only a part of the larger whole. If the supra-system, or larger system (Betts, 1992) changes in significant ways, the elements within the larger whole must change also and adapt in order for the system to survive (Hutchins, 1996).

The context within which ISD takes shape began to be analyzed. For ISD the super/supra system refers to the context, and can be as broad as to include all those systems ISD serves: K-12 schools, higher education, corporations, health agencies, the armed forces, museums, and other institutions in the private, public, and "third" (not-for-profit) sectors (Reigeluth, 1996). From the other perspective, as the subsystem changes, it has an affect on the system; if the subsystem(s) change it affects the super (aka supra) system (Ackoff, 1990). Since there were numerous changes taking place during the information age, it was not surprising, though it has been disruptive, that ISD has been in such a state of flux. Many factors surrounding

ISD change and affect the practice's evolution and the evolution of the models. Many changes can be observed between the creation of the first flow chart used to describe the process, to the proliferation of models at the present time.

In a 1996 study, Dolbec described the need to look at the context of designers when they're designing and to take into account the context of learners when they're learning. In other words, he found a dire need to look at the larger system. This incorporation of the systems view took its toll on the literature on ISD and on the education arena in general. Dolbec's so-called "Gestalt Approach" recommends designers take into account a broader view, including the instruction, the environment, the learner, and the teacher. He writes:

> "It is my view that the Gestalt Approach may provide a framework to deal with the systemicity of the changing environment. Through this approach, the designer has to be aware that change is a process that is experienced in a particular context, at a particular time, with particular individuals. During the Industrial Revolution age the over-arching world view was Newtonian. The world was seen as an orderly and closed system. Initially ISD was primarily a regimented process to expedite training for the military. During the 1940's and 50's, rigorous and rigid steps were needed to prepare U.S. troops for battle. With the need to indoctrinate many soldiers came the creation of this new field called instructional design. 'World War II gave a big boost to the field of instructional design. The need to rapidly train tens of thousands of new military personnel created a heightened interest in applying educational research in a systematic way' (Newby et al., 1996). Reigeluth (1983) referred to ISD as a prescriptive science -- a long established and used set of rules or guidelines."

Dolbec's "Gestalt Approach" stands in marked contrast even as recently as 1996, when Merrill et al made their views of the foundations of instructional design professionals quite clear:

> "Instructional science is concerned with the discovery of the natural principles involved in instructional strategies; instructional design is the use of these scientific principles to invent instructional design procedures and tools. Those who claim that knowledge is founded on collaboration rather than empirical science, or who claim that all truth is relative, are not instructional designers."

Merrill quite clearly feels that there is a science of instruction and a technology of instructional design. In addition, Merrienboer (1997) in his work referred to ISD professionals as instructional scientists.

But at the same time others (Carr, 1996) were perceiving the process of design by utilizing analogies from systems engineering that were translated into the design of instruction and applied to training for military applications even in the early days of "systems thinking." During the 1950's and 60's, there was a convergence of several disciplines which could be classified under the general heading of "systems thinking," including biology, cybernetics, information theory, and communications theory (Lilienfeld, 1978).

ISD started out at least, as a system to create meaningful and relevant instruction for learners and students. It may have begun with a presidential address to the American Psychological Association in 1899, by John Dewey when he called for "the development of a linking science between learning theory and educational practice" (Reiguluth, 1983). Ralph Tyler, during the same period, also expressed the need for increased studies in this area. Reiguluth refers to ISD as instructional design and calls it "a linking science - a body of knowledge that prescribes instructional outcomes, such as achievement and affect" and more than a body of knowledge; it is also a process and a prescription for creating that knowledge and analyzing its use.

In the 1950's, Benjamin Bloom (1956) developed the taxonomy of measurable learning objectives in three domains: cognitive, affective, and psycho-

motor. Robert Mager developed behavioral objectives as a way to define instructional goals (1960, 1975). Their work continues to influence training and education settings in order to set objectives, design curriculum, and develop evaluation instruments. In 1961, the National Society for Performance and Instruction (NSPI) was created to reflect the performance orientation side to Instructional Systems Design.

ISD, in education and training, has grown into a discipline of study (indeed, it begins to look like the process an architect goes through to design a house prior to its being built). ISD is also a skill set and a group of procedures and tools (Merrill et al, 1996) whose complexity is not unlike the physical sciences. In 1965, Robert Gange's research laid the ground work for an instructional science that led to "prescriptive theories and rules, if you will, that teachers could follow that would lead to improved learning" (Osguthorpe & Zhou, 1989). Gagne's *The Conditions of Learning* is considered a milestone that elaborated on the analysis of learning objectives and went on to relate classes of learning objectives with certain appropriate instructional designs (Anglin, 1995).

The Instructional Systems Design Process

The phrase Instructional System Design or "ISD" is used to refer to the process whereby one first analyzes the content, available media, and subject matter resources. Then a design is put together to create a workable document (like an architect's blueprint). The next step is the development or "production" of the instruction. Initial implementation constitutes field testing of the product. Then the product is evaluated as to whether it works or not. Both formative and summative evaluations are usually utilized. Summative evaluation takes place when the product is finally implemented, finished, and examined.

The Instructional Systems Designer can be a teacher working alone or someone working in a team. Although somewhat confusing, according to Braden (1996), other phrases found in the literature that are used to describe the instructional systems designer include:

- Instructional developer
- Instructional technologist
- Educational technologist
- Performance technologist
- Training designer
- Curriculum designer
- Production expert/specialist
- Teacher/trainer
- Project Manager

Jonassen (1989) tried to get at more meaningful definitions of 126 terms in design, but the paper seems to have come and gone with little fanfare.

The confusion in reading research and hearing reports from practitioners can be great. To add to the confusion, "many writers have used the term instructional design to include all five elements labeled as 'instructional development'" (Gustafson & Branch, 1997) while some call all five elements 'instructional design.' For the purposes of this research, the ISD person is a practitioner who executes the five ISD steps outlined in Figure 1.1. The second step herein is called design.

More quandaries have grown around the discipline where the systems approach joins technology with instructional systems design. Both the relationship and discipline definition have caused much confusion. Seels (1989) writes, "it is unlikely that a correspondence between a learning paradigm (ISD) and a delivery system (technology) will continue to define a learning technology, as was the case with programmed instruction technology. Whether the 'suprateram' becomes instructional design or instructional technology, or educational technology, is

unresolved." Herein, technology used in instruction for education and training will be referred to as instructional technology.

Just as classrooms reflect a shift to an information age, "the role of the instructional developer and the ID models should reflect the condition of the shifting paradigm" (Gustafson & Branch, 1997). The constant change in verbiage and confusion over terms demonstrates the emergence of a larger field and changes in ISD and the changes in ISD models. "The field cannot afford to be content with existing theory, any more than it can be satisfied only with past models of ID practice" (Richey, 1993).

The Process Models

Process models are used as procedure guides by instructional systems design professionals. Many of the models are patterned after Maher and Ingram's (1989) "sequential waterfall model," where the output of one phase serves as the input for another (see Figure 2.1).

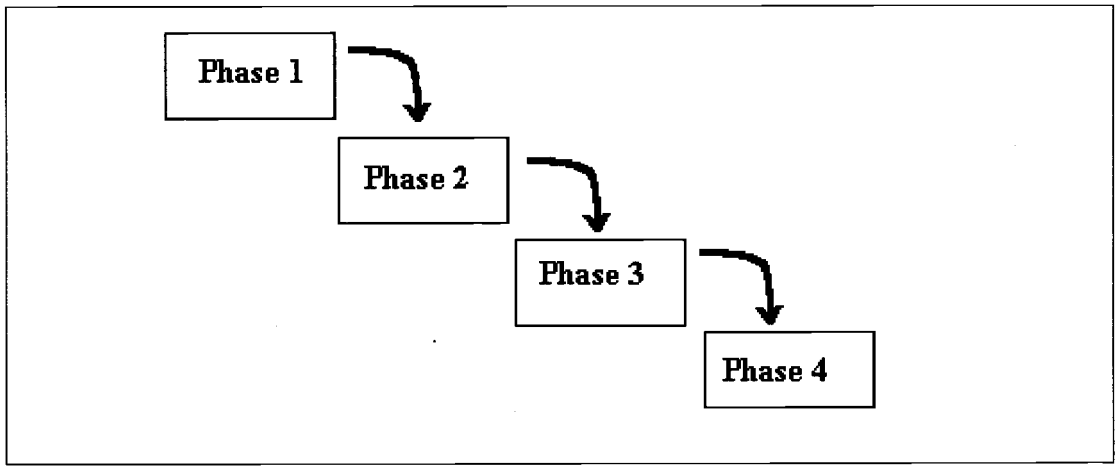


Figure 2.1 Maher and Ingram's Sequential Waterfall Model (1989).

There are practically as many opinions on ISD and ISD models as there are ISD professionals. While process models are sometimes equated with theories, in the literature (Richey, 1986) they are different. Process models are representations of reality drawn by practitioners and researchers in order to communicate procedures. Richey (1986) displays a model of "A Training Consulting Firm's Program Development System" (see Figure 2.2). Richey's graphic is really quite expressive of the steps in the process, although the evaluation step is somewhat weakly displayed.

In general, ISD models are of two kinds:

Model-1: simplified representations of a part of known reality. They are direct representations of something in everyday life, like a toy train that emulates the Amtrak version.

Model-2: Imported analogues to assist thinking about the unknown or unfamiliar. This type of model is used to explain, understand, and depict something unknown by making comparisons, or using analogies, to that which is familiar. Models of both types might be, to varying degrees, value-laden (Chapman & Jones, 1980).

Within ISD as the broader framework, models offer explanations or guidance on more specific thought and action and also exclude certain types of thought and action from the process of ISD. A model is judged as good or bad in terms of its usefulness (Dick, 1993). If practitioners and researchers use or refer to them, they're thought to be good.

Instructional development models (Gustafson, 1981) are found to be of four categories: focused on the classroom, focused on products, focused on systems, and focused on the organization. There has been no shortage of models recently

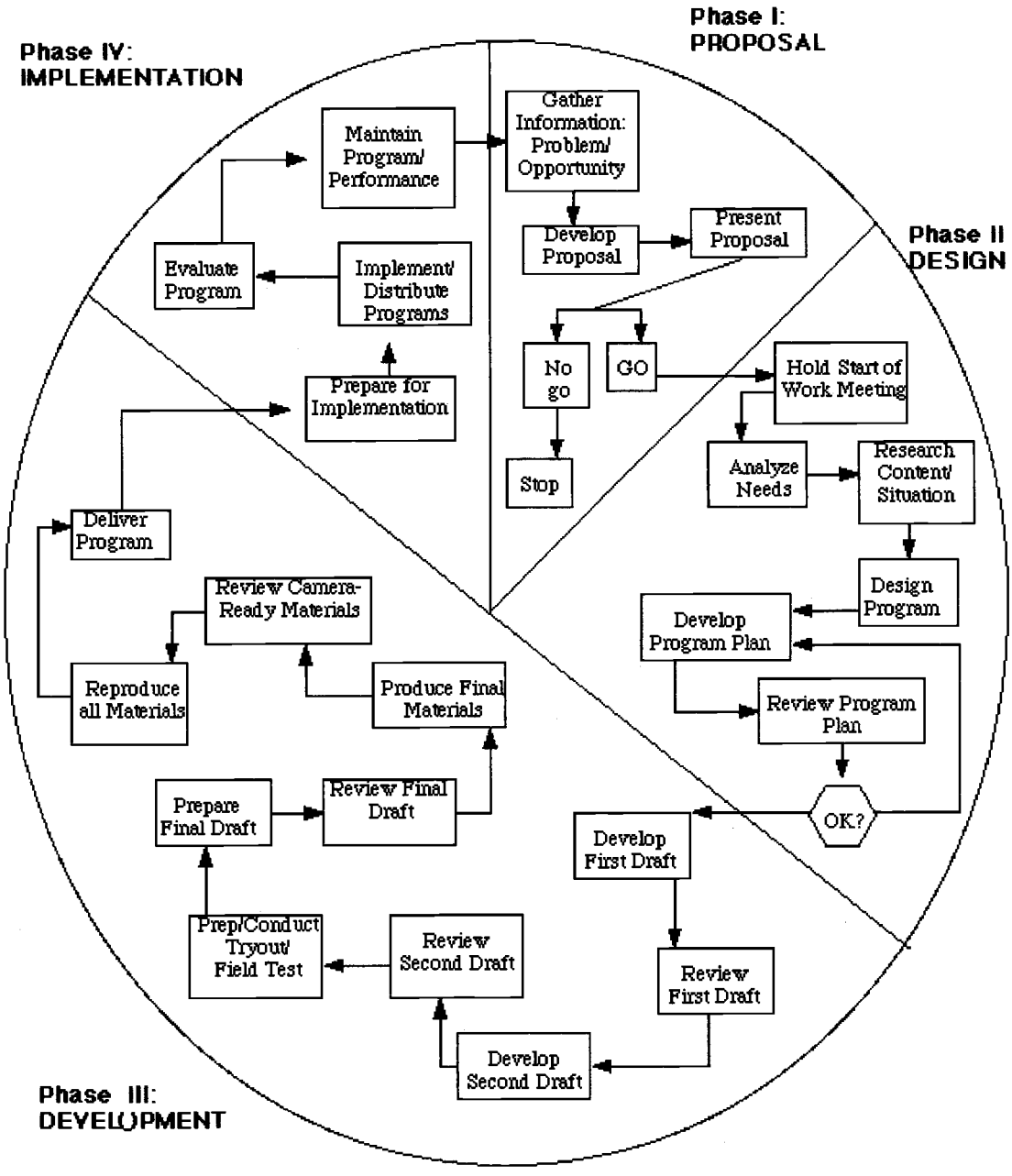


Figure 2.2 One Training Consulting Firm's Program Development System (Richey, 1986).

(Braden, 1996). They are commonly of four, five, or eight distinct steps, with elaborate models involving up to 21 steps. Ruben's (1996) "Eleven Steps in Designing Effective Instruction" is still linear, with boxes and arrows, but has 15 steps (see Figure 2.3).

Richey's model (see Figure 2-1) has 24 steps. Some differences can be explained by variances in the way they are applied, "for example, models used for developing instructional materials for industry may vary slightly from those used to develop materials for educational systems" (Costello, 1993). The argument for some models' simplicity is sometimes that they are used by classroom teachers and therefore do not require all the intricate steps of a model used in training.

In 1980, Andrews and Goodson analyzed 40 models and concluded that they had four purposes: improving teaching and learning; improving management of instructional design and development; improving evaluation; and testing or building on learning or instructional theory. Models usually are quite linear (Braden, 1992) and have boxes or circles (DeCecco, 1968) most connected by arrows. Gustafson and Branch (1997) write that early ID models "were based in behaviorism". ISD Models are like flowcharts. They provide guidelines for practitioners to follow (and "data" for researchers to argue about).

It is evidently preferential to compare alternative models rather than reject a single model (Lave & March, 1975). Many comparisons of alternative models in ISD have been done (Gustafson, 1991, Gustafson & Branch, 1997; Braden, 1996; Andrews & Goodson, 1980; Reigeluth, 1983). In comparing the models, studies remark on attributes and adequacies, or present better alternatives. In order to

refute any model, new data must be presented that cannot be explained well by the present models (Lave & March, 1975).

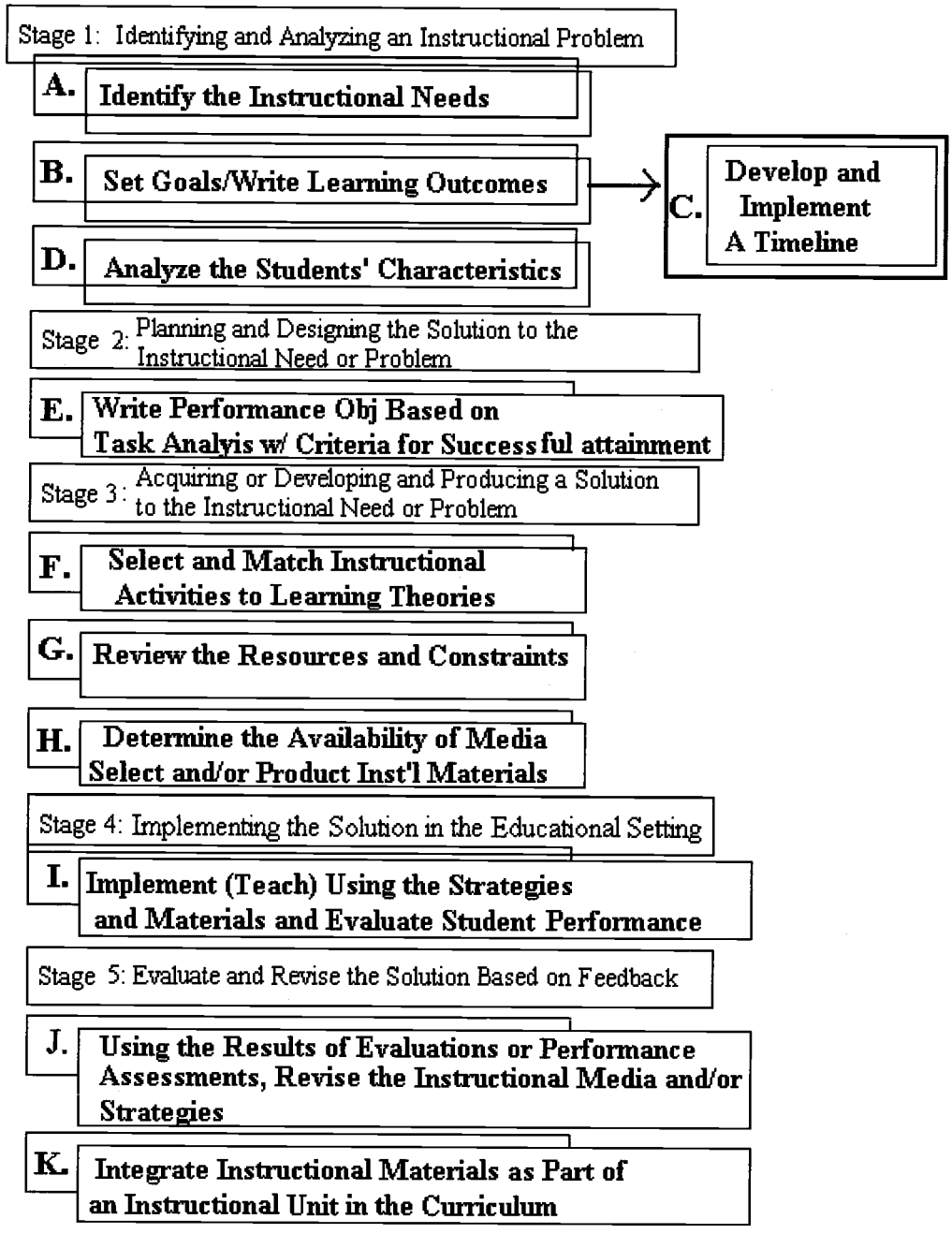


Figure 2.3 The Eleven Steps in Designing Effective Instruction (Ruben, 1996).

According to Lave and March (1975) the criteria for model building and creating a "good" model include:

1. Simple - with a small number of assumptions rather than a large number of them;

2. Fertile - producing a relatively large number of interesting predictions per assumption;

3. Surprising - presenting things not considered before and not immediately apparent when looking at the assumptions.

The researchers to date present new models as freely as they refute the old ones. So far, none have accepted a criteria or regimen as proposed herein and then placed their work against this measurement. If each model were required to meet a quality control mechanism it might eliminate the proliferation of new models being proposed. If each new model were presenting a different aspect of ISD then the many models out there would be understandable; but each model seems to be trying to get at the process of ISD itself and to describe it. The numerous models being proposed of late point to the need for clarification that is not only functional but that will stand the test of time, rather than offering conclusive answers.

Kember and Murphy (1990) recommend that a more dynamic model is needed in which the elements interact with each other and within which any of the elements could be considered at any time. As an example, they state that objectives should be used when "required, not by decree." They opt for a more "intuitive" approach.

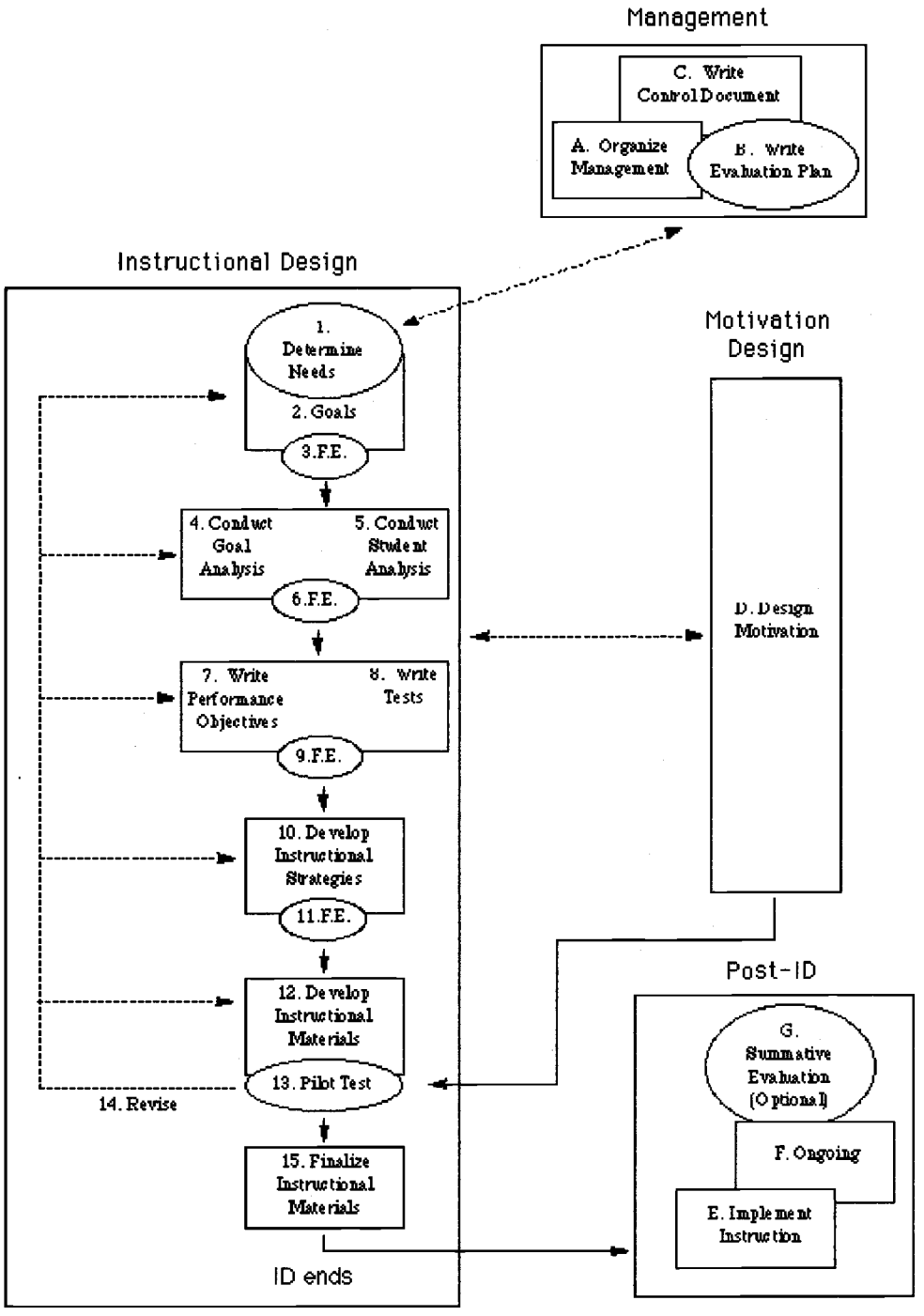


Figure 2.4 Braden's Top-to-Bottom Formative Evaluation Instructional Design Model (Braden 1996).

A similar model, like Ruben's, was drawn by Braden in 1996 (see Figure 2.4). Sometimes, in the busy environment of real-world settings, "designers report they just don't do part of the ISD process because of lack of time" (Dick, 1993). The content goals, needs, and objectives are "in a state of continuous process of emergence in the real world of ID practice" (Kwang, 1995). Tessmer and Wedman (1990, 1991, 1992) even created a "process selection" model they call "layers of necessity" (Figure 2.5) that they use to display the process, whereby in creating instruction the number of steps to be completed changes depending on the given amount of time and money available. It would seem like the quality of the end product would be affected by this approach. If there is a small budget and little time, the creation cannot possibly be of its finest quality. This "model" - in that it is referred to frequently - is another popular one. Rather than select any model to advocate, Richey (1993) suggests that new "priorities" in the design process be discovered.

Criteria for a New Model

The current models, simply put, need to be more useful (Dick, 1993). The roots of what today is called instructional (systems) design was historically based on Skinnerian psychology (Willis, 1995). The models today need to reflect more modern constructive-interpretive theories of learning rather than the behavioral-empirical theories.

How are ISD models actually used by practitioners? Some view an ISD model as simply a starting point, or a basis on which to begin (Kwang, 1995), rather

than something they follow. Others abhor the models and the boxes and arrows, and argue that models are unnecessary and "the refuge of weak minds"

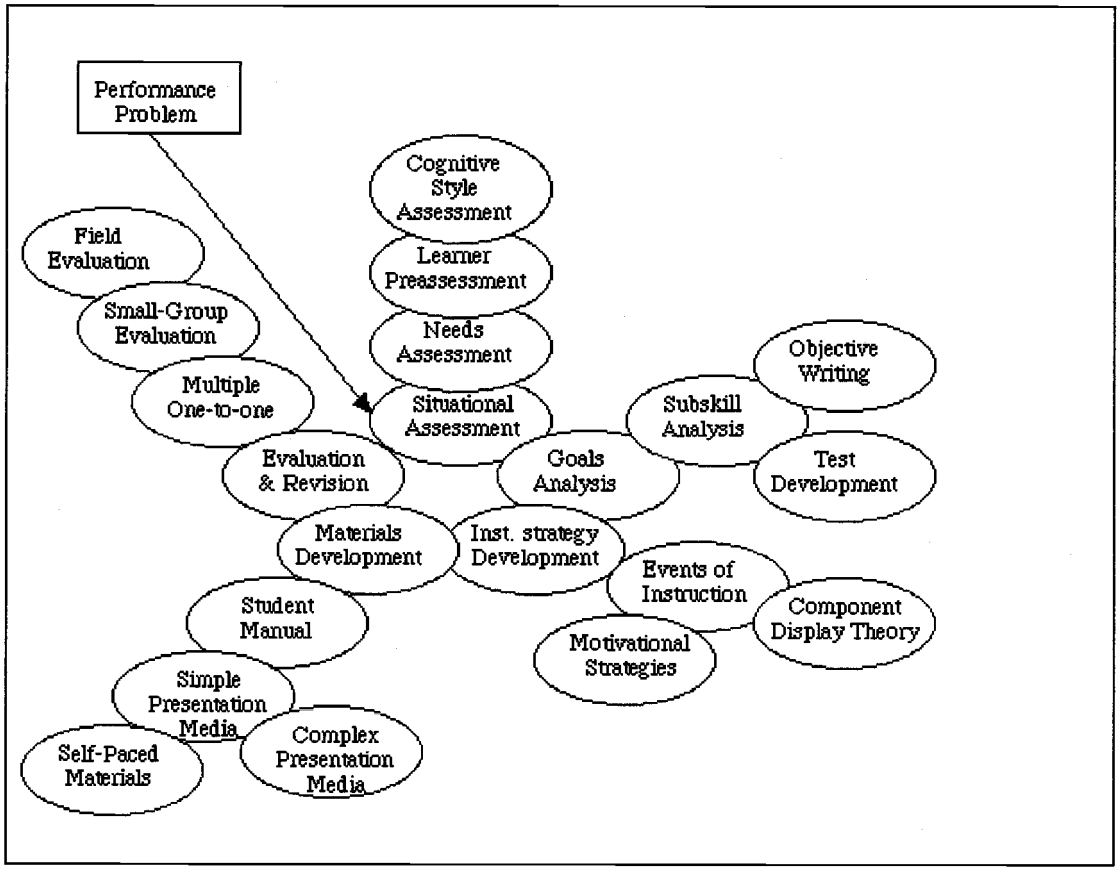


Figure 2.5 Tessmer & Wedman's Layers of Necessity Model of Instructional Design (Tessmer & Wedman, 1990).

(Dick, 1997). In light of the continuing changes in the teaching and working environments, it may be necessary to make changes in the fundamentals of ISD. There is an ever present need for objectives and assessments, instructional strategies, and formative evaluation in order to have an ISD model that continues to be useful (Dick, 1993).

The real world situation of design may be more complex than the linear, two-dimensional models display. Dick (1993) states "in most real-world situations,

there is insufficient trained staff and time, and no one is sure what the institutional goals should be, or there are a variety of views on the subject. So what are the implications for the ISD process?" One article, (Dick, 1996), "The Dick and Carey model: Will it survive the decade?" shows the A-D-D-I-E model changing but it is ultimately still linear, going from left to right with boxes and arrows and still not completely reflective or thorough.

ISD models if they are to be used must work in a broad environment. They must work in training applications and in education settings. Researchers and professionals are both utilizing the same data and they need to avoid the "Fallacy of Self-Projection" (Dick, 1995) in which they value what appeals to them personally. Researchers and professionals alike need to stop having the false perspective that they are "the audience of a design intended for others" to use.

Designers and the models that they use must "be creative in identifying and solving a problem within the parameters of the client's context" (Dick, 1995), whether the client is a K-12 learner, a student in higher education, or a trainee in business and industry. They are all customers. All designers must "meet the needs of the client" (Dick, 1995); whether the client is a learner in training or a student in education, the delivered end product must meet its objectives to fit its purpose.

Much of the research reflects the need for change (Dick, 1993) and suggests that world view changes are impacting the ISD practice (Richey, 1993). At the same time that researchers struggle to depict the "reality" of the ISD process, practitioners, in Dick's view (1993), are not concerned with theories of learning at all. They want to create the best product as fast and as cheaply as they can.

To date, effectiveness and efficiency have been held up as the criteria for "good" instruction (Rowland, 1995; Dick, 1993, Richey, 1993). It is as if to say

instruction should be created fast and at the least possible expense. Instruction should be "effective, efficient, and appealing" (Dick, 1997; Merrill, et al, 1996). From the early times of ISD, this has been true. Silvern (1965) believed GST (General Sytems Theory) could be used to create effective and efficient training. According to Gustafson and Branch (1997), what was created was considered the first ID model and was as if "effective and efficient" were benchmarks against which quality instruction could be measured.

In today's context, good instruction has more to do with transference of meaningful learning than "effectiveness and efficiency." There is need for an expansion of the dimensions of learning where limits are experienced in terms of desires and goals of the learner (Cooper, 1993), not in terms of what can be done efficiently and effectively. Richey (1993) proposes that design "efficiency" be judged in terms of "learning efficiency" -- not the time required to learn [or the money it costs to create learning], but in terms of measurable standards that display the extent to which the learner is learning.

When effectiveness and efficiency so often come up, one is reminded of Max Weber, the turn-of-the-century German sociologist, who lauded the bureaucracy in which a given task is broken up into its components and an office is held responsible for a clear cut portion of that larger task. Weber held that the bureaucracy was the most "efficient" structure for handling numerous tasks that required a lot of paperwork. In 1996, George Ritzer wrote a book called, "The McDonaldization of Society." In it he calls bureaucracies the "paradigm of McDonaldization." Until recently, all of the linear, step by step, arrows and boxes that explain the process of ISD look like a McDonaldization of what some are reporting might be a more complicated process. Perhaps it is more than one thing leading to another, more

than simply taking a hamburger from the grill, slapping on some mustard, and putting it in a bun.

Quality has been an issue since the creation of new technologies for delivery of instruction (Heterick & Gehl, 1995) and since the total quality movement. Concern has arisen as to what good or quality instruction is, and some seem to think it has more to do with a measure of the learner's own understanding (Richey, 1993). By these standards the amount of learning a student gets from instruction would be a measure of quality instruction. However instructional design theories have "little to say about encouraging students to adopt a 'deep approach' -- and little to say about encouraging meaningful rather than surface learning:" (Kember & Murphy, 1990).

The present ISD models do not reflect emerging views and understandings about learning. In the past, research has compared the way people think to the way computers process information - with the brain taking in input, processing information, and giving output, "able to record and store information, and programmed to retrieve data when the proper commands are used" (Mehlinger, 1995). This is called information processing theory, or contemporary cognitive theory. This behavioral input/output model is not reflective of the whole of learning (Cooper, 1993). Learners are not machines. Learners "approach a learning task with a set of personal beliefs, motivations, and conceptions about the subject area and about knowledge itself" (Kember & Murphy, 1990). The input/output model contends that knowledge may be entered (in our brains), stored, and retrieved in memory and memory becomes the focal point. But information processing may not be the final metaphor for the way people think. The thought process may be a much more complicated one (Dede, 1995; Rivard, 1988). To meet this challenge, some

are coming forward with what's being called a more "systemic" view (Carr, 1996; Banathy, 1995) of how instruction should be designed, or a systemic approach for accommodating instructional design problems (Kwang, 1995).

The New ISD – Is it Systematic or Systemic?

There is an apparent need for an evolution of the models, a revision of theory, or for researchers and practitioners to completely replace the present ISD theory with another, more powerful and elegant one (Dick, 1997). During the last two decades systems thinking has been applied to education and other social systems. "As a result of these applications we now have available to us models and methods of systems inquiry that enable us to work creatively with the dynamic and complex nature of education as a purpose-seeking social system" (Benathy, 1995).

Dick (1993) describes the entire ISD process as systematic in that "each step flows from the preceding one, and evaluation and associated revisions are used to determine when the instruction is acceptable to the client." One study surveyed 45 Japanese Corporations and found that most of the companies were designing their own training programs and that a great many companies desire "more systematic design approaches, especially with the introduction of more technology in support of training" (Keller & Taguchi, 1996).

Wedman and Tessmer (1993) conducted another study in which they investigated the actual design process of 73 practicing "course developers" in order to pinpoint which of eleven design activities they actually use. They found that "design activities occur on an irregular basis, with some activities occurring most of the time and others more infrequently. Almost no one used all 'model' design activities [or processes] in all of their projects." In addition they found that practitioners selectively picked and chose what steps they did.

Wedman and Tessmer pointed out that the sequence is often prescribed (Dick & Carey, 1990) as if it should be followed step-by-step. At the same time, they recommended that a study be conducted to determine if practitioners really follow the "A-D-D-I-E" model sequence (Wedman & Tesmer, 1993). This 1993 study did not examine what factors caused one to sequence one activity over another. They did not study the sequence in which steps were performed. This was made as recommendations for further study. They did find that reasons for leaving out certain steps were varied – that a decision had already been made, not enough time, or a step was considered at the time unnecessary.

The Newer Models: What Do They Look Like?

Some newer models still elaborate on the sequential waterfall model and have, by now, the requisite and well-known boxes and arrows – one leading to another. They depict a clean break as one performs and finishes one task area; and it is assumed by observation of the diagrams (see Figures 2.6 and 2.7), one moves then on to the next task and so on.

There are three basic steps depicted in the Instructional Development Institute's (IDI) model (Figure 2.6) that are described by Gustafson and Branch (1997) as "different levels of detail (that) formed the basis for a teacher training package." Whether or not the model (created by the National Special Media Institute) shows any significant "detail," or whether it gives particulars enough to be followed item by item as its image implies, is arguable.

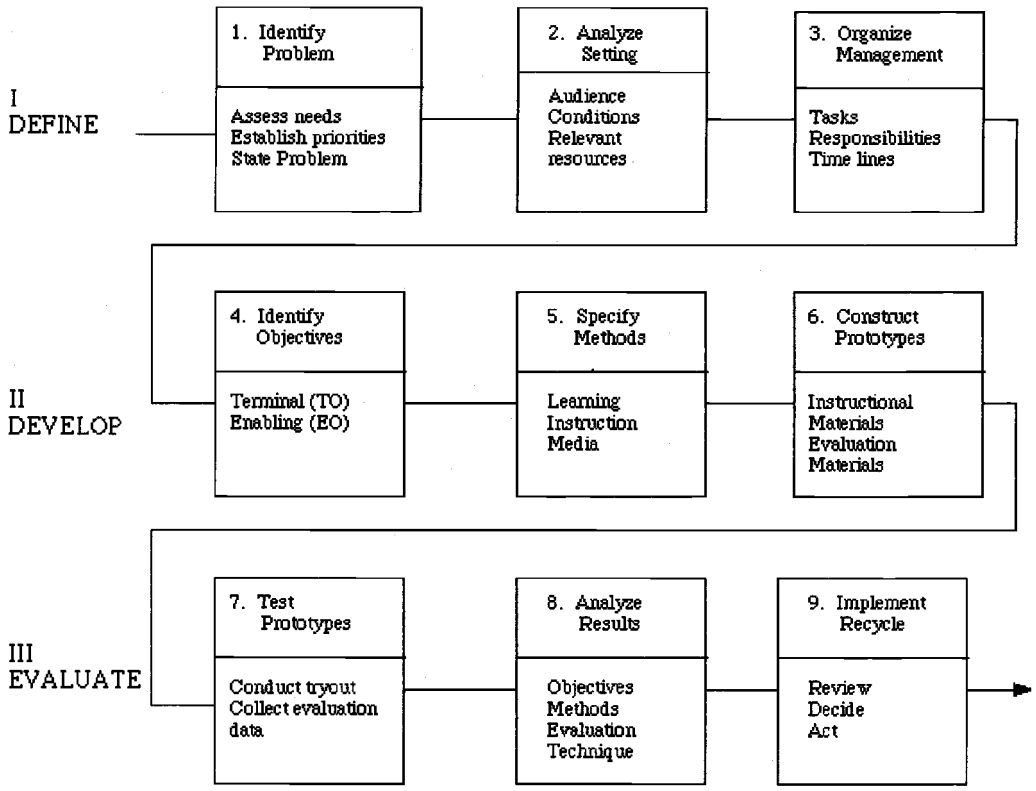


Figure 2.6 The Instructional Development Institute's Model (National Special Media Institute, 1971).

Romiszowski (1981) created a similar model with just three basic steps referred to as "principal stages" (see Figure 2.7), implying that the most important and chief events are depicted.

A rather interesting "curvilinear" portrayal appears in Figure 2.8 (Gustafson & Branch, 1997). This one reflects the process rather simplistically and has the beginning (situation assessment), middle (instructional strategies and formative evaluation), and end (acceptable summative evaluation after a pilot test) presented in a left to right linear, though somewhat circular, representation.

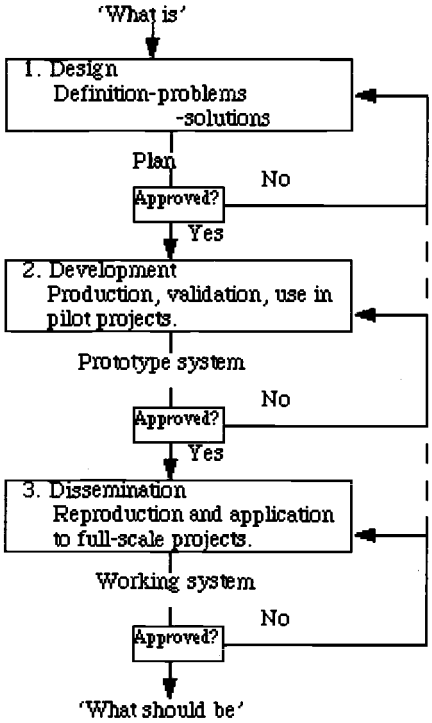
Introduction	Any project that is worth carrying through should produce results, that is, it should solve a problem, to convert 'what is' into 'what should be'.
The three main stages of a project	To achieve this the project passes through three principal stages: 1. *Design stage*: proposal, objectives, methods, content, etc leading to a plan. 2. *Development stage*: detailed design, production and validation of materials, development of implementation and management systems, etc leading to a pilot project. 3. *Dissemination stage*: application of the tested system on a large scale in many institutions, building up to the full-scale project. 
Comment	Each stage should have its own evaluation, approval and feedback provisions, as shown above.

Figure 2.7 Romiszowki's principal stages of an instructional design and development process (1981).

Some real progress and changes in the model start to appear in what is called a "layers of negotiation" model that was created by Cennamo et al in 1996 (see Figure 2.9). The process is described as "spiral" and, according to the author, is

dependent upon five things: "embracing the complexity of the design process, social negotiations of shared meanings, examining information several times from multiple perspectives, reflectivity in the design process, and active client involvement."

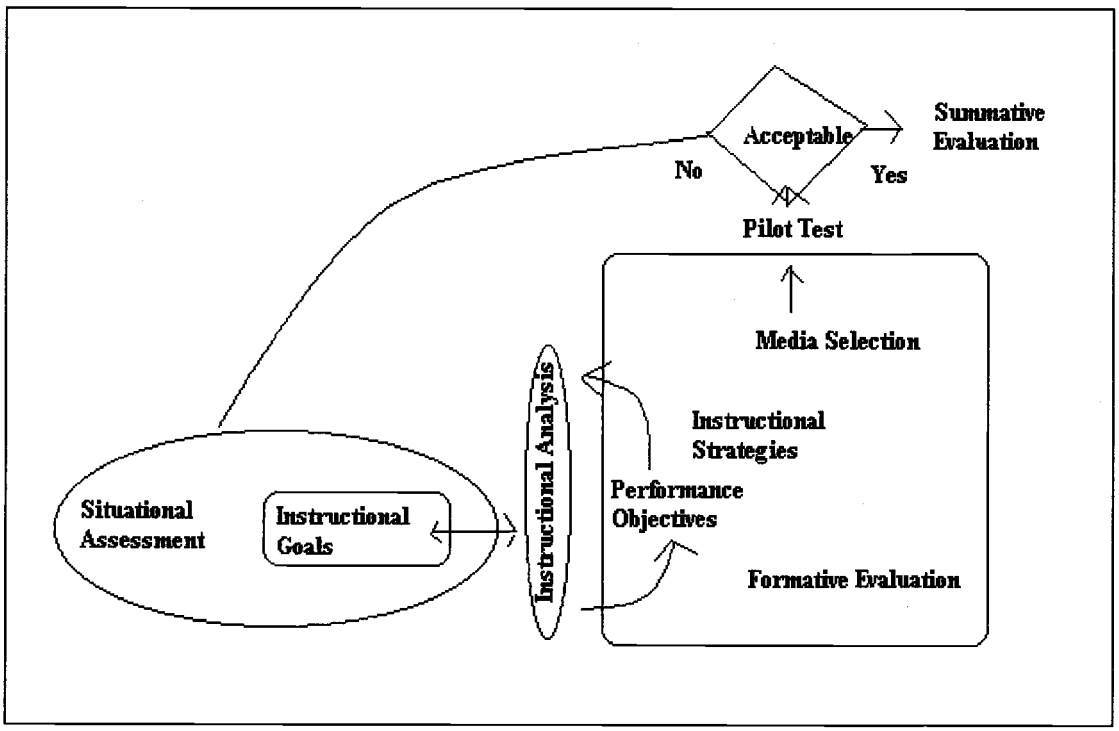


Figure 2.8 Gustafson's curvilinear portrayal of instructional development process (Gustafson & Branch, 1997).

There has been much in the literature related to ISD about what works best to get "good" instruction; much of it lately talks about systems thinking and systematic processes. Systematic is "associated with images of a linear, generalizable model of how to do something. Systemic, on the other hand, implies a global conception of the problem and an understanding of the interrelationships and interconnections" (Carr, 1996). Systemic and systematic appear at times almost

interchangeably in the literature on instructional design and technology, reflecting confusion regarding the terms (e.g., Gentry, 1995).

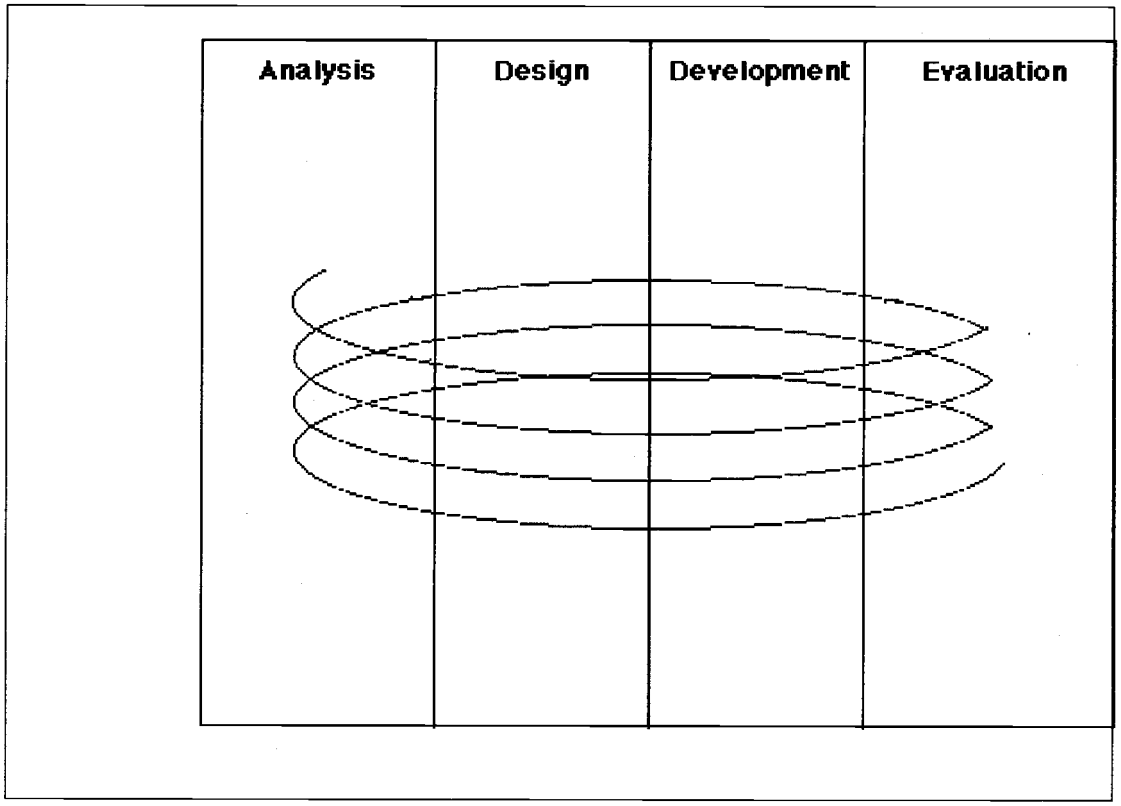


Figure 2.9 Cennamo's Layers of Negotiation Model (1996).

Carr (1996) discusses the "confusion within instructional technology and beyond" around the systematic vs. systemic issue. She highlights Boulding (1985, p. 9) as part of her 1996 report, who, in trying to get at a definition of systemic, describes systems in the following way: "The broadest possible definition of a system is that it is anything that is not chaos." Instead, looking from an ecologist's point of view, a system includes the interconnectedness of all things, as Capra (1991) points out, one

cannot talk about 'higher' and 'lower' [orgranisms] at all... Can't even talk about higher complexity, because there are so many aspects to complexity... every species

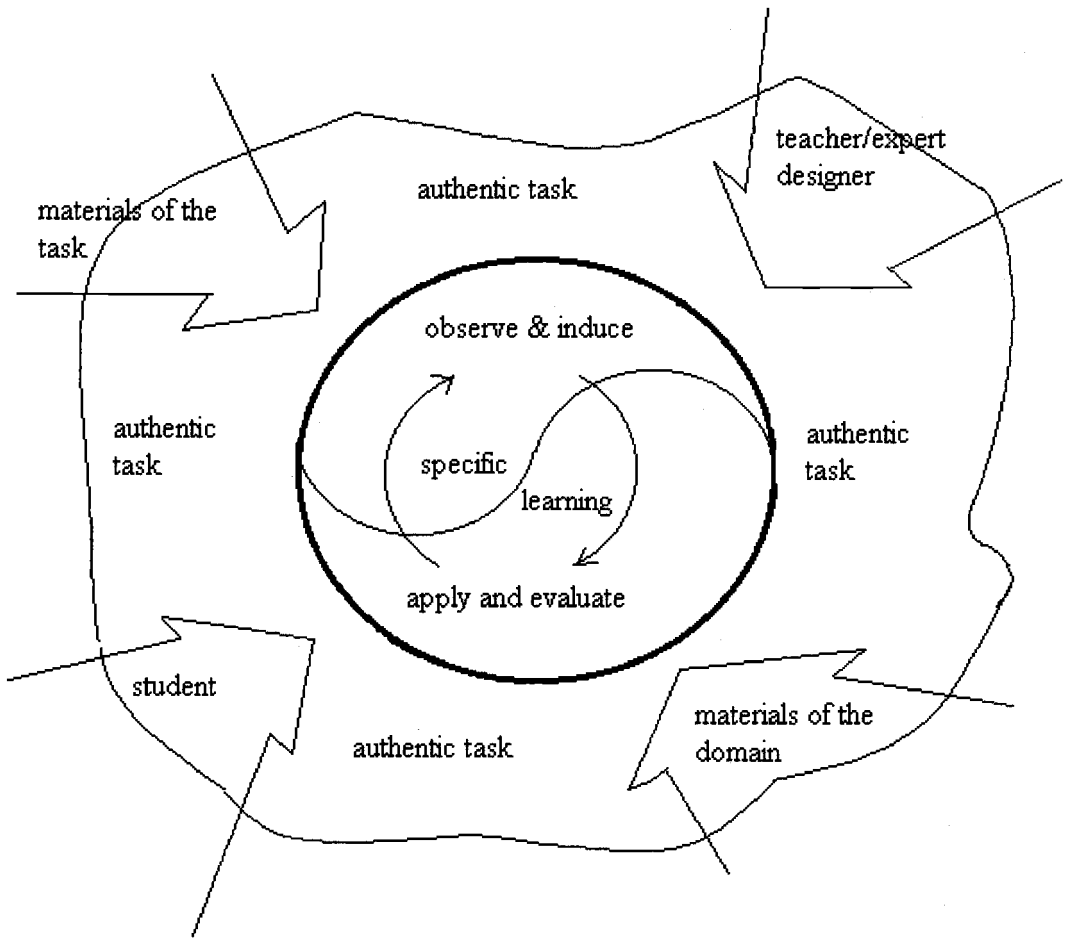


Figure 2.10 Rowland's model of the Teaching/Learning Process (1992).

has its own special characteristics... the bees would say that they are the crown of creation... [whereas in the past] humans were always seen as being above and

outside nature, destined to dominate nature." The more current trend is to see humans as part of a large ecological system.

The new models of ISD are reflecting shapes from nature, what Volk calls "metapatterns" (1995). There are circles within circles in Wedman and Tessmer's 1991 model (see Figure 2.5). There are spirals that make up Cennamo's 1996 creation (see Figure 2.9). There is a strange organically curved outer shape with a center shaped like the Tao symbol from Eastern Religion form Rowland's 1992 structure (see Figure 2.10).

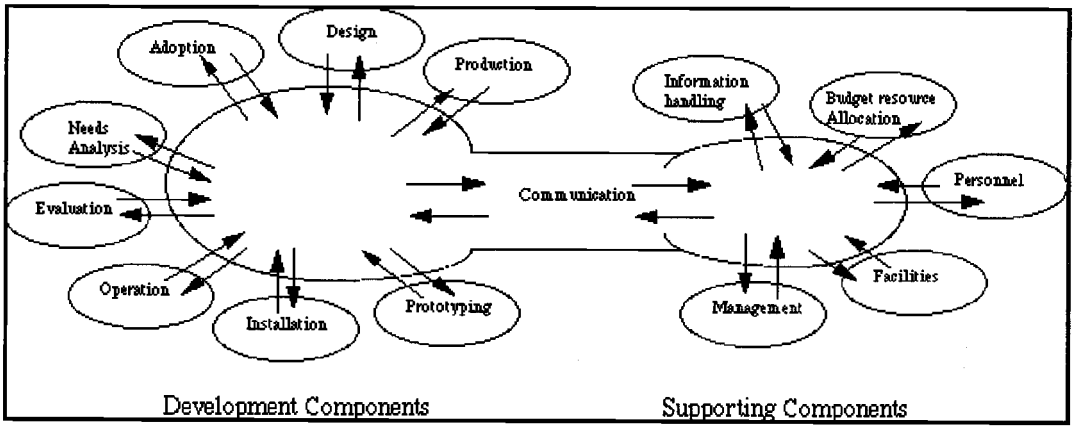


Figure 2.11 Gentry's Development Components and Supporting Components (Gustafson & Branch, 1997).

Rowland's model reflects aspects of the constructivist approach in which the learning is at the center, affected by the attitudes of the student, the teacher, the materials, and the authentic tasks.

In Figure 2.11, Gentry has drawn two globes that look as if they are connected by a "communication" link (Gustafson & Branch, 1997). Several stages have been included like design and production (i.e., development), but in no particular order. Nothing indicates where one starts or where the process, using this

model, might end. This model reflects a significant change in the depiction of new ISD process models. The process is not necessarily linear and may in fact be quite dynamic, recursive and never-ending (Gustafson & Branch, 1997).

In recent literature, it is obvious that new thoughts about the ISD process are emerging. Seels and Richey (1994) described the need for models to portray a procedure that was iterative and yet demanded thoroughness and consistency. Merrienboer (1997) wrote that the stages "are in fact highly interrelated and typically not performed in a linear but [rather] in an iterative and cyclic fashion."

Concepts and words have started to appear that include cycle time (Dick, 1993); positive and negative feedback (Salisbury, 1989; Dick & Carey, 1996), feedback loop (Braden, 1992), feedback mechanisms (Betts, 1992), fuzzy goals (Dick & Carey, 1996); fuzzy image (Reigeluth, 1996); self-regulation (Seels, 1989; Betts, 1992); emergence (Northrup, 1995; Kwang, 1995); fluidity/flow; linear and non-linear; open and closed systems; and variables (Merrill, et al 1996; Richey, 1996); and equifinality (Reigeluth, 1996).

All of these concepts hinge on the fact that ISD is always part of a larger, super system composed of subsystems. The super system surrounding Instructional Systems Design would be the educational context -- whether K-12, higher education, business and industry, health agency, museum, or military (Reigeluth, 1996). All instructional systems operate in a larger educational system or context that is always changing.

The "systems" approach to instructional design that is reflected in newer models (Dick & Carey, 1996) are still too limiting for some. Researchers have begun to draw a distinction between instructional design that is systemic (more naturally emanating from within the system) and instructional design that is

systematic (linear, process-oriented and regimented). Reigeluth (1992) states it more boldly when he says that systemic change is:

> "Often called a paradigm shift, which entails replacing the whole thing. Systemic change is comprehensive. It recognizes that a fundamental change in one aspect of a system requires fundamental changes in other aspects in order for it to be successful."

Instructional Systems Design may be in need of systemic change, a reconceptualization of the process in context. Minor changes in the steps may not adequately reflect the paradigm shifts taking place in Western culture. What ISD is evolving into might be a soft systemic mode of design that would take into account a larger interconnected, emerging environment for the individual trying to design and develop quality products. What Capra (1991) called "deep ecology". A model of design may be needed that can "accommodate the total picture of problems in the instructional development process" (Bhola, 1991 in Kwang, 1995) while allowing for reflection and creation (Banathy, 1995).

Recommendations Made in the Literature

A review of recent ISD literature reveals the following recommendations for change:

1. Performance Improvement – A Broader Framework. One of the recent movements in ISD is toward what the National Society for Performance and Instruction called Performance Technology. This means a broader framework for ISD because training and education are not always the solution to a performance, or learning, problem/gap (Richey, 1993). To improve the learning/working situation there are several possibilities of what might be needed. One is a contextual or organizational redesign (e.g., Lane Community College, 1993-97). Another is company reorganization. A third is relocation of the learner to a different classroom

or teacher. A fourth is relocation of a worker to a new boss, new offices, cutbacks, reorganization of the hierarchy, or increase in staff. Swanson (1996) never mentions ISD in his book but describes performance improvement of this type in his work, *Analysis for Improving Performance*.

Richey (1993) maintains that the character of the organizational environment (whether business or educational) is critical; "the learning environment includes all the physical, human, and contextual elements that may influence the trainee's learning and subsequent performance." The new models of ISD need to take into account more general systems theory as the teacher/training system interacts with its environment. The current models do not reflect the continuous decision-making that takes place in response to contextual issues.

2. Learner Characteristics, Changes in Content, Concern for Context. Desires and goals of the learner should be expanded onto the current dimension of learning (Cooper, 1993) along with a new type of learning, which some refer to as "deep" or meaningful learning (Kember & Murphy, 1990). Higher-order learning, transfer of training, and facilitation of learning are becoming a better sign of design's efficiency as opposed to whether or not the process is fast or cheap (Richey, 1993). Richey advocates the creation of microworlds -- "systems that provide environments where learning is nurtured rather than knowledge taught" (Hannafin, 1992, p. 54, reporting Papert).

Instructional content in all areas is moving beyond basic skills to more complex phenomenon. "As our technology grows increasingly complex in both machinery and human organization, the role of the school [program] becomes more central in the society, not simply as an agent of socialism" (Bruner, 1996). Some argue that as the content of instruction gains depth, instruction in areas of the

affective domain may become necessary (Martin, 1989) like instruction in ethical issues of technology and motivation (Seels, 1993). Present models of ISD are cognitive and behaviorally oriented, not constructivist, i.e., they create the entire environment and learning experience for the learner. Adaptable and interactive designs are being requested (Richey, 1993) but not yet produced.

Still the pressures to increase efficiency, reduce costs, and focus on organizational (system wide) problems exist. The answers may not lie in only changing the processes, eliminating certain steps, or finding a new process; answers may be found in looking at how to make a more quality product. Applications of technology are allowing new curriculum to be designed, "creating instruction [that is] controlled, and sometimes even developed, by learners rather than designers" (Richey, 1993), what has been noted herein as the "constructivist" approach. Constructivism very much concerns itself with the context in which the learning takes place and "should and would completely change the models and processes we use" (Dick, 1997). Constructivism will change the instructional design process (Richey, 1995; Dick, 1997). Extreme constructivism even eliminates the fundamental assumption that design of instruction begins with identifying what the learner must be able to do. This may explain the preponderance of recent statements about the possible demise of ISD in general (Merrill, et al, 1996).

Richey (1993) points out several areas for further study in regard to ISD, they are:

- learner characteristics,
- contextual variables related to learning and transfer,
- learner control processes, and
- validation of design principles with various learners in alternative contexts.

3. Changes in ISD Training. In 1992, the Committee on Definition and Terminology for the Association for Educational Communications and Technology created the domain of instructional design to include topics of systems design, message design, instructional strategies, and learner characteristics. This recent addition of learner characteristics is a fairly new area for instructional systems design professionals. The present models, and those in the past, do not focus as much on what's being designed, or the product, as on delineating (indeed sometimes as superficially as possible) the steps one goes through in the process from idea to creation to distribution and finally analysis of the product's effectiveness.

Historically, educational communications specialists (as ISD professionals were once called) were good at helping to communicate a message, but not concerned so much with what that message should be (Seels, 1993).

As ISD's focus moves toward a concern for deeper, more contextual learning, the profession begins to ask questions about how we prepare Instructional Systems Designers (Seels, 1993). Seels (1993) interestingly, predicts "the proposed redefinition of the field will de-emphasize the systems approach as a requirement for instructional technology theory and practice." While the systems approach apparantly proved limiting to some, for others it introduced the realization of a broader framework in which decisions could be made (Rowland, 1993). For some practioners (Kerr, 1983), designing involves more personal choices based on a sense of what's right. Indeed, general systems theory had its prime in the 1960's and 70's (Salisbury, 1989) and perhaps, as other fields such as engineering have advanced farther along in describing and making correlations to general systems theory, ISD should change also. Whether or not the systems approach is over as an influence on

ISD, how to foster creativity in the process of creating good product is a major concern today (Robinson & Stern, 1997; McNiff, 1998).

If training for the ISD professionals begins to be about value, then instruction may begin to move toward the affective domain. Some argue (McNiff, 1998) that instructional technology is not value-free. Instruction in self-development, values, morals, ethics, and continuing motivation may be appropriate for ISD professionals both in relation to their own development and that of the learners with/for whom they'll be working. Some strategies for facilitating instruction of affective behaviors are self-directed learning and experiential learning (both resemble the constructivist approach; Martin, 1989). While a few leaders of the constructivist approach may seem to put an end to instructional design as it is known, many others feel there is still a lot of designing to do (Winn, 1991).

As training for ISD changes, many advocate that it should become more experiential (Seels, 1993), providing the learner with real-world experiences (Smith, 1989), or involve more "field-based research" rather than experimental work away from the real-world setting (Heinich, 1984). Cooper calls it an expansion of the learning setting (1993). Designers could learn by serving as "apprentices" to a discipline rather than learning as "recipients of academic knowledge and as solvers of contrived problems" (Winn, 1993).

Some are advocating that studies be done on real-world practitioners from whom we would glean our research and theories (Kember & Murphy, 1990). A few recent articles (Kember & Murphy, 1990; Wedman & Tessmer, 1993; Seels, 1993; Richey, 1997) recommend studies be done of instructional designers in their place of work, in order for researchers to find out for a fact, what they really do. Rather

than theorizing about it, or experimenting with it, the recommendations call for someone to go out in the field and find out what's being done.

Conclusion

ISD may be evolving into more of an art than a science, requiring an iterative, improvisational approach where adjustments are made as more is learned (Willis, 1995). Just as in teaching a painter to paint, one learns complimentary colors, hue and saturation, there may be fundamental ISD training that would allow designers to freely "build other skills and forms" (Seels, 1993). With multiple factors and goals interacting intermittently, ISD requires a process that is exploratory and in which one is constantly learning. If the process is more loosely defined and practiced, then creativity will be allowed to flourish and better products may result (McNiff, 1998; Robinson & Stern, 1997):

> "A complicated expressive gesture cannot be broken down into a lesson plan. It can only be learned through practice and repetition, with the goal of reaching a point when it happens instinctively."

Some contend that "it is not the destination but the journey" that is important. McNiff (1998, p. 193) proposes that process and product are both important and suggests they tend to support one another. ISD has in the past drawn models to describe the process, and used efficiency and effectiveness to define a good product. It would appear that ISD is overdue for an overhaul -- as process and product are both changing along with the environments and world view within which they are embedded.

Chapter III

Methodology

> I no longer believe that organizations can be changed by imposing a model developed elsewhere. . . There are no recipes or formulae, no checklists or advice that describe "reality." There is only what we create through our engagement with others and with events. Nothing really transfers; everything is always new and different and unique to us.
> (Wheatley, 1992)

The purpose of this study was to discern the unpredicted non-linear patterns that emerged from the Instructional Systems Design process. The secondary purpose was to determine how existing models could be redesigned to accommodate emerging factors. The study focused on real-life happenings of ISD professionals in five different settings. When a doctor looks at a patient with a bad heart, she begins by diagnosing the problem. When Instructional Designers begin, they analyze the need before designing the intervention. One step always leads to another predictable step in the instructional design process. But is the design process more complex and less predictable than that? This chapter describes the methodology used, population studied, data gathered, and analytic procedures employed to study this question.

Methodology Issues

The preliminary stage consisted of a review of relevant literature to establish a foundation for what would follow. In addition, conversations with peers and mentors helped place the study within the larger framework. A qualitative study of this nature had to deal with several issues:

1. Researcher as the instrument. One of the key characteristics of a qualitative study is that the human interviewer is the instrument. This necessitated that the researcher be aware of her own biases and sensitive to the fact that the researcher's presence could have an effect on the subjects (Miles & Huberman, 1994).

The researcher had experience and skills necessary to carry out a qualitative study of this nature. Among other things, she wrote, directed, and managed productions and broadcasts of over thirty-five educational productions for K-12 learners across the State of Oregon for the U.S. Department Education and the Oregon Department of Education from 1993 to 1996. She also served as project manager, employing a programmer, videographer, graphic artists, and evaluators, in the creation of a 300+ screen interactive computer assisted instruction (CAI) on Basic Hydraulics for an Oregon Community College. For content development, input was gathered from faculty, the United States Coast Guard, the Federal Aviation Administration, and the local office of Caterpillar Incorporated. The CAI is to be distributed to other community colleges and business and industry. Therefore the researcher felt confident that she possessed:

- familiarity with the phenomenon and the setting under study;
- strong conceptual interest and a multidisciplinary perspective of the issue;
- good "investigative" skills, including conversational ability to conduct these interviews; she would be able to draw out the interviewees and keep them talking (Miles & Huberman, 1994).

The researcher had worked as an instructional designer for community education, agencies, foundations and museums -- environments that make up the categories for the contextual factors affecting this study (Thomas, 1995).

However, in order to eliminate bias, the researcher's own projects were not part of the documentation and findings.

2. Validity. This referred to the need for this study to use thick rich descriptions, to paint an entire "picture" for the reader that was comprehensive, and to converge in coherent conclusions and explanations (Miles & Huberman, 1994). Also, since one goal of naturalistic inquiry is to portray the world as it appears to those in it, what seems true becomes more important than what is true (Lincoln and Guba, 1985). The truth was recorded just as the interviewees described it. This contributes to the internal validity of this study.

3. Triangulation (a type of validity). From data collection (field notes, phone conversations, written materials, interview transcriptions) to the checking of findings, the researcher used multiple sources and modes of evidence to arrive at conclusions. The verification process was largely built into the data collection as it went (Miles & Huberman, 1994). This was the primary method used in data analysis. In this study, triangulation was not just a tactic, "but a way of life."

4. Reliability. The findings of this study paralleled materials from data sources (informants, contexts, time) in order to establish contexts, subjects, and time frames similar to those used in previous studies. Merriam (1988) states that the ability for a study to be replicated increases reliability. This study, having been based on previous published and credible studies, may too be reliable because it is replicable. Reliability and validity were further strengthened by the fact that only one investigator was used to perform the study (Miles & Huberman, 1994).

5. Model Consistency. Gustafson (1997) draws the following diagram as the "core elements of instructional development." For the purposes of this study these core elements will always be referred to as instructional systems design. The steps

in Gustafson (1997) below (see Figure 3.1) are the same as in Figure 1.1 in the A-D-D-I-E model.

The "taxonomy" presented by Gustafson (1997) divides the purposes of instructional systems design into three types of end products. The first are those that are for the *classroom* (where people interact "during a specified period of time"). The second are those whereby the *product* facilitates interaction for learning that is instructor-driven or self-instructional. The third are those end products that

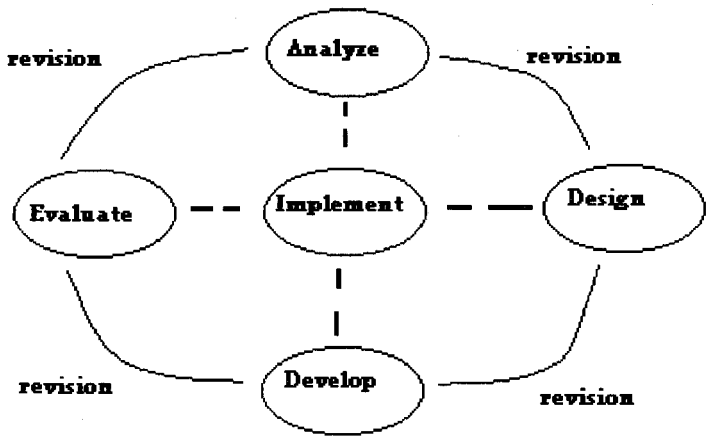


Figure 3.1 Gustafson's core elements of "instructional development" (1997).

are directed at a *system*, i.e., an organization's training problems (performance improvement, skill upgrade, or instruction directed toward clarification of organizational goals). This study focused on the process of instructional systems design and the models that describe the processes whether the end products were for the classroom, the product, or the system. Regardless of the purpose for the end product, the process was the area of focus for this study – not the product.

Study Participants

Instructional Designers who participated in this study were purposely chosen because they had worked on multiple, large ISD projects. Subjects had been trained in ISD at accredited academic institutions or through at least five years of work experience in designing instructional systems on the job.

The original individuals were researched and selected based on the quality of their work that was determined by the popularity of the end product, i.e., in all cases the end product was utilized by more than one classroom full of students. Interviewees were also chosen on the basis of their availability.

Beyond the original five subjects, subsequent interviews were selected if it became apparent that their view would be integral in shedding light on the main interviewees' statements. Comparisons were made and avenues were picked that seemed "most promising" but the interviewer always returned to the core interview questions and the "story" the main interviewee was telling. The research was formatively analyzed in order to pursue a line of inquiry directed at building a theory (Rubin & Rubin, 1995). Hypothesies were built and tested step by step.

Organizations Represented

Sites for data collection were selected originally based on five representative categories in which ISD takes place. The settings were purposefully selected from the many kinds of organizations in which ISD currently takes place -- K-12 schools, higher education, corporations, health agencies, the armed forces, museums, and

other institutions in the private, public, and "third" (not-for-profit) sectors (Reigeluth, 1996). The five kinds of environments purposefully chosen were:

1. A high-tech manufacturing organization that designs communication technologies and computer hardware. This company does in-house training for their own workers in order to upgrade performance, train a new skill, or increase productivity;
2. Projects funded through grants from private foundations, or public agencies and produced by one of the agencies;
3. A university center created to assist faculty in the ability to use and implement technology in their own classrooms. This particular category also assists faculty in delivering courses via satellite, via the world wide web, or through computer assisted instruction; at some colleges and universities this type of center employs Instructional System Designers to support faculty in the adaptation of their curriculum to meet current and future trends;
4. A business service corporation -- private vendors of Instructional Systems Design projects who develop and sell training materials for profit on topics like team building, creative management, and sometimes specific skills like "Basic Hydraulics"; and
5. A museum where they create materials for public education.

Depth, rather than breadth, was the primary criteria (Wolcott, 1990) for each interview; therefore all fields in which ISD occurred were not herein represented. For example, the classroom setting where the teacher designs her course, lesson plans, and lectures was not represented here. Nor was the military environment

represented, where for example the Army still has prescribed steps for systems engineering of training (Briggs, Gustafson, Tillman, 1991). The five sites were selected from this researchers previous experience in the job market and where it seemed instructional design was undergoing the largest change.

The interviewees described above were instructional designers in five different organizations. The contrast of the interviewee's circumstances or contextual environments is called dissimilarity sampling (Rubin & Rubin, 1995). The contextual factors examined were meant to be only representative of environments in which ISD takes place and not meant in any way to represent all the environments in which ISD takes place. Much attention was paid to transcribing and analyzing information about environmental contexts (Miles & Huberman, 1994) to attend only to the questions at hand. Subjects gave rich, thick descriptions of their environments far beyond the expectations of this researcher. In addition, only a few select subjects were interviewed so that time could be spent talking in depth with each interviewee rather than getting a shallow perspective from many subjects, e.g., depth was chosen over breadth as recommended by Wolcott (1990).

Framework for Data Collection

The researcher created an interview guide (see Exhibit) to give structure to the interview process. An attempt was made to develop questions that would generate meaningful answers and gain a feel for the interviewee's situation in an atmosphere of trust (Swanson, 1996). Complete and accurate field notes were

written on site. In addition, an audio recording was made at the time of each interview.

First, the organization was described in field notes. In notes after the interviews, the process and interviewee were examined in relation to the organizational chart. This laid out the setting, or stage, for the ISD project that was constructed. The general environmental factors were examined at each site. This was called the "environment."

Second, the product in each of the five cases was examined and described, including where the idea originated, and who was on the team to get the project finished. This section was referred to as the "product delivered".

Then the processes at each site were described as the stories of the interviewees were examined. Each of the five cases was critically assessed and the results were considered in QSR-Nu*dist in detail. Each case was analyzed and put into two main categories:

- Processes – changes in the process as the project went along. The stages are analysis, design and development (which were examined together for reasons that will become apparent), implementation, and evaluation. An attempt was made to document the unpredicted things that occurred.
- The unexpected – the many things that changed or were not expected during the process that had an affect on how the production went along.

Finally, the five cases and results were compared and patterns were examined that were common between them. At this point, conclusions surfaced. The last step was a synthesis of the data collected.

As described in Mishler's work (1986) on issues of interviewing quality in the area of qualitative research, the interviewer and informant can co-construct

meaning, producing a "story" around the "facts" as each person "reads" one another's "signals." This interviewer looked for phrases, pauses, digressions, while also initiating new questions, probing in particular areas, cutting off unnecessary discussion, while insisting on a particular line of questioning. Caution was taken, as per Mishler, that the interviewer did not veer off onto an unrelated issue. If the interviewee did begin to take a tangent the interviewer might refocus the discussion in order to keep the conversation on track. Each subject described one project from beginning to end as if they were telling a story.

Since the interviewer shared a similar background as the interviewees, the shared culture was emphasized. The interviewer took a position of partner and collaborator rather than having the subject made to feel a victim (Rubin & Rubin, 1995). Within reason, and while keeping the interview on track, new ideas and themes were allowed to emerge during the interviews. The researcher did not dominate the interview. As proposed by Rubin & Rubin (1995), themes were followed as they emerged and new interviewees were followed up on if need be to enlighten views on the particular answers to the set of questions of this study. This is referred to by Rubin & Rubin as a "flexible, iterative, and continuous design" process.

The intent of each interview was to establish rapport, get details, and learn about linear and non-linear aspects of the process. In addition, it was intended that the interviewer would get the subjects' perspectives on ISD procedures, find out if there were any particular difficulties or causes for celebration, and get opinions about the organization, the team's morale, the way their system operated, and check for any critical incidents (Swanson, 1996). The interviewer sought an in-depth understanding of the ISD process that was best communicated through the

interviewees stories, or "detailed examples and rich narratives" (Rubin & Rubin, 1995).

Conducting Interviews

Each initial interview was expected to take approximately three hours. Interviews were structured/unstructured, meaning that a framework was set up in which the conversation would take place and then a line of questioning was followed that responded to the interviewee's answers. No one was constrained by pre-set rigid questions. There was an emphasis on understanding the meaning subjects gave to their experiences (Glaser & Strauss, 1990). Methods from continuous design were used also in the creation of questions that explored meanings of new concepts as they arose and as they were discovered (Rubin & Rubin, 1995).

Analysis was done at the same time as the interviews. Notes were made and coded concurrent with the data collection; the process was therefore cyclic or iterative throughout (Tesch, 1990).

Each interview began with an explanation of the researcher's background and the purpose of the study, followed by an explanation of why the researcher perceived the study to be important (Rubin & Rubin, 1995). Each subject was asked to tell the story, describe the process they went through, from beginning to end, to create one specific ISD project. Each story provided details about the actual process and whether the processes paralleled existing ISD models. If the process was documented, and mapped out at all, those data were also collected. The interview guide was used when the interviewee began to grow quiet. This set a tone of shared "responsibility for finding the words and concepts in which ideas could be expressed and lives described" (Rubin & Rubin, 1995). Specific questions were

designed to determine to what extent the process paralleled the A-D-D-I-E model described by Dick & Carey (1996). Specific questions included were whether they:

- Established and wrote learning objectives
- Conducted a needs assessment
- Determined if the need could be solved by training/education
- Conducted a task analysis
- Assessed the trainee's/learner's entry level skills and characteristics
- Identified the types of learning outcomes desired
- Developed test items
- Selected instructional strategies
- Selected instructional media
- Conducted ISD reviews during instructional development
- Ensured subject-matter-expert reviews were conducted during development
- Conducted individual (one-to-one) trials of instruction before completion
- Conducted small group trials of instruction before completion
- Pilot tested the instruction before completion
- Conducted a follow-up evaluation after training
- Conducted evaluations to determine update/revision requirements
- Conducted evaluations to determine possible training system deterioration

Specific attention was directed towards ascertaining what happened that was unexpected, unplanned, and/or uncontrolled. At the end of each interview, a "norming question" was usually asked (Rubin & Rubin, 1995) to determine to what extent the subject felt the ISD process they were involved in was not predicted (see the interview guide's last page).

Field notes were generated at the time of interviews. Notes included: a running description of key points; reminders of written materials to collect from the interviewee; impressions and feelings; comments about the interviewer's, or the interviewee's body language; notes on things said that required further investigation; and connections to other interviews that were evident. At the conclusion, the ISD documents provided by the interviewees were collected and reviewed.

The series of interviews continued as long as the interviewer was confident that she was still learning more from subsequent interviews as Rubin & Rubin describe (1995):

> "The iterative design stops when the information you are putting together supports a small number of integrated themes and each additional interview adds no more ideas or issues to the themes on which you are now questioning. Glaser and Strauss (1967) call this point theoretical saturation (Rubin & Rubin, 1995)."

Analyzing Data and Generating Hypothesis

A three step process was used to analyze the data.

Step 1: Each interview was transcribed by the researcher and took an average of eleven hours to compute. The software program "QSR – Nud*ist" was then used to analyze the results. Text was coded in various index categories. A search was also conducted to highlight key phrases and words that were commonly used with each interviewee. Notes were made and ideas and theories described and organized as the theories emerged.

Step 2: Methods put forth by Tesch (1990) were used to try and find regularities in the interviews about what occurred and reoccurred and what themes or patterns emerged. Notes were made at each step. The data were then categorized from a system that derived from the interviews themselves as data were

entered into the qualitative research analysis tool, QSR-Nud*ist. Categories were tentative and formative and remained flexible. The data were manipulated as theories were synthesized and became clearer.

Step 3: As data were examined and put into Nud*ist, a tree diagram began to emerge of the ISD processes followed and the not predicted happenings (as described above). In Nud*ist a core, or trunk node emerged of shared results, and concepts formed as branches from it. The four main branches that formed off the trunk were communication, the process, structure that was referred to, and the stages.

From the branches came free nodes that depicted patterns not in the four main categories that emerged and could also be examined. The free nodes were chunked from the results and described because they demonstrated other angles on results in some interesting areas like concepts, issues, concerns, and skills that ISDers possessed. The one free node reported by interviewers and discussed in detail was, "the most important thing to make the process go smoothly." Similarities in important aspects of the process that the interviewee pointed out could be noted.

The interview data were recounted according to the steps in Glaser (1978). Data was collected; the researcher looked for key issues, recurrent events, or activities in the data that became categories of focus; then after many incidents of the categories appeared, focus was put on an eye toward seeing the dimensions and diversity in the categories. The researcher then explored the categories that were discovered, accounted for some incidents that remained independent (as free nodes) and allowed relationships to form between others. As the analysis focused on core categories, the writing of results began and the process at each site was drawn,

displayed, and analytically compared. In diagramming the data in this manner, it became possible to formulate hypotheses about the processes and unpredicted happenings in each particular context.

Validation of the Transcripts

Each interviewee had the opportunity to read his/her interview report and make his/her opinion and notes on it. Several made copious notes. A few gave a verbal or written okay with no notes. Changes were made in the transcripts and the final draft report of the findings was the one that was coded and used to generate the hypothesis, theories, and recommendations.

Follow Up

At each site, those who had the key roles in the ISD process were interviewed. Of those, several were interviewed a second time via follow up phone calls or in one case, a letter clarifying key points. Transcripts from the interviews were sent to each participant for verification of the content. Letters were sent or phone calls were made to follow up and clarify questions.

Conclusion

Five sites were studied. The results were analyzed for emerging patterns, similarities and differences, and comparisons between perceptions of the issues common to the A-D-D-I-E model and its association with ISD. Interviewees were asked to look at factors within the process of one main project as if telling a story and in summary asked to look at factors across multiple projects in which they had been involved.

Chapter IV

Presentation and Analysis of the Data

When society requires to be rebuilt, there is no use
attempting to rebuild it on the old plan (John Stuart Mill 1806-1873).

For the purposes of this study, Instructional Systems Design (ISD) has been defined as a set of procedures for systematically designing and developing instructional materials, displayed in a variety of different models that all involve five basic phases or steps: analysis, design, development, implementation, and evaluation (Merrill, 1996). This study examines ISD as it was put to use in five different kinds of organizations:

Business Service Corporation	**BSC**
Community Education Agency	**CEA**
High Tech Manufacturing	**HTM**
Museum	**MUS**
University	**UNI**

In the five case studies presented in this chapter, names have been changed in order to conceal the identity of the participants and their organizations. This study was not meant to criticize or pass judgment on the way the process was carried out in each setting. The intent was to examine each situation impartially.

The following stories are not necessarily examined in the order that the data was collected, nor are the subjects presented in the order in which they were interviewed. In fact, they will always be presented in the order above, for clarity. The cases in this study are examinations of both private-for-profit and not-for-profit organizations.

Five Different Contexts – Five Different Teams

1. Business Service Corporation: The business service corporation (BSC) was an environment with around 50,000 personnel with locations all over the world. Over the last two years, their growth was in double digits— $5.2 billion in fiscal year 1997. This business service corporation provides consulting services to businesses. They take an industry focus and work in nine industry categories: commercial services, consumer products, energy, telecommunications, financial markets, government services, manufacturing, real estate, and enterprise. Their primary clients are from telecommunications, banks, and financial markets. At the time of the interview, our interviewee, Marie, was working with the manufacturing group as a Project Manager. She was a trained Instructional Systems Designer.

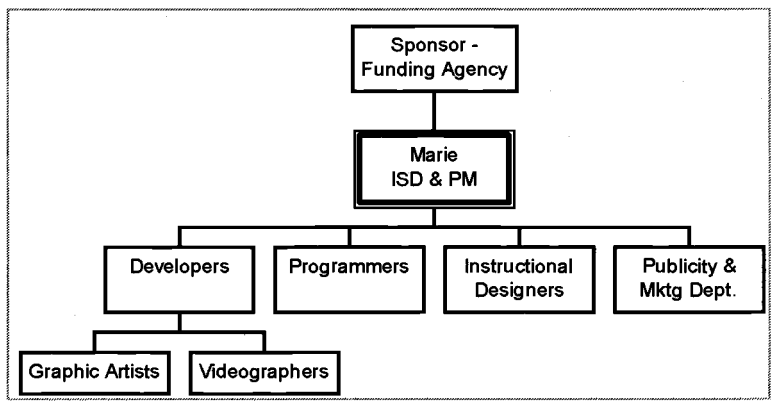


Figure 4.1 Business Service Corporation ISD Project Team.

Marie has a Ph.D. from Brigham Young University with a major in Instructional Science. She described it as the typical coursework in theory and statistics, research and evaluation, that was based around three projects -- a development project, a research project, and an evaluation project. The final dissertation was in one of the three areas.

During graduate school Marie held assistantships and had several different kinds of work experiences. At one point she said she "developed" an instructional brochure for a university's Instructional Technology & Telecommunications Department. She also said she "designed" educational manuals for IBM to accompany computer software for K-12 schools. (Note: Marie's interchangeable use of the words "develop" and "design.")

In Marie's work at the business service corporation, she designs many different types of programs, including self-study videos with workbooks, computer assisted instructions, electronic performance support tools, and seminars for in-person instruction to large groups. "In working with our sponsors to determine what the appropriate needs are. . . [we always have an] education focus. . . we are a firm dedicated to education going way back to when we thought that the more we knew about our clients the better able to serve them we would be."

As Project Manager and Instructional Designer, Marie formed a team from those around her office in whom she had confidence. A computer-assisted instruction module was to be built with the help of a "content partner" who was assigned to Marie by the sponsor. The project sponsor was the head of worldwide manufacturing -- marketing, training and new product development.

Marie chose a Senior Instructional Designer to lead a "design team" of four trained ISDers, a technology manager, three computer programmers, two graphic artists, and a video production crew of three people. An additional team produced "collateral material, instructions, and other written items," like the specifications about the CD-Rom.

2. Community Education Agency: The American Council of Life Insurance in Washington, D.C. approached Valerie (the SME interviewed) a university

gerontology specialist, connected with a prominent university's extension agency, about producing community education material to help adult children assist aging relatives. The contact initiated an ISD project that would result in nine multimedia programs over a period of almost ten years, with multiple funding sources. Valerie had a bachelors degree in home economics, education, and health education (what is called today "Community Education") from Montana State University. Her focus was on family relationships and human sexuality. Her Ph.D. was in Family Studies and Gerontology with a minor in Sociology. She became director of a university gerontology program, and later on, a gerontology specialist with the Extension Service. She was in this position when the project idea came in to her from Washington, D.C. Her boss, who had served on committees with Ronda, the instructional systems designer interviewed, suggested that she talk with Ronda "about some possibilities" because she knew Ronda's reputation as an instructional systems designer was outstanding.

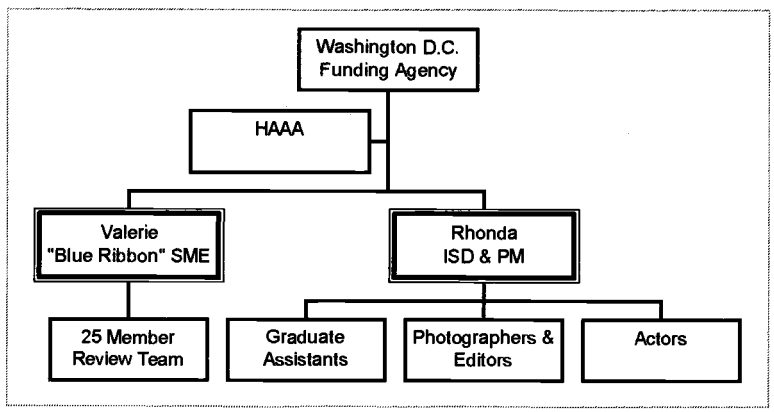


Figure 4.2 Community Education Agency ISD Project Team.

Ronda taught English in high school for two years before going on to get a masters in instructional media. Immediately after, she went for her doctorate in

instructional systems. At the age of twenty-six, she began teaching at the same research university where Valerie was employed with the extension service. Ronda started there in teacher education, eventually moving into adult education. In addition to her teaching duties, Ronda wrote grants with various subject matter experts for the development of instructional materials, and worked as the instructional designer, director, and often producer. Valerie and Ronda formed a unique partnership, a central core, with other team members on the periphery. Both Valerie and Ronda were interviewed for this study.

3. High Tech Manufacturing: The high technology manufacturing site is a world leader in communications technologies with training needs for new hires, change of policy, and skill upgrades for those already employed at the company.

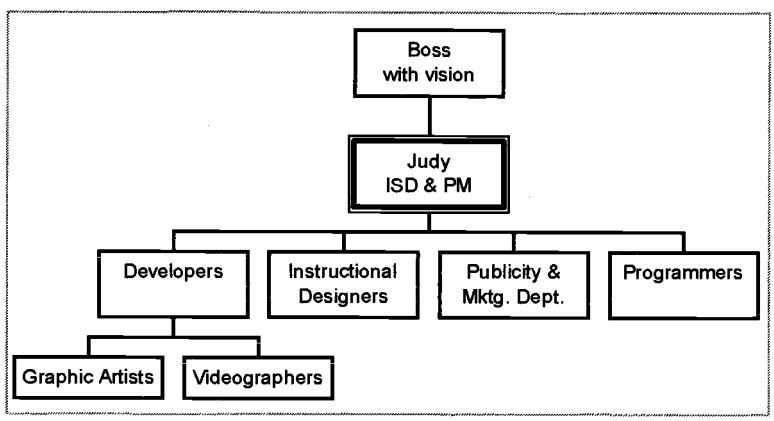


Figure 4.3 High Tech Manufacturing ISD Project Team.

Judy, a project manager and instructional designer at the high tech manufacturing site, was the interviewee. She entered a graduate program in Educational Media because it combined art, music, and photography, all of which had been life-long interests.

The masters degree provided Judy with the credentials she needed to get a job as a Media Specialist in a middle school for eight years, teaching photography and filmmaking while doing productions on the side for the school district. It wasn't long before she realized one trouble with work in public schools: there was not much chance for upward advancement from the position of teacher. She said, "when you enter at that level you stay at that level, unless you go into counseling or administration," which she didn't want to do. The medical field had also fascinated her. When an Educational Media Producer position opened at a hospital, she took it.

Soon after Judy began working as the Educational Media Producer at the hospital, she became the Manager of Production Services, a position that included medical photography, filmmaking, surgical videography, and all the publications for hospital advertising as well as nursing education. While there, she was involved in purchasing a satellite, setting up teleconferencing, and installing a five channel in-house television system for patient education. When she went back to school, it was with the intention of getting a Ph.D. and then getting another job in a medical school.

While she was in a Ph.D. program, she did an internship at a heavy manufacturing plant. "It was dirty, noisy, smelly, and mostly guys," she added. It was very different from the operating room and quite a change from the sterile hospital environment. While she was completing her doctorate, she did instructional

design work for truck, airplane, and paper manufacturing companies in the United States and Europe.

With her doctorate completed, she joined high tech manufacturing and quickly became involved in more than one project at once. She was rarely the one to go out and do the media production. She was a full-time "designer." She described having a fondness for and missing her work in production. Since she always worked in teams, the instructional designer/project manager (Judy in this case) did the design, layout, and management. She describes her job as follows: "My expertise... is in taking very sophisticated scientific and technical information and refining it down to teachable and trainable... like a lay person's language." Videographers, programmers, and graphic artists did the actual production. Judy oversaw them in their work. One of the projects she was involved in was the large simulation project that she described in her interview.

4. Museum: The museum was internationally known and located in a major metropolis. There were four different interviews at the museum, including a curator (or subject matter expert), the Assistant to the President for Cultural Understanding, and the Director of Educational Programming. The interview to be described in detail here will be that of Flora, the Project Manager and Instructional Systems Designer. The others were interviewed because of their unique views of the process.

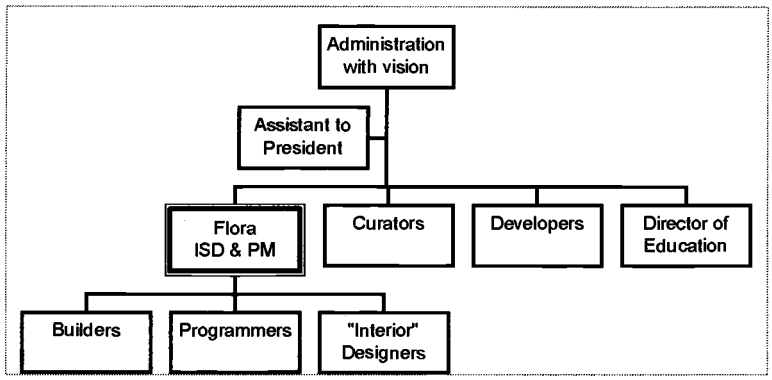


Figure 4.4 Museum ISD Project Team.

Flora, the project manager/instructional designer, described herself as being "intimately involved in the exhibition development and design." Flora had a masters degree in evolutionary biology. She actually began a Ph.D. program at University of Chicago in Evolutionary Biology, studying to be a research scientist of animal behavior. She mentioned how the behavioral training was often appropriate in her work at the museum. She finished the requirements for her masters degree and wasn't sure that the University of Chicago was where she wanted to continue.

Flora took a leave of absence to work at the museum as a content researcher on one of the exhibit projects. She found that something that felt like a liability when she was a graduate student, became a strength in her work at the museum. . When she was in school, she said she felt very slow compared to some of her fellow students at University of Chicago. She didn't hear a complex concept and say, "oh, sure, obviously I understand this." She described that she would "tend to think about it and break it down, think it into its most basic components and then rebuild it," which was how she would end up understanding it. "That is precisely the

process you have to take in developing an exhibit": take it apart into its most basic components and then rebuild it systematically.

While Flora's academic preparation wasn't in ISD, she had over seven years of experience as an instructional designer working at the museum. Flora was in some ways frustrated by the multiple roles in her position. She was in charge of the team, schedules, budgets, as well as physical space, and ultimately had the final say on what the instructional exhibit would look like.

The Vice President of Academic Affairs made Flora (project manager, instructional designer, and visitor advocate) and Anya (subject matter expert/curator) the core of the team. The two would work closely on the content for the permanent exhibit described in Flora's interview. Anya, the curator, had a background in social anthropology. She worked in Central and South America and was responsible for the ethnographic collections from that region. She also did Urban Anthropology in the United States. Other "interior" designers did the "three dimensional look of the exhibit itself," but they were not involved in the content. There were many on the production staff: videographers, programmers, and graphic artists. In addition, the education department had input, although their main responsibility was public awareness. The assistant to the Vice President for Cultural Affairs worked with the Community Advisory Board (twenty-five people from the community) to ensure that views and input from the diverse community were solicited concerning the exhibit. Flora stated that other curators or SMEs were consulted as needed.

5. University: The University setting was a central office, with about three dozen employees, where faculty and department chairs could bring their curriculum to be "designed" for delivery in a mode that might utilize technology, or be presented in written guides, or both. The center also broadcast classes to all fifty states in partnership with North Carolina, Florida, Texas, and New Mexico.

Pat, the Instructional Systems Designer interviewed for this study, was trained at Northern Illinois University where she got her master's degree in Instructional Technology in 1995. It was there that she received the majority of her training in Instructional Design. She began the doctorate in Instructional Design in January of 1997. Pat describes her work as "assisting faculty in incorporating technology into their classrooms through the use of Instructional Design or Instructional Development, that being, sitting down with them and figuring out which technologies best match what they're teaching, their teaching styles, the type of students they have, and their subject."

A second subject, Peggy, at this site was interviewed because Pat kept referring to a timeline she used (that standardized the ISD process) that Peggy had created. Peggy, as an undergraduate, completed a double major in television broadcasting and studio art and a minor in marketing. Her masters degree was in Instructional Technology and Telecommunications (which had, as part of it, Instructional Systems Design). After finishing her masters degree, she went to work as an instructional designer and then became a producer at the University where Pat worked.

The core team consisted of the instructional designer and the teacher (who was also the subject matter expert). Adjunct to the team were also various employees of the University who were hired as needed for video taping, graphic art, programming, and evaluating the content.

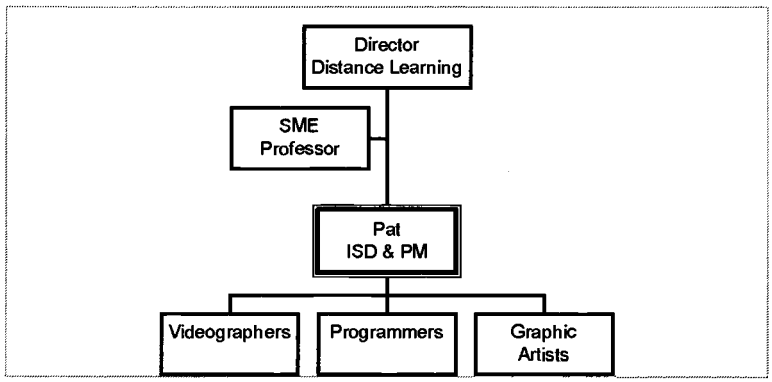


Figure 4.5 University ISD Project Team.

In order to get the full description needed for this study, numerous other project team members were interviewed. However, in keeping with the purpose of the study, person(s) who were the experienced instructional designers and project team leaders provided the greatest insights into the process.

Products Designed

1. Business Service Corporation: The business service corporation product was called Manufacturing Interactive -- a multimedia, large scale production with hundreds of screens of interactive text, moving video, graphic drawings, and animations that introduced individuals (new hires or those being relocated) to the "shop floor" of manufacturing plants that were located internationally. The interviewee, Marie, describes the idea's origination:

> "The idea came from... a meeting I was having with a sponsor and we were talking about what does the practice need... It was his idea that we needed some kind of foundation training that people could go to and get the basics. . . He really had a strong desire to make it multimedia, some type of interactive multimedia. He didn't want it to be a book, like a self study manual. We didn't want it to be a video because we had a few of the videotapes that kind of told this story, but it was 20 videotapes. The offices, the people, didn't watch them... they weren't being used and we weren't getting any value from them."

A small needs-analysis was conducted, which found that this training was a need at nearly all of the sponsor's international plants. The computer-based training was to contain the basics of a manufacturing site, the shop floor, etc., and was called "Manufacturing Interactive." The product required a team of fifteen people and a total outlay of $420,000 dollars.

2. Community Education Agency: The products produced by the Community Education Agency between 1984 and 1991 consisted of instructional slides with narration, accompanied by workbooks, transparencies, and publicity. The first one was for the Health Association of America, in Washington, D.C. Interviewees were asked to focus on one of those instructional products (the first one) and then make generalizations to the others in order to get at the process involved from start to finish. The media consisted of voice-over narration while the camera panned or zoomed slowly and significantly over an intricately detailed slide of a scene, pointing out relevant people or items. Because the experience gave the impression of movement, they were referred to as "videos" in positive responses

from audiences who felt as if they had watched a video. Subjects ranged from depression to financial concerns in later life.

The products consisted of a series called "When Dependency Increases" and included: "The Dollmaker: Stresses of Caregiving"; "Best Wishes, Edith and Henry: Family Relationships"; "The Final Course: Depression"; "The Second Story: Loss and Grief; "260 Primrose Lane: Living Arrangement Options"; "Due Upon Receipt: Financial Concerns"; "Winter Comforts: Alcohol Problems"; and "Choosing When There Is No Choice: The Rest Home Decision." "Winter Comforts" received national recognition for excellence in education from the Journal of Nursing.

3. High Tech Manufacturing: At the high-tech manufacturing company, the trainees were taught sitting at computer assisted instruction programs for hours, or through more hours of videos. The trainers, including Judy, wanted to try something new. One on one instruction (otherwise known as on-the-job-training) was not a good option because it was felt it took too many trainers and trainees off the job for too long and therefore was extremely costly for the company. So they developed a series of simulations consisting of modules, team based activities, and practice exercises for Basic Fab Skills Training called "BFST." An exercise, for example, could teach "suiting up" to 30 new hires exposing the new hires to the real uniforms that they would be wearing to work. They wanted to teach certain keystrokes, that used to be taught out of context, in an actual simulation event, to add to the authenticity of the experience. They would participate in the instruction,

standing up, typing at computer keypads on high tables. The instruction was planned to be highly interactive and quite original. The project team was selected by Judy (project manager and instructional designer) and consisted of a programmer, videographer, other instructional designers, and two primary-level school teachers to assist as subject matter experts.

4. Museum: The 1.2 million dollar product designed by the museum ISD team was a permanent exhibit on insects, presenting them both life-size and larger than life. There were hands-on experiences, video productions, computer assisted interactive instructions, as well as items or objects on display.

This permanent exhibit was an idea that began in the office of the Vice President for Academic Affairs, who oversaw the curators/subject matter experts. The same VP also appointed the team content specialist and project manager. Flora stated that the VP was usually fairly sensitive to who he/she thought was going to be good on a particular exhibit. There were downfalls to this method of putting a team together however, as Flora stated:

> "What it means. . . is you've got some curators that may get tapped all the time and that means that their own programs (additional permanent exhibits that they are developing on their own) may suffer over time. And there are some curators that would just never get assigned to be the primary content people. We end up interacting with a lot of curators... even though I have these two assigned to a team."

The museum contained what were referred to as temporary (or traveling) exhibits and permanent exhibits. The permanent exhibit that Flora described herein involved a design "team" and took over a year to create from start to finish.

Environment	Budget	Number on Team	Dev Time Span	Audience
BSC	$420,000	15	Multimedia 18 months	Business' employees
CEA	$500,000 for nine programs	2+/-	17 months per program	General public
HTM	unlimited	7+/-	2 years	Manu-facturing new hires
MUS	$1.2 million	7+/-	18 months	General public
UNIV	unlimited	2+/-	6 months	University students

Figure 4.6 Summary of ISD Project Teams.

5. University: The university center was where, as Peggy said, the instructional systems designers "rearranged the content" from the subject matter experts and made an instructional "product" out of it. The final product was sometimes distributed on the web, through computer assisted instruction, through video, through live satellite teleconference, through distance learning classes, or through written handouts. While Peggy worked with all methods of delivery, "the

process for each part was basically the same. It was just the mode of delivery that changed."

The product described in Pat's interview was a course in Public Relations to be delivered on the world wide web asynchronously, meaning the students do not have to be on-line at the same time as the teacher. This was the first project of its kind for the center. Previous to this project the university had done distance learning via satellite, "two way CODEC courses," and internet courses, but "no one had really known about what was involved in an online asynchronous course," Pat commented. The director of the university's center solicited the instructor, Dr. Max, with the idea of creating their first asynchronous course because the content was well fleshed out and the course was a strong one. As Peggy stated, "once it's decided administratively that it'll be done then it's [the responsibility of the ISD person] to work with the teacher until it's finished." As far as this production went, Dr. Max was extremely enthusiastic and willing to spend a lot of time working with Pat who was to be the Project Manager and Instructional Systems Designer. From that point onward, Pat was responsible for getting the class on the world wide web and into asynchronous mode. A textbook already existed and the teacher was ready to work. Pat worked for months to get the program up and running.

The Meetings

An important part of each product that allowed the processes to happen were the meetings spoken of at each site. They were held at least weekly and consisted of at least all core team members. In all cases, there was a person who had "final say;" in the absence of the sponsor/funding agency, this was the interviewee who held the project manager or lead instructional designer role. The project manager, in the meetings, brought stability to the project. In addition, the

meetings proved to be a method of moving the project along. The core team might work on the vision, base content, a budget analysis, a task analysis, a project definition, a product description, a concept proposal, a content outline, a skeleton, storyboard, or a prototype. Meetings were a time to sift through the number of ideas, to chunk them, to make checklists and tools for communicating, to establish guideposts, and to make decisions quickly on which everyone's input was required.

In analyzing the data in Nud*ist, meetings appeared in each of the four areas in which data were categorized: stages, the process, communication, and structure. In other words, meetings were a way of moving the product through the stages, a way for the team to encounter one another to talk about the next phase of the process, a forum for communication, and provided a structure for working towards the completion of the project.

In the museum site, one of the interviewees pointed out that no "monolithic approach" was taken to the design or development of the exhibits. As she perceived it, this freedom (as opposed to a dictum that stated how the exhibit would turn out) was a positive approach. Meetings were held about once a month at this site. However, Flora, the lead at this site, spoke of setting up avenues of communication for team members like electronic messaging and voice mail by telephone. She also circulated the drafts of work often to many different SMEs and was proud of having received much input from them.

At other sites, meetings were held wherein the core team could deal with attitudinal issues like differences of opinion, decision making, compromising,

prioritizing, and establishing who had the final say in the absence of the funding agency. Meetings were held to give direction, focus, and even to stake out the roles and tasks. Methods of teamwork were established in meetings. They provided a time to go over reviewer's comments, to clarify product or process, to plan for known circumstances, and talk about the unpredicted happenings that may have resulted since the previous meetings.

The Process

In order to compile the data for this study, QSR Nud*ist proved to be an invaluable tool. Each interview was dissected word by word and coded for its content. The results showed multiple references in each interview to factors of communication, process, structure, and the stages of ISD. These four main themes emerged from the investigation and from the data themselves. They were not created prior to the results being read. As a matter of fact, data that did not chunk and make those categories naturally were called "free nodes" and were not forced into any categories.

In a standard ISD model, the "analysis" stage (sometimes called a "front-end" analysis) involves an instructional designer finding out what is the audience, what is the need for the product, how the task analysis can be detailed, and what the instructional objectives might be. Sometimes the available media, resources, and financing for the projects are considered also during this early stage (Heinich et al, 1989).

In this study, some interesting things appeared as the first steps: project definition, figuring out what the meeting schedule would be, and immediately finding the subject matter expert. In the community education agency case, they found out

exactly how much time and money was available to complete the production. The museum case found out who was on the team. The university case looked at competing projects – projects similar to the one to be produced. The business service corporation started with a three page list of learning objectives. The high tech manufacturing team started by examining the content and resources available. Interviewees considered all of them to be viable beginnings.

The documents that resulted from these first few steps were described differently by each person at each site. They were called a project definition, product description (with concept papers and a content outline), a skeleton, a proposal, a written vision, or base content. From that beginning point on, the process at each site varied dramatically.

Unpredicted happenings (UPHs) are occurrences that emerge from the uniqueness of the context (organization, players, agencies, culture, and resources, or the environment) that are not described in the typical ISD models (such as the ADDIE model). As depicted in the illustrations that follow, the large circles represent occurrences outside the ADDIE model not included in the normal telling of the process. In each case, the conceptualizations of the process at each of the sites are accompanied by "process narratives" that explain the steps. The process appears in no way linear in any of the cases.

1. Business Service Corporation – ISD Process. There are several key features of the process followed by the business service corporation team:

a) They had "piles of content," but no vision of the "look" or design of the end product until quite late in the process.

b) There was turnover in key positions on the team that caused a new individual to have to come in to the ongoing process and be brought up to speed.

c) There were several planning tools used at the business service corporation that are worthy of note.

d) The evaluation was ongoing throughout and non-existent summarily.

e) The vision, or idea, at the business service corporation came from the sponsor or funder of the project. Once the project was given to the PM/ISD person and interviewee, Marie, it was her job to pick the team with whom she would work. The team was not chosen by the administration.

f) At the business service corporation, Marie was bothered that they had "piles of content," but did not know what the end product would look like. She indicated that they would usually create a "look" or design to the product before gathering content.

Marie mentioned that,

> "We would have liked to design before developing but that didn't work out. And then we would have known what [content] to get. But we just couldn't rely on [the numerous content people still being available later on] so... getting to the point of an idea to getting to where we did a design took a really long time... we decided to generate content first without a design. Kind of backwards."

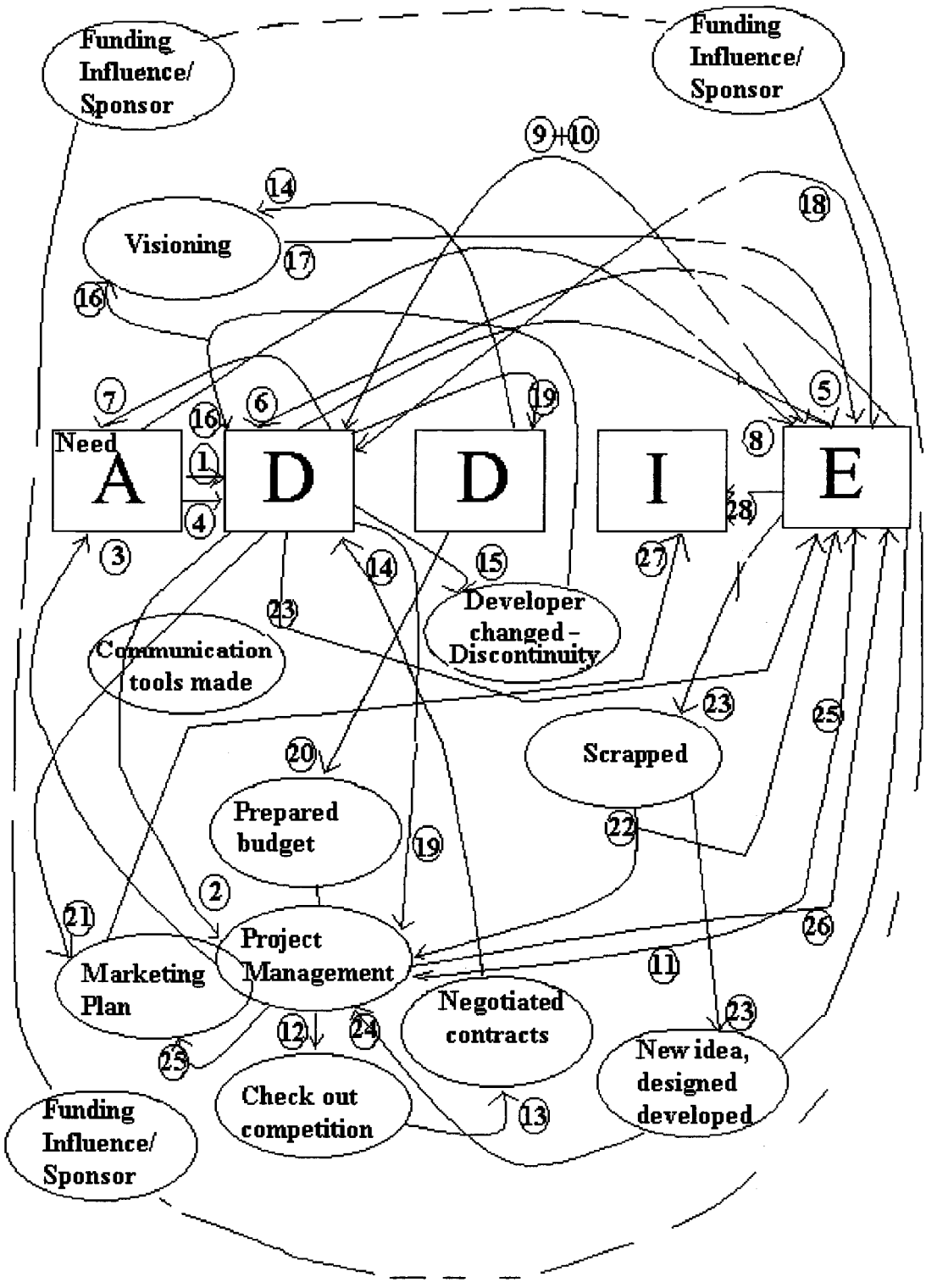


Figure 4.7 Business Service Corporation ISD Process Map

Table 4.1 Business Service Corporation Process Narrative.

1	Sponsor suggests need for project. Project manager (PM) and sponsor
	designed beginning idea - goal, objectives. What would they produce?
2	PM defined team. Try to find subject matter expert (SME) in company.
	Meeting - PM, SME, designer, SME put objectives into outline form.
3	Analyzed focus group data. Lots of content. Set priorities.
4	Meeting - took focus group data - on flip charts chunked content.
5	Outlined the content, and sent it out to the other offices for validation.
6	After this formative evaluation, made a project definition report.
7	Analyzed the need for the product. Confirmed need with other offices.
8	Shared report with other offices who evaluated definition report.
9	Created a definition of what the course would be about. Defined content.
10	Took that document and sent to worldwide offices for confirmation.
11	Project manager searched for SMEs, found people inside too busy.
12	Checked out the competition, was there a product like this out there?
13	Project manager negotiated and hired SMEs/consultants from outside.
14	Piles of content. Project Manager did overall design with sponsor input.
15	The developers changed - turnover happened = technology person left.
16	Pulled together guest speakers, present good multimedia. Visioning.
17	Big meeting - evaluated ideas for designs. Scrapped several.
18	Looking for the "aha" experience. Brainstormed. No design yet.
	Finally found design. Worked out detailed storyboard templates,
	sketched graphics, looked into what video clips would be needed.
19	Programmer continued on templates. Designers tried to think of "look."
20	The technical project manager began preparing a budget.
21	The graphic artists and programmers storyboarded and built templates.
22	Sent all the work thus far out for review. Project too complicated.
23	Scrapped entire idea. Budget changed. New idea = "aha" experience.
24	Project manager worked with designers on marketing + roll out plan.
25	The systems tests began, successful. Evaluator worked on evaluation.
26	Evaluated marketing plan and followed through on it -- CD packaging.
27	Developed and produced multimedia product and distributed to world.

Marie recalled that they "needed to have the ah-hah experience." She seemed to be referring to a vision of what they wanted the product to look like. From the BSC process map, it is clear that the vision came very late in the process (step #23 out of 27). They had guest presenters demonstrate projects that were similar in terms of the interactivity in a computer-based program. And they checked out the competition in terms of the subject matter area. While they were working out ideas, "the program was getting a little too complex and we only had so much money. Or so we thought," she said. So at one point two members of the design team came back to Marie and said, "you know what, we decided we don't like that idea." They had brainstormed and come up with a different idea.

However, Marie was not eager to rush into changing the entire plan. She felt they all needed to step back and make sure they were doing the right thing. She asked the team to do something that she called "tedious;" but she remarked that it had turned out to be a good learning experience for them all.

> "I asked them to go back and look at all of the stakeholders involved in the product... what are the criteria that each of these stakeholders is looking for in this product and come up with sort of a case for why the new design meets all those criteria... I'll agree if you show me. [She told them.] So they came back and they'd come up with a matrix of all the details and we walked through it. And actually it was a good exercise because you really do need to go through and make sure all the [criteria] are achieved. We back tracked and did [the new idea]."

Because of the new idea, and even though they were three quarters of the way finished with the product, they scrapped a lot of material that was no longer appropriate and designed and developed the new idea using portions that still

worked. They went on to develop new content, pushing forward with new ideas in place. Marie and one of the principle ISDers realized that the budget needed to be redone. They would have to ask for additional funds. They asked for them on paper, substantiating each request with reasons and solid explanations, and received the needed money.

In addition to all that had transpired, and very far along in production, one of the key technical people (the one who was in charge of the technical qualities of the computer assisted instruction) resigned and had to be replaced. This is referred to herein as discontinuity. The production was interrupted as the new technology lead had to be briefed and brought up to speed with the rest of the team.

> "When we started, our previous technical person [note: turnover] put together a budget which was very off base, but you can't build a budget until you have a design. You've got to have more of a detailed design because you can't tell how much it's going to cost until you know what you're building."

Including instructional systems design, Marie, as PM/ISD person, had several job functions. She worked out the budget with the team, negotiated contracts for outside content experts and locations at which to shoot the video segments, prepared Gantt schedules that included plans for the entire team, and even, when the time came, helped prepare the marketing plan. Marie mentioned that, "Many things were going on at the same time." She continued:

> "In the meantime, we had the video planned for the papermill site that we had to scrap because we couldn't find video and couldn't find graphics to fill in. The usability testing is done. The programming is done. Okay, after everything was programmed, the designers reviewed it, the content people reviewed it, video footage

> is done, video is dropped in. So we brought in a bunch of systems testers. And their job was just to find all the errors, break it, whatever they could do, and they caught a lot of stuff. So there were two systems testers. And in the meantime one of my designers was working on sort of our marketing and role out plan, for how do we announce this to the world. As well as the graphic artist was working on the packaging and CD cover or work design. So there's that going on too. Then the systems test was over. We sent it [the project] off to get it printed. Put the cover together. Then we sent out our marketing pieces and distributed it out to the world. In the meantime, oh wait a minute, and our evaluator is working on the evaluation."

The continued use of the phrase, "in the meantime" was obvious as Marie talked. At another point she stated, "there are many concurrent processes. It's just that kind of work."

In order to keep things straight, many planning tools were created and utilized by the business service corporation team to improve communications:

- a project definition report,
- a project roles and responsibilities matrix,
- a weekly progress report to be filled out by each team member,
- a detailed manufacturing interactive work plan,
- a checklist for project setup,
- a team update form made in Lotus Notes to keep everyone informed,
- conceptual design documentation which was a written description of how the finished CAI would look,
- a set of ISD standards for the project which was a checklist for the contents of each storyboard frame,
- a checklist that included the steps for instructional development and implementation,
- a change request and approval form – in which one could "order" a change in design, content, technical, or media,
- a change log.

The process at the business service corporation was probably the most rigorous of the five cases studied and contained quite a substantial paper trail.

Marie stated that they had vast quantities of content to sort through, chunked it into topics, and made sense of it. Then they decided, "how we would come up with maybe a rough outline of content." They then took that content and "sent it out to the world for validation" [to thirty people in offices in Mexico, Asia, Europe]. The work was at the same time, evaluated internally, and evaluated much more often than appears in the traditional models.

> "So after they were done with a particular topic, they sent it off to the internal person to take a look at it, there were changes made back and forth."

The evaluation portion of the process was given attention on an ongoing basis. For example, Marie remarked,

> "So, while we were storyboarding and programming, we had another team member, Anne, and her assignment was [to do the] usability testing. She came up with a usability test plan that (rather than wait until its all in and test it with the target audience and see if they like it) [would] allow them to test it early... And starting at the very beginning where all we had were pictures of what it would look like, she brought people in [or she went to them] and asked them [for their opinion] on this particular project [segment]."

As time went on, if comments were made or corrections requested that required additional programming, the changes were overlooked because programming changes were very time consuming and complex and therefore expensive to make. Summative evaluation was overlooked if there were no time left to deliver the product. As Marie said,

> "Being in the business world you have to do it differently which means maybe faster, maybe you cut out some of the steps, which you know comes right down to evaluation. Do we do the best job of evaluating? No. We have a huge evaluation department. They bring

> in statisticians and things like that. But there are some things in the process, whether it's budgets, or your client, or whatever, where you have to shorten or say, okay, we can't do a full blown needs analysis... what's the next best thing? Can we do just three focus groups and five phone interviews verses a long drawn out process?"

One of the documents Marie donated to this study was her "lessons learned" that consisted of eleven "random thoughts and observations" on how she would improve the process if doing a huge production like that again. They include observations to cut back on the amount of paperwork and decrease the number of instructional designers involved. The eleven random thoughts are: to have processes in place prior to design/development work; have case companies secured before starting development; streamline the review process at the end of the project; have a usability test for the entire product; cut back on the amount of administrative documentation; streamline design documentation; provide more "technology consulting;" allow more time to review and change content graphics; decrease length of development time by using full-time resources; use fewer designers; and gain better access to dedicated content experts. She did not mention on paper anything about wanting to have a vision for the end product earlier in the process. In all four other cases studied, the vision was arrived at conspicuously early.

2. Community Education Agency – ISD Process. The most unique things that stand out upon reflecting on the process of the team involved at the Community Education Agency site include:

a) They set up a review process with a core of twenty-five people from around the nation.

b) They were extremely thorough in their work.

c) They had a vast amount of experience between the two of them.

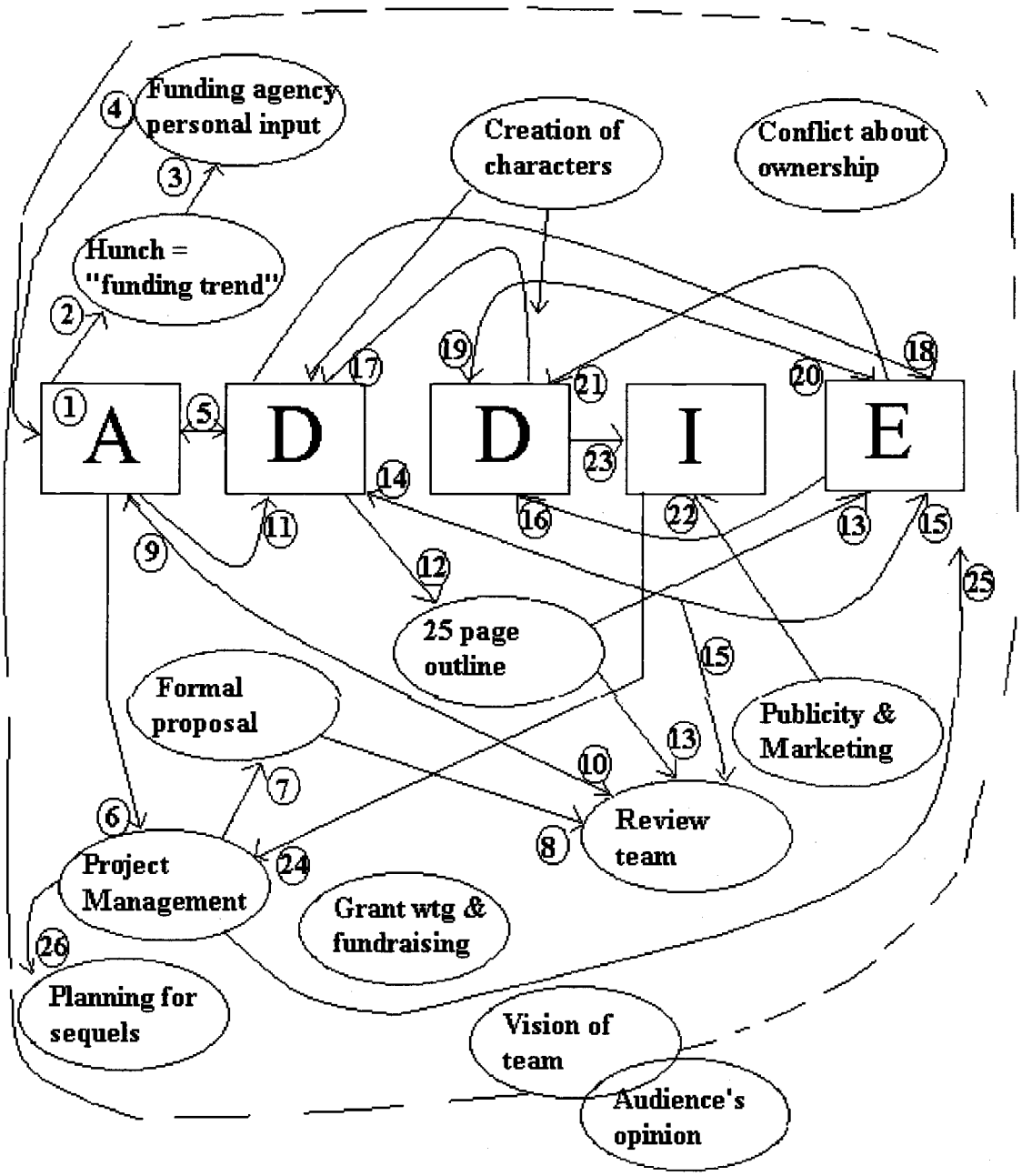


Figure 4.8 Community Education Agency ISD Process Map

Table 4.2 Community Education Agency Process Narrative.

1	Front-end analysis - content, structure, agreement. PM checked out
	competition. SME knew nothing out there.
2	PM had hunch this was a hot topic, or "funding trend"
3	Funding agency (HAA) gave team personal input. Priorities were set.
4	Funding agency supported proposal. PM compared HAA ideas with
	their own and with SME's issues she wanted to include.
5	Piles of content, team narrowed down.
6	Compared # of ideas with 10K and 1 year time frame.
7	Wrote formal proposal. Got 13K. Identified key people - and got
	experts together. Formed review team of 25 -- "buy-in" supporters.
8	Shared formal proposal with review team. Got input.
9	PM interviewed SME on entire decision making issue. Identified eight
	very important affective domain objectives.
10	Asked review team to review and prioritize the eight.
11	Put feedback together and formed objectives for first video. In eight
	objectives asked them 3/4 questions. Answered on audio tape
	on their own. Sometimes PM interviewed to immerse self in material.
	Grad student, assisting PM, took results and categorized under eight
	catagories on note cards.
12	PM and SME distilled note cards into twenty five page outline.
13	Sent outline out for review.
14	PM created character descriptions and a family tree. Feedback
	provided research for PM to write treatment.
15	Sent treatment out to review team.
16	PM Considered time, money, audience, resources. There was no
	money for video -- create in slide show. Produced plan B workshop
	to fit wide audience's technology.
17	Storyboarded to form composites to enhance theme. Created script.
18	Sent only scene descriptions out to review team.
19	PM got props actors, locations together, made production schedule -
	got equipment, including camera backup people, got signed releases,
	supervised shoots.

Table 4.2 Community Education Agency Process Narrative (continued).

	Supervised voice overs.
	PM supervised filming of slides stylistically to video tape, with SME
	wrote and arranged music.
20	Tried draft two or three times on review team to get feedback.
	Developed and evaluated until "quit getting comments that were helpful."
21	Produced training manual. Transparancies, handouts, instructions.
22	SME arranged news releases to promote product. Sudden conflict of
	ownership between two departments in which the Community Education
	Agency was located.
23	Implemented the slide show with audio around the country.
24	PM made Gantt chart and process template to use for future.
25	Prepared summative report and formal proposal for funding.
26	Raised resources, wrote grants, showed project for future 8 sequels.

d) They had a lot of passion for the content.

e) They worked closely and effortlessly with one another.

In the beginning, the "blue ribbon" subject matter expert, Valerie, knew the audience and the subject very well. She also knew there was nothing available to educate families on issues of aging parents. Therefore, she did not need to research the competition. Furthermore, Valerie was extremely well connected throughout the United States with the extension offices and with gerontology practitioners. Accordingly, it was possible for Valerie to create a "review team" (or expert panel) of "buy-in" supporters who would be there when needed to provide content, to review the work (whether it was a twenty-five page outline or a sequence-by-sequence script), and to provide feedback whenever needed. The review

team/supporters worked with Valerie and Ronda "through the entire project and so when it was finished they were anxious to see it get used." When the product was done, the supporters felt ownership of it because they had been involved in the process from its inception. They wanted to see more productions like it in the future. Valerie described them, "some [evaluators] were research based, doing research, others were practitioners working directly with families." Elsewhere she said that some reviewers involved were clients of those practitioners. This support group was key in making the project strong enough to induce the many sequels that followed the first production.

Ronda and Valerie were extremely thorough. Before beginning work on the first production, Ronda, the PM/ISD person, budgeted the project at a cost above the $10,000 they were being offered to produce it. This was not including pay for either Ronda or Valerie's time. But Ronda knew that their involvement in this subject matter would lead to future projects. She wrote out a plan of action, with a Gantt chart, time table, and budget and asked for $13,000, rather than $10,000. It was awarded. In the future, they would succeed in raising almost $500,000 to fund projects in this content area.

One of their strengths was the habit of sending materials out for review at every step of the way. Valerie, in the interview, said "everything went out for review. . . our outlines. . . each stage of things as they were being developed, they went out. We'd get feedback. I took all the information together and things that I had questions about content, Ronda and I would talk about."

In addition, Ronda had years of experience as an instructional designer and subscribed to the steps of the ADDIE model both in her process and in her testimony or interview. For example, she performed a front-end analysis that set down "content, structure, and agreement." She wrote eight "affective domain objectives" and basically adhered to the ADDIE model. As she said in her own words,

> "I always go back to that ADDIE model when we're working on proposals for what it'll look like, just because those are general stages. It's really easy, and people can understand it so easily without very many details. Say, you know, just talk about we're going to do this, the analysis, we're going to be able to design it and deliver it and then we'll do field testing and we'll, you know, all these things... And that's how we budget it... by those stages too, those general stages. It's what it would cost. See we only had $13,000 to budget all that stuff, so [for the first program] we took the rest out of our hide and did a product."

But later Ronda reflected a little on the unpredictable nature of the process. She said,

> "You can't anticipate [what will happen] any more than you can anticipate that our first program would have been our one and only. . . because it emerged. One thing leads to another and you couldn't really have anticipated that."

When discussing a time when Valerie got sick with MS during the process of developing one of the instructional programs, Ronda remarked, "Who would ever think that a Dick and Carey model [the ADDIE model] would be affected by someone's health? There's nothing in the ADDIE model about that!"

Together, their work amounted to years of experience, which they used to create a production a year for almost ten years. Ronda described the beginning,

> "She [Valerie] had already written a community education piece. And we used some training materials that I already had done in training with families, so there was kind of a base that we could build from content-wise rather than starting from scratch. It didn't just all of a sudden start, see there were all of these threads that came together. . . Valerie's previous work and my previous work and we were ready to embark on something that was an undertaking that neither one of us had done before in the scope of what this was going to be in terms of national delivery and whatever."

The two of them worked extremely long hours in addition to their regular jobs in order to get the first production done. The woman representative of the Health Association of America, the review team, and Ronda and Valerie, all had a clear vision of the product and an instinct as to the importance of the subject matter. Indeed their "hunches" as to the importance of the subject were confirmed every time another production was funded. They not only knew there was a need for the product, but Valerie and Ronda had a passion for their work that acted both as a boundary, focusing their expertise on this area, as well as a driving force that kept them going throughout the years. It was an important product and they felt that someone needed to create some training in this area. Ronda said,

> "A lot of it [the work] was out of our hides. Because I knew that if we had the opportunity to do something and do it well the minimal funding [would lead to later funding]. This was an area that because of that initial description of what [ideas]. . . the lady. . . [from HAA] had that this was something that could go on for a period of time, and ten programs, I mean we didn't ever say that, but [we knew] this could go on. . . the need was certainly there for that kind of set."

Ronda and Valerie worked together effortlessly and had implicit trust in each other's expertise and ability. They knew the other would meet deadlines and

requirements of the rigorous schedule they were keeping. Ronda described it this way,

> "These are the concepts and we had all the concepts duplicated and then we synthesized those. And Valerie would go over those, and I'd change them, and she'd go over those again, and I'd change them. Until we'd get this down and then we got below twenty pages, full crammed with content."

From that point, they decided to create stories and characters rather than presenting the information in a didactic and informational way. The characters appeared in the stories to seamlessly explicate the instructional content. They allowed each other enough freedom in their partnership to get creative.

Valerie seemed surprised when asked how they handled working together so closely and for so long and whether things went smoothly between the two of them. She said,

> "[I knew] what my role was next, what needed to occur, so there was structure there, but flexibility. I think the flexibility was in the working with each other. Structure was the project but flexibility in working [was important]... I've worked on some other projects with people that have gone really well but none of the other projects have been as intense, or as long as the time as ours was working together."

From having done one production from beginning to end, Ronda was able, after the first production, to document a step-by-step process by which they would continue to produce the rest of the programs (see Figure 4.9). She said about it:

> "It was the ADDIE model broken down into... more detailed stages. The right hand side was the product that came out of each one of those phases."

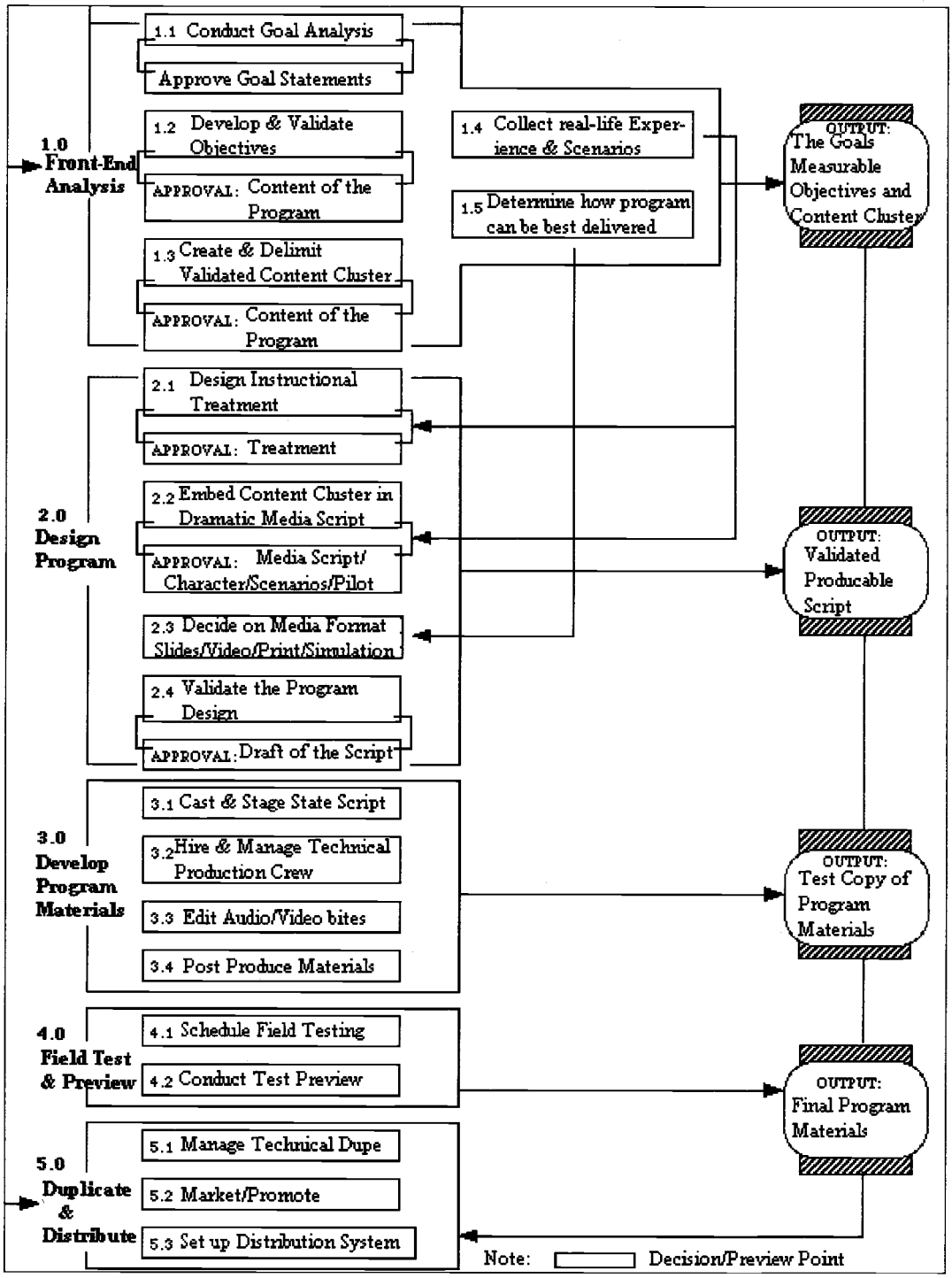


Figure 4.9 The Community Education Agency Instructional Model.

I asked Ronda if a product came out of each stage and whether each stage was formatively evaluated; she replied, "Yes, that's right. . . but the actual final model emerged after we had done it many times."

Valerie and Ronda were one of the most well trained and thorough teams. They had a distinct vision of what they wanted to create and went towards it. Ronda said, looking back:

"We could have never anticipated that those [productions] would have ever happened in the way that they did. We did the best we could do at each step. What emerged out of that, out of Valerie's contacts, out of her expertise, out of my expertise, led to a whole series of successful products. One thing leads to another and we couldn't really have anticipated the results."

In order to deliver the program, Valerie, who had all along been working with people all across the nation, merely let the word out, and the marketing campaign was launched. Early after the release, an external source conducted a thorough evaluation of the program's impact. Valerie began a grant search for opportunities for funding to continue the project. They improved their proposal and presented it, along with the first production, for more funding. The product helped sell the idea for future projects. As time went on, they received funding for eight more productions. In addition to the model of the process they used, Ronda also prepared a template for the structure of each sequel so that they would have a cohesive nature to each and a style that held them all together. In some cases, characters' stories flowed from one production to the next. Even with excellent

Table 4.3 High Tech Manufacturing Process Narrative

1	The PM's boss had vision of new kind of training. PM pulled team
	together to build intro to environment of fabrication.
2	The existing training CBT and videos redistributed, reviewed.
3	Some CBT and videos rebuilt. Some animations put in place.
4	PM created core concepts and learning objectives.
5	PM consulted SME's in fab and worked with them on ideas.
6	A Gantt chart was created for team tasks and when due. Deadlines
	cannot be missed or would throw entire schedule off.
7	Concepts, objectives, mind map -- where new training would go.
8	The PM created detailed task analysis. Wrote proposal.
9	Paper-based skeleton was built.
10	Sent content to fabs for evaluation.
11	Utilized input, had review for safety. Mistakes costly. Input from
	advisory group + training team. Final say = customers important.
12	Made puzzles and sent them out for review.
13	Got to know audience -- had short attention spans.
14	Prototype approved by foreign and domestic offices.
15	Two teachers hired as consultant - trained for 1 wk. on culture of
	company. Release forms signed. PM with two teachers, took
	apart then put back together. Decided environment for delivery.
16	Designed activity with cookies and frosting for 1200 people.
	Got feedback. To facilitate communication on PM's team, a
	consultant hired to talk on "meaning and relationships" at retreat.
17	Got feedback from instructors and developers (who implement
	content) on how to implement the orientation. Still evaluating
	proposal -- now more developed went to engineers.
18	Audience changed from new hires to retraining transfers.
19	Tossed out orientation activities (because transfers already knew it).
20	Made training in modules to accommodate many different sized
	groups. Had to think of options, what can be delivered without
	changing integrity of product design.

Table 4.3 High Tech Manufacturing Process Narrative (continued)

21	Made another prototype system. Tried out on potential audience.
22	Made activities with stand up adjustable tables, tried out on people.
23	Made simulations with qualification tests to measure progress, took
	ten hours to finish. Had to rebuild to be able to do in 8-hour shift.
24	At one point during development, PM called off project for 3 mos.
25	When back at it, set priorities, what has to be done first.
26	Hired contractor to write more modules, put materials together.
27	Built portfolio performance assessment and tried it out.
28	Created role plays for peer evaluation -- word games and exercises.
29	Got prototype okayed. Implemented whole four day program.
30	Surveyed trainees and peer trainers for results.

organization and highly experienced people, the process was remarkably complicated. By 1991, they finished the work they began years earlier.

3. High Tech Manufacturing – ISD Process. The high tech manufacturing site had similarly well-trained members on their team. There were primarily six key features to the process at this site:

a) Judy, the interviewee, got to know her audience well.

b) She kept her eye on what the customer wanted (the vision).

c) She had a definite process she kept in mind from start to finish. Even when the audience changed, almost three quarters of the way through production, the PM/ISD person, Judy, remained flexible and accommodated the change.

d) Even when she was pulled off the production and everything stopped, she was able to pick up months later and go on.

e) She involved many subject matter experts and had the work evaluated at many stages along the way.

In this case, the vision was that of the boss who saw a new kind of training for employees – something interactive and fresh. Once the job was handed to Judy it was her job to choose the team members.

When asked if she got to know her audience personally, Judy responded, "yes, and they had the attention spans of seventh graders." They were what she considered her customer, however, and kept them in mind. It was not a matter of whether she approved of them or liked them; she was working toward making a product that they liked – in this case, Basic Fab Skills Training. She said, "possibly the things that helped me most [on this project] were teaching kindergarten and teaching seventh grade." She described the BMW roadsters in the parking lot as her audience's "toys."

In the process that Judy followed, she prepared a list of milestones and deliverables for everyone on the team. There was also a step by step activity sheet that kept track of roles and responsibilities and when things were due. Judy and the team wrote process skills, a detailed task analysis, and went through the ADDIE model. She talked about the iterations the process went through.

> "I think that realistically people get hung up on some of the models. Because if you think you're doing analysis and then that's over and then you do design and then that's over and if it's a lengthy project – if you waited to get done with one part before you did the next one, you'd never get started."

Judy was very flexible. In this case, almost 75% of the way through with the production, the purpose changed from new hire training to retraining transfers. Judy "tossed out" the orientation activities (because the audience was suddenly transfers and they had already been oriented). She was fortunate, she said, that she had structured the training in modules because when this change occurred, suddenly the finished work needed to accommodate many sized groups. She scrapped much of the developed material and kept bits. In some cases, she was able to keep an entire module or chunk. Judy said, "good designs are flexible." She said she always tried to "think of options... what can we deliver [in the amount of time given] without changing the integrity of our original design?" She did quick evaluations of the new audience as best she could in the time allowed. She said, "I think you have to be rigorous to the deadlines... and then you have to be flexible to be able to change and accommodate your product to meet the deadline."

Judy's flexibility appears again in the incident when she was called off the production for three months (right during the development stage). This interruption was not out of the ordinary. In many cases, Judy described, she was preparing several products at once. She was the project manager and main instructional systems designer on many different products at one time. She said, about this particular production, that when she came back on she had to immediately set priorities. In her words, "I have to say out of twenty things I can do fifteen – what are the important ones to do?"

Judy was also open to criticism. In having the work evaluated, she involved two primary teachers as consultants to come together with her and spend six weeks going through the content. They divided it up and took it apart and put it back together again. They wanted, as Judy said, to "get the learners going!" She even took the time to train the teachers for one week in the culture of the company so that they would know enough to help design the product.

Judy sent work out for evaluation when it was at a stage, or in a format, that she felt appropriate. A mind map was created that demonstrated the thought process a learner would go through from concept to concept. A proposal was evaluated internally by an international audience of employees. Then the formal proposal, once in a more developed form, was shown to engineers. A first prototype and second prototype were sent out for review. She had the habit of involving a lot of people.

> "[We include] the operations managers in the fab. We also have included a lot of technicians who get involved in this. . . We did a pre-survey. . . a whole confidence thing, what do you know, what do you want to know. . . We had three people come over at different times from Israel, and we've had a couple of people from Arizona, because they are going to be the ones that are going to be getting it."

Feedback was solicited from those who would be implementing the product. She had constant reviews by operations managers and technicians. She worked with content experts in the fab. Formative evaluation was conducted all the way through the process. Evaluation tools were designed and developed by Judy herself. When asked if there was ever a point when she stopped evaluating the work, Judy said,

"No, although to continue past a certain point, like redoing the simulations, would be expensive because of the programming and coding involved." After it was implemented, she surveyed the trainees and peer trainers for results to make sure the training worked. Summative evaluation was conducted through peer review, participant interview, and by interviewing the training participant's supervisors to see if there was noticeable increase in performance and knowledge. She had plans to continue improving her work.

> "I'm also going to survey their peer trainers and probably do one on one interviews... [I'm going to say,] you had these people as trainees. What did you think about their gowning and automation [competence]."

4. Museum - ISD Process. The most important things about the process at the museum site were:

a) The process was not a simple one, and regardless of how complicated it got, it was important for Flora and the team to work within the constraints of the scope of the budget and space that they had. However, it was Flora's role, more than any of the other team members, to keep the audience in mind at all times when creating the design. In this case, as the audience's needs became more clear, it changed the scope of the exhibit. It altered the way the space would be used and increased the amount of money necessary to complete the project.

b) The museum's mission was also considered at all times as the vision for the project took form.

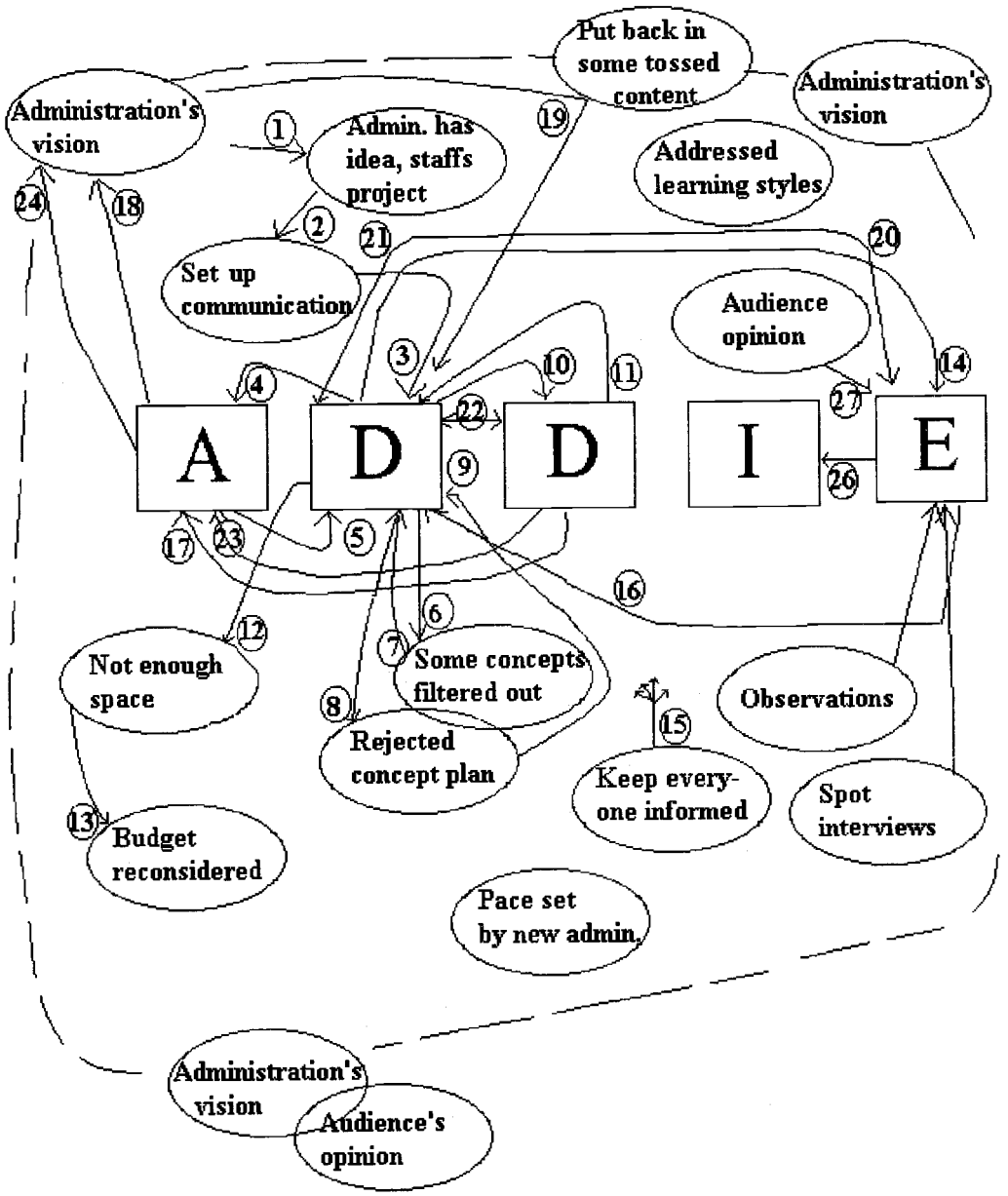


Figure 4.11 Museum ISD Process Map

Table 4.4 Museum Process Narrative

1	Administration had idea and staffed project. Funds allocated.
2	Project Manager (PM) set up communication, sign off, and review.
3	Worked on concepts, "look" and design - rough 3-D of exhibit.
4	Performed audience analysis - interviews on topic of new exhibit.
5	Worked out concepts using interviews.
6	Some concepts too "heavy" and were filtered out.
7	Concept plan well laid out.
8	Rejected concept plan layout.
9	Outlined concepts, content not finished.
10	"Designed" the 3-D layout and begin building parts of it.
11	Pre-planning phase, set parameters and main concept.
12	Not enough space for concept as planned.
13	Budget reconsidered -- needed to re-do ideas or add objects.
14	Sent research of full range of content to the "team."
15	Kept curators and others informed at all steps. Involved SME's.
16	Brainstormed with all with content and simplified it. Scrapped ideas.
17	Re-looked at interviews/analysis -- found audience connection to soil.
18	Set priorities on concepts -- emphasized mission. Visioning.
19	Put back in some of the "jettisoned" material.
	Concept reduced to topics with human connection fo theatre portion.
	Addressed different learning styles re: objects, theatre, walk through.
20	Sent "labels" to curators -- if scientists disagreed -- had final say.
21	Encorporated all feedback. PM said here is direction we need to go.
	Sent out script to team and got notes.
22	"Developers" (production people) and "designers" (interior-type)
	came to first team meeting with PM and curator at this point.
23	PM had trouble getting agreement -- went back to audience analysis.
24	Looked at whether whole thin hung together and conveyed
	overarching theme. New President increased pace.
25	Used observations, surveys, spot interviews -- evaluate whole thing.
26	Implemented it.

c) Clear lines of communication were established by Flora and a sign off process was set up between all members of the team.

Flora was working with a given amount of square feet (fifteen thousand) and a given budget that was, unlike other situations, not flexible. First, the administration came up with an idea for a permanent exhibit. They then handed that idea off to the "project developer," Flora, and one "curator" (or SME). Once appointed, Flora conducted interviews of the prospective audience to get a feel for their attitudes toward the subject matter at hand. From there, the team began putting content together and creating ideas. However, at one point in the process, Flora described the team as having different views of how the project should come out. Flora said,

> "I love working in teams, but you know creative teams always reach points when they are in total disagreement and it feels like you're at a road black. And I think going back to your audience research helps you remember that this isn't about this team member's opinion vs. this one, it's about communicating to this audience. So it keeps you focused on who you're doing it for."

When differences of opinion surfaced, she took it upon herself to reexamine the audience interviews. She spoke of her job as being that of the decision-maker and audience's advocate.

> "Really to be the visitor advocate and decision maker. And it doesn't mean that the designer and the production staff can't also be thinking about the visitor, but that's specifically what the developers have been charged with is communicating to the visitor and to be the visitor advocates in the process."

At this crucial point, based upon her reexamination of the front-end interviews, Flora decided that the concept plan would be rejected entirely because the subject matter had become too convoluted for the audience to understand.

> "But we also in re-reading our front-end interviews, there was a personal connection to the soil that really seemed to be a good compelling way to get people into the topic. If you say soil to most people they say, 'Why are you even asking me.' It's something they don't think about and we were thinking: we're doing this major ten million dollar exhibit on something that no one cares about? And so we felt we needed something in there to help people recall their own connections with soil; so we felt the Anthropology was more important than soil changing over time."

It was the audience's views on the subject that became the driving force for the theme of the exhibit. She found that the team had jettisoned human aspects and needed to put them back in because soil, as it turned out, had a personal meaning to people. So Flora reduced the presence of some topics to a few glass cases and made the human connection a larger part of the subject of the theater. She also brought in the creation of larger-than-life bugs and objects that could be touched and experienced.

> "We took out and reduced the role of things they [the audience] knew very little about, and that were really hard – for instance, the fact that soil changes over time. Now that concept's in the exhibit because we do think it's really important but it's one that visitors clearly from our interviews had a hard time grasping. And you either needed to do it very thoroughly in some way that built the story like in a theater, or you needed to do it in a very cursory way, that just says that soil is made. It just doesn't happen, it develops over time. And rather than that what we had to do was to set more priorities on those concepts."

Flora called this a trade-off, or sacrifice, that she continually made in one area in order to accentuate another, always keeping the visitor view in mind; in this case, it was their own connections with the soil that they had expressed in their interviews.

Keeping the audience in mind at all times was critical in order to create an exhibit that would be meaningful over the long period of time that permanent exhibits were expected to stand. There were a lot of factors that Flora and the team had to keep in mind as they worked to create an exhibit that would be long lasting.

During the process, Flora discovered there was not enough space to build the project as it was being conceived. The budget had to be reconsidered as space and new concepts began to surface and take shape (based on audience's preferences revealed in the front-end interviews). Some ideas were scrapped as others became more prominent. The exhibit's $1.2 million budget had changed considerably from the time when it was first only the administration's concept.

When the new administration came on board, all issues took a back seat to the suddenly prominent notion that things should be moving more swiftly toward completion. The pressure was on. While Flora constantly tried to accommodate the audience's point of view, the administration's increased pressure to speed up the process was surprising.

The actual ISD process for the Museum project in the map looks extremely confusing. It was important, regardless of how complicated it got, for Flora and the team to work within the scope and budget and space constraints that they had, while keeping the audience in mind.

The museum's mission also had to be kept in mind at all times. Flora described prioritizing concepts that the audience preferred and "built the story, like [it would appear] in a theater." The biggest "main goal" was to present

"biodiversity and the interconnection of soil organisms and ecology" because it was the emphasis of the institution and part of their mission, she said.

The process was not a simple one. One can see by Flora's example, how "design and content work hand in hand... and you don't finish content and then begin design." Flora felt it was important for the administration to understand this for budgeting purposes as well as for other reasons. The case at the museum also demonstrates how one can have a design that is well "laid out and actually developed to a fairly detailed point, and still... be rejected."

In addition, Flora established clear lines of communication and a sign off process was set up between members of the team. Flora had many things to say about the uncertainty of the process at the museum.

> "I think in communicating with the administration about the process, they will lay out this process [she later refers to this as the administrative process] that's very linear, first you do this and then you do that and then you do that. And I think you need to have that framework in which to work but in reality it's never going to work quite like that. There's a lot of going back and forth and flow between those stages. And there are no discreet end points for those stages and there's flow between them. And... if you did concept development then design in stage one, something that happens in stage two is going to make you revisit that content development and the concepts will change. But, how to actually define that in a way that can create useful dialogue with the administration for setting schedules and work plans is something we haven't quite done successfully."

Flora made an earnest effort at all times to keep everyone informed and involved. They even had established a community group whose opinion was solicited when Flora felt it was appropriate. As content developed, ideas were laid out by the team and filtered through.

Once complete, the evaluation process was said to be fairly perfunctory,

> "There haven't been evaluation studies of all of the exhibits and their effectiveness. But certainly if you watch visitor's behavior [at exhibits that are up and running] there is a wealth of material presented and it's extremely interesting to people... they come away saying that they think it was a good and interesting exhibit."

The evaluation process seemed to be an area in need of further study. Summatively, the team used observation and spot on-site interviews of their guests to tell them how effective the exhibits were. They recognized the need to find out if these were accurate measures.

5. University ISD Process. At the University, several things were unique about the process:

a) Pat had many job duties that were not usually part of an instructional designer's or project manager's position.

b) She checked out the competition to see if there were other classes like the one that she was going to design that were available already.

c) The vision for the course was based on the SME's views, who in this case, was the professor who had previously delivered the course via traditional lecture.

d) She had a process and due dates for team members that was very loosely followed. By the end, she adopted a process from one of her peers, but kept the dates flexible as she found that more to the liking of the parties involved.

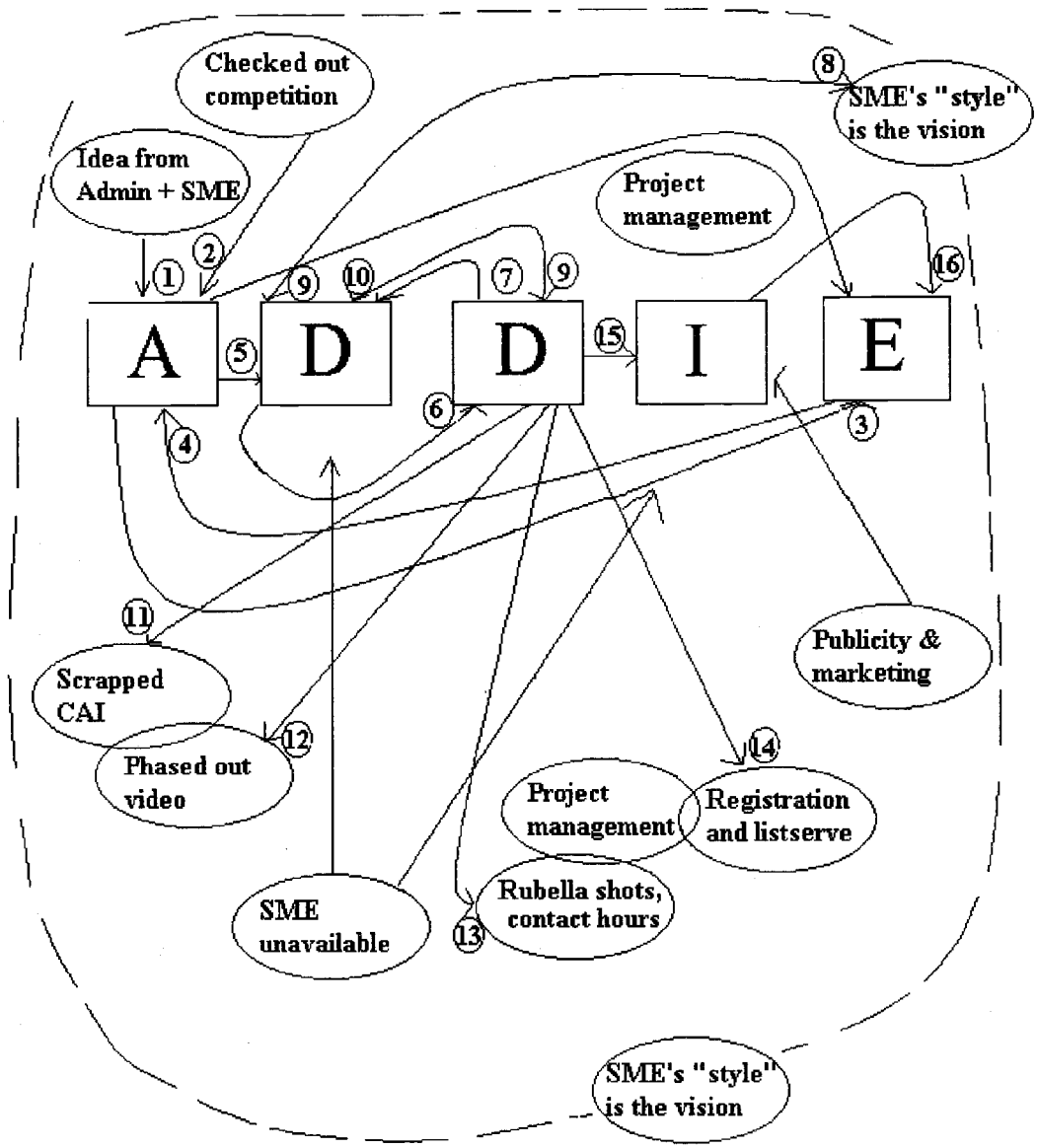


Figure 4.12 University ISD Process Map

Table 4.5 University Process Narrative

1	Administration and teacher had idea for web based class - gave to PM
2	PM/ISD checked out competition, what else like it out there.
3	PM/ISD evaluated current course by observing. Audience known.
4	Made current course the basis for web based student evaluation.
5	PM/ISD (with syllabus) brainstormed with SME (teacher).
6	Videographer taped SME teaching to augment web based course.
7	PM/ISD worked with bookstore to sell videos.
8	PM/ISD worked on interface & graphics with SME's style/vision.
9	Organized content into lessons that were applicable cognitive units.
10	Curriculum put together so programmer could start CAI component
	to augment the course. The "look" came from SME, not template.
	Worked with SME to put content in website templates for course.
	PM/ISD developed brochure to advertise class (marketing).
	Contacted superintendents to publish class to community (mktg).
	Produced guideline calendar for students of when assignments due.
	PM/ISD met with business office to set up student pay for course.
	Worked with grad school. Conflict w/ extension and continuing ed.
	PM helped SME manage existing listserve to attach to new course.
11	Scrapped CAI "tech trends" idea from course.
12	Phased out "boring" videos of teacher/SME lecturing.
13	Found out students needed rubella shots to take the course -- changes
	were made in policy -- the graduate by-laws. Then when asked how
	the course would account for contact hours - used content hours.
14	Set up on-line registration and summative faculty evaluation forms.
	Looked at curriculum registration guidelines and had some things
	changed with the graduate office/university.
15	Course was put on web.
	PM/ISD Built evaluation into web site.
16	Evaluations were collected from students as part of web site.

Pat was trained in instructional systems design while working as an instructional systems designer at the university. The original idea or vision for this project was handed to Pat by the administration because the university wanted to be

among the ranks of those who offered courses on line. This was the first asynchronous course Pat had designed for the web. She had many duties that were beyond the regular aspects of the instructional systems designer or project manager. At one point, she was told that there had to be a way to check that each student enrolled in the on-line course had a rubella shot.

> "The whole rubella thing was unexpected and we dealt with that by... [meetings] with some of the higher ups and we actually had to look at the current registration guidelines and circle the things that were really ridiculous and didn't apply. And they had to be written up."

She also was asked to figure the number of contact hours a distant student would have based on the content in the web course. She sought assistance from the Dean's office in solving this problem.

> "The director and Dean had to rationalize the contact hours that was just the content hours... We had to go through and make sure that the contact hours were really accounted for."

The unexpected things that happened in the university case could never have been anticipated – from the rubella situation to the number of contact hours that the web course would provide.

When Pat was handed the task of building the web course, one of the first things she did was to check out other classes like it being offered on the world wide web. She even enrolled in one so that she would have the experience of being a learner in this type of arrangement.

When it came to developing her first web based course, Pat said the vision that she used to design the course was, what she called, the teacher's own teaching style.

> "So we finished up that course and had an idea of what we needed to do... [and that was to] take a look at Dr. Max's syllabi and how he had traditionally taught the course, and how this technology could then be, how it could be transferred over to the use of the technology, or as a fully online course. I sat in on some of his courses, observed his teaching style, kind of got a feel for the type of content."

Pat let the professor have full input on the way the site looked in terms of graphics and text so that it reflected the teacher's style, she said, instead of using templates that would make all courses look the same as some schools she examined were doing.

Pat as PM/ISD made a schedule for the production team to follow and dates or deadlines were targeted, so that the teacher would know when to turn in content materials to her. She said it was loosely followed. She tried to use the fact that the teacher would disappear over the summer break as a motivation for him to be thorough in his compilation of content and get him to turn in materials to her in a timely fashion. She still ended up not having all she needed to know from the teacher before he went away for summer. The development of the course was somewhat random. As she herself stated,

> "It was more our own intuition, I mean some of the times, we knew we had to evaluate the audience, I mean you just know that. . . It [the process] is more like, 'anything you can handle'."

Pat's having been trained in Instructional Systems Design, while doing the work of the ISD, seems to have affected the work at this site. She ran things rather loosely, as opposed to the other sites, where rather "tight ships" were run. She had

a good heart and did her best with the tasks assigned to her. The work at this site was not managed as closely as the other sites.

The next time she designed a course, she used a process that she adopted from one of her peers that began with a proposal that was based on the learner needs and competencies the instructor had identified for the class already. The next step was the content organization that was referred to as "instructional design." At this point interactive elements were integrated. Then a segment of the site as a prototype was designed with graphics; potential students formatively evaluated it. From that point the entire site was designed, graphics and interactive elements were added, and it was formatively evaluated. At last, the site was delivered, technical support was established, and updates were made as needed. When it was all over, and somewhat perfunctorily, Pat spoke of a summative evaluation being conducted.

One of the weakest areas of the university case was in the evaluation. Along the way, formative evaluations were conducted. For example, student reviewers perceived that the videos, that were intended to augment the web-based class, added nothing more than a normal classroom lecture would add. They were therefore scrapped. In addition, a computer-assisted instruction that had been created to introduce the learner to computing was scrapped because it was surmised that if the learner is taking a course on line then he/she must know something about computers.

Something Pat said about the evaluations was, "No one really quite knew what kind of problems a person would encounter as it (the class) went along. But

the evaluations are complete. I don't know if anything's going to be done with the data from them."

The Unpredicted Happenings

Unpredicted happenings (UPHs) have been defined in this study as the occurrences that emerge from the uniqueness of the context (organization or agencies, players, culture, resources) in which the project resides. They are happenings that are excluded in typical descriptions of the ISD process like the ADDIE model. UPHs were found in the ISD processes at each site during this investigation. When the processes at all sites were compared, several happenings emerged and were found to be common to the ISD process across sites, raising the question of why they are not predictable parts of ISD models. These include the following:

1. Visioning in context is an important driving force in the ISD process. Visioning can be associated with the project "sponsor," the funding agency, administration, boss, or the audience. In this study, it was something to which each team kept returning as a reference point for the project. The vision served as both a boundary and as a motivator behind the actions of the PM/ISD person. In two cases, the funding agency, administration, sponsor, or boss, envisioned the product even before the instructional designers were involved.

At the business service corporation, they had plenty of content but, as Marie stated, they had no vision of the design in place. The sponsor, upon whom the

project was depending, came to the table with no vision. Several different concepts were presented, many meetings were held, many discussions were carried out, pitches were heard, but it was not until two-thirds of the way through the process that the vision, the "ah-hah" experience happened. Once the vision was clear, the budget had to be modified to accommodate it. This, in combination with the fact that there was turn over in the project leadership, made this particular production one of the most haphazard.

In the case of the community education ISD project, the first funding agency established the project vision. When Ronda and Valerie contacted the HAA, the woman in "power" took an immediate interest because she had a personal vision for the project. She continued to influence the project through its duration.

In two of the five cases studied, the audience was the source of the vision, boundary, and driving force. In the case of the high tech manufacturing simulation project, the training director had the vision but not the funding. Once the funding was obtained, the director maintained that vision and conveyed it to the instructional systems designer (interviewee); it was that vision to which they kept returning. It was the original vision that formed the boundary and served as the driving force behind the project.

At the museum, the vision originated with an administrator. Once conveyed to Flora (the PM/ISD and interviewee) and the curator (SME), the vision began to take on more form and definition. Through interviews Flora conducted with the prospective audiences, the spark began to ignite. When the perceived desire of the

audience became clear, upon which the vision was based, then the scope and vision were adjusted to reflect the audience's desires more carefully. Flora felt that the audience's personal connection to the soil was not being accurately reflected in the glass cases and artifacts. That's when the vision shifted. Consequently the floor space and budget, and all that depends upon them, were adjusted. All of this changed because Flora re-read the audience interviews.

In only one case was the subject expert (the professor/SME) the source and force behind the vision. In the case of the university ISD project, an administrator first envisioned a web-based course. The administration selected a very presentable faculty member with a well-developed course that was supported by already established content, used in lectures by the professor for years. Once the administration handed off the initial idea to Pat (PM/ISD person), the project was on its way. Pat relied on the faculty member, appointed by the administration, to further define the vision.

2. Managing the ISD project in context. The duties of the instructional designer at each site ranged from hiring contractors to negotiating contracts, creating and managing budgets, to preparing Gantt charts, making the schedule for the team to establishing lines of communication, and even finding out whether rubella shots were necessary.

Marie, at the business service corporation, described her job like this:

> "[I would sit] in on meetings and help determine direction... [I was] working with the sponsor, determining needs, figuring out where to spend the money and that kind of thing."

At the Community Education Agency, Ronda negotiated their funding from ten thousand to thirteen thousand dollars. Valerie said:

> "[The woman at the funding agency as she was describing her ideas for the content of the project] just went from A-Z and there was like under ten thousand dollars we had. And she wanted everything... [There was an] incredible amount of content."

Then Ronda explained that she examined the parameters, given the amount of time available, the number of ideas there were to sort through, and the budget that was being offered. She remarked, "it took a little talking to say, I think this is really all we can effectively do." She must have said just the right thing. Thirteen thousand dollars became the new budget's figure. Once funding was received, Ronda had to carefully allocate it to cover costs of production, equipment rental, photographers, editors, graduate assistants, and other help that was crucial if a quality product was to be completed on time. Ronda and Valerie saw that the finished videos were duplicated, the accompanying written materials printed, and the product distributed to all its potential users around the United States.

By examining the interview data, one can see that Ronda and Valerie also kept the spark alive. They described knowing the importance of the subject matter of their work. There was a clear need for product in education on issues regarding the elderly. They personally went out and presented the first video seeking funding for sequels. They knew their work was going to lead to future projects and that they were on to something very big. They researched and wrote the other grants that followed; they created a total of nine programs.

At High Tech Manufacturing, Judy hired teachers who would serve as subject matter experts. They would be oriented in the fab, but they brought a fresh look at it, and a perspective to the product that Judy encouraged. Together they created an exciting game-type of curriculum aimed at a playful seventh grade mentality. To further enhance the product and improve the atmosphere for its creation, Judy negotiated the hiring of a speaker on "relationship building" who inspired the team at one point when it was needed.

At the museum, Flora lamented the fact that she was in charge of so much. Her title was "Project Developer," but she, like many of our interviewees, had the job functions of lead instructional designer and project manager; hence, they are referred to herein as "PM/ISD" people. Flora says of her work:

> "The way it is structured right now is that I'm in charge of everything -- budgets, schedule. I'm involved in all the construction issues. So I think they've defined this position too broadly. Now exactly how that authority works, if you have a coordinator who's really doing the logistical things like the budget and schedule and then you have the content development team. I think in terms of, the Museum chose that the decision-maker be the developer because the developer's job is really to be the visitor advocate and so the lead developer becomes that decision-maker. And so it's not the designer [at the museum they are similar to interior designers], it's not the production staff. That's specifically what the developers have been charged with is communicating to the visitor and to be the visitor advocates in the process."

She hired building contractors to put up the exhibit. In some of the projects (though not the one she focused on for this study), she hired outside subject matter experts because the expertise that was needed for a particular exhibit was not available among their own curators.

At the University, Pat tried to create a schedule of deadlines to which team members would adhere but she admitted she had to be flexible in order to accommodate others. She described setting up a schedule that was loosely followed. From solving the question as to whether students needed rubella shots to figuring out student contact hours, Pat found her job to contain a wide variety of responsibilities.

A. Team Development. In each of the five cases studied, early team formation was critical to the ISD process. At the business service corporation, the high tech manufacturing site, and the university, the team was created by the instructional designer who had been handed the idea by the sponsor, boss, or administrator.

At the community education agency, the two-person team was the core creator of the production. Ronda, the instructional designer, hired production assistance (photographers, graduate assistants, an editor) as needed for various functions.

In the museum, the administrator initiated the vision, generated the funding and established the team that was then responsible for seeing the production through to the finish. When asked what would happen if someone wanted to decline a place on the team, the interviewee simply replied, "that doesn't happen."

B. Team Roles and Responsibilities. Team role definitions were made known in all cases, whether formally or informally. At the business service

corporation, it was formally declared what everyone was responsible for and their tasks. Marie defined the role of the PM/ISD as follows:

> "You facilitate design meetings and make determinations of where to go. You review design documents. You review written documents that someone else drafted... [you do] budgeting, [have] relationships with clients, [and do the] managing of the team of designers. Obviously you get final say on the design."

At the community education agency, Ronda and Valerie informally assumed multiple, contrasting roles. Ronda described the two of them as having multiple roles – scriptwriter, subject matter expert, and public relations. They were also responsible for casting, rehearsals, lighting, sound, editing, and in addition wrote music that would accompany some of the finished products. They never felt the need to formally define roles. They simply worked well together and let the roles emerge. Valerie stated:

> "I was more of the content expert... our roles were pretty separate. I mean I looked to Ronda for expertise in instructional design... there was structure there, but flexibility. I think the flexibility was in the working with each other. Structure was the project but flexibility in working."

At the museum, the job titles in no way reflected ISD design and development. Flora defined it as a cross-functional team, where responsibility emerged.

> "The team never really acknowledged what is the role of each person on this exhibit... There were co-leaders on the team, the content specialist that was Amy, an Anthropologist/Academic, and the master exhibit developer [Flora]. And no one said how we were supposed to work through differences of opinion and whose opinion should be heard. In fact it should have been everyone's, but it came down to

> those two people [Flora and Amy] were the ones that... had to work it out."

At the university, roles were formally established. Pat said that from the start they knew each other's roles because in the very first meeting with the faculty/SME she clearly defined what each person's job function was and where their responsibilities would begin and end.

> "From the start... [I said] this is what your role is, this is what my role is, [this is what] the graphic designer, the instructional designer's roles are. So they know what they're responsible for right from the beginning. So we can have an open question and answer for as long as they want. And they can ask me questions and I've actually had them talk to teachers that have been through the process before. [The more experienced teacher takes on] kind of a mentor role."

PM/ISDers negotiated and did legal work and hired outside contractors. The interview data show that when they were more experienced they seemed to experience fewer random acts in their work. The interviewees also reported their biggest struggles were finding the SMEs, assigning roles, and getting the team motivated. They most valued that their work partners be flexible and trustworthy.

C. Work Review Teams. The work's progress was reviewed many times and at different, somewhat arbitrary stages during the process. The teams all sought informed criticism on their task analysis, formal proposal, content, mindmap, storyboard, and prototype models.

In describing the process, Judy said:

> "This kind of a project took two years. I definitely went through the kind of stuff like Analysis, Design, Development, Implementation, Evaluation - in iterations. Like we do some, to get to a proposal stage. And then the evaluation component of that was to take it to

> the other places and have them look at that and say, yea, this is okay. So then, when they say, yes this is okay, then I start over again with the next step - [the proposal more developed]."

Review teams were assembled in some cases; in other cases, the individual best qualified to look at the work in its present form was chosen (e.g. an engineer was asked to review a very detailed task analysis for verification of facts). In most cases there was a group to which the team could turn for feedback. At the business service corporation site, Marie explained:

> "[The evaluation] is all internal... the worldwide audience is all internal. So we had to get the people in Asia, the people in Europe, the people in Mexico City, whoever. We sent it to like thirty people and said, hey, this is a course that we're proposing and here's the description, here are the objectives, here's the content. You have this course in your hand and we also have this statement. We believe this will be developed as computer based training. We didn't exactly know what that meant or what that should look like but we explained how we would be delivering it. And then something else went out and we got feedback on it. We didn't get back a whole lot of feedback on it, most of them [the comments were] just great. We used the method of if we don't hear back from you by this date we assume that you will, that this is fine with you, because if you wait for that response."

Later Marie spoke again about their review set up:

> "So Kip [one of the instructional designers] was struggling with, how do I present this concept... I've got this general content but it really doesn't make sense to me. She had people to call, you know, to help explain the content, and also people to review it. So after they [the team] were done with a particular topic... she sent it off to the internal person to take a look at it. There were changes made back and forth, or either there were gaps that Kip couldn't find the answer to... or couldn't decide how to explain and that person would fill in those too."

The most efficient case of setting up a review team was in the community education agency case in which the "blue ribbon" SME, Valerie, selected twenty-five practitioners and experts from across the United States. In turn, each of the experts had clients, associates, or experiences of their own which they called upon to make intelligent comments on the work at all stages of development.

Once they reached the script stage, Ronda and Valerie sent out scene descriptions without word-for-word dialogue to the review team for comments. Through experience they had learned that reviewers will edit words and forget to look at the script's substance. Therefore the comments would be superficial and nit-picky rather than of some consequence.

At the high tech manufacturing site, Judy asked for and received comments at many steps along the way, one of which she describes here:

> "We had to get input from all of the fabs. So, when we first sort of had a skeleton of what it would look like -- a draft -- then I went to New Mexico a couple of times and Arizona and California and actually met with the people that do the orientation. And here I actually met with them and tried to talk with them about what we were trying to do. And got [their input]."

There was not one case out of the five in which things were as linear as, "we'll do this step and have it reviewed and move on to designing the product and then produce it." The review process was much more complex that that, with many individuals consulted at many points along the way.

D. Team Turnover. Turnover was present in almost every case except the community education agency.

At the business service corporation, they lost their lead technology developer. When a new one was brought on board, h/she had to be oriented to the project.

At the high tech manufacturing site, there was no turnover reported. This could be partly attributable to the fact that Judy, the PM/ISD person in charge, gave her team members a sense of ownership and responsibility in the production. She spoke of wanting her co-workers to take ownership of the project and to have increased satisfaction in their work.

In the case of the community education agency, the only things that changed were the photographers. This may have been due to the fact that one particular cameraman (Valerie's husband) was found to be really in tune with the content and aware of the needs of the production. As he worked more and more often on the shoots, other photographers were needed less often.

Only in the museum site did the turnover affect the project much more uniquely. The administration changed – a new president and eventually both vice presidents were replaced. The new administration wanted exhibitions to be put out more swiftly without really understanding the process. One of the new vice presidents asked for a retreat with the museum developers, curators, and designers in order to understand the process. There was some question as to whether, in a

weekend, anyone could fully understand what goes on from concept to finished and delivered project.

At the university, the core of the team was Pat (the PM/ISD person) and the SME/ professor. All others were sought more by their titles than by names. For example, if a graphic object was needed, Pat went to the center at the university and requested one from anyone who had a good reputation and who was available. In terms of turnover, the closest the university came to it was the disappearance of the teacher during the summer months which was very disturbing to the production because he was the content and subject matter expert. No solution to this problem was proposed, however.

E. Budget and Space Changes. The original budget, or funds provided for the project, often did not reflect, nor compensate for, the actual time it took to produce the end product. In some of the cases, more space, equipment, people, or other materials were needed. In the case of the business service corporation, the budget was even rewritten three quarters of the way through the process toward completion of the project. In that case they asked for another $250,000 – the amount provided in the first place. In other words, it was decided fairly late in the game that the production would cost nearly twice the original amount allotted for it.

For the community education agency, Ronda got the funding agency to come up with thirteen thousand dollars instead of ten thousand. There was little, if any, of that money available to pay herself and Valerie.

In the high tech manufacturing situation, time was more a concern than was funding. The company would fund the product at whatever level it required. The training team was trusted. The amount of time the process took to roll out was an important focus in this company. Each week's work was planned way into the future. Each product had to be delivered on time. In fact, Judy said that productions for the next five to ten years down the road had been established. They were on a tight timeline for training, but the funding was in place.

At the museum, the budget changed and was redone as in the situation at the business service corporation. When the museum design/development team really examined what was needed to satisfy the audience, more space became an issue, and with it, more money. The audience's "connection with the soil" was to be emphasized. In addition, they were going to build life-sized bugs and that would be expensive. When the idea changed to meet the audience's needs, the budget became an issue. It had to change. Getting the product to meet the needs of the audience was the goal.

At the university, pressure was applied to get courses on line. Whether it be for distance learning via satellite or distribution of courses on the world wide web, money was not expressed as a concern. The university had a mission to fund to whatever level necessary (within reason). The goal was to be among those who were putting courses on line. When asked what the budget for production was, Pat answered that she did not know. She spent money and bills were paid. It was not a subject of concern.

F. Marketing the Product. Marketing was performed as part of the instructional systems designer's job responsibilities. In most cases, there was not an additional person or department to whom the team could turn for these functions. As one might expect, the museum had a department set up for public outreach. In the case of the business settings, business service corporation and high tech manufacturing, it may have been that the interviewees wanted to participate in the publicity of their project. The creator wanted to have input in the roll out of the project.

At the community education agency, Valerie and Ronda, because of the limited funding that was available, participated in the publicity and marketing of the end product for expediency. Ronda included grant preparation in her job functions stemming from her own initiative. She took responsibility for fueling the fire for the funding of future projects.

At the high tech manufacturing site, there was not much marketing required because the training was mandatory as part of the employee's job.

At the museum, there was a marketing and public relations department. There was also an education department. They prepared materials to go out to educational institutions telling the public about the permanent and traveling exhibits.

At the university, Pat actually took it upon herself to call the superintendents around the state to let them know that this new course was to be offered on the world wide web. She encouraged the superintendents to let principals, teachers, and students in their districts know of this new learning opportunity

G. Tools for Communication. Tools for communication were created in many of the cases. These might be called job aids, but they were materials to make the process run more smoothly. At the business service corporation, there were many forms for planning as described earlier. Oddly enough, Marie went on to write in "lessons learned" that she would like to simplify the process in the future and create less of a paper trail.

In all cases, phases were represented by written, paper-based examples of the program. Some used outlines, treatments, or storyboards. In all cases, a prototype (whether on paper or as a computer presentation) was used to display to others what the product would look like and get feedback prior to starting production of the final product.

3. Researching Competing Products. The competition in both form and content was well researched in order to make sure there was not already a similar product available. There would not be a market for the product if it were already available from someone else. Why reinvent the wheel if it has already been invented? In some cases, checking out the competition provided ideas, resources, or lessons learned. For example, a similar project might point out things that the team would like to avoid because they showed examples of poor execution. In other words, a "we can do better than that" attitude was sparked by examining a similar product.

The business service corporation had guest speakers visit to present finished projects similar in scope to the one being proposed. One of the guest speakers was a consultant who brought some work he had done before in multimedia to just look at different ideas, different graphical interfaces, and different menu structures. They talked about what would be a goal for this participant and why they would want to complete this training. They brainstormed ideas of the metaphor that they would use for the training they would build.

The community education agency knew the content area already, and with a "blue ribbon" subject matter expert aboard, had no need to look at the competition. Valerie had already written a community education piece on the topic of national distribution. Ronda had already produced training materials for families. They had a base that they could build from rather than having to start from scratch. They also had contact with subject matter experts from across the United States whom they could consult.

The high tech manufacturing site had a very specific need for training for their fab. They wanted to move away from having the worker watching videos or sitting and staring at a computer screens for hours on end. They wanted a new kind of exciting and interactive training that introduced basic fab skills. They used components of their existing training (videos and lecture-based content) as a starting point.

The museum's sudden interest in an exhibit on bugs was coincidentally timed with the release of two feature films on a similar subject. This encouraged Flora, the

program developer. She felt that those two films combined with the initial audience interviews demonstrated an interest in this subject area that was encouraging.

4. Scrapping and Starting Over. In some cases, entire materials were scrapped as the team started over from the beginning. In two of the cases, this happened very late. The business service corporation had already compiled much of their content and distributed it among the design team. Marie had already contracted with external subject matter experts for their expertise because internal SME's did not have time to devote to such an elaborate and time consuming project. They came up with several ideas, Marie said:

> "We had discussed several different approaches to this, what you might call an overall design. And we talked about different models that we could frame this training around. For example there's one that's a process view of manufacture, it's a one page model that has different processes and we talked about using that as like the main menu structure, and you click on a topic and go from there. Then somebody else had another idea, so we had two or three ideas as to how to do it, but nothing we were ready to go with at that point. So then we had a meeting and decided [the themes they were looking at] weren't really practical... [They felt] the program was getting a little too complex. We only had so much money... and so they... came up with a different one. And so at that point I... asked them to do something tedious but important. I asked them to go back and look at all of the stakeholders involved in this product... [to examine their points of view and their needs]... So they came back and they'd come up with a matrix... and we walked through it. [We had to] make sure all [objectives they had laid out] are achieved... So we came up with this matrix and we... flip charted it and we decided that this was going to be it... but it was interesting because it wasn't in any of our first two design meetings or any of the previous design discussions."

Two-thirds of the way through in the process, the team finally settled on a concept that Marie and the rest were excited about.

The thing that saved Valerie and Ronda endless labor later on was the meticulous planning they did from the front-end analysis. They both knew the area, there was no need to scrap anything later. They were very well prepared.

The high tech manufacturing company changed their concept drastically very late in the process. This was not due to poor management; it was due to the fact that the audience changed. Suddenly, Judy was no longer designing training for new, incoming employees, but for transfers. This changed the content quite a bit. Suddenly they didn't need an orientation or beginners view of the fab. Instead, they needed a look at the fab in terms of its uniqueness within the broader, larger scope of the company.

What did affect Judy's work tremendously was the fact that all the way in the development (production) stage of the project she was pulled away from the project. She described the situation:

> "Last Fall, like September or August, I got pulled off for some other stuff for almost three months. And that really took a lot - we had to start the momentum all over again. I think it was that, I got pulled away from the project, and I had so many other things going on here that I need to do. I couldn't even deal with it. So it really kind of hindered us. I have to say out of twenty things if I can do fifteen - what are the important ones to do? But luckily I had somebody help me. But still it was hard, it was hard on them, because I couldn't spend the time giving them the guidance that I needed to give."

At the museum, the idea was a good one – bugs, insects, etc. But the team started disagreeing about what aspect of that subject matter was important. Scientists wanted to take a very clinical view. Others disagreed. What ended up taking precedent over all was the front-end analysis, the viewpoints of the audience,

and the interviews that had been taken with the visitors on the subject at the outset. When things got confused and people started to argue over what was important, Flora looked back at the audience' front-end interviews and what they thought of the subject. Even though the design was fairly detailed at that point, it was still rejected. The audience views helped the team focus like a laser on seeing the project clearly to completion.

At the university, the course being designed for the world wide web had to meet a certain criteria. It was to be taught by a prepared, photogenic, and good-natured teacher. But when the teacher became unavailable during the summer months, it caused problems for the team. Pat suggested that the support of the subject matter expert was one of the crucial components to seeing the project through and without such support the project could have died. She stated:

> "Constant communication with the Subject Matter Expert [was one of the critical components to a successful production]... technology working could be another one."

In every case examined, the project that the interviewees described was only one of the many things they were involved in at their jobs. Many managed several projects at once. Some even had a word for it, "multitasking."

The Unpredictable Process

These cases all revealed that the ISD process itself was largely unpredictable and totally dependent on the specific contexts that were all different. In every case,

the process was clearly non-linear. The cases also revealed some factors that appeared to provide stability and direction to the process. These included:

1. Visioning. The clarity of vision at the outset reduced confusion. The "project owner" conveyed a clear view of what it was the team was to create. In this way the organization could support the creation. Marie, at the business service corporation, described her job in the following way:

> "In the meantime... our technical project manager person was also building a budget for me of what she thought this would cost because when we started, our previous technical person put together a budget which was very off base, but you can't build a budget until you have a design. Even a conceptual design doesn't do it. You've got to have more of a detailed design because you can't tell how much it's going to cost until you know what you're building."

Wheatley (1992) said, "something as a clear core of values and vision, kept in motion through continuing dialogue, can lead to order." The meetings, held repeatedly over time, provided the orderly framework for the process.

2. Team Consistency. When all necessary team members were on board for the duration of the project, the process was more stable. The more individual experience team members possessed, the more stable the process. The more experience team members had together, the more stable the process. Unpredictability was directly related to the amount of real-world experience the individuals had. Those prepared by more real-world, on-the-job experience performed better than those who were learning from textbooks and applying their knowledge as in the university setting.

3. Passion. In each case, there were both internal and external groups identified who had ownership in the production (though not involved in its creation); these individuals cared whether or not the product was completed. Interview subjects spoke of having passion for their work -- at times when perhaps their pay wasn't their motivator, their passion was. In addition, it is clear that others, outside the team, needed to see value in the intended product.

4. Organization Factors. A supportive organization is clearly important to the success or failure of an ISD project. ISD projects are systemically related to the organization from which they received funding. Communications and relations seem to have been seamless, that is, there wasn't a struggle to get the project from one step to the next. The environment surrounding the production was like a life support system; the ISD project is an organism that takes on a life of its own within the system. The organization operates in support of the project just as the human body operates in support of the heart. Whether the administration provided a framework for creativity and supported the clear vision for the end product was extremely important in determining the process' expediency. Whether the team worked well together and trusted one another was crucial. Roles and responsibilities needed to be clearly defined.

5. Adequate Time and Resources. The amount of time the team was given needed to be ample. Marie, at the high tech manufacturing site, said projects could take from two weeks to two years to complete. She had worked on close to a

hundred ISD projects. Budget, space, available equipment, locations for shooting, and other elements of production needed to be settled clearly, quickly, and up front.

> "Some of them could be like the multimedia ["Multimedia Interactive"] to something really small like a revision to some instructor-led course and all we had to do was one new activity or something really minor. Or we design a lot of seminars that are higher level for our partners and managers that are bringing in external speakers, designing break out sessions, that kind of stuff."

With the assistance of Nud*ist software, the findings from the interviews were examined and pictures began to form that best described the process in all cases. In no way could the results have been described step-by-step. In fact, the interviewees had trouble describing things in a step-by-step manner. The graphics emerged from the findings and proved to enlighten the happenings in the actual processes.

Summary

In all cases it would have been difficult to talk about results without drawing pictures. It was impossible to explain with words alone. In the beginning, it was not known whether the results would indicate that instructional systems designers had a smooth, step-by-step, experience producing instruction or whether the results would point to a more random process. As one examines the results it appears that the process is organic and that it arises from and is indeed interconnected with the context in which it takes place. The results point toward the production process relating to its context in many ways like an organism in an ecosystem is connected with its environment. What Capra (1991) refers to as "deep ecology" is worth looking at in further detail in relation to the results of this study.

Chapter V

Conclusions, Recommendations, and Discussion

"What the aware individual knows has not yet taken shape. If you see the subtle and notice the hidden when there is no form, this is really good. A leader of wisdom and ability lays deep plans for what others do not figure on." (Boar, 1993)

In this study ISD Projects from five very different environments were investigated in detail. The intent of the study was not to generalize from this sample, but to understand these specific cases. Just as Diane Fossey went to the jungle to study gorillas, so too, it is necessary that one go into the context in which ISD takes place in order to study it. The conclusions and recommendations in this chapter are the result of intensely looking at the ISD process in five significantly different contexts.

Four major findings

1. The meetings are the most important aspect of the ISD process and therefore further study should be done on how to make the meetings more informative, effective, and powerful. It is through the meetings that the vision and direction of the team is relayed. It is from the meetings that the unpredicted occurrences come to the surface and are recognized and from this recognition come the group's ability to redirect if necessary or deal with the occurrence in whatever way found necessary. By studying meetings further it can be realized how to more

thoroughly arrive at the desired goal and do so within the specified budget and time frame.

2. "Unpredicted Happenings" are occurrences in complex ISD Projects that emerge as a result of the context (the organization or agency, players, culture, and resources available like time, money, expected product, and equipment). The ISD process is an ecological phenomenon. ISD cannot be studied outside of the context.

3. Instructional Systems Design is an "Unpredictable Process" in complex projects. The ISD process itself is directly influenced by the context and in no case studied was it linear. The most "unpredictable" aspect of instructional systems design is not found in the "happenings," but in the process itself. The process (pattern or plan) is complex. It emerges out of the context over time.

4. The ADDIE model is a simplified depiction of general ISD stages that can be anticipated, but not necessarily in any particular order. Not every instructional systems design project moves through the general stages from one to the next. Not all of them go through each stage. All complex ISD projects studied included work in three stages – Analysis, Design, and Development. Implementation and Evaluation were performed so frequently in some cases that they could hardly be called stages. To implement a product simply meant that is was used at some point. To evaluate the product meant that it was reviewed and, in every case, the work was reviewed continuously.

Question #1 – In what ways does the actual ISD process, in action, exhibit unpredicted, non-linear patterns?

Based on these complex cases studied, it was found that in no context is the ISD process linear in nature, even though traditional ISD models imply linearity. Dick and Carey (1996) and others have tried to expand their linear version of an ISD model without giving adequate attention to the influence of the context. An expansion of the model demands the inclusion of contextual elements. ISD cannot be studied in isolation. The processes are as different as the contexts are different. The commonality seems to be the fact that there is no linear relationship between the five phases. Some projects are designed while being developed and some are even developed before any design is in place. Some projects are evaluated repeatedly. And some projects, for whatever reason, are never evaluated. Some are never utilized, i.e., implemented. The most unpredictable aspect of instructional systems design is not found in the specific "happenings," but in the process itself.

Recommendation: create a fluid process model that clearly exhibits a non-linear dependency on contextual conditions wherein the five stages -- analysis, design, development, implementation, and evaluation are constantly repeated and cycled through. In addition, the model needs to represent the environment within which it all takes place; for example, at the business service corporation, Marie said there was:

> "An emphasis on building culture, we like to build a firm culture into our people, so that they all think somewhat the same and get a feel for who we are and our investment in training and what's important."

And again, at the high tech manufacturing company, Judy said:

> "Everyone takes a corporate culture class and then there are basic core classes that [high tech manufacturing] requires everybody to take within the first three months. To kind of get everybody on the same page."

As the project continues toward completion, what holds the team together is the meetings in which the vision and purpose of the project, indeed, at times, the mission and culture of the company, are reiterated.

Meetings, as stated in chapter four, provide a time to go over formative evaluation materials, to clarify the vision or purpose of the product, and to clarify the process. Meetings are crucial time to pull the team together and propel the project toward its final destination. They provide a time for the team to plan for known circumstances and to talk about the unpredicted happenings that may have resulted since the previous meeting. Meetings help the team move the product through the stages, talk about the next phase of the process, and provide a form of structure as the product heads towards completion.

Question #2 - What common happenings are not predicted by the ADDIE process model?

The ADDIE process model is flawed in that it does not show the whole picture. As Csikszentmihalyi wrote (1990), "when knowledge within separate domains is pursued without understanding how its applications affect the whole, it unleashes forces that can be enormously destructive." Until now, instructional

systems design has been pursuing knowledge without understanding how it applies to the whole.

For a model to be accurate it must "pull back" far enough to reveal a "macro-process" that includes aspects of project management like: developing the ISD team, researching the competition, developing the planning and communication tools, defining and negotiating team roles and responsibilities, establishing work review teams (persons), and marketing the products. All of these tasks were present in the five case studies and had enormous influence on the process itself.

Recommendation: the instructional design team is part of the picture, rather than outside the picture. Represented by the core, the meetings serve to pull the team together and keep them together throughout the process. Specific recommendations for how to conduct meetings and make them extremely effective are recommended. The ISD model by way of that central core includes elements of project management.

In addition, project management needs to be addressed when teaching ISD. Indeed, it should be a major part of the familiar preparation of the instructional systems designer. Project management should focus on factors that bring stability to the project in non-linear ways.

Reigeluth and Merrill touched on this in 1979 when they identified three major categories of instructional variables as part of instructional design theory: organizational strategies, delivery strategies, and management strategies. Kemp confused project management as a layer in his model in 1994 when he placed it with

elements of summative evaluation, planning in general, and support services. A closer examination of project management discloses entire textbooks that have been written on that subject alone. However, as has been stated elsewhere in this study, one "learns the rules of the game by playing the game, not by studying a rulebook" (Willis, 1995). Therefore, project management needs to be included in the internships and real-world experiences that instructional systems designers get as they are trained in ISD.

Question #3: What kinds of contextual happenings emerged to disturb the process?

Disturbances in the context that have the greatest effect on complex ISD processes included team turnover, budget and space changes, change of audience, and purpose changes. Some were significant enough to result in scrapping the entire project and starting over. None of these happenings were anticipated, but emerged out of the context unexpectedly.

Recommendation: It is easy for instructional designers to become so focused on completing a project that they fail to monitor what is happening in the larger context. This has potential to cause delays or, in some cases, cause the project to be scrapped entirely. This potential for major shifts in planning should be accommodated in all ISD models. Furthermore, ISD cannot be taught effectively to novices as a process in isolation because too much is dependent on the organizational environment.

If students in training are to know how instructional projects develop, they need to be taught in the context of an environment. Accordingly, educational programs should include field trips, internships, job shadows, and experiential learning. Students will not learn about the complexity of instructional systems design from textbooks. Perhaps this can best be envisioned through what we already know about living systems. The cell is a group of tissues functioning together for specific purposes (see Figure 5.1) within the environment around it. The cell nucleus is the largest organelle that contains the DNA, which in turn directs all cell activities (Memmler & Wood, 1983), just as a project manager in an organization directs the activities of the project. At the nucleus of the organization is the project as it progresses toward completion. It is the focal point leader from which all energy for the successful completion of the project emanate; it is coordinated and driven by the meetings that are held by the project manager/ISD team.

Teachers and students of instructional systems design must teach and learn within the real-world context or environment. All meaningful knowledge is contextual knowledge.

> "The properties of the parts are not intrinsic properties but can be understood only within the context of the larger whole. Thus systems thinking is "contextual" thinking; and since explaining things in terms of their context means explaining them in terms of their environment, we can also say that all systems thinking is environmental thinking." (Capra, 1996).

ISD is a system, and like any other system, it is an ecological process totally dependent upon environmental factors. To understand the part (ISD) is to understand the whole – its framework and context. The process itself is totally interdependent with the environment. This is the true meaning of "systems."

Training, for ISD practitioners, needs to prepare minds for anything in the real-world context. As Capra said (Capra & Steindl-Rast, 1991), "When you look at ecosystems, you see that everywhere, you have symbiotic relationships, you have a continual interchange of matter, cyclical pathways, and so on. What you observe then is that the ecosystem tends and keeps itself." The project manager/lead instructional designer, as the keeper of the project, needs to allow, even plan for, unpredicted events to occur. Unpredicted happenings are reflected in the budget, in the Gantt charts and schedules, and in the design.

Question #4: If the ISD process cannot be predicted, what events or conditions provide stability and direction?

This study determined that a shared vision of the product up front, consistency in team membership, passion for the work, and a supportive organizational culture are essential for stability and a sense of direction in ISD projects.

Recommendation: Understanding the entire nature of the environment and context are important also. The environment includes dichotomies – the haphazard and the stable. Stability becomes as important as the openness to change. Order is

as necessary as freedom and tradition. Knowledge of a company's culture is as crucial as are its innovations.

Question #5: What might an ISD model look like that reflects emerging factors?

When describing ISD there needs to be a model that is contextual, iterative and non-linear, in which unpredicted happenings are addressed. The organism in the environment is equal to the creation of the product within the organizational framework. The on-going production moves and lives and breathes like an organism within the context or environment of the workplace.

Recommendation: The model would be three-dimensional, moving; in the center would be the meetings held continually, at least weekly, throughout the process.

Jung, in his studies of synchronicity, hinted at an underlying order to the nature of things, which later, in studying Jung's work Peat (1987) wrote, "the universe springs from a creative source whose primary action is one of unconditioned perception in the void which gives rise... [to] their ever-changing context." If every system is part of the context within which it abounds, then how can one teach without that framework? The instruction would need to reflect change, different types of planning processes, different product descriptions, and different types of implementation would result. Additionally, the new model would reflect the affective domain of the patience a project manager must possess, the flexibility, and the trust and feelings that go on between and among team members.

The affective domain is currently missing from the training that the instructional systems designers are receiving. Rather than teaching people to work harder and faster, emphasis needs to be placed on working smarter. If one tries to "maximize any single variable instead of optimizing it, this will invariably lead to the destruction of the system as a whole" (Capra, 1996). A diverse ecological community is a resilient community (Capra, 1996). In teaching and learning styles, this translates into training students about different relationships and many different approaches to the same problem. Anxiety, crises, regressions, and transformations are all expected parts of the process one goes through – they should not be avoided!

In the center of the model in Figure 5-1 is a black block which indicates the meetings. At each meeting, the project manager/lead instructional systems designer, brings the team together for a number of purposes, the main one being to continue the ball rolling toward its destination – completion of the project.

Each tube, or strand, is of a different color, and there are five colors, representing A-D-D-I-E. As each team member goes through iterations of ADDIE, they enter the meetings and get briefed on the culture and vision of the project. The three dimensional model, emerging out of its two-dimensional predecessor is based on the two-dimensional photograph and may help in conceptualizing the actual process.

The moving, three-dimensional model is impossible to view on paper but the prototype can be seen on the accompanying CD-Rom. This 3-D model of Instructional Systems Design moves and looks similar to an atom, the protons and

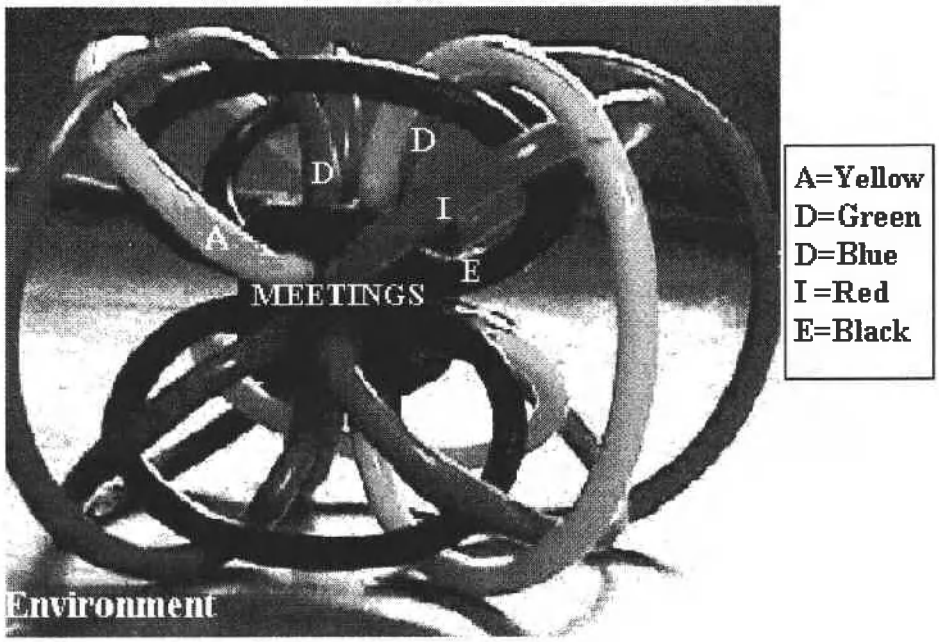


Figure 5-1 Beal-Stiehl Ecological Model of Instructional Design.

neutrons flying in and out of the nucleus – the only place where they all come together is the inner core – the meetings. It was in the meetings that the project manager/ISD person was able to bring stability to the project. In addition, the meetings proved to be a method of moving the project along. The model includes the organism, the project, and its environment, the organization. The environment is depicted, in the models, as the background or situation within which the organism exists. The entire system (model and background) is an open one and open systems are partners with their environment. Wheatley (1992) wrote that, "systems possess innate properties to reconfigure themselves to adjust to new information, this equilibrium is a necessary state or condition of a system's growth."

Each process is represented by a color (of the A-D-D-I-E model) in the Beal-Stiehl Ecological Model. Each of those colors moves in a circle that travels through the core. Each person, or team member, can be in any one of the stages at any one time -- traveling along the stage – or several can be in the same stage. Team members travel into the meeting, or core, at which focus and guidance are obtained.

As Judy said at the high tech manufacturing site:

> "If you waited to get done with one part before you did the next one, you'd never get started. You'd be thinking I still have more analysis to do over and over and over again. I can't do anything else until analysis is done. But you could [have it be done] yet that would totally end your project. I think that you have to constantly go through the thing of saying okay – I'll do these five steps, and then we'll come back, and then we'll come back, and then we'll come back. You know, over and over, and it just continuously cycles through the whole thing."

Each team member is dependent upon the others. The success or failure of the entire project is contingent upon the success of each team member. They are inter-dependent. Wheatley (1992) stated that, "a self-organizing system has the freedom to grow and evolve... guided only by one rule: it must remain consistent with itself and its past." The project is a three-dimensional, moving, living organism, contained within the environment or context and the team is the entity that keeps it running. The more experience the team has results in a process that is a little less unpredictable. The entire organism/project then goes rolling along toward completion. It is a system.

Butz (1997) wrote that systems must not be too open or else they would lose their coherence. That is, systems would lose their characters that make them identifiable wholes. On the other hand, "a system that is too closed will be cut off from sources of energy and may eventually die." Thus there is a need for the boundary to exist. The boundary is the mission and culture of the company within which the project is being produced.

The boundary within which ISDers work is semi-permeable because the instructional design process needs to be open and fluid. Being open to the environment differentiates human existence from that of an automaton. If ISD were "easy," it could and would be done by machines; though many are attempting to create instruction with interactive computer systems, there is still nothing like the real thing, a person.

We have treated organizations like machines, acting as though they were dead when all this time they have been living, open systems capable of self renewal (Wheatley, 1992). When unpredicted happenings occur one might say, "Boy that really threw a wrench in the machinery." However, if the process is not a machine, but a fluid organism, then when a wrench is tossed at it, it may make a gurgle, not a crash.

Discussion: Ecological ISD

As the ISD project is perceived as an organism in itself, it is also perceived as an ecological one, dependent upon the environment within which it exists.

Organism and organization both have the same root, "organ" which are the parts organized to perform a particular function. It is a means of action or an instrument. The process itself is an organism existing within the organization or environment. With this in mind, a closer examination of the organism's components, it's relationships, and the environment itself may be helpful.

If the process were better understood, the administration, customers, clients and others, would not be asking for the product to be made faster, cheaper, and more quickly. They would instead be asking questions that provided them with a clearer picture of what goes on in a production and better reflected the process. Compensation might better reflect the work of ISD teams as a result. They could stop requiring products to be more "efficient, effective and appealing" (Dick, 1997; Merrill, et al, 1996) and instead judge them within a more realistic context. A different perception and even respect for the process would result such that others appreciated the quality in the finished product and the time it took to produce it.

> "In a corporate setting, it is more the environment that is fluent, because it presents employees throughout the company with thousands of new possibilities every day... Creativity does not happen magically when people are taken out of their workplace and a procedure is invoked to set up a special environment where creativity might flourish. The workplace itself is alive with the unexpected; when employees interact with it, it yields provocations no one can possibly expect." (Robinson & Stern, 1997)

Steindl-Rast, in speaking with Capra (Capra & Steindl-Rast, 1991), said we "are not a moveable part of a cosmic machine but a co-creator." The instructional systems designer/project manager in keeping with this ecological analogy becomes a

keeper of the healthy cell, that is, the director of activities toward the quality design and development of the project.

The concern, according to Capra (1996) "is with the organization... it is a network of production processes, in which the function of each component is to participate in the production... [and] the entire network continually makes itself." The product reflects the wider environment; the wider environment or organization allows the product to be created.

Recommendations for Further Study

The following questions deserve further study as we approach the 21st century:

1. How can we better train our ISDers with regard to project management and the unpredicted happenings in complex design projects?
2. How can the complicated nature of the process be better communicated to sponsors?
3. How should we judge the process and the end product without using words like effective, efficient, and appealing that sound like the McDonaldization of instructional systems design?
4. Should we examine more ways to teach novices in real-world settings while overseeing their efforts?

5. How can project management focus more on factors that bring stability to projects in non-linear ways, for example through meetings that are more efficient and visionary?
6. Can the prototype model of a moving, iterative process of ID be refined and disseminated and if it were, could it be useful in instruction, practice, or communication with administration?
7. Most importantly, if meetings are as important as this research demonstrates, then how can we better conduct them in order to achieve a quality product and a smooth process?

Summary

The environment that ISDers work within responds to changes by changing itself and contains processes that are, according to Wheatley (1992), "forces in opposition – change and stability, continuity and newness, autonomy and control."

Complexity, general systems, and self-organizing theories all concern themselves with the processes of life. Development and complexity need not be feared, but instead sought out as they are the seeds of creation. Butz (1997) writes that organs do not develop independently of one another, but shape one another to a certain extent so that their later integration in the functions of the organism as a whole poses no problem.

One needs to be sensitive to the initial conditions (Butz, 1997), part of which is going to be the environment and the training of the team members. As we start to

look closely at the system, it can be seen that it is a living, breathing organism. Project managers and instructional designers, the good ones, are extremely flexible. Because they are riding a wild organism; and that organism is a production with a life of its own – headed toward completion. Wheatley (1992) wrote, "autopoiesis then, points to a different universe. Not the fragile fragmented world we attempt to hold together, but a universe rich in processes that support growth and coherence, individuality and community." Autopoiesis points to the fact that one cannot just deal with components, but also must take into account relationships and context.

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APPENDIX

APPENDIX
INTERVIEW GUIDE

Date: ___/___/___ Start Time: _____ End Time: _____

Interviewee: _____ Location: _____

Project: _____ Position: _____

Project Start: _____ Completed: _____ Phone # _____

Basic Information about respondent:

How long have you been at _____, in your current position _____?

Introduction

2-3 minutes - My credibility, background, Ed/Prof.
My motives and intentions, purpose of the study - preparing future ID's
What I want from them - their perceptions - "story" of a particular project and the process
What this isn't - product or personnel evaluation
Confidentiality and use of codes and pseudonyms
Their opportunity to react and provide feedback
Logistics issues - initial time and subsequent interviews
Check for signed consent forms _____
Questions???

Preliminary Data - Common for projects to be done in stages. Use model/graphic: ID's have models for the way we manage projects, the ISD process - going from beginning to end.

The study: We will begin by focusing on one project from start to finish, first, and then examine any patterns, you may see across multiple projects within your career.

0. Training

0.1 Where were you trained? What does an ISD person do in your view.

0.2 Describe your career as an ISD person - when did it start and where/how did it evolve?

1. Involvement in Project:

1.1. What prior involvement have you had in instructional projects?
how many? what kind? topics?

1.2 Will you tell me your "story" (perception) of a _____ project which you were involved in from its conception to its implementation?
general idea and purpose? was it a smooth process?
how did it originate? what were the steps involved?
how did you begin - next steps?

1.3 What were the steps to your involvement?
how did you prepare? collect information/sources?

2. Roles and Responsibilities

2.1 Describe those who worked on the project? What roles were involved?
were roles clearly defined?

2.2 What was your role and responsibility?
how were these determined - by whom?

2.3 Tell me about who was on the team at the beginning and at the end of the project?
Did the team remain constant? People change? Roles change? When, and how often?

3. The Plan

3.1 Was there time spent "up front" working out the process you would go through?
was it decided as a team or were you on your own?
did the roles/expectations change at all as the project moved along?

3.2 What process did/do you go through in planning the project and laying it out prior to beginning actual "work" on the production of it?

3.3 Was the "plan" decided by all or given to the team.
was the plan clearly understood and all committed to the same goal?
step-by-step
linear? general? broad? free-flowing? allow for change/fluidity?

3.4 What did you believe to be the strategy for completion of the project?
schedule? All laid out in beginning? Unveiled along the way?

3.5 What ISD model or model modification was used on this project?
use model graphic - Was this model used on other projects?
are you familiar with the Dick and Carey model of ISD? In what way does your work on this production reflect the use of that or similar ISD model?
what process was used, and did it parallel an existing ISD model?
was the process documented, and mapped out, may I get a copy for my data?
was there a need to "stick to the plan" if something unexpected came up?

3.6 Were you able to stick to the plan or did the plan change and you had to make allowances for things? What things did you have to make allowances for?
3.7 What happened that was unexpected, unplanned and/or uncontrolled? at what stage did it occur?
3.8 What were the characteristics of the unpredicted occurrence - how did you deal with it?
3.10 Were you able to finish on-time and on-budget. what factors contributed to this happening?
3.11 Tell me about the things that happened to change the project plan/schedule? goals? budget? availability of case subject? changes to project team?
3.12 When an unplanned event happened did you change the plan from that point on to end - or deal with the problem/unexpected and continue with plan?
3.12 What, in your view, was critical in order to make the production come off smoothly?
3.13 What was the end product like? was there room for people's creativity, was it appropriate, or was the product expected to be more regimented/textbook fashion?

4. The steps
4.1 Did you write learning objectives?
4.2 Was a needs assessment conducted?
4.3 How did you select instructional strategies?
4.4 How did you select the instructional delivery/media? How was it determined that the need could be solved by this training/education project in specific? If it was a CAI/video/written/delivered live - how was it determined that would be the best choice for delivery?
4.4 Was a task analysis conducted?
4.5 How did you assess the trainee's/learner's entry level skills and characteristics?
4.6 How were learning objectives established?
4.7 How did you identify the types of learning outcomes that were desired?
4.8 How were test items developed?
4.9 Did you conduct ISD "reviews" (like peer/student/trainer/learner reviews) during instructional development?
4.10 Did you conduct SME reviews during development?
4.11 Did you conduct individual (one-to-one) trails (or formative evaluation) of the instruction before it was called "complete"?
4.12 Did you conduct small group trials of the instruction before completion?
4.13 Did you pilot test the instruction before completion?
4.14 How did you conduct a follow-up evaluation after the training?

4.15 How did you evaluate whether an update or revision will/would be needed? If it was determined that update/revision was needed - how was it done/carried out?
4.16 How did you conduct evaluations to determine the possible training system deterioration?

5. Context
5.1 Was the project contingent or dependent upon the environment within which it was produced or was it fairly self-sufficient in its operation?
Were a budget and conditions fixed or could they change depending on the context - what did the organization within which the project was produced look like?
5.2 What effect did the environment/context have upon the plan? If the context changed, did the plan have to change?
5.3 What events or conditions could have or did disturb the planning process?
5.4 How was the project supervised?
5.5 What was the morale of the workers on the project? Was it a team?
5.6 How did you follow up on critical stages/incidents?
5.7 How did the organization/context support/not-support the appearance of the unpredicted occurrence?
5.8 Was there a mentor/champion on this project - how important was this person to you?
5.9 Were you allowed to be "creative" in the project, and if so what factors supported your creativity and allowed it to emerge?
5.10 What would you do differently if you were involved in this process in the future? more flexible? more aware of problems? challenge to organizational procedures?

6. Wrapping it up
6.1 Were there any difficulties as the project went along?
6.2 Were there any calls for celebration?
6.3 How was the project concluded?

7. The Projects
7.1 How was work coordinated? How often?
Formally? Informally?
7.4 Was the project collaborative or was leadership established and stuck to? Did this ever seem "haphazard"?
7.5 How was the team involved in decision-making, problem-solving? process used? how is this different than the way you make decisions on your own when not part of a team?

7.6 How did creativity express itself? In the atmosphere/climate, in the ways of communicating, in the ideas people had? What type of people expressed creative ideas - what did they have in common?
What factors allowed creativity to emerge?
context/environment? "safe" communal environment? people?
team/independence?

7.7 As you look back at the projects you've worked on are there similarities in the way they progressed? Patterns of similarity? Differences?

7.8 What, in your view, allowed the projects to proceed "as planned" and what factors contributed to unpredictable acts? Was the random, less planned environment necessarily detrimental?

7.9 Can you think of times when you worked on projects that were free flowing and that environment or process was actually advantageous? Why was it beneficial?

On a 1-5 scale, 5 being high and 1 being low:

How would your rate the instructional product?

1 2 3 4 5

How would you rate the process?

1 2 3 4 5

What do you think the overall feeling of the team was about the process?

1 2 3 4 5

What else should I have asked to get a complete sense of this project and the way it proceeded from start to finish?

CLOSING

Available materials to help me better understand the process? Memos, scripts, plans, etc.

Additional meetings or phone calls or people to interview.

Thank you!

POST INTERVIEW NOTES

Examples	Lo			Hi	Specific
	1	2	3	4	5
Interviewee:					
Self-Introduction					
Body language					
Eye contact					
Listening					
Detraction of my note-taking/ audio recording					
Knowledge of organization					
Knowledge of situation					
Interviewer:					
Self introduction					
Questioning techniques:					
general to specific					
open-ended					
Listening techniques:					
lean forward/interested					
uh-huh					
I know what you mean					