Identification of Academic Program Strengths and Weaknesses through Use of a Prototype Systematic Tool

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Dissertation submitted to faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

in

Curriculum and Instruction

(Instructional Design and Technology)

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March 28, 2007

Blacksburg, VA

Keywords: program evaluation, developmental research, database driven web-based tool, instructional design and development, and accreditation tool
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(ABSTRACT)

Because of the rapid development of the use of computers in education, as well as the introduction of the World Wide Web (WWW), a growing number of web-based educational applications/tools have been developed and implemented to help both educators and administrators in the field of education. In order to assist program directors and faculty members in determining whether or not there is a gap between the current situation of the program and the desired situation of the program and whether or not program objectives meet accreditation standards, there is a need for a tool that works effectively and efficiently. However, literature review showed that there is no automated tool specifically used for determining strengths and weaknesses of an academic program, and there is a lack of research in this area.

In Chapter 1, the author’s intent is to discuss the purpose behind this developmental research and to provide a literature review that serves as the basis for the design of such an automated tool. This review investigates the following issues: objectives related to programs and courses, taxonomies of educational objectives, curriculum evaluation, accreditation and standards, automated tools, and a brief collaborative create-adapt-generalize model. Chapter 2 discusses the design and development of the automated tool as well as methodology focusing on the instructional design model and its steps. Chapter 3 presents the results of the expert review process and possible solutions for the problems identified during the expert review process. Also the Appendices include the documentation used during the expert review process.
DEDICATION

I dedicate this dissertation to my wife, Meral, my daughters, Munise Zulal and Semiha Nihal, and my parents.
ACKNOWLEDGMENTS

I would like to thank Dr. Lockee for her support during my Ph.D. education. She is a great advisor and she has always some time to answers my questions. I would also like to thank the rest of the members of my committee, Dr. Potter, Dr. Burton, and Dr. Ogle for their guidance and support in completing this dissertation. Words are not sufficient to express my thanks to Dr. Potter for his constant support, guidance, and care during not only my dissertation study but also my ITMA experience. I would also like to thank to Dr. Mike Moore because taking his class and his guidance accelerated my decision process to identify the dissertation topic.

I would like to acknowledge my expert reviewers, Dr. Muzaffer (Muzzo) Uysal and Dr. Todd Ogle for their comments and suggestions. Their comments and suggestions helped me a lot to determine the next development steps.
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CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW

Introduction

According to Royse and Thyer (1996), an academic program is an organized collection of activities designed to reach certain objectives. In academia, every academic program has certain objectives, which help us to focus our attention and our efforts; they indicate what we want to accomplish (Anderson & Krathwohl, 2001). These objectives can be divided into two areas – program objectives and desired outcomes.

First, program objectives are the highest-level goals of the program (Accreditation Board for Engineering and Technology, 1998). They are written to inform students, prospective employers, and the public-at-large of the nature of the program and are published in appropriate university, college, and department publications. Program objectives are reviewed for consistency with the university, college, and department strategic plans, as well as appropriate accreditation criteria.

In addition to program objectives, the second important objective area for academic programs is desired outcomes (Accreditation Board for Engineering and Technology, 1998). There is an important distinction between program objectives and desired outcomes. While program objectives are the top-level goals advertised to the public, desired outcomes are measurable skills and attributes that, if acquired, help ensure that program objectives are being met.

Annually updated desired outcomes are established by the faculty with input from the constituency groups including students, alumni, and employers. The outcomes are based on program objectives, standards by accreditation and professional associations, desires of the program constituencies, and the university, college, and department strategic plans.
In order to determine program strengths and weaknesses, a program evaluator needs to determine if the programs are meeting their stated objectives or not. Specifically, the proof of student outcomes has become an important part of program evaluation, which can be employed for accreditation.

So far, many automated tools have been developed for grading, curriculum design and development, and assessment with different target audiences. These automated tools have been given different labels, such as expert systems, computerized systems, electronic portfolio tools, and assessment management systems (Nieveen, 1994).

However, there is no automated tool that uses a systematic approach to provide opportunities for students, faculty, and administrators to use the same tool to get the job done. This tool would help program directors and faculty members in determining whether or not there is a gap between the current situation of the program and the desired situation of the program. It would reveal to what degree the program is ready for accreditation, and how many of the mission, goals, educational objectives, curriculum, and student learning outcomes of the program have already been met. Also, the tool would indicate whether accrediting, professional, and academic standards have been applied to the program holistically or not. Thus, program strengths and weaknesses could be detected by such an automated tool. At the same time, the automated tool would offer some predetermined formats and templates that would help students and faculty when they create syllabus and objectives aligned with appropriate standards.

This study is a developmental research and a prototype systematic tool has been designed, developed, and evaluated to identify academic program strengths and weaknesses. In this dissertation, a prototype systematic tool, an automated tool, an automated accreditation tool, and the tool will be interchangeably used. Also, the type of
automation will be defined in the literature review in this chapter and what type of automated tool is intended in this study will be explained in the Chapter 2.

Literature Review

Objectives

In daily life, objectives help us to use our efforts and attention in a predetermined direction; they point out what we want to achieve at the end of any action (Anderson & Krathwohl, 2001). Particularly in education, objectives are used as a statement that specifies what students will learn, and they are “explicit formulations of the ways in which students are expected to be changed by the educative process” (Bloom, et al., 1956, p. 26). Also, in order to determine whether academic programs are successful or not, we have to have the goals of academic programs, courses, and curricula (Diamond, 1989). In order for students to reach these goals, educators must describe what students are expected to be able to do at the completion of instructional process. Objectives can be considered the facilitators of a sound curriculum, and if they are not being used, we would have irrelevant or ineffective instruction (Kibler et al., 1981). According to Ornstein and Hunkins (1988), “within the context of educational aims and goals, it is necessary to formulate objectives that will indicate in more specific terms the outcomes of the curriculum or project being considered” (p.150).

In the context of education, there is no consensus in using the terminology of philosophies, objectives, aims, and goals; these terms need to be clearly separated to understand how they proceed “from the very general-couched in a long-term framework-to the more specific-couched in a short-term time sequence” (Ornstein & Hunkins, 1988, p.150). The relationship among aims, goals, and objectives is illustrated as follows starting with philosophy:
Also, according to Rouillard (1993), the relationship between missions, goals and objectives can be visually demonstrated in the following figures:

*Figure 1. Goals and objectives pyramids. From Rouillard (1993, p. 18).*

While goals can be defined as “particular and measurable accomplishments” that we are going to achieve, missions can be defined as “a wide-ranging intention and described as a general statement” (Rouillard, 1993, p.18).

In the 1920s, objectives were variously called aims, purposes, goals, or guiding outcomes (Bobbitt, 1918), and now they are seen as content standards or curriculum standards (Kendall & Marzano, 1996). Specifically, an objective can be defined as “a written, active and operational subdivision (sometimes referred to as a specific objective) of a production goal. It must be well defined and, above all, measurable in its accomplishment. An objective should be specific respective to what is to be done, who is to do it, when is it to be completed, how it is to be evaluated and by what measure” (McLeod & Atwell, 1992, p.35).
Objectives also can be defined as statements that “enable curriculum decision makers – curriculum developers, teachers, and even students and members of a general public – to identify the particular intent of a particular action” (Ornstein & Hunkins, 1988, p.151).

For years, many well-known scholars have employed a wide variety of definitions of objectives. For example, Hilda Taba (1962) pointed out that there are two kinds of objectives; while one type describes school-wide outcomes, the other is more specific and is used to show what kinds of behaviors should be achieved by students in a specific unit, course, or grade-level program. More specifically, when school-wide objectives can be classified as curriculum goals, the more specific objectives can be classified as curriculum objectives (Zais, 1976). The more specific objectives defined by Taba could be seen as equivalent to what Baker (1973) calls instructional objectives (1973). Robert Mager (1962) has a very important role in educational research through using the term behavioral objective to emphasize that it is “a description of what students will be able to do at the end of a unit of instruction” (Dick et. al, 2001, p. 25). Mager’s work about writing objectives has “become the bible for writing objectives” (Lockee, et al., 2004, p. 548). Bruce Tuckman (1985) pointed out that objectives need to be called performance objectives and they require some skills and knowledge to be achieved. Although some educators have a strong objection to use behavioral objective, in the literature the terms performance objective, learning objective, instructional objective and behavioral objective are used synonymously (Dick et. al, 2001). Also, in the literature, huge numbers of studies have considered objectives in instruction in terms of behavioral rather than cognitive objectives.

In order to understand performance objectives more clearly, it should be known that there are two types: the terminal, or subordinate, objective and the enabling, or
supportive, objective (Dick et. al, 2001; Finch & Crunkilton, 1999). While terminal objectives describe what performance students should be able to accomplish at the end of the instruction, enabling objectives describe the skills and knowledge that students should have in order to achieve the terminal objective.

Krathwohl and Payne (1971) clearly described the general domain of objectives on three levels: global, educational, and instructional guidance objectives. The last one is commonly known as instructional objectives. Global objectives can be described as “complex, multifaceted learning outcomes that require substantial time and instruction to accomplish” (Anderson & Krathwohl, 2001, p.15). Program goals can be considered global objectives, are defined with general terms, and include a big number of specific objectives. In order for educators to use global objectives in their own settings, educational objectives must be translated to more focused and measurable forms (Anderson & Krathwohl, 2001).

Since the publication of Bloom’s taxonomy, educational trends have required more specific objectives in curriculum (Airasian, 1994), which are now called instructional objectives whose purpose is “to focus teaching and testing on narrow, day-to-day slices of learning in fairly specific content areas” (Anderson & Krathwohl, 2001, p.16). The relations between global, educational and instructional objectives are shown in the following table:
Robert Diamond (1989) has offered another useful structure for analyzing the type or level of the objectives in educational programs. According to him, it is crucial that “an effort be made to ensure that useful statements be written, that they include all of the elements that should be addressed, and that they be measurable within the context of the course” (Diamond, 1989, p.130). Diamond (1989) has illustrated the hierarchy of objective specificity in the following figure:

Table 1. Relationship of global, educational, and instructional objectives. Diamond (1989, p. 125).

<table>
<thead>
<tr>
<th>Level of Objectives</th>
<th>Global</th>
<th>Educational</th>
<th>Instructional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope</td>
<td>Broad</td>
<td>Moderate</td>
<td>Narrow</td>
</tr>
<tr>
<td>Time Needed to Learn</td>
<td>One or more years (often many)</td>
<td>Weeks or months</td>
<td>Hours or days</td>
</tr>
<tr>
<td>Purpose/function plans</td>
<td>Provide vision Plan a multiyear Curriculum (e.g., Elementary reading)</td>
<td>Design curriculum Plan units of instruction</td>
<td>Prepare lesson Plan daily experiences, exercises</td>
</tr>
<tr>
<td>Example of Use</td>
<td>Plan a multiyear Curriculum (e.g., Elementary reading)</td>
<td>Plan daily experiences, exercises</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2. Hierarchy of objective specificity. Diamond (1989, p. 127).
When generating objectives, educators should consider three different types of
learning domains: cognitive, affective, and psychomotor (Bloom et al, 1956). There are
several well-known classifications that have organized various types of learning into
taxonomies (Ornstein & Hunkins, 1988). The best-known taxonomies can be summarized
as follows:

1) The Taxonomy of Educational Objectives, Cognitive Domain: The educational
objectives pertaining to the cognitive domain was developed by Benjamin Bloom
and his colleagues (1956). Later, Bloom's original taxonomy was revised by
Anderson and Krathwohl (2001). The revised taxonomy includes two dimensions:
the cognitive process and the knowledge dimension. The cognitive processes
consist of 6 categories with 19 sub-categories, which are similar to Bloom’s
original taxonomy. However, there are some differences with the names of
categories. The knowledge dimension is divided into four categories: factual,
conceptual, procedural, and meta-cognitive knowledge.

2) The Taxonomy of Educational Objectives, Affective Domain: The objectives
falling into the affective domain were developed by David Krathwohl and his
colleguages (1964). The major categories in the affective domain are receiving,
responding, valuing, organizing, and characterizing by a value or value complex.

3) The Taxonomy of Educational Objectives, Psychomotor Domain: A Taxonomy of
the Psychomotor Domain was developed by Anita Harrow (1972). There are six
major categories in this domain – reflex movements, basic fundamental
movement, perception, physical activities, skilled movements, and non-discursive
communication.
In addition to these taxonomies, Gagné (1972) developed five major categories of learning. These categories are verbal information, intellectual skill, cognitive strategy, attitude, and motor skill. Gagné, Briggs, and Wager (1992) pointed out that these categories can be used to clarify objectives effectively. According to Kibler and his colleagues (1981), classifying objectives is required

1) to avoid concentrating on one or two categories to the exclusion of others;
2) to make sure that instruction is provided for prerequisite objectives before attempting to teach more complex ones; and
3) to assure that appropriate instruments are employed to evaluate desired outcomes.

Besides different learning domains, there are different formats for describing components of an objective in order to write objectives that are more accurate. Commonly acknowledged formats are the Mager format (1997), consisting of performance, conditions, criterion; the Gagné and Briggs format (1997), having five parts – situation, learned capability, object, action, and tools and other constraints; and the ABCD format, suggested by Heinich and his colleagues (2002), which stands for audience, behavior, condition, and degree. The following table, which compares these three formats, was created by Seels and Glasgow (1990).

<table>
<thead>
<tr>
<th>Components</th>
<th>Mager</th>
<th>Gagné &amp; Briggs</th>
<th>ABCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance (What will be done)</td>
<td>Performance (Doing verb)</td>
<td>Learned capability, object, and action</td>
<td>Behavior</td>
</tr>
<tr>
<td>Condition (Under what)</td>
<td>Condition</td>
<td>Situation</td>
<td>Condition</td>
</tr>
<tr>
<td>Criteria (How well)</td>
<td>Criterion</td>
<td>Tools/Constraints</td>
<td>Degree</td>
</tr>
<tr>
<td>Learner (By whom)</td>
<td>(Implied)</td>
<td>(Implied)</td>
<td>Audience</td>
</tr>
</tbody>
</table>

Table 2. Comparisons of formats. Seels & Glasgow (1990).
In each field, the use of objectives has shown different functions. According to Grounlund (2000), Dick, Carey and Carey (2001), and Duchastel and Merrill (1973), functions of objectives are

- To help design relevant instruction;
- To prevent instructional gaps or duplication;
- To provide guidelines for learning;
- To serve as a management tool for organization of learning time and experiences by students;
- To provide targets for assessment;
- To indicate to parents or supervisors what students or employees are being taught;
- To increase the accuracy of communication among instructors;
- To convey instructional intent to others;
- To act as a reinforcement tool; and
- To provide for evaluation of instruction and program.

Moreover, in the objective-based evaluation used to determine whether the objectives have been attained, some objectives can provide an advance organizer (Stufflebeam & Webster, 1983).

However, there are some objections to using objectives. Opponents argue that objectives require a lot of time, emphasize formal and trivial aspects as opposed to substantive and important aspects of instruction, and alienate students from intellectual activity (Popham, 1975; Scriven, 1972). Furthermore, Marra and Jonassen (1993) pointed out that representation of individual learner differences and complex knowledge structures is weak in instructional objectives.
Identification of Academic Program Strengths and Weaknesses

In terms of advantages and disadvantages of behavioral objectives, Michael Macdonald-Ross (1973) developed the following table:

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**The advantages claimed for behavioral objectives**

- They form the basis of the only well-worked out method of rational planning in education.
- They encourage educators to think and plan in detailed, specific terms.
- They encourage educators to make explicit previously concealed values.
- They provide a rational basis for evaluation.
- They prescribe the choice of instructional means.
- They form the basis of a self-improving system.
- The system eventually achieves internal consistency.
- The system eventually realizes in practice the aims set in theory.
- Objectives serve as a medium of communication.
- Objectives can be made the basis for individualized instruction.

---

**The objections to behavioral objectives**

- No consistent view exists as the origin of objectives.
- Defining objectives before the event conflicts with voyages of exploration.
- Advocates do not show how teachers can use objectives to guide unpredicted classroom events.
- There are an extremely large number of paths through any body of knowledge, thus reducing the effectiveness of objectives in design.
- In some disciplines, criteria can only be applied after the event.
- Objectives do not prescribe the validity of test items.
- Objectives are inherently ambiguous.
- Trivial objectives are the easiest to operationalize, and this is a problem.
- Weak prescriptions lead to cycling. This can be costly.

---

*Table 3. Advantages of, objections to behavioral objectives. From Davies (1976, p.77).*

**Taxonomy**

There are many terms, such as ontology, thesaurus, index, catalogue and classification, that are used interchangeably with taxonomy. However, according to Bloom et al (1956), “they are not interchangeable” (p.17). On the other hand, classification is seen as the taxonomic science in which certain structural rules are used to
establish a system of attributes or categories (Travers, 1980). Graef (2001) defines

taxonomies as structures that provide a way of classifying things into a series of

hierarchical groups in order to easily identify, study, or locate them. So far, taxonomies

have been used to define and explain such disparate concepts as plants, animals,

algorithmic processes, and educational objectives (Honey & Paxman, 1986; Trigari,

2003). This forms of taxonomizing has been long developed, for example in the works of

Aristotle, Linnaeus, Lavoisier, and Darwin (Conway & Sligar, 2002).

Today, the term *taxonomy* is widely used in discussions about organizing

knowledge or information in an electronic form. In this sense, Corcoran (2002)

emphasizes that taxonomy is “a form of categorization that is a hierarchically ordered,

systematic list of the subject matter of data, information, and knowledge organized by

keyword or term” (p.76). For example, in the field of web production, taxonomies have

been used in “creating metadata, or common words to describe an object, for information

retrieval categories supporting browse navigation, schemas governing Web page layout

and structure, and data control lists used in support of data mining (searching thousands

of data records to uncover patterns and relationships contained within the activity and

history store to fulfill a reporting request).” (Conway & Sligar, 2002, p.3). In order to

assist in automating the taxonomy-building process, there are many software packages

available, such as Autonomy (Autonomy, 2005), and Semio (Entrieva, 2005).

Although in the broadest sense, a taxonomy is seen as a classification system

(Woolfolk, 1993), according to Bloom (Bloom et al, 1956), a taxonomy is not simply a

classification system. A taxonomy is more complex than simple classification and it must

be constructed so that its elements reflect some real order underlying the phenomena that

are being classified. It “must be validated by demonstrating its consistency with the
identifying theoretical views in research findings of the field it attempts to order” (Bloom et al, 1956, p.17)

The focus of taxonomies in education is primarily on evaluation and objectives. The taxonomy is a useful and effective tool in developing a framework to help “teachers, administrators, professional specialists, and research workers” discuss and deal with “curricular and evaluation problems” (Bloom et al, 1956, p.1). In the context of educational objectives, Krathwohl et al (1964) described a taxonomy in the following way:

A true taxonomy is a set of classifications which is ordered and arranged on the basis of a single principle or on the basis of a consistent set of principles. Such a true taxonomy may be tested by determining whether it is in agreement with empirical evidence and whether the way in which the classifications are ordered corresponds to a real order among the relevant phenomena. The taxonomy must also be consistent with sound theoretical views available in the field...finally, a true taxonomy should be of value in pointing to phenomena yet to be discovered. (Krathwohl, et al., 1964, p. 11).

In order to organize a huge number of objectives and to deal with the problem of vagueness, educators need such an organizing framework, for example Bloom’s taxonomy, that can increase accuracy and promote understanding (Anderson et al, 2001). Bloom’s taxonomy is the most widely acknowledged taxonomy in the field of education. It was later revised and expanded by Anderson and her colleagues in terms of structures of cognitive and knowledge domains (Anderson et al, 2001).

Bloom’s taxonomy describes three primary domains for educational objectives, beginning with outlining the cognitive domain in six categories, almost all with
Identification of Academic Program Strengths and Weaknesses

Bloom’s group never completed the taxonomies of the other two domains – affective and psychomotor, though others have carried on their work. However, Bloom’s six categories in the cognitive domain are knowledge, comprehension, application, analysis, synthesis, and evaluation. These categories are arranged in a cumulative hierarchical framework with achievement of the next, more complex, skill or ability requiring achievement of the prior ones (Bloom et al, 1956).

Anderson and Krathwohl’s (2001) revised taxonomy is in a two-dimensional framework: knowledge domain and cognitive processes. The first dimension consisting of factual, conceptual, procedural, and meta-cognitive knowledge looks like the subcategories of the original knowledge category. The second dimension resembles the six categories of the original taxonomy with Bloom’s knowledge category named remember, the comprehension category named understand, the synthesis category renamed create and made the top category, and the remaining categories changed to their verb forms: apply, analyze, and evaluate. They are arranged in a hierarchical structure, but not as rigidly as in the original taxonomy (Anderson et al, 2001; Krathwohl, 2002).

According to Anderson and her colleagues (2001), the combination of the knowledge and cognitive process dimensions provides a very useful table called the taxonomy table. In order to classify objectives, activities, and assessments, the table provides a clear, concise, and visual representation of a particular course or unit (Krathwohl, 2002).

The second taxonomy that Krathwohl and his colleagues (1964) developed was related to the affective domain, which was the second major domain that Bloom et al (1956) described. This taxonomy consisted of five categories: receiving, responding, valuing, organization, and characterization.
To cover the third area identified by Bloom and his colleagues, several taxonomies focus on the psychomotor domain. Harrow’s taxonomy (1972) has six categories – reflex movements, basic fundamental movement, perceptions, physical activities, skilled movements, and non-discursive communication. Other well-known taxonomies were developed by Simpson (1972) and Dave (1970). While Simpson’s taxonomy has seven categories – perception, set, guided response, mechanism, complex overt response, adaptation, and origination – there are seven major categories in Dave’s taxonomy: imitation, manipulation, precision, articulation, and naturalization.

The main purpose in developing a taxonomy of educational objectives is to facilitate communication among examiners by providing an organizational structure (Bloom et al, 1956). In order to have a widely accepted taxonomy, taxonomy developers should select appropriate symbols, have precise and usable definitions, and secure consensus of the group that is to use them (Bloom et al, 1956).

Bloom’s taxonomy focuses mainly on student behavior. According to Bloom et al. (1956), “uses of the taxonomy can also help one gain a perspective on the emphasis given to certain behaviors by a particular set of educational plans” (p.2). A taxonomy is a very effective tool for translating educational objectives in terms of the behaviors that are used as criteria about whether or not the objectives have been accomplished. In this sense, Bloom states that to overcome the problem of classifying objectives which could not be observed or manipulated as directly as those in the physical and biological sciences, the group decided that virtually all educational objectives when stated in behavioral form have their counterparts in student behavior. These behaviors, then, could be observed and described, and the descriptions could be classified (1994, p.3).
Hill (1984) notes four main features of Bloom’s taxonomy that could be applied to other taxonomies: (1) the existence of classes; (2) the classes hierarchically ordered in terms of complexity; (3) a cumulative nature; and (4) a generality in the processes of the various classes.

Krathwohl (2002) discusses how Bloom believed the taxonomy is more than a measurement tool: “It could serve as a

- common language about learning goals to facilitate communication across persons, subject matter, and grade levels;
- basis for determining for a particular course or curriculum the specific meaning of broad educational goals, such as those found in the currently prevalent national, state, and local standards;
- means for determining the congruence of educational objectives, activities, and assessments in a unit, course, or curriculum; and
- panorama of the range of educational possibilities against which the limited breadth and depth of any particular educational course or curriculum could be contrasted” (p. 212).

It is crucial to identify both the content of instruction and what students should be able to do with the content, because an educational program’s objectives define the purpose of the program. However, while objectives constantly specify the content, they generally fail to specify how mastery will be demonstrated. In here, the taxonomy can be used to clarify the intent of instructional objectives, which are limited to a statement of the content to be learned or the skills which should be mastered.
Curriculum Evaluation

It is necessary to look at the historical evolution of curriculum evaluation to have a broad understanding of the differences between how curricula were seen long ago and how they are seen now. It should be noted that much of the history of evaluation has focused on education and, specifically, on the curriculum field.

In the United States at the beginning of the 20th century, for example in the work of Bobbitt (1918) and Charters (1923), evaluation concentrated on measuring student achievement. The curriculum work of these two educators was used as a basis to determine specific student-achievement objectives; evaluation focused on measuring whether these objectives were achieved. Therefore, curriculum evaluation emphasized testing and measurement methodology as a kind of product control (Bobbitt, 1924).

According to Stufflebeam and Shinkfield (1985), with the “The Eight-Year Study” of Ralph Tyler from 1933 to 1941, modern educational evaluation began. Because of that, he is regarded as the father of the modern educational evaluation (Armstrong, 1989). Tyler’s work is seen as the first major evaluation effort directed at curriculum (Giles, et all, 1942). At the end of the study, Tyler (1942) gave to evaluators seven very important recommendations, listed below:

1. Establish broad goals or objectives;
2. Classify objectives;
3. Define objectives in behavioral terms;
4. Find situations in which achievement of objectives can be shown;
5. Develop or select measurement techniques;
6. Collect student performance data; and
7. Compare data with behaviorally stated objectives.
In 1949, Tyler published his Basic Principles of Curriculum and Instruction, which has been seen as the established reference in the field of curriculum development. He wrote that “the process of evaluation begins with the objectives of the educational program” (Tyler, 1949, p.110). From 1930 to 1960, curriculum evaluation grew rapidly as the pace of social change and the complexity of educational innovations (Norris, 1998).

The launching of Sputnik in 1957 played an important role in American education system. The content of the national curriculum began to be questioned (Miller & Seller, 1985). During the 1960s, a great number of new programs were developed, but as a method of evaluation, the measurement of student achievement was used. Cronbach (1963) led the reform in the curriculum evaluation by focusing on program improvement, as well as evaluating the results of instruction.

Although curriculum evaluation has its roots in the field of educational evaluation, testing, and measurement, it grew to be an area within curriculum development (Lewy, 1977). This did not continue long; educational evaluation became an independent field, and the difference between curriculum evaluation and curriculum development became clear in terms of theory and practice. Curriculum evaluation consists of two different and complicated fields, curriculum and evaluation. It is crucial to examine both fields to understand the foundation of curriculum evaluation.

According Ornstein and Hunkins (1988), the definition of curriculum evaluation changes along with the changing definition of the curriculum. Evaluation has been defined by Worthing and Sanders (1973) as “the determination of the worth of a thing. It includes obtaining information for use in judging the worth of a program, product, procedure, or objective, or the potential utility of alternative approaches designed to
attain specified objectives.” (p.19). Daniel Stufflebeam (2000) has defined evaluation as “a systematic investigation of the merit and/or worth of a program, project, service or other object of interest.” (p.280). Basically, evaluation as a methodological activity includes gathering and combining data in relation to an established set of goals or criteria so that people make judgment about worth or merit of the thing (Scriven, 1991).

According to Kerbeshian (1986), evaluations may be seen as serving several functions: clarifying goals and objectives, determining criteria for measuring success, identifying unintended outcomes, and assessing the value of a program – ultimately, the purpose of an evaluation is to provide information for making decisions.

Curriculum evaluation as a process of determining whether or not curriculum objectives have been achieved is the best known and most frequently used form of evaluation. This is called an objectives-based evaluation model, which is Ralph Tyler’s greatest gift to the field of education. Because of this model, curriculum evaluation is seen as a description of structures of strengths and weaknesses in terms of predetermined educational objectives.

How curriculum is conceived (Alkin, 1994; Madaus & Kellaghan, 1992; Norris, 1998) and implemented (Snyder, Bolin, & Zumwalt, 1992) plays a central role for curriculum evaluation. Therefore, to look at how curriculum has been defined in the literature is necessary. Also, many educators say that there is a problem with defining the meaning of curriculum (Lewy, 1977; Madaus & Kellaghan, 1992; Wolf, 1990). In this sense, Miller and Seller (1985) say that

What do we mean when we use the word curriculum? As one would expect, the definitions offered run a spectrum. At one end, curriculum is seen merely as a course of study; at the other hand, curriculum is more
broadly defined as everything that occurs under the auspices of the school.

In the middle of the spectrum, curriculum is viewed as an interaction between students and teachers that is designed to achieve specific educational goals (p.17).

The curriculum is a list of knowledge areas, arranged systematically, in a precisely defined format that must be learned according to specific, predetermined rules (Ornstein & Hunkins, 1988). In this sense, a curriculum is a tangible entity, something we can point to, something that the teachers can implement. It is also something the evaluator can evaluate in order to determine whether its goals have been attained or not.

Mauritz Johnson (1967), defining curriculum as a series of intended learning outcomes, argues that evaluators need to reveal at the beginning just what they want their program to accomplish in order to determine how to evaluate their program.

Lewy (1977) points out that, in the curriculum field, the evaluators encounter difficulties in selecting a model because so many respected evaluators (e.g., Stake, 1967, 1975; Stufflebeam, 1983; Alkin, 1969; Scriven, 1967; and Provus, 1971) have developed valuable evaluation models or approaches. Furthermore, Jasparro (1998) states that, even though new curriculum models have been designed, curriculum evaluation still uses obsolete models and methods. Over the years, curriculum evaluators have extended curriculum subjects that consist of curriculum goals, curriculum design and implementation performances, in addition to students and their achievements.

After Tyler’s seven recommendations, which can be named “the Tylerian Evaluation Approach,” Lee J. Cronbach (1963) called for course improvement as the most important outcome of evaluation. Scriven (1967), building on Cronbach’s earlier work, introduced formative and summative evaluation. When conducting curriculum
evaluation, it is helpful to distinguish between these two types of evaluation. Formative evaluation is viewed as an ongoing evaluation to revise and improve the implementation of curriculum (Scriven, 1991; Weston, Mc Alpine, & Bordonaro, 1995). It focuses on implementation process. On the other hand, summative evaluation focuses on the outcomes or the final product to determine what has been achieved over a period of time, to summarize the progress, and to report the findings to related stakeholders (Scriven, 1991; Shambaugh & Magliaro, 1997). Also, Scriven (1967) points out that summative evaluation does not seek to determine causes; it is only focused on the overall worth of a program, whereas formative evaluation involves making judgments and attempting to determine specific causes.

To distinguish between summative and formative evaluation is not always easy. Sometimes, summative evaluation results require that a decision should be made to revise the program. In this sense, the evaluation can be considered formative in nature. Miller and Seller (1985) points out that “the basic difference between summative and formative evaluation involves how an evaluation will be conducted, what will be evaluated, and how the results will be used” (p. 299).

During the curriculum evaluation, some evaluation models are being used. One of the commonly used models is the Contingency-Congruence Model that was developed by Stake (1967). Stake (1967) points out that the purpose of the Contingency-Congruence Model is to provide framework for the development of an evaluation model. The model is designed to make sure that all the data is gathered and processed to have information relevant to the recipients. It focuses on antecedents (e.g. goals, resources, teacher preparation, student attitudes), transactions (e.g. interactions between student and teacher) and outcomes. In order to organize the information gathered and to ensure the
information is complete, matrices are used. The first box is *rationale*, which is a statement of the basic purposes of the program and its orientation. The rest of data is organized as Description and Judgment. In the Description matrix, there are two types of data: (1) intents (the purposes related to student achievement, teaching strategies, and resources), and (2) observations (records of what happens in the educational environment). The Judgment matrix consists of two categories: (1) standards (acceptable levels of achievement, understanding), which are provided from different bodies, such as accrediting agencies, and (2) judgments (statements about how the performance that is described in the observations compares to the standards). The model is best illustrated in the following figure.

![The Context-Input-Process-Product (CIPP) model](image)

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The Context-Input-Process-Product (CIPP) model is also one of the most widely-recognized evaluation models in curriculum evaluation. This model was developed by the Study Committee on Evaluation (Stufflebeam et al., 1971), which was created by the Phi Delta Kappa Research Advisory Committee. The purpose of the model is to assist in the improvement of curricula within a school system. There are four components in this
model: context evaluation, input evaluation, process evaluation, and product evaluation. Each component is associated with a specific type of curriculum decision (Miller & Seller, 1985).

The main purpose of a context evaluation is “to identify the strengths and weaknesses of some object, such as an institution, a program, a target population, or a person, and to provide direction for improvement” (Stufflebeam, 1983, p.128). Input evaluation is “to help the clients consider alternatives in the context of their needs and environmental circumstances and to evolve a plan that will work for them” (Stufflebeam, 1983, p.131). Process and product evaluations may be conducted at the same time. A process evaluation is used to determine the congruency between the planned and actual activities called by the program (Stufflebeam, 1983). On the other hand, product evaluation examines the outcomes of the program during the field tests and compares them to the expected outcomes (Stufflebeam, 1983). Criteria for this comparison are drawn from the program objectives and the information collected from context, input, and process evaluation (Stufflebeam, 2000).

Most models have distinctive conditions that would not generalize to other situations. For that reason, some evaluators prefer to use an eclectic approach to curriculum evaluation. However, it would be difficult to translate the model into practical guidelines, when using eclectic approach..

As mentioned above, summative evaluation focuses on the outcomes of a completed program or product (Scriven, 1967). It is helpful to improve the performance of the program, to determine what changes the program needs, and to determine whether learners achieve the predetermined program objectives or not (Seels & Glasgow, 1998). In this sense, Tyler’s approach (1949), and Stufflebeam model (1971) are similar to this
type of summative evaluation. On the other hand, Cronbach (1983) states that summative evaluation procedures that are used constantly become inefficient. He also adds that “established programs are comparatively immune to serious evaluation, save as proposed modifications lead to a new study of prototypes” (p.3). Cronbach (1983) sees the purposes of curriculum evaluation as both decision making and program improvement.

Eisner (1979) proposes that there are five purposes of curriculum evaluation: (1) to diagnose, (2) to revise curricula, (3) to compare, (4) to anticipate educational needs, and (5) to determine if objectives have been achieved (p.168). According to Eisner, who favors a more formative type of evaluation, curriculum evaluation serves a formative purpose. Lewy (1977) asserts that evaluation can be formative in the curriculum process:

Evaluation essentially is the provision of information for the sake of facilitating decision making at various stages of curriculum development. This information may pertain to the program as a complete entity or only to some of its components. Evaluation also implies the selection of criteria, the collection of data, and data analysis (p.30).

The following figure indicates the stages of curriculum development at which formative evaluation might occur, the parts that might be studied, and the criteria that might be used.
Both the evaluation and curriculum fields have many different definitions, approaches, and methods. For example, Stufflebeam (2000) lists 22 different approaches to evaluation. So, it can be said that there is no ideal evaluation approach.

According to Worthen (1990), there is a lack of empirical information about the effectiveness of alternative evaluation plans, techniques or evaluation components related to any model. By using scientific methods (i.e. qualitative research), collection and interpretation of data can be considered as reasonable and legitimate. Recently, some educators have begun to declare that qualitative approaches and descriptive data are as useful as quantitative approaches (Fetterman, 1988; Ornstein & Hunkins, 1998). There is a trend to use pluralistic approaches to curriculum evaluation, but there are some
difficulties involved in using them, such as finances, time, and particularly expertise (Miller & Seller, 1990).

The major approaches to evaluation are listed below:

- The **comparative approach** is used to compare different aspects of the curriculum (Eisner, 1979). To evaluate a standardized curriculum is the main focus of this approach.

- The **adversarial approach** involves evaluators taking up opposite positions regarding a curriculum (Ornstein & Hunkins, 1998).

- The **case study approach** is a better selection when the evaluators focus on the smallest details of a particular curriculum (Saez & Carreto, 1998).

- The **participatory approach** is viewed as the most effective approach. In this approach, program participants, such as practitioners/academics, learners, and volunteers, are actively involved in the evaluation process (Brandon, 1999), while experienced evaluation staff guides the participants.

In addition to these, Cronbach’s (1982) adds two other basic approaches, the **scientistic ideals approach** and the **humanistic ideals approach**, to curriculum evaluation that provide a description of or a judgment about the program being studied. The scientistic evaluation presents a description, and it usually presents statistical results of tests and comparative data and allows the reader to judge the best course of action. The humanistic approach acknowledges subjectivity in reporting results. The evaluator in this situation makes subjective judgments about what was observed.

Stake (1967) suggested that a balance of both approaches is required. Also, according to Stake (1967):
Curriculum evaluation requires collection, processing, and interpretation of data pertaining to an educational program. For a complete evaluation, two main kinds of data are collected: (1) objective descriptions of goals, environments, personnel, methods and content, and outcomes; and (2) personnel judgment as to the quality and appropriateness of those goals, environments, etc. (p.5)

While description derived from scientific activities can be used to help judge merit, findings from humanistic activities can be used to describe and judge the effectiveness of a program’s less measurable objectives and unintended outcomes (Stake, 1967).

Accreditation

In the United States, accreditation is unique; it is different from other countries that have a "Ministry of Education" or its equal that exercises direct control over the quality of educational institutions (Bogue & Saunders, 1992; Selden, 1960). Although the U.S. Department of Education does not accredit educational institutions and programs, it publishes “a list of nationally recognized accrediting agencies that the Secretary determines to be reliable authorities as to the quality of education or training provided by the institutions of higher education and the higher education programs they accredit” (U.S. Department of Education, 2004).

In order to understand exactly what accreditation is and why it is important for the field of education, and its structure in the United States, it is crucial to know how it was started, and how accreditation process has evolved over the years in the United States (Young, Chambers, & Kells, 1983). After accreditation is defined from the literature, some brief information related to its history will be given. Following that, types of accreditation, standards and some contemporary accreditation issues will be reviewed.
In general, accreditation can be defined as “the process by which an organization grants approval to an educational institution” (Floden 1991, p.261). Dill et al., (1996) state that accreditation is a voluntary non-governmental system of quality assurance. Olsen (1984) declares that, to ensure a quality program, a formal, fair, and objective accreditation system is a practical alternative. Accreditation has been defined as “a process by which an institution of postsecondary education evaluates its educational activities, in whole or in part, and seeks an independent judgment to confirm that it substantially achieves its objectives and is generally equal in quality to comparable institutions or specialized units” (Young, Chambers, & Kells, 1983, p.21). Eaton (2000), while president of the Council for Higher Education Accreditation, states that “accreditation is a process of external quality review used by higher education to scrutinize colleges, universities and higher education programs for quality assurance and quality improvement” (p.3). Accreditation is a voluntary process sought by institutions and programs and is conferred by non-governmental bodies using peer review from the region. One of six regional accrediting organizations, the Northwest Association of Schools and Colleges, describes accreditation as a process of recognizing educational institutions for performance, integrity, and quality which entitles them to the confidence of the educational community and the public. In the United States this recognition is extended largely through non-governmental, voluntary institutional or professional associations which have responsibility for establishing criteria, visiting and evaluating institutions at their requests and approving those institutions and programs which meet their criteria. (NASC, 1994, p.1)
According to Selden (1960), it is the contemporary form of control of academic standards. In this sense, accreditation is the evaluation of institutional or program in which “a set of minimal standards” is used against the performance as guidance (Bogue & Saunders, 1992).

From these several definitions, some terms are repeated as main points – quality assurance, standards, peer review, and voluntary process. On the other hand, according to Reeves (2002), accreditation was a voluntary process until the 1950s when the U.S. Congress passed legislation that prohibited students from spending federal aid funds at institutions that were not accredited. Since then, accreditation has become “a de facto requirement” (Reeves, 2002, p.12).

In the Tenth Amendment to the Constitution in 1791, education was under the responsibility of state and local government (Selden, 1960). Also, this amendment provided states more power than the federal government (Harcleroad, 1983).

Between the 1860s and 1890s, as the consequent of the Land-Grant Acts, many land grant colleges and universities were established. During the same years, the number of public secondary schools increased considerably. After the Civil War, some regional associations of colleges and secondary schools were founded to develop definitions of secondary and postsecondary institutions and standards of articulation between requirements for high school graduation and the admission to colleges within the various geographic regions represented by the associations (Bemis, 1983; Young, 1983). The New England Association of Schools and Colleges, founded in 1885, pioneered the field for regional associations of accrediting agencies.

Stufflebeam and Webster (1980) describe how the College Entrance Examination Board led the way to the accreditation of education around 1901. In 1904, the American
Medical Association founded its Council on Medical Education. In collaboration with the Carnegie Foundation, this council studied medical education, publishing the results in the Flexner Report in 1910 (Young, 1983). The Flexner Report had an important role in developing the standards for medical schools (Nevins, 1959).

The origin of accreditation at a national level was in the establishment of a plan by the National Association of State Universities for college admission standards across regions of the country because of students migration from one state to another state for education (Young, 1983). By 1909, the North Central Association of Colleges and Secondary School created standards for the accreditation of colleges in its region. Therefore, these standards can be seen as the starting step that regional accrediting associations have begun to accredit the colleges and universities. By 1913, the first accredited colleges were listed by the North Central Association of Colleges and Secondary Schools.

In 1921, the American Bar Association established standards for law schools (Cardoza, 1975). During the 1920s, specialized accreditation standards were established in some other fields, such as teacher education, nursing, business, and optometry (Young & Chambers, 1980). Similar accreditation practices took a place in the fields of architecture, chemistry and many other areas (Stufflebeam, 2001).

In 1938, the National Association of State Universities and the Association of Land-Grant Colleges and Universities founded the Joint Committee on Accrediting to give a response to the accrediting agency problems. In 1949, the National Commission on Accrediting (NCA) was established because the Joint Committee on Accrediting had failed to achieve its predetermined objectives (Selden, 1960). Following the
establishment of the NCA, many specialized accreditation bodies were created (Harceroad, 1980a).

In 1951, as an umbrella agency, The National Committee of Regional Accrediting Agencies (NCRAA) was established to reduce limited contact among regional associations (Brady, 1988). In 1964, the Federation of Regional Accrediting Commissions of Higher Education (FRACHE) was founded with an endorsement of NCA (Brady, 1988).

In 1975, as a new entity, the Council on Postsecondary Accreditation (COPA) was formed in the merging of the NCA and the FRACHE. COPA’s objectives were to recognize, coordinate, and review the work of its member accrediting bodies and to determine the appropriateness of proposed changes in accreditation activities (Brady, 1988).

In December 1993, COPA was dissolved and one month later, the Commission on Recognition of Postsecondary Accreditation (CORPA) was formed to continue the recognition of accrediting bodies. However, consensus could not be reached by the National Policy Board, an alliance among the regional accrediting associations and major higher education associations about a permanent solution for the governance of accreditation (Glidden, 1996). In 1997, the Council for Higher Education Accreditation (CHEA) was established, and it currently carries out a recognition function in the private, nongovernmental sector. The following table summarizes academic accreditation standards in the United States from the beginning to present:
Identification of Academic Program Strengths and Weaknesses


In the United States, accreditation is divided into two parts: institutional accreditation and specialized (or program) accreditation (Kells, 1988). While institutional accreditation deals with the entire institution, specialized accreditation focuses on program itself. Higher education institutions and programs are accredited by three types of accrediting organizations:

- **Regional**: The six regional accrediting agencies evaluate entire institutions, not the individual programs within them. Regional accreditation can be seen as a product of the American genius (Wolff, 1994). According to CHEA records in 2002, there are 2963 regionally accredited institutions.

- **National**: National accreditation also focuses on the entire institution. Many are single-purpose institutions like education in business and information technology, or institutions totally based on distance education. Also, faith-based institutions are under this type of accreditation.
Specialized: Specialized accreditors evaluate individual programs throughout the country. These programs are usually within an institution (that institution probably holds regional or national accreditation as a whole) and are often those leading to a professional degree. Programs in education, law, medicine, and business are among those that have specialized accreditation. Also, there are some single-purpose institutions that are accredited by specialized accrediting organizations. Glidden (1983) states that the first specialized accreditation actions taken by the American Medical Association actually predated regional accrediting activities and is believed to be the earliest use of accreditation as a means of quality improvement. It was initiated out of the concerns of a profession rather than of educational institutions. The tension thus created in various ways as specialized accreditation has grown to include well over fifty professional and disciplinary fields, subfields, or areas of study. Specialized accreditation is valuable because it not only shows how programs can be improved but also helps the institution to understand and become more committed to the proper resources and delivery requirements for quality education in special fields with unique needs.

The following table demonstrates the major characteristics of two types of accreditation in the higher education.
In order to operate, the accrediting organizations should meet the standards of the United States Department of Education (USDE) or CHEA for recognition. Being recognized by the USDE is to assure that federal student aid funds are purchasing quality courses and programs, while for CHEA, recognition is to assure and strengthen academic quality and ongoing quality improvement in courses, programs, and degrees (CHEA, 2003).

The Council for Higher Education Accreditation (CHEA) lists four major purposes of accreditation (CHEA, 2003):

1. Assuring Quality
2. Access to Federal Fund
3. Easing Transfer
4. Engendering Employer Confidence

Another purpose of accreditation is to protect against both internal and external forces (Alstete, 2004). Harclerod (1980b) points out that accreditation protects students’ rights and realization of social equity goals.

After application for accreditation or reaccreditation, the first step is an in-depth institutional or program self-evaluation conducted by the educational institution or

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<td>Organized regionally or nationally</td>
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<td>Relies on general, qualitative standards</td>
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<td>Relies heavily on institutional self-study</td>
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*Table 5. Characteristics of two types of postsecondary accreditation. From Kells (1988, p. 10)*
program itself in the light of accrediting organizations’ standards and requirements. Self-
study can be seen as the main mechanism that academic accrediting bodies use to
measure quality and to assist educational institutions in self-improvement. Also, self-
study can give opportunities for ongoing institutional research and analysis, can improve
institutional openness, and can provide staff development (Young, Chambers, & Kells,
1983). Self-study should be performed as internally motivated and supported (Jones &
Schendel, 2000). Institutions and programs should involve individuals from the
community as much as possible in this process (Bartelt & Mishler, 1996).

Usually, the self-evaluation process for regional accreditation is the responsibility
of the chief academic officer, often called the vice president for academic affairs or the
provost. In specialized accreditation reviews, this responsibility normally falls under the
school or department leader, such as a dean. Other elements of self-study to consider
include the selection of institutional members on the formal self-evaluation team, group
dynamics, report writing, and virtual team technology (Young, Chambers, & Kells,
1983).

The steps in the self-study process often consist of preparing for and designing the
self-study, organizing the study, monitoring the process, using peers, and integrating the
cycles of study and planning (Young, Chambers, & Kells, 1983). In the process, the
following information should be gathered to provide evidence of improvement: samples
of syllabi and program descriptions, evaluation materials and methods, and changes made
in instructional content, materials, and organization that improve teaching and learning as
a result of the consideration of evaluation findings (Gray, 2002).

Departments and programs undertaking an accreditation self-study focusing on
student learning must (1) define the learning goals for their students, (2) identify how
those outcomes are facilitated through the curriculum and structured learning experiences, and (3) design and implement assessment processes and methods (Hatfield, 2001). The department or program must have identified specific learning goals for their students, promoted those goals through a set of specifically designed learning activities, and made conscious decisions as to how those goals can be best measured (Kornfeld et. al., 2003).

The continuous improvement cycle should begin with clear departmental goals that identify what a student can expect to gain as a result of studying a particular field or discipline (Kornfeld et. al., 2003). Specifically, student learning outcomes cluster in three areas: cognitive outcomes, behavioral outcomes, and affective outcomes. Cognitive outcomes might include the knowledge of a certain set of historical facts, key theories, essential processes, or the accepted set of criteria used by professionals in the field to evaluate a piece of evidence. Behavioral outcomes are skill based, involving the demonstrated ability to perform a specific skill with an identified level of success. Like cognitive and behavioral outcomes, affective outcomes are developmental, demonstrating the student’s growth as a thinker in the discipline.

The accreditation self-study must address student academic achievement in the discipline (Hatfield, 2001). Therefore, departments and programs must contribute to the accreditation self-study by assessing their students’ learning at the departmental level.

The many potential benefits of accreditation and self-study at colleges, universities, and other types of institutions are often unrealized (Kells, 1994), partly because most efforts are burdensome, descriptive, mechanical efforts that are not related to the important problems and do not explore the significant achievements and opportunities that renewal through accreditation can offer (Lubinescu et. al., 2001).
study allows the institution to examine strengths and opportunities for improvement (weaknesses) using set criteria or questions designed around quality principles (Kells, 1994). Some institutions have used the self-study (also called self-evaluation) process as an important tool for change (Kells, 1988).

Although strategic planning and accreditation are treated as separate issues in the literature, the two processes share many common elements (Barker & Smith, 1998), including an examination of the college or university’s mission, goals, and operational plans to meet the goals and an assessment of how well the goals were met. It can be said that self-study and strategic planning are critical combination (Alstete, 2004).

Institutions too often overlook the link between an accreditation self-study and strategic planning and the ability of the self-study to provide feedback for updating the strategic plan and identifying new or expanded strategic issues (Alstete, 2004).

It should be noted that self-study team performance can be enhanced using e-learning systems, which have many useful features that a self-study team can use (Alstete, 2001).

The second step in the accreditation process is peer review, which is conducted by faculty and administrative peers who review the self-study and serve on visiting teams that review institutions and programs after the first step is done.

The third step would be a site visit by the accrediting organization. The organization evaluates the self-study report and then decides whether or not to send a visiting team to the educational institutions. The team members are volunteers. Also, the visiting team usually has five to fifteen members, with the number depending on the nature of the institution and its programs and the procedure of the accrediting organization.
During the visit days, team members examine data and conduct interviews to evaluate the quality and accuracy of self-study in order to ascertain whether the institution or program is in compliance with the standards of accreditation organization. In this step, the self-study is regarded as the foundation (Young, Chambers, & Kells, 1983) for proceeding. The team provides written advice to the institution or program, develops a consensus on its findings, and completes a draft report. Finally, on the last day, the team presents an oral summary in an exit report to the institution or program officials.

Finally, the last step will be judgment made by the accrediting organization. According to the report results by the visiting teams, commissions in the accrediting organizations make a judgment to either affirm accreditation for new institutions and programs or reaffirm accreditation for ongoing institutions and programs, or to refuse accreditation to institutions and programs (Eaton, 2002).

*Standards*

The history of accreditation shows that establishment of standards is the foundation of accreditation. Standards can be seen as a list, or representation, of the qualities or characteristics the objects should have (Stufflebeam, 2001). While according to Stufflebeam (2001), criterion and standards are used interchangeably, Stake (2004) says that criteria and standards are not used in the same way by evaluators. A criterion is used as a key descriptor or attribute; a standard is used as the amount of that attribute needed for a certain judgment (Stake, 2004). Standards as advance organizers should be connected to achievement of educational objectives, goals, and missions (Stufflebeam, 2001).
In the field of education, standards are widely used in terms of both accreditation and assessment. According to Horn (2004), four types of standards that are commonly used in the field include state standards, content standards, outcome or performance standards, and professional standards as well as other types of standards that are national standards, grade-level standards, functional standards, opportunity-to-learn standards, new standards, high standards, and maverick standards.

State standards apply to the educational standards independently established by each state for all public educational institutions, whether K-12 or higher education (Horn, 2004). These standards are influenced by the federal government in its attempt to promote a nationwide curricular continuity through legislation and the condition of federal funds.

Content standards are developed by professional organizations. These standards measure the content of specific subject area, and they are conceptual (Horn, 2004). On the other hand, state standards are being more factual than conceptual.

Outcome or performance standards are a transformation of content standards with the addition of performance descriptors of what students need to do demonstrate their mastery of content standards (Horn, 2004). Performance criteria are specific descriptors of what students should be able to do prove mastery. The terminology in Bloom’s (1956) and Anderson and Krathwohl’s (2001) taxonomy of educational objectives is a very useful tool for these kinds of criteria.

Professional standards cover all of the standards developed by professional organizations. In general, the focus of these standards is on the colleges and universities in order to enhance the level of professionalism in the field (Horn, 2004). On the other hand, the state mandates supercede all professional standards. In some states, some
accreditation organizations have a partnership agreement with the state, and institutions are required to address the state accreditation standards as part of the accreditation review process. In other states, the partnership agreement requires the program reviews to be conducted by the state (NCATE, 2004). In this review, the accreditation standards or similar professional standards or both are being used.

Hagerty and Stark (1989) state that accrediting standards in many professional fields emphasize mission and goals, faculty, students, curriculum, administration and governance, resources and facilities and evaluation, all instead of student learning outcomes. Prior to the 1980s, accreditation standards focused largely on processes, procedures, and the inputs that were supposed to result in educated, well-prepared students. When the conversation within higher education began to focus on results, outputs, and outcomes, many accrediting bodies, especially in the specialized and professional fields, began to incorporate outcomes into their accreditation standards and reviews more consciously (Davenport, 2001).

Within the accreditation process, special attention is given to assessment of student learning and outcomes (Miller, 2000). Outcomes, however, are difficult to measure and many faculty members are looking for alternative ways to increase student learning, such as requiring attendance at faculty development programs (Alstete, 2000). Regardless of whether the accreditation is programmatic, institutional, or virtual, colleges and universities are expected to show effective student learning outcomes. The Council for Higher Education Accreditation (CHEA) recognizes the obligation that institutions and the accreditation organizations have in addressing continuing public pressure for evidence of student learning outcomes (Eggers, 2000).
Accreditation organizations, meanwhile, have grown increasingly vigorous in their demands that institutions examine learning outcomes, though they are also allowing institutions more flexibility in how they proceed (Eaton, 2001). According to CHEA (2002), approximately 85 percent of recognized accreditors report that they give significant weight to evidence of student learning outcomes or competencies in their judgments about quality.

There are several advantages of accreditation. Heiman and Sneed (1996) state that accreditation forces faculty members to take a critical look at the program. Establishing a long-range process of continual self study, giving programs internal and external status symbols, bringing the whole faculty together, giving a direction for the program, identifying program strengths and weaknesses, requiring systems of record keeping, and maintaining quality standards can be listed as other advantages of accreditation. Stufflebeam and Webster (2000) assert that the main advantage of accreditation is that it helps in making a judgment about the quality of educational institutions. Also, by accredited institutions and programs, accreditation is used as a marketing tool (Heiman & Sneed, 1996).

Although the reason for accreditation is to ensure the quality of educational institutions, several accreditation requirements hinder curriculum innovation and ignore an institution’s distinctive goals and markets served (Dill, 1998; Markward, 1999). Also, self-study and site-visit processes used in accreditation offer many opportunities for corruption and inept performance (Stufflebeam & Webster, 2000). In the self-study and visitation process, the cost in personnel time and opportunity cost in work hours are stressed as the criticisms of accreditation (Ewell, 1994; Dill, 2000). Time-consuming, political involvement, and ill preparation of the site visiting team, cumbersome,
unfairness of standards, lack of in-depth evaluation for many institutions involved are other negative comment on the accreditation (Ewell, 1994, 2001; Dill, 1998). Heiman and Sneed (1996) identified accreditation as overly expensive, too lengthy and complex, and poorly linked to quality. Some important institutions and academic persons have condemned accreditation, including a report in 1995 that was financed by the Mellon Foundation and published by Columbia University (Graham, Lyman, & Trow, 1995). The American Council of Trustees and Alumni (ACTA) presented a recent report claiming that accreditation fails to ensure academic quality. It has just been ensuring that colleges and universities have proper inputs (e.g., libraries and academic staff) and internal procedures (e.g., procedures for admissions and the awarding of degrees) (Leef & Burris, 2002).

Automated Tools

Because of rapid development of the use of computers in education, as well as the introduction of the World Wide Web (WWW), a growing number of web-based educational applications/tools have been developed and implemented to help both educators and administrators in the field (Nieven & Gustafson, 2000; van Merrienboer et al., 2002). According to Palmer, Williams, and Dreher (2002), to carry out some tasks without a means sometimes requires too much time, effort and money or is very difficult. The important contribution of these types of tools to education is to provide knowledge-based access to resources. Wilson and Welsh (1991) state that automated tools have important implications for education and training. In education, there are several types of automated tools that have been developed and implemented, such as automated instructional design tools (Cline, & Merrill, 1995; Spector, & Song, 1995; Nieveen, & Gustafson, 2000), automated testing and measurement tools (Larkey, 1998; Palmer,
Williams, & Dreher, 2002; Valenti, Neri, & Cucchiarelli, 2003), curriculum and portfolio development tools, learning management tools (LiveText, 2004; TaskStream, 2004; Chalk & Wire, 2004), and so on.

In order to know understand what an automated tool is, as well as the philosophy behind them, it is crucial to review the definition of automation. Automation has different forms. Expert systems, decision-aiding systems, intelligent agents, and automated tools have been used to describe these different forms of automation. Automation can be thought of as the process of assigned tasks that is performed by a machine or system (Parsons, 1985). In practice, automation is viewed as a “tool” by which a human operator executes some tasks that would otherwise be hard to accomplish or not possible without the tool. In some situations, to reduce human attention or effort, these devices or systems execute some tasks more or less independently (Billings, 1997). Sarter et al. (1997) note that a wide variety of system capabilities and characteristics that would be classified as automation. In a technical sense, when we deal with automation, computers are extensively used as a tool for human operations and control of the system, in addition to an implementation environment (Järvinen & Hiltunen, 2000). There are three major goals of automation (Wickens, 1992):

1. Performing tasks that humans cannot perform at all,
2. Performing tasks that humans cannot perform very well or that are performed with the cost of high human workload, and
3. Assisting humans who demonstrate insufficient performance when they perform tasks.

An intelligent agent refers to when the system has two attributes that not only imply that the system has the characteristic to think of a task and learn task performance,
but also it helps the user in some forms (Stan & Art, 1997; Milewski & Lewis, 1997).

Examples of intelligent agents are mostly in computer software form (Franklin & Graesser, 1997; Kiss, et al., 2004).

According to Rossett and Gautier-Downes (1991), a job aid, also called on-line help systems or reference systems (Gery, 1991; Stevens & Stevens, 1995), is used to store information, processes, or perspectives that do not require the user to memorize information. Moreover, it is used to support work and tasks and to direct, guide and enlighten human performance. Subsequently, more intelligent job aids have been developed and implemented such as expert systems.

An expert system is a computer-based system including a knowledge base and a set of algorithms that are used to draw conclusions and offer an advice on specific topic (Grabinger, et al., 1990; Lippert, 1989; Mason-Mason & Tessmer, 2000). Specifically, in the field of instructional technology, some expert Instructional Design (ID) systems have been developed. They have focused on specific tasks, such as automating the production of technical documentation for instructional and other systems (Emmott, 1998) or producing partly complete programming problems in an intelligent tutoring system (van Merriëboer & Paas, 1990). There are two well-known examples of this kind expert ID system. The first one is Instructional Design Environment (IDE), which was created by Pirolli and Russell (1990) and is a hypermedia system for designing and developing instructional materials. The second one, ID Expert, by Merrill (1998), generates instruction based on Merrill’s second generation instructional transaction theory. Other examples of expert tools including mindtools (Marra & Jonassen, 1997; Mason-Mason & Tessmer, 2000), medical diagnostic aids (Gardner & Lundsgaarde, 1994), flight planning
aids (Layton, Smith, & McCoy, 1994), and an aircraft and air traffic control systems (Hammer & Small, 1995; Wickens et al, 1998).

Automated tools, expert systems, artificial agents, decision-aiding systems, even electronic performance support system (EPSS) are terms used interchangeably in the literature. In order to understand what differences are among these systems and tools, it is critical to understand the levels of automation. Also, instead of putting a label on any of those systems and tools, it is important to investigate what level of automation is represented by them.

Sheridan and Verplanck (1978) have developed a ten-level classification of automation that represents the degree of human involvement in the system. Later, this was modified by Wickens, et al. (1998), which is represented below:

<table>
<thead>
<tr>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. The computer decides everything and acts autonomously, ignoring the human.</td>
<td>1. The computer offers no assistance: The human must take all decisions and actions.</td>
</tr>
<tr>
<td>9. informs the human only if it, the computer, decides to</td>
<td></td>
</tr>
<tr>
<td>8. informs the human only if asked, or</td>
<td></td>
</tr>
<tr>
<td>7. executes automatically, then necessarily informs the human, and</td>
<td></td>
</tr>
<tr>
<td>6. allows the human a restricted time to veto before automatic execution, or</td>
<td></td>
</tr>
<tr>
<td>5. executes that suggestion if the human approves, or</td>
<td></td>
</tr>
<tr>
<td>4. suggest one alternative,</td>
<td></td>
</tr>
<tr>
<td>3. narrows the selection down to a few, or</td>
<td></td>
</tr>
<tr>
<td>2. The computer offers a complete set of decision/action alternatives, or</td>
<td></td>
</tr>
</tbody>
</table>


This table of levels of automation consists of three different scales, according to Wickens, et al. (1998).

1. Information acquisition and integration from high to low;
2. Decision and action selection from high to low; and
3. Action implementation as either automatic or manual.
Endsley and Kaber (1999) have developed similar a ten-level taxonomy of automation, which is represented in Table 7 and is based on the four information processing functions of monitoring, generating, selecting, and implementing.

<table>
<thead>
<tr>
<th>Level of Automation</th>
<th>Roles</th>
<th>Monitoring</th>
<th>Generating</th>
<th>Selecting</th>
<th>Implementing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Manual control</td>
<td>Human</td>
<td>Human</td>
<td>Human</td>
<td>Human</td>
<td>Human</td>
</tr>
<tr>
<td>2. Action support</td>
<td>Human/computer</td>
<td>Human</td>
<td>Human</td>
<td>Human</td>
<td>Human/computer</td>
</tr>
<tr>
<td>3. Batch processing</td>
<td>Human/computer</td>
<td>Human</td>
<td>Human</td>
<td>Human</td>
<td>Computer</td>
</tr>
<tr>
<td>4. Shared control</td>
<td>Human/computer</td>
<td>Human/computer</td>
<td>Human</td>
<td>Human</td>
<td>Human/computer</td>
</tr>
<tr>
<td>5. Decision support</td>
<td>Human/computer</td>
<td>Human/computer</td>
<td>Human</td>
<td>Human</td>
<td>Computer</td>
</tr>
<tr>
<td>6. Blended decision-making</td>
<td>Human/computer</td>
<td>Human/computer</td>
<td>Human/computer</td>
<td>Human/computer</td>
<td>Computer</td>
</tr>
<tr>
<td>7. Rigid system</td>
<td>Human/computer</td>
<td>Computer</td>
<td>Human</td>
<td>Computer</td>
<td>Computer</td>
</tr>
</tbody>
</table>

Table 7. Taxonomy of levels of automation applicable to dynamic-cognitive and psychomotor control task performance. From Endsley and Kaber (1999, p. 463).

In 2000, Parasuraman and his colleagues expanded the three-level scale of automation developed by Wickens et al. (1998) into four categories of human information processing:

1. Information acquisition,
2. Information analysis,
3. Decision selection, and
4. Action implementation.

These classifications can be used to describe the characteristics of automated systems. Also, automated systems could be described based on how much automation they have taken for each step within the processing of a task, instead of labeling systems as expert systems, artificial agents, automated tools, for example. In traditional decision aiding systems, while automation of information acquisition and information analysis are
provided by the tool, decision selection and action implementation are operated by humans.

In addition to these classifications, there are two more kinds of automation systems defined in the literature. The first kind of automation is called strong support and the associated system is called a strong system, and the second kind of system is referred to weak support and the associated system is called a weak system (Goodyear, 1995; Halff, 1993; Spector, 1999). With the strong system, the main purpose is to replace what humans can do with something to be completed by a computer. On the other hand, weak systems are aimed at extending what humans can do rather than replacing the human, especially for less experienced workers. A form of performance support is a type of weak system.

With the integration of a variety of phases and activities, weak support systems can be used by a wide variety of users. In the field of education, as examples of these kinds of systems, knowledge management systems and electronic portfolio software have been used extensively. According to Spector and Edmonds (2002), these systems have supported the following capabilities: (a) communications support for a variety of users; (b) coordination of various user activities; (c) collaboration among user groups on various project tasks and activities involving the creation of products and artifacts; and (d) control processes to ensure the integrity of collaborative activities and to track the progress of projects.

Automation has several advantages and actually depends heavily on its context. In general, it reduces the workload for humans and the number of operation errors because computers have a great capability to perform tasks quickly with minimal errors.
However, humans are not good at monitoring tasks and giving attention to them (Endsley, 1995).

When we design and develop automated tools, we have different rationales in our mind. For example, according to Nieveen and Gustafson (1999), there are three purposes for computer-supported tools. First, transfer of knowledge and skills because these tools encourage the users to integrate work and learning in the job environment. Second is improved task performance. These tools reduce the users’ working load memory and extend their long-term memory so they do not need to memorize or remember much information. Therefore, it brings better task performance with minimal error and more quality. The last one, organizational learning results from the users applying their knowledge during task performance, and acquiring new knowledge related to the task.

In the context of automated grading of rough hardwood lumber, any automated system contains two components (Cho et al. 1990). The first component is a computer vision system for locating and identifying. This step is considered as most difficult to design and develop. The second component is a system for generating results based on the output of the vision system.

The literature review shows that there are some advantages of automated tools, and they can be collected under two major titles, time and money (French, 1998; Palmer, et al., 2002). Actually, their advantages depend heavily upon the context in which they are applied. On the other hand, there are some objections to using automated tools. For example, French (1998) and Page (2003) state that, in the context of automated grading tools, objections can be found in three areas:

- **Humanist objections:** Its history is shown as parallel to the beginning of the computer revolution. The main point under this category is that
“certain choices require 'human' knowledge and background wisdom” (Page, 2003, p. 51). However, research results point out that computer results are more consistent than human ones (French, 1998).

- **Defensive objections:** They are related to tool environment and how to prevent mischievous and hostile students’ effort to make the system ineffective.

- **Construct objections:** They are focused on “whether the computer is counting variables that are truly important” (Page, 2003, p.52).

Although more research needs to be conducted for investigation of system accuracy and efficiency, current results show that automated systems are consistent (Dodd & Fitzpatrick, 2002; Hearst, 2000).

In higher education, the past decade has shown that there is a problem with the traditional accreditation procedures to make a real contribution to educational quality. Also, it has shown that self-study is an expensive process, and there is a little impact on improving the institution or program whose focus of accreditation should shift from resources and structures to the important function of education students effectively. The reason behind focusing on structures and resources is that institutions and teams have felt more confident because the evidence for them is more understood and consistent across institutions. On the other hand, educational effectiveness, planning outcomes, and academic quality are difficult to discuss. Because the evidence shows some differences within institutions, and also the concern is with processes as well as with data, educational and organizational effectiveness are harder to describe.

In order to reduce amount of time, money, and burden on the institution related to self-study, one of the forms of automated tools, portfolio software, has been widely used.
Because they enable self-study teams to establish consistency with standards and to select documents and data that make its case for peer review and site visit.

Although many teacher education institutions are using electronic portfolios because accreditation organizations are requiring them, according to Barrett and Wilkerson (2004), this is not true because “NCATE Unit Standard 2 requires that an institution adopt an assessment system, that collects and analyzes data on applicant qualifications, candidate and graduate performance, and unit operations to evaluate and improve the unit and its programs." (p.1). Web-based automated tools offer three significant advantages: (1) they offer a way to organize and interrelate an enormous amount of information, (2) they mandate an organization different from a print-based traditional presentation, and (3) they make that information available to the campus community on an ongoing basis (Wexler, 2001). Finally, maintenance and update of materials are very easy.

*The Collaborative Create-Adapt-Generalize model*

The Collaborative Create-Adapt-Generalize model represented in Table 8 was developed at Virginia Tech, when one of the faculty members was conducting a database project in the Instructional Technology program (Hicks, et al, 2004). This model can be used in developing a technological framework for addressing the needs identified above.

This model is very appropriate for any project started with a narrow focus. If an initial development of the project is successful after a field trial, additional features could be adapted; after that, it could be generalized to multiple situations by using this model.

The proposed tool was used initially in the Instructional Technology program at Virginia Tech. Since the field trial was successful, the tool framework is going to be modified, and it will be adapted to other programs, for example the Elementary
Education program. In a third phase, according to the testing results of the adapted framework, it will be decided whether or not the tool framework will be modified again. If the results give are reasonable, the tool would be used in multiple contexts and contents (Hicks, et al, 2004).

<table>
<thead>
<tr>
<th>Create</th>
<th>Adapt</th>
<th>Generalize</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1. Identify needs in content-specific terms (CST)</td>
<td>A1. Examine initial system for adaptability to other contexts</td>
<td>G1. Examine adapted system for generalizability to multiple contexts and contents</td>
</tr>
<tr>
<td>C3. Determine role of technology in meeting needs</td>
<td>A2b. Populate framework with data from other context(s)</td>
<td>G3. Populate generalized framework with multi-contextual data</td>
</tr>
<tr>
<td>C4. Design system</td>
<td>A3. Test adapted system</td>
<td>G4. For each context, assess functionality of generalized framework</td>
</tr>
<tr>
<td>C5. Select appropriate technologies</td>
<td>A4. Modify adapted system, as needed</td>
<td>G5. Modify functionality of generalized framework, as needed</td>
</tr>
<tr>
<td>C6a. Develop technological framework</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C6b. Populate framework with initial data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7. Test initial system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C8. Modify initial system, as needed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 8. Collaborative Create-Adapt-Generalize (CAG) model. From Hicks et al. (2004, p. 170).*

*Summary of Literature Review*

The literature review reveals that curriculum evaluation, program and course objectives, taxonomy, accreditation, and standards are overlapping, and there is a very close relationship between these areas. When curriculum or program evaluation is conducted, the evaluator should look at the program objectives and course objectives as criteria. Also, in order to develop program and course objectives, some framework should
be considered, such as Bloom’s taxonomy (1956), action verbs, or the policy of the program or institution.

Many people believe evaluation is an unnecessary process that produces a lot of boring data with useless conclusions. On the other hand, many others believe that evaluation is about proving the success or failure of a program (McNamara, 1999). Regardless of these assumptions, evaluation gives an idea about strong or weak points of the program. Evaluation of program and curriculum cannot be separated from the accreditation process, specifically from self-study.

The results of the literature review verified that there is no actual automated tool developed to identify a program’s strengths and weaknesses while giving varied opportunities to students, faculty and administrators, such as a syllabus tool.
CHAPTER 2: DESIGN AND DEVELOPMENT

Introduction

The focus of this research is the design and development of a low level automated tool to identify an academic program’s strengths and weaknesses. The literature review provided a baseline for a developmental research study to design and develop such automated tool. In general, this automated tool can be classified as a weak system with an emphasis on data/information collection and reporting (Goodyear, 1995; Halff, 1993; Spector, 1999). Specifically, it may be classified as a Level 4 automation which is a shared control by Endsley & Kaber (1999, p. 463).

Rationale for Study

It was determined after conducting a thorough research on the literature an automated tool to determine an academic program’s strengths and weaknesses did not exist. There are several types of assessment tools, including electronic portfolios and assessment management systems; however, none of these tools employs a comprehensive approach to provide administrators, faculty, and students with data concerning student outcomes and departmental information which would be helpful in the self study process.

In addition to provide data, an automated accreditation tool would provide assistance to faculty in the design of a course syllabus.

With an automated accreditation tool, there would be no need to collect accreditation related information from different sources because this tool provides those information in a systematic and unified manner to the user. Therefore, identification of program strengths and weaknesses can be described without wasting time, money and efforts.
Type of Research

This study is a developmental research which involves designing, developing, and evaluating an accreditation support tool to identify academic program strengths and weaknesses.

The developmental research in the design and development of an automated tool helps to define and develop the components of the tool by identifying and developing the tool focus, use context, technologies and techniques, methods, and conclusions sought at the end of the formative evaluation. The outcomes of this research provided a framework for the automated accreditation tool and defined conditions that facilitate design and development of future products in various contexts.

Design Process

In this developmental research study, a Collaborative Create-Adapt-Generalize (CAG) model was adapted. This model was created by one of the faculty members in the Instructional Technology Program in Virginia Tech (Hicks, et al, 2004). The model is appropriate for developing a technological framework that addresses predetermined needs. Also, the use of CAG gives an opportunity for designers to see a general picture of a project that starts with a narrow focus. The CAG model is represented below.
The first phase of the CAG model is called “Create” and is used in the design and
development of the automated accreditation tool. Its sub-steps are discussed in more
detail later in this chapter. Based on the feedback from expert reviewers, it will be
determined whether or the development of the tool will move to the Adapt and
Generalize phases.

**C1. Identify needs in content-specific terms (CST)**

Need can be defined as a gap between the current situation (“what is”) and the desired
situation (“what should be”) (Kaufman, et al, 1993). In the design of the automated tool,
this first step is conducted to determine if there is an automated tool used for identifying
program strengths and weaknesses. If not, the current tools being used and their structure
and components are examined. In this case, the literature review and a review of the web-

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<td></td>
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</tr>
</tbody>
</table>

*Table 8. Collaborative Create-Adapt-Generalize (CAG) model. From Hicks et al. (2004, p. 170).*
based e-portfolio softwares and assessment management systems verified that there is no such automated tool used. At the end of this step, the following need is identified:

- There is a need for an automated accreditation tool to identify an academic program’s strengths and weaknesses.

C2. Convert CST to technology-related terms

The automated tool is a web-based tool with a relational database structure. This tool supports several types of users including administrators, faculty, and students. Each user has his or her own username and password and the ability to manipulate and view the tool content. For example, administrators have the ability to control everything in the tool and limit user rights. Faculty can change some course-related parts and see what the students do. Students are able to see and use some parts of the tool. In addition, outside users, including evaluators, can be granted rights to see some parts of the tool.

C3. Determine role of technology in meeting needs

Technology has become crucial in almost all educational environments. In terms of information acquisition, information analysis, decision selection, and action implementation, technology offers an important contribution and gives several options in improving the human performance in the process of identification of a program’s strengths and weaknesses.

As stated in the literature review, there are several roles of technology in meeting the needs of programmatic accreditation. An automated accreditation tool will assist individuals to perform tasks more effectively and efficiently. By providing data in a format or template so that the users do not waste their time finding and figuring out information.
By using the tool, which will have predetermined formats or templates with job aid information and a database structure, the process of identification of program’s strengths and weaknesses can be done in a short time.

Also, technology assists a human who does not need a higher level knowledge of subject, when performing a task. The tool provides information in certain of formats that can be understood and used easily.

C4. Design system

The automated accreditation tool consists of six main components: data entry, standards, reports, standards report, profile alignment, and standard alignment report as seen in Figure 5. These six components are explained in more detail in this chapter:

![ACCREDITATION TOOL -- MASTER MENU](image)

- **Enter Data**
- **Standards**
- **Reports**
- **Standards Reports**
- **Profile Alignment - Create/Edit Profiles**
- **Standards Alignment Report by Profile**

*Figure 5. The tool components.*

1. **Data Entry**

This component of the tool is where the user enters data. There are 27 different data entry forms that make up this component and are illustrated in Figure 6. By using these forms, the user can enter new data or use the data that has already been entered into
the system. These forms were created according to the literature review and are categorized into the following areas:

1) Forms should be filled out first: These forms including fundamental information for other forms are numbered 1-4.

2) Mission, Vision, Goal, Objective: Form number 5 should be used after the Institution General Information form because it requires some information from the Institution General Information form.

3) Publication and Services: Form numbers 7-13 can be considered together because they need to use some information from either the Faculty General Information or the Student General Information forms.

Instructional Equipments and Classroom: Form numbers 14-26 are directly related to Institution General Information form. Since each academic program should provide the list of instructional equipment, internship opportunities, program service, program practice, and clinical experience during the accreditation process, form numbers 14-26 including internship, program service, practice, clinical experience, camera or camcorder, computer, projector, printer, scanner, tv or plasma, vcr, smartboard, and classroom was created.

4) Courses: Form number 6 is titled as courses. This form is associated with form number 26 titled as classes because in order for the user to enter the course information the classroom information should be entered beforehand. By using this form, the user can develop a syllabus in the database environment.

5) Student Data Entry: This category includes one form numbered and titled as 27 Student Data which can be used to enter student outcomes data.
**Figure 6. Data entry forms main menu.**

In the following part, brief information will be provided for each form including the fields.

1) **Faculty General Information:** The user can enter new information or use previously entered data using dropdown menus in the faculty general information data entry form. This form will be used to generate data related to each faculty member and includes last, first, and middle names, degree, major and minor, institution name, work start date, termination date, email, rank, tenure status, and curriculum vitae URL fields.

2) **Student General Information:** The user can enter new information or use previously entered data using dropdown menus in the student general information data entry form.
Identification of Academic Program Strengths and Weaknesses

This form will be used to generate data related to each student and includes last, first, and middle names, last degree received, institution name, major and minor, email, and curriculum vitae and portfolio URLs fields.

3) Institution General Information: The user can enter new information or use previously entered data using dropdown menus in the institution general information data entry form. This form includes institution name, college name, school name, department name, center name, program name. In addition to these fields, this form includes some fields related to state, content, performance, and professional standards which each academic program should meet in terms of student outcomes. These fields are standard type, standard agency name, and standard name fields. Since this form provides many fields and in some cases some fields do not have any association with other fields, the user can leave those fields a blank.

4) Standard: Since academic program should meet some type of standards including state, content, performance, and professional, these standards can be entered into the system using this form. Also, if these standards have already been entered, the user can view those standards in this form using dropdown menus. By this form the association can be created between programs and standards. This form includes standard type, standard agency name, standard name, standard component name, and three level standards and their numbers.

5) Mission, Vision, Goal, Objective: The user can enter new information or use previously entered data using dropdown menus related to the mission, vision, goal, and objective of each academic institution in this form. This form includes institution name, college name, school name, department name, center name, program name,
mission and its number, vision and its number, goal and its number, objective and its number fields.

6) Courses: The user can enter new course information or use previously entered course data using dropdown menus in the courses data entry form. This form includes Course Registration Number (CRN), course name, semester & year, instructor name and his/her rank title, instructor email, class meeting place, course description, course objectives, standards, lesson or module title, reading information, assessment information, grading, course policy, and textbook information.

7) Publication: The user can enter information of new publications including article, book chapters, etc. or use previously entered publication data using dropdown menus in this form. This form includes author name, publication type, publication title, if applicable an additional publication title, edition number, publication date, publisher name, publication place name, volume number, issue number, page(s) number, and retrieve date fields if publication is placed on the web.

8) Presentation: The user can enter information of new presentations or use previously entered presentation data using dropdown menus in this form. This form includes author name, presentation title, presentation date, conference name, and presentation place fields.

9) Research: The user can enter new research information for faculty members and students or use previously entered research data using dropdown menus in the research data entry form. This form includes author name, research title, research date, research place, and research fund fields.

10) University Service: The user can enter information of new university services conducted by faculty members and students or use previously entered data using
dropdown menus in this form. This form includes participant name, university service title, university service date, and university service place fields.

11) Community Service: The user can enter information of new community services conducted by faculty members and students or use previously entered data using dropdown menus in this form. This form includes participant name, community service title, community service date, and community service place fields.

12) Professional Service: The user can enter information of new professional services conducted by faculty members and students or use previously entered data using dropdown menus in the professional service data entry form. This form includes participant name, professional service title, professional service date, and professional service place fields.

13) Awards or Recognitions: The user can enter information of new awards or recognitions received by faculty members and students or use previously entered data using dropdown menus in this form. This form includes participant name, award or recognition title, and award or recognition date fields.

14) Internship Opportunities: The user can enter information of new internship opportunity related to students or use previously entered data using dropdown menus in the internship opportunities data entry form. This form includes institution name, college name, school name, department name, center name, program name, internship title, internship place, and internship date fields.

15) Program Service: The user can enter information of new program services that an academic program offers or use previously entered data using dropdown menus in this form. This form includes institution name, college name, school name,
department name, center name, program name, program service title, program service place, and program service date fields.

16) Practice: The user can enter information of new practices that an academic program offers or use previously entered data using dropdown menus in the practice data entry form. This form includes institution name, college name, school name, department name, center name, program name, program practice title, program practice place, and program practice date fields.

17) Clinical Experience: The user can enter information of new clinical experiences that an academic program offers or use previously entered data using dropdown menus in the clinical experience data entry form. This form includes institution name, college name, school name, department name, center name, program name, clinical experience title, and clinical experience date fields.

18) Camera or Camcorder: The user can enter information of new camera or camcorder that an academic program possesses or use previously entered data using dropdown menus in this form. This form includes institution name, college name, school name, department name, center name, program name, manufacturer, camera type, camera model, camera resolution, digital zoom, and optical zoom fields.

19) Computers: The user can enter information of computers that an academic program possesses or use previously entered data using dropdown menus in the computers data entry form. This form includes institution name, college name, school name, department name, center name, program name, manufacturer, computer type, computer model, CPU, operating system, system board, memory (RAM), hard drive, floppy disk, ZIP drive, CD or DVD-ROM, CD-RW or DVD-RW, monitor (CRT),
monitor (LCD), keyboard, mouse, modem, wired LAN, wireless LAN, case type, and speakers fields.

20) Projector: The user can enter information of new projectors that an academic program possesses or use previously entered data using dropdown menus in the projector data entry form. This form includes institution name, college name, school name, department name, center name, program name, manufacturer, projector model, resolution, and data compatibility fields.

21) Printer: The user can enter information of new printers that an academic program possesses or use previously entered data using dropdown menus in the printer data entry form. This form includes institution name, college name, school name, department name, center name, program name, manufacturer, printer model name, print technology, print speed, print resolution, and color technology fields.

22) Scanner: The user can enter information of new scanners that an academic program possesses or use previously entered data using dropdown menus in this form. This form includes institution name, college name, school name, department name, center name, program name, manufacturer, scanner model, scanner optical resolution, scanner resolution, and type of scanner interface fields.

23) Television: The user can enter information of new televisions that an academic program possesses or use previously entered data using dropdown menus in the television data entry form. This form includes institution name, college name, school name, department name, center name, program name, manufacturer, tv or plasma type, screen size, tv aspect ratio, and resolution fields.

24) VCR: The user can enter information of new VCRs that an academic program possesses or use previously entered data using dropdown menus in the VCR data
entry form. This form includes institution name, college name, school name, department name, center name, program name, manufacturer, VCR model, and video heads fields.

25) Smart Board: The user can enter information of new Smart Boards that an academic program possesses or use previously entered data using dropdown menus in the smart board data entry form. This form includes institution name, college name, school name, department name, center name, program name, manufacturer, smart board model, and size of smart board fields.

26) Classroom: The user can enter information of classrooms that faculty members or students can use or use previously entered data using dropdown menus in the classroom data entry form. This form includes institution name, college name, school name, department name, center name, program name, building name, classroom name, number of seats, and number of computers fields.

27) Student Data: This form is one of the important forms of the tool. This form enables the user (faculty member, student, or administrator) to enter student outcomes which can be assignments, projects, test results, portfolios, etc. into the system based on existing course lists. When the user clicks on the Student Data form link, he or she will view the following interface as seen in Figure 7. By this interface, the user can select the student name, identify student outcome type including only test and exam, project paper, reflection, lesson plan, capstone project, software evaluation, internship, field experience fields, and portfolio evaluation, enter associated URL with the selected outcome, and describe the outcome using the description field.
2. Standards

This component of the tool provides standards that the program needs to meet. As a result of resource limitations, one of the Center for Instructional Technology Solutions in Industry and Education (CITSIE) projects have been partly used for this tool as seen in Figure 8. The website that was made available in part by an initiative funded by the U.S. Department of Education through the Preparing Tomorrow's Teachers to use Technology (PT3) grant to create an alignment between and some major parts of a syllabus which are objectives, activities, assessments, and comments. According to the literature review (Horn, 2004), four levels of standards, state standards, content standards, performance standards, and professional standards, were planned to be represented in this tool; however, in the current tool the user just can see the list of all standards by clicking on the Select Standards field. The standard list can be expanded by creating an association table between the number 4 Standard form and this Standards webpage. By this association table the user would enter new standards into the number 4 Standard form. Once this entry is done, the user would view more standards, when the select standards drop down menu is used. However, currently there is no association table created.
between the number 4 Standard form and this Standards component so new standards cannot be viewed in this interface.

3. Reports

This component provides the user with two ways to view data as seen in Figure 9.

These two ways are the standard report and the custom report.

![Figure 8. Standards.](image1)

![Figure 9. Reports main page.](image2)
The standard report works according to predetermined queries and the user can view association table data in the predetermined format as seen in Figure 10. In this report type, there is no flexibility given to the user to manipulate the reports.

Figure 10. Awards or recognitions standard report page.

On the other hand, custom report works based on the user’s selection. The user can filter the report by selecting specific data from the predetermined fields as seen in Figure 11. The custom report selection provides more flexibility than the standard report.

Figure 11. Awards or recognitions custom report page.
In addition to these two types of report, the tool has the basic report function based on association tables and user selections. As seen in Figure 12, users are given a list of predetermined report options. When users select one of the links listed in Figure 13, they are directed to another page as seen on the faculty general information report graphic to select some boxes to determine the report data. After that, on the report page, users can view data related to their selection.

Figure 12. Basic report page.

Figure 13. Basic report field selection page.
3. Standards Reports

This component of the tool reports the standards which have already been aligned with courses. For this component, one of the CITSIE’s projects for PT3 was adapted. When users select the course from the list on the page, they can retrieve the standards associated with the selected course as seen in Figure 14. Therefore, the course alignment with standards can be determined.

![Figure 14. Standards report page.](image)

4. Profile Alignment

An important feature of the accreditation tool is its ability to align the many entries in the database with various standards. This capability was addressed by integrating a utility developed by the Center for Instructional Technology Solutions in Industry and Education with the rest of the accreditation tool. This utility permits the alignment of one set of database records with another set of database records through the use of one or more profiles. Each profile contains a set of characteristics that provide the basis for aligning the two sets of records. For example, a student delivering a presentation at a specific professional conference might address a standard dealing with the selection of appropriate media to produce effective learning environments using
technology resources. After a profile has been defined, all other records in the database that share the same characteristics are automatically aligned. If the profile is modified, the alignment of other records with the new profile is automatically adjusted.

5. **Standard Alignment Report**

This feature works based on the previously entered profiles. When users create the alignment between tables and standards, they will be able to view the reports including the profile tables and their fields on the screen using this feature. By this feature, users also will be able to see the student outcomes which are aligned with any data entry forms.

*Database Development Process*

During the design process, the most important step is the design of the database itself. In order to design a relational database, three main steps were used.

The first step was “Conceptual Modeling.” Once the system objectives were identified and the scope and boundaries of the system were determined, a conceptual modeling phase was conducted (Nailburg & Maksimchuk, 2001; Rob & Coronel, 1997). In order to develop a good conceptual model, information was collected and assimilated into the literature review. Also, some e-portfolio softwares and data management systems, including LiveText© and TrackDat© were reviewed. This information let me identify what objects I need and what attributes and relationships existed. Initially, I designed a conceptual model based on the use of primary and foreign keys, which are the fundamental parts of a relational database. However, based on the structure that is currently in use in the Instructional Technology Master of Arts (ITMA) program and the expert feedback, I changed my conceptual model. For example, instead of using different field names including author name, faculty name, student name fields, participant name
field is created. Therefore, all data related to names can be collected in one table. After that, association tables were designed to make relationships between those fields which can be used for forms identified above.

The second step is logical modeling. During this step, the conceptual model findings were translated into an internal model for the selected database management system, Microsoft® Access®. This step involved mapping all objects in the model to the specific constructs used by the selected database software. At the end of the step, I designed the tables, indexes, views, transactions, and association tables (Nailburg & Maksimchuk, 2001; Rob & Coronel, 1997). A logical modeling of the tool using Microsoft® Access® was created in two months. During these two months I received feedback from the person, a database expert and based on his feedback, I modified my logical modeling. More than 170 tables and approximately 20 association tables were created and the relationships were defined among those tables. In addition to tables, I created form and report components in Access®.

The third and final step is physical design. According to Rob and Coronel (1997), physical modeling is “the process of selecting the data storage and data access characteristics of the database” (p. 48). Physical modeling involves not only tables and columns, but also tablespaces, partitions, hardware, and the whole creation of the database system (Nailburg & Maksimchuk, 2001). Physical modeling is important because it affects both the location of the data on the server and the performance of the system. In fact, logical modeling and physical modeling can be carried out in parallel design. The tool’s physical design was planned and implemented by one of ITMA’s programmers.
C5. Select appropriate technologies

After the system design is determined, the next step is to develop the prototype of the tool. According to Wilson, Jonassen, and Cole (1993), “a prototype is explored and tested in an effort to get a better handle on the requirements of the larger system” (p. 4). Prior to building the larger-scale system, it is necessary to conduct this process, which is also known as a rapid prototype, for the “tryout of key concepts at early stages when costs are small and changes more easily made” (Wilson, Jonassen, & Cole, 1993, p. 4).

In order to construct physical models, appropriate technologies needed to be selected. The automated tool is web-based and its interface was built with Macromedia Dreamweaver MX®, which is a professional Hypertext Markup Language (HTML) editor for designing, coding, and developing websites, web pages and web applications. Since Dreamweaver MX® helps the developers to build dynamic database-backed web applications using server languages such as ASP®, PHP®, ColdFusion® and so on, I preferred using it.

As a web application server, ColdFusion MX® was used. ColdFusion MX® lets the developer create strong sites and applications. ColdFusion MX® consists of three main components:

- ColdFusion Server
- ColdFusion Markup Language (CFML)
- ColdFusion Administrator

In the beginning, free database server and ASP.NET® were considered for this tool development. However, since ColdFusion MX® program and its server, in use for ITMA program, were available for the automated tool, these resources were used during the development process.
C6a. Develop technological framework

As mentioned above, after the tool design and technology selection was made, development stage was started. The development of a database model in Microsoft® Access® program took two months. During these months, I developed the webpages for the database form interface using Dreamweaver MX®. I turned in the database to the programmer. The programmer converted the database tables to the ColdFusion® format and uploaded them to the database server. Also, the programmer developed the interface called the table parser in the database server to upload the tool webpages to the server. This table parser was intended to create a relationship between the database table fields and the tool webpages. In order to use the table parser, I uploaded each webpage in .HTML format and selected the key field from the databases tables. When I clicked on the submit button, the table parser automatically started to use the defined fields and made a relationship between the tables and form webpages which was then converted to the .CFM format.

Once the data entry forms were developed, they were checked to see if all the forms were working appropriately. Some problems were detected, such as incorrect table fields and wrong relations. Also the drop down menus had limited functionality because these menus were using data that had already been entered into the tables and there was no way to enter new data. Therefore, an "ADD" button was added for all drop down menus so that the user can easily enter new data if the data do not exist in the system.

The next component developed for the tool was reports. As mentioned in the reports section initially, reports were created based on association tables and there was no way to change the order of reports. These reports listed the data that was related to each other in the association tables. After the feedback from the doctoral committee members,
the report page was planned to utilize queries, and the programmer developed a query builder as seen in Figure 15.

![Query Builder](image)

**Figure 15. Query builder page.**

In order to extract data from the database in a predetermined format, a query is used in this tool. The use of queries in this tool provides a lot of flexibilities to create report pages. Therefore, the programmer created the query builder for this tool so that the user can create the queries easily by this user friendly interface.

In order to create queries, I selected tables that I wanted to be associated with each other and then selected table fields to be matched. When I was selecting the tables and fields, I took advantage of the association tables and data entry forms. The query builder makes some general assumptions about the matching between fields, but I had to make sure those matchings were correct. When the query was submitted, the query builder asked me to name each query. I also edited names and description of the queries as well as the order of field columns that are displayed in the report. I used the report edit page for this job and the graphic of this page can be seen in Figure 16.
Once the queries were done, the programmer developed the report page. The report pages have two types of report functions as described in the reports section and both functions are supported by the queries.

In parallel with the report page development, the programmer modified CITSIE’s the Objectives & Standards tool to create standards report component of the automated tool.

For the tool access authorization, the programmer developed a web page which is based on the roles. There are eight roles that are being used partly by the tool. The tool currently provides some data entry forms based on those roles which are grouped in three major roles, student, faculty, and administration. According to these roles, the number of data entry forms changes. For example, if the user is a student, he or she can access data entry forms #2, 7, 8, 9 and 13. If the user is a faculty member, he or she can access data
entry forms # 1, 3, 4, 5, 6, 7, 8, 9, 13, 14, 15, 16, 17, and 27. If the user is granted administrator access, all data entry forms are displayed for him or her. The tool utilizes Virginia Tech’s personal identity information if the login type is identified as VT. In this case, there is no need to assign passwords for VT users. If the user does not have any affiliation with Virginia Tech, any login name and password can be assigned as seen in Figure 17.

<table>
<thead>
<tr>
<th>Delete?</th>
<th>ID</th>
<th>Login Type</th>
<th>Login</th>
<th>Password</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>VT</td>
<td>hayilnaz</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>VT</td>
<td>kpotter</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>VT</td>
<td>tbowden</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>VT</td>
<td>faculty</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td>student</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td>harun</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
<td>admin</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

*Figure 17. User role assignment page.*

*C6b. Populate framework with initial data*

After the Access® database was converted into .CFM format in the database server, I entered initial data into the database by using the table page. In order to enter new data, the user should click on a table name as seen in Figure 18.
Identification of Academic Program Strengths and Weaknesses

**Figure 18. Database table main page.**

After clicking one of the table links listed in Figure 16. Database table main page, the associated table comes up so that the user can enter new data as seen in the following Figure 19. I entered data into all of the tables and created associated data in the association tables using data from the tables.

**Figure 19. Textbook table page.**
C7. Test initial system (Expert Review)

When the prototype of the automated tool was developed, it was reviewed by an expert. Before this expert review, all components were systematically reviewed. If we identified any problem, the programmer was informed to fix the identified deficiencies.

According to Tessmer (1993), an expert review focuses on examining the prototype version of the tool to determine its strengths and weaknesses and the following information can be obtained from experts during the review:

- Content information – completeness, accuracy, importance, currency
- Implementation information – ease of use, potential problems in use, user appeal, fit to intended environment
- Technical information – visual quality, potential production problems, suitability of production techniques, media appropriateness
- Design expertise – need for the tool, clarity of objectives, quality of instructional strategies, and match of instruction to needs

Two experts have been used for the review process. These two experts were not exposed to the prototype and they can be described in the following manner: one accreditation expert, other instructional design expert having accreditation experience. The accreditation expert possesses a vast knowledge and experience in program evaluation and accreditation at the undergraduate and graduate levels. This individual is going to represent the external perspective of Instructional Design and Technology. The other expert has an instructional design background, as well as database development and accreditation experience. The expert reviewers evaluated the prototype from the perspectives of content, implementation, technical quality, and design.
In addition to the URLs for the tool, the expert review instrument (see Appendix B) was given to the expert reviewers. Also, a brief introduction of the tool and instructions for the expert reviewers was provided (see Appendix A).

The expert review process was completed in two weeks.

The expert review instrument was adapted from ASTD (American Society for Training & Development) E-learning Courseware Certification (ECC) Standards (1.5) and the Formative Evaluation Tool Expert Review Instrument, which was developed by Dr. Gwendolyn J. Ogle for her dissertation in 2002. ECC was specifically designed to evaluate the instructional design and usability factors associated with asynchronous web-based and multimedia courseware (ASTD, 2005). It can be easily adapted to any web-based tool because the standards used in ECC are about interface, compatibility, production quality, and instructional design. On the other hand, Dr. Ogle’s expert review instrument is useful because it stresses three components: inputs, process, and outcomes.

In the instrument, the reviewer can select Not Applicable “N/A” for some cases. The meaning of N/A is that the feature does not exist in the tool, and/or that the feature is not required.

Table 9 represents the process of expert review.

<table>
<thead>
<tr>
<th>To be evaluated</th>
<th>Methodology</th>
<th># of Evaluators</th>
<th>Instruments</th>
</tr>
</thead>
</table>

*Table 9. Instrumentation table.*
CHAPTER 3: RESULTS AND CONCLUSIONS

Introduction

Two experts reviewed the automated accreditation tool. One is from outside of the Instructional Design and Technology field and has some accreditation experiences. The other have an instructional design background as well as accreditation and database development experience. These experts will be identified as Accreditation Expert from outside of the instructional design field (AE) and Instructional Design and Accreditation Expert (IDAE).

In general, the idea of the design and development of an automated accreditation tool was accepted, if the necessary modifications and additions are done. Because of the limitations of the tool and expert reviewer questionnaire, some responses tell that the reviewers had some confusion during the review process. All of the reviewers’ responses are listed in Appendix C. According to the feedback from two experts and the committee members, the following Table 10 was created to illustrate the feedback and solutions.
<table>
<thead>
<tr>
<th>Suggestions of Expert Reviewers</th>
<th>Implementation Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interface Design</strong></td>
<td></td>
</tr>
<tr>
<td>• Orientation pages are required.</td>
<td></td>
</tr>
<tr>
<td>• Tracking feature does not work for all components.</td>
<td>• The tool has a strong database structure and most parts of the database works well. However, the tool currently does not provide information display features which help users understand the tool components, the relationship among components, and how these components work. This feature needs to be created in a consistent manner.</td>
</tr>
<tr>
<td>• Navigation features are not consistent.</td>
<td>• While some components have the tracking feature, some do not. Because of this reason, users may have problem with tracking what they are in the tool. In the next phase of the tool development, the tracking feature might be integrated into the system in a consistent manner.</td>
</tr>
<tr>
<td>• User support/help feature is required.</td>
<td>• Some components of the tool have the navigation function, but there are some problems with them. Also, some components of the tool do not have the navigation function so the users do not know what the next step is or where to go for the next step. Since the current navigation function does</td>
</tr>
<tr>
<td>Suggestions of Expert Reviewers</td>
<td>Implementation Plan</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td></td>
<td>not provide any information related to the buttons, users may be confused. Therefore, in the next step of the tool development process the navigation function might be created for all components of the tool and there should be a consistency in this navigation function.</td>
</tr>
<tr>
<td></td>
<td>• Currently the tool does not provide any user support or help. When users have problem with the use of the components and if they cannot figure out the next step in the tool, they cannot have any support or help provided by the tool. Thus, the next phase of the tool development should include creation of user support/help function.</td>
</tr>
<tr>
<td><strong>Compatibility</strong></td>
<td>• The reviewers’ feedback was positive in terms of compatibility of the tool. Since the tool is a web-based and database-driven tool, there is no need for installing and uninstalling. In order to use the tool, users just need to have internet connection and internet browser. However, since the tool has a pop-up window, there is no warning given for users to turn off their pop-up blocker in</td>
</tr>
<tr>
<td>Suggestions of Expert Reviewers</td>
<td>Implementation Plan</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td></td>
<td>the web browser. This warning might be provided in the orientation pages.</td>
</tr>
</tbody>
</table>

### Production Quality
- Tool interface is inconsistent.
- The reviewers did not encounter any problem in the tool regarding legibility of text and graphics. However, they stated that there is an inconsistency among the tool components. The reason for that is adaptation of CITSIE’s tool. This adapted part has a different interface from the rest of the tool. Therefore, it causes the inconsistency. In the next step of the tool development, this problem might be fixed.

### Instructional Design
- There is no expression of the tool purpose in the tool.
- Information related to the purpose of the tool might be included in the orientation pages. However, some of the questions under the Instructional Design section are not relevant to this tool so no feedback was provided by the instructional design expert except Expression of the Tool Purpose.
<table>
<thead>
<tr>
<th>Suggestions of Expert Reviewers</th>
<th>Implementation Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Process and Outcomes</strong></td>
<td>• Based on a given feedback, more alignment features were added into the tool.</td>
</tr>
<tr>
<td>• Standards alignment needs to be supported.</td>
<td>• The following fields might be added:</td>
</tr>
<tr>
<td>• More fields need to be added into data entry forms.</td>
<td>Gender and Ethnicity fields into the Faculty General Information form; Course Level Indicator field into the Courses form; Duration of Internship field into the Internship form; Duration of Program Service field into the Program Service form; and Duration of Practice field into the Practice form.</td>
</tr>
<tr>
<td>• Some of data entry field names need to be changed.</td>
<td>• The following field names might be edited:</td>
</tr>
<tr>
<td></td>
<td>Final Degree field name changed as Final Degree Received in the Faculty General Information form; Place field name changed as Office Location in the Courses form; and Research Date field name changed as Research Project / Contract Duration in the Research form.</td>
</tr>
</tbody>
</table>

*Table 10. Expert Reviewer’s Responses and Implementation Plan*
Self-Evaluation and Future Steps

The expert review process has lasted two weeks. During the analysis of their responses and suggestions, two major issues were identified.

The first issue was related to the tool itself. Since the tool was not fully developed and had a lack of features related to user support, interface, consistency, and the tool language, expert reviewers had some difficulty understanding what the components are for and why some components are associated with others.

The second issue was related to the expert review process. This issue can be divided into two categories: The expert review questionnaire and the tool introduction and instructions document.

Although the expert review instrument was adapted from ASTD (American Society for Training & Development) E-learning Courseware Certification (ECC) Standards (1.5) and the Formative Evaluation Tool Expert Review Instrument, which was developed by Dr. Gwendolyn J. Ogle, some of questions were unrelated with the review process. Therefore, it produced some confusion for the expert reviewers. For example, under the Instructional Design section, question #4.e asked about “Engagement Techniques: Appropriate techniques for engaging and maintaining the user’s interest are used in the tool.” however, the tool was intended to support engagement techniques. This question is more appropriate for the online course environment instead of a web-based tool which does not aim to promote learning. Another question #4.f was asking about “Assessment of Learning: The tool provides valid assessments that provide feedback to the user.” Since the tool was not intended specifically to promote learning, asking this type of question was not appropriate.
Expert reviewers were provided some information about the tool and instructions providing when steps to follow when they were conducting the review. As the tool did not provide sufficient support and navigation, the information and instructions did not help the reviewers. Adding the information and instructions into the tool may help the reviewers, eliminating some of their confusion.

Conclusion

The need for the design and development of an automated accreditation tool emerged as a response to identifying academic program strengths and weaknesses in a weak automated manner. In the educational market, there are many software applications with different names and titles with very specific focus areas. For example, e-portfolio applications such as LiveText and Taskstream just focus on student outcomes and accreditation, or program standards. However, the accreditation process is very comprehensive and focuses not only on student outcomes, syllabus alignment, or standards, but also academic program resources, faculty performance, program service, etc. The literature review confirmed that there was no such a tool existed. Therefore, the first step of developmental research was conducted by having a literature review. This stage played very important role in the identification of the tool components and the tool design methodologies. The second step was to design and develop the working prototype of the tool. The third step was to have the tool reviewed by experts in light of given instructions and expert review instrument.

The second step lasted more than 18 months because the designer and developer had some challenges with the current techniques utilized for the development of web-based database applications. In order to develop different components of the tool, new editing techniques were utilized to manipulate the database structure. By utilizing these
techniques, the developer did not need to deal with data entry, data modifications, and/or data deletion. Also, these techniques helped to change the report title, description, and display of the columns in the report page. In addition to editing techniques, creating different queries based on association tables was provided by new techniques. This approach assisted in presenting wide-ranging reporting opportunities for the user. Another outcome from the process itself was to have a table data entry interface created for the tool administrator to enter multiple data sets into tables while faculty and others could enter single items. One of the most important outcomes from the tool was to be able to use association tables which provide a great deal of flexibility to create relationships among tables and fields.

During the third step, expert review of the tool was very beneficial because it provided feedbacks not only related to implementation of the tool, but also to the improvement or enhancement of the tool to be more a user friendly and to function well. The findings of the expert review process can be considered as summative evaluation findings in terms of the first phase of the CAG model, (Create) because by the expert review the tool was constantly reviewed by the author and programmer. However, for the implementation of the other phases of the CAG, (Adapt and Generalize), the expert review findings can be considered as formative evaluation findings if the CAG model is considered as a whole. Also, these findings will be a baseline for the next step of development.

The expert review findings showed that the fully developed automated accreditation tool, identified as weak system, will offer many values for academic program personnel, such as faculty and program administrators, to identify program strengths and weaknesses in an automated manner as well as for students. The results also
verified that this developmental research meets the definition of developmental research involving the design, development, and evaluation of an accreditation support tool. The design and development process of this tool also showed that there are many parameters such as human personality, physical resources, and time that affect the process directly which should be considered beforehand. Although the tool development process was too long, the results of this process were encouraging and the author feels that the entire analysis, design, development, implementation, and evaluation of the process was a success.
REFERENCES


Identification of Academic Program Strengths and Weaknesses


For my dissertation, I am designing and developing a tool (database driven website) whose purpose is to determine program strengths and weaknesses. This tool is intended to help program directors and faculty to prepare for accreditation. It will also help them in conducting program evaluations.

The one thing that I need is to find some individuals to conduct expert reviews of my developmental research. This is crucial and it will focus on examining the prototype version of the tool to determine its strengths and weaknesses (Tessmer, 1993).

The expert reviewers will evaluate the prototype tool by filling out given Expert Review Instrument from the perspectives of content, implementation, technical quality and instructional design. The total commitment of the review will be approximately 2 hours.

In order to review the tool, please read the following instructions. If you have any questions or problems, please do not hesitate to contact me at hayilmaz@vt.edu or my cell (540) XXX-XXXX.

Once you are done with the review, please answer the questions in the Expert Review Instrument attached to this email and save your answers as a Word document and send it to my email, hayilmaz@vt.edu. If you finish the review and turn in the expert review instrument by February 6, 2007, I would appreciate it very much.

**INSTRUCTIONS**

In order to enter the system you should click on

http://www.citsie.net/harun/menu.cfm.
When you click on this link, you will be asked to enter a Username and Password. The information you will enter here is determined by the type of user you are simulating.

There are three main types of users available for this tool for now.

1) Administrator who can use all data entry forms.

Username: admin
Password: xxxx

2) Faculty who can use 13 forms out of 26 data entry forms.

Username: faculty
Password: xxxx

3) Student who can use 5 forms out of 26 data entry forms.

Username: student
Password: xxxx

Once you enter the system based on any access module listed above, you will get the main menu including Enter Data, Standards, Reports, and Standards Reports link.

Enter Data link includes 26 data entry forms. Admin can have access to all forms while students have access to #2, 7, 8, 9, 13 forms and faculty has access to # 1, 3, 4, 5, 6, 7, 8, 9, 13, 14, 15, 16, 17 forms.

Standards link includes an objectives & standards tool which has been modified for the automated accreditation tool. By using this page, users can associate a course syllabus with specific standards.

Reports link includes two types of reports, standard and custom reports. The standard reports are based on queries that I created and can be expanded if a new query is needed. In the custom report, a user can identify values that he or she wants to see on the report page.
Standards Report includes the modified CITSIE objectives & standards tool in which the user can see standards and sub-standards by clicking arrow sign on the page. Right now, several courses are populated with the AECT standards. Standards associated with additional organizations are included in the Select Standards dropdown menu.

The following link directs you to the page that contains all of the databases tables for the automated tool. When you click on any link on this page you will see table fields and the data which have already been entered. Data entered into forms using the Enter Data link is stored in various combinations of these tables. In order to link data between the tables I used association tables and my report pages are supported by these association tables. If there is no field information entered into an association table, you cannot see any data related to that association table on the report page. The association tables on this page begin with the prefix assoc_.

http://www.citsie.net/harun/edit/index.cfm

Thank you so much for your time and constructive feedback in advance.

Sincerely,
APPENDIX B: THE AUTOMATED TOOL EXPERT REVIEW INSTRUMENT

This instrument consists of two main parts. The first part consists of Interface Design, Compatibility, Production Quality, and Instructional Design with sub-parts. Please provide feedback related to each part. If any of these sub-parts are not applicable or do not exist in the tool, please put N/A. The second part includes Process and Outcomes, and Overall Comments and Suggestions. Please provide feedback related to the second part.

*Describe your current role as an expert reviewer of this automated tool.*

1. **Interface Design**
   a. Orientation: The tool provides clear information display features that indicate the user’s current location within the content.

   b. Tracking: The tool provides tracking features of where the user has been.

   c. Navigational Functions: The tool allows the user to start, move forward, move backward, return the main page, and use the main menu components when desired or necessary.
d. User Support/Help: The tool provides support to the user on a variety of functions, including navigation, technical assistance, and instructions for special features.

2. Compatibility
   a. Installation and Initial Launching: The tool installs and/or launches all necessary components within the operating environment without requiring professional technical assistance, and with all additional required software indicated.

   b. Subsequent Launching: The tool launches every time, allows the user to go to any necessary point in the tool and without requiring professional assistance.
c. Uninstalling: All assets related to the tool can be uninstalled through the operating system and without professional assistance.

3. Production Quality
   a. Legibility of Text and Graphics: The tool uses text and graphics that are clearly legible and defined as commonly used (i.e., 800 x 600 resolution) computer screen.

   b. Formatting and Internal Consistency: The tool exhibits appropriate language, formatting, and internal consistency.

4. Instructional Design
   a. Expression of the Tool Purpose: The tool purpose explicitly describes the intended outcome and scope of the tool.
b. Presentation, Demonstration, Facilitation of Learning: The tool uses appropriate instructional methods to support the tool purpose, provide new information to the learner, and help the learner to internalize, synthesize, and apply the new information.

c. Target Audience of the Tool: The tool describes the intended user of the tool and the appropriateness between the user and intended environment.

d. Practice with Feedback: The tool provides practice opportunities with feedback and guidance, allowing the users to apply their newly learned knowledge and/or skills.

e. Engagement Techniques: Appropriate techniques for engaging and maintaining the user’s interest are used in the tool.
f. Assessment of Learning: The tool provides valid assessments that provide feedback to the user.

5. Process and Outcomes
   a. Does each component on this tool seem necessary for your purposes? If not, explain.

   b. What would you add or remove to improve the tool?

   c. Does each component contain the sub-components necessary to make the tool systematic and efficient? If not, explain.
d. Would utilizing this tool save you time?

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6. Overall comments and Suggestions:

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APPENDIX C: EXPERT REVIEWER’S QUESTIONNAIRE RESPONSES

Describe your current role as an expert reviewer of this automated tool.

(AE) I am a faculty member in the Pamplin College of Business at Virginia Tech. I have served as a member of several site visits to different programs both in the U.S. and abroad to evaluate programs for academic accreditations.

(IDAE) I work in the Virginia Tech Office of Institutional Research and Effectiveness as the coordinator of Web reporting. I work specifically on preparing the electronic response the upcoming SACS-COC Reaffirmation of Accreditation.

1. Interface Design

   a. Orientation: The tool provides clear information display features that indicate the user’s current location within the content.

      (AE) Overall, I felt that the tool provides clear information display features and indicates where I am within the content. Transition from one file to next did not always work. Perhaps links are not fully put in place.

      (IDAE) In the detailed view (Objectives and Standards) only.

   b. Tracking: The tool provides tracking features of where the user has been.

      (AE) Yes, but not always.

      (IDAE) N/A

   c. Navigational Functions: The tool allows the user to start, move forward, move backward, return the main page, and use the main menu components when desired or necessary.
Identification of Academic Program Strengths and Weaknesses

(AE) The navigational features seem good. I was able to move forward, backward, and return to the main menu. However, I am not sure if “submit” option works for all at this time.

(IDAE) Yes but much is not working.

d. User Support/Help: The tool provides support to the user on a variety of functions, including navigation, technical assistance, and instructions for special features.

(AE) Nevertheless, instructions for special features may be improved.

(IDAE) N/A

2. Compatibility

a. Installation and Initial Launching: The tool installs and/or launches all necessary components within the operating environment without requiring professional technical assistance, and with all additional required software indicated.

(AE) As I navigated the tool, I felt that the tool installed and/or launched all necessary components within the operating environment without requiring professional technical assistance. Nevertheless, I am not sure about all the additional required software that was supposed to be indicated.

(IDAE) Yes

b. Subsequent Launching: The tool launches every time, allowing the user to go to any point necessary in the tool without requiring professional assistance.

(AE) Yes, I felt that the tool launched every time and allowed me to go to any necessary point in the tool and without requiring professional assistance. So, this was very comfortable.

(IDAE) Yes
Summary of comments, suggestions, and possible solutions

c. Uninstalling: All assets related to the tool can be uninstalled through the operating system and without professional assistance.

(AE) That I just do not know – perhaps I am having difficulty in understanding the uninstalling part of the tool.

(IDAE) N/A

3. Production Quality

a. Legibility of Text and Graphics: The tool uses text and graphics that are clearly legible and defined as commonly used (i.e., 800 x 600 resolution) computer screen.

(AE) Legibility of text and related features are all fine, legible and well defined. All seemed fine.

(IDAE) Yes

b. Formatting and Internal Consistency: The tool exhibits appropriate language, formatting, and internal consistency.

(AE) Based on terms used, there was consistency across different exhibits.

(IDAE) The interface is inconsistent. The most developed portion is the detailed ‘View Course’ level.

4. Instructional Design

a. Expression of the Tool Purpose: The tool purpose explicitly describes the intended outcomes and scope of the tool.

(AE) Yes, if we agree on its content.

(IDAE) I did not find any expression of the tool purpose within the tool itself.
b. **Presentation, Demonstration, and Facilitation of Learning:** The tool uses appropriate instructional methods to support the tool purpose, provide new information to the learner, and help the learner to internalize, synthesize, and apply the new information.

(AE) In terms of final reports and presentation of information, yes, the tool does provide new information to us in the form of synthesis, which we could then apply it to a setting to negate further new information.

(IDAE) N/A

c. **Target Audience of the Tool:** The tool describes the intended user of the tool and the appropriateness between the user and intended environment.

(AE) The tool has a clearly define target audience that makes the intended user – say, a member of accreditation team, or an administrator – and the intended environment - say, assessing a set of activities to see if they meet ‘accreditation standards” for a given entity.

  • (IDAE) N/A

d. **Practice with Feedback:** The tool provides practice opportunities with feedback and guidance, allowing the users to apply their newly learned knowledge and/or skills.

(AE) This is mostly in the area of institution, department, and program descriptions. Yes, the tool, to some extent, limited though, seems to allow me to apply the newly learned knowledge and skills. It is a bit hard to asses this based on what I have done with the tool.

(IDAE) N/A

e. **Engagement Techniques:** Appropriate techniques for engaging and maintaining the user’s interest are used in the tool.
(AE) For me as faculty, I would say that tool is engaging. I am not sure how it would be for others, say, if you were an administrator or student.

(IDAE) N/A

f. Assessment of Learning: The tool provides valid assessments that provide feedback to the user.

(AE) To some extent, yes. I am not fully sure of this at this time.

(IDAE) N/A

5. Process and Outcomes

a. Does each component on this tool seem necessary for your purposes? If not, explain.

(AE) Given the architecture of the tool, and me being in academia as an educator, my answer is absolutely yes.

(IDAE) A further developed version might show promise in tying course offerings to accrediting standards.

b. What would you add or remove to improve the tool?

(AE) Please see my minor comments that are listed as part of the table I shared with you. I am not sure if all makes sense, but thought some “features” included in each file could use some additions and/or rewording etc.

This reviewer also provided suggestions for some of the data entry forms identified by number and title below.

1) Faculty General Information

I would add Gender and Ethnicity to this section. These two descriptors are very important for a number of reasons- diversity, multi-cultural education environment etc. I would also say “Final Degree Received”. It is not clear when
Identification of Academic Program Strengths and Weaknesses

you say Start date and End date - do they refer to the obtained terminal degree
duration?

3) Institution General Information

I assume that in its final stage, all the pull-down or pop-up menus would have
all the options or allow all the options to be written in.

4) Standard

The general menu is pretty good and very extensive. Again, I am assuming that
this file would allow all the possible number of standards, 1 to n, to be entered.

5) Mission, Vision, Goal, Objective

Therefore, it is then possible to write in as many goals / objectives as one
institution, department, and program would have.

6) Courses

Course level should also be indicated – with some designation, either number
(levels) or class levels - freshman, sophomore, senior, junior, and grade course.
How about the term – Course Designation, e.g., MATH, MGT, Semester & year
offered rather than Place, say, Office Location.

7) Publication

The requested items seem tedious, I wonder If not all that could be simplified by
allowing individuals – faculty to simply upload publications. The same point
could also be made for other files here.

9) Research

It is not clear what we mean by Research here. If it covers Grants and Contracts,
then indicate so. Maybe “Research Project / Contract Duration” is also important
(rather than Research date).
14) Internship
   Duration of Internship – Start and End dates may be included.

15) Program Service
   Duration of Program Service – Start and End dates may be included.

16) Practice
   Duration of Practice – Start and End dates may be included.

17) Clinical experience
   How about study abroad or international experiences.

(IDAE) Finish the navigation. Add help. Add an orienting or overview screen. Add a facility for tying course objectives to program objectives, college objectives, and institution objectives.

c. Does each component contain the sub-components necessary to make the tool systematic and efficient? If not, explain.

(AE) Yes.

(IDAE) I am not sure how to answer this question.

d. Would utilizing this tool save you time?

(AE) With some improvement or enhancement, I would use it to save time.

(IDAE) If developed further.

6. Overall comments and Suggestions:

(AE) It seems to be a very good project. Good luck with it.

(IDAE) Complete the navigation and user aids previously mentioned. Consider altering the interface for data entry to break it down into individual pages for each task or activity.
APPENDIX D: INSTITUTIONAL REVIEW BOARD (IRB) EXEMPT APPROVAL FORM

Virginia Tech

INSTITUTIONAL REVIEW BOARD
AND STATE UNIVERSITY

Dr. David M. Moore
IRB (Human Subjects) Chair
Assistant Vice President for Research Compliance
1410 Furtick Drive, Suite 2006, Blacksburg, VA 24061-0442
Office: 540/231-4999; FAX: 540/231-6033
email: moored@vt.edu

DATE: August 26, 2005

MEMORANDUM

TO: Barbara B. Lockee Teaching and Learning 0313
Harun Yilmaz EDCI 313

FROM: David Moore

SUBJECT: IRB Exempt Approval: "Identification of Program Strengths and Weaknesses Through Use of Automated Tool" IRB # 05-503

I have reviewed your request to the IRB for exemption for the above referenced project. I concur that the research falls within the exempt status. Approval is granted effective as of August 25, 2005.

Virginia Tech has an approved Federal Wide Assurance (FWA00000572, exp. 7/20/07) on file with OHRP, and its IRB Registration Number is IRB00000667.

cc: File

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