A White Paper

That which has changed is only that which has been measured.

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Competency-based Learning Systems: Implementation in a Corporate Environment

by Base Corp Learning Systems

for

SaskPower

Competency-based learning systems are experiencing resurgence in corporate learning environments. Organizations today, recognizing the benefits, are implementing these systems at a rapid pace. Interestingly, there seems to be lack of consensus on the definition, significance and requirements of a competency-based learning environment. This white paper will assist those organizations considering implementation of a competency-based learning system. Described, identified and illustrated are the rationale, science of competency, the requirements for a successful competency-based learning system, and workplace culture implications.

Successful implementations require that organizations prepare carefully and fully understand all aspects of competency-based learning.

BASE CORP. Learning Systems

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Purpose

The purpose of the following White Paper "*Competency-based Learning Systems: Implementation in a Corporate Environment*" is to provide a tool for understanding and appreciating the requirements for implementing a competency-based learning system in corporate environments.

Research and Writing Team

Each member of the Base Corp Learning Systems research team is an experienced and thoughtful academic as well as practitioner in the area of competency-based learning and technology.

Assumptions

This paper assumes awareness of:
- learning and training fundamentals in corporate learning environments,
- learning technologies for corporate training,
- adult learning principles,
- current corporate training requirements,
- organizational change implications, and
- workplace culture.

Expected Outcomes

The expected outcomes of this white paper are:
- to assist learning professionals to identify and define the major principles of competency-based learning,
- to describe the rationale for implementation of competency-based learning systems,
- to provide a valid and reliable presentation of the factors that influence the decisions to employ competency-based learning systems in corporate environments,
- to assist learning professionals to defend the principles of competency-based learning, and
- to assist learning professionals to understand the impact of competency-based learning on corporate culture and to understand the change issues.

Overview

There is no one definition of competency. "Competency, competencies, competency models, and competency-based training are Humpty Dumpty words meaning only what the definer wants them to mean". (Dubois, 1993, p5). Organizations adopt the term and then attempt to define the concept within their own paradigm. Regardless, most agree, in general terms competence means being capable. More specifically it means that an individual can perform a task to a set standard -- it is a *yes* they can or a *no* they can not, or a *0* or *1* for the technically inclined.

This concept is not new, however, over many years of use has proven to be extremely effective in corporate learning environments. It is in contrast to the typical traditional training model where comparison of performance is often in relation to other employees. Competency models strive to ensure a set standard is met for all targeted employees.

"Many companies now use competency-based tools and applications to drive organizational performance" (Shandler, 2000, p1). Shandler summarizes a simple four step model to describe the outcomes of a competency-based learning system:

Step 1: Individuals and organizations identify and acquire competencies (knowledge, skills and attitudes).

Step 2: There is a change in behavior, the new knowledge, skills and attitudes are applied.

Step 3: These new behaviors produce output (improved customer service, new product development, increased corporate support, etc.).

Step 4: The performance of the organization improves; the expectations are met (reduced costs, increased safety, improved bottom line performance, improved moral and others).

While very popular in the 60's and 70's, the complexity of the competency-based learning resource development process and the tracking of employee performance made implementation and usage cumbersome. As more people were added to the competency-based learning system, the work to deliver and track the program increased exponentially.

It was not unusual to see organizations using spreadsheets to support content development, program delivery, and employee performance tracking. Literally, inches of paper were used in the process. Today's competency-based learning systems are much more efficient and successful. They are typically supported with the newest technologies that provide an infrastructure for information resources, standards of performance, learning resource and content development, evaluation criteria and testing, and workplace competency management and tracking. The Internet is the latest technology supporting competency-based learning systems.

Organizations are looking for improved performance in all areas of operation. The science of competency-based learning now married with new technologies is demonstrating even greater advantages and benefits to organizations, not just in achieving improved workplace performance, but also in unexpected returns on investments through numerous cost savings.

Terminology Clarification

For the purposes of this paper we acknowledge that competency-based learning (CBL) and competency-training (CBT) are often used interchangeably in the literature. Some authors distinguish the terms by defining competency-based learning as focusing on an individual's long-term, future job needs versus competency-based training as focusing on an individual's immediate job-related needs.[1] For us, they are virtually indistinguishable and for consistency we have elected to use the term competency-based learning throughout this white paper.

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[1] See Shandler 2002.

Overview

The primary role of a competency-based learning system is to ensure that all workers have the information and skills needed to perform their workplace tasks to an established and documented standard of performance. Additional roles of a competency-based learning system include the provision of management tools, information tracking, and change management.

Other advantages include:
- Regulatory Compliance
- Consistency and Integrity
- Competency Assurance
- Learning Effectiveness
- Records Management

Regulatory Compliance

In the current economic and political environments, many companies are experiencing considerable pressure to meet regulatory standards in their workplace practices. These standards may be legislatively imposed, such as workplace health and safety regulations, FDA requirements, or may be a result of a market need, such as ISO certification. Furthermore, companies are discovering that they must not only be compliant, but they must be able to authoritatively demonstrate that compliance to external authorities. The management burden of tracking and documenting compliance is often a significant component of meeting regulatory requirements.

A competency-based learning system is an effective tool for documenting, implementing and tracking regulations and compliance. The latest standards and procedures are made available in the workplace, and employee access to such documents can be tracked. Training standards, knowledge evaluations, and re-certification are provided without significant management overhead. Compliance reports can be generated periodically to satisfy management and regulatory bodies that the workplace conforms to, or exceeds, the set standard.

Consistency and Integrity

A common difficulty in workplace training and evaluation is maintaining consistency. Employee skill acquisition is affected by the abilities of the instructor/ mentor, the time allotted to the training program, the availability of any training materials, and the accuracy of any evaluations of skill. Because these factors are often variable, different employees will have different experiences of training, and may have quite different levels of skill at the end of the process. Furthermore, employee evaluations (tests or sign-offs) are often subjective, and the results can depend on the relationship between the employee and the evaluator, rather than on an objective evaluation of competency. In its worst incarnation, a lack of consistency can lead to workplace hazards as not all employees perform a task in the same way or follow the same safety guidelines.

A key principle of a competency-based learning system is the provision of standardized curriculum, supporting resources, learning opportunities, and evaluation. All employees have access to identical documents and resources, have a structured learning environment for skill acquisition and are evaluated using the same methods and standards. The result is a consistent standard of performance and evaluation of competency.

Competency Assurance

Competency is, simply stated, the ability to perform a specific job-related task to a defined standard of performance. A competency-based learning system documents the standards and provides training and performance support resources to meet those standards. The result is a clear picture of what is expected of a competent employee and a route for developing competency. Employees may be recognized and rewarded for demonstrated skill, and the presence of a competent work force reduces workplace hazards and inefficiencies.

Learning Effectiveness

Employee training can require the expenditure of significant resources. Course fees, training facilities, training materials, employee time, and supervisor oversight may all be required, often at significant cost or inconvenience. If the training is ineffective or not directly applicable to the workplace, those resources are expended for no benefit. A Competency-based learning system precisely documents what skills are needed, provides resources only for those skills and permits self-directed and on-the-job learning. Consequently, training resource needs can often be reduced, and training results are both documented and relevant.

Records Management

Regulatory compliance, employee recompense, budgeting, and scheduling are all management activities that require reference to training records. An effective competency-based learning system should automate much of the record-keeping burden associated with training and employee performance. Employee access to resources, competency evaluation, regulatory compliance needs, and changes to the system or resources should be tracked by the system and be immediately available to meet administrative needs.

As illustrated above the primary role of a competency-based learning system is to ensure that all workers have the information and skills needed to perform their workplace tasks to an established and documented standard of performance. The rational for performance standards is supported by current corporate learning expectations. Support for competency-based learning systems is built on a foundation of fifty-plus years of formal learning research findings and implementation experiences.

History, Science and Principles

Overview

The concept of competency-based learning or education has descended most directly from the behavioral objectives movement of the 1950s in the United States and, the thinking of educator Benjamin Bloom[2].

This movement sought to focus attention on the intended outcomes of learning programs and to encourage the development of instructional objectives as changes in observable learner behaviors.[3] Proponents of the behavioral objectives movement advocated specification of objectives as directly observable behaviors, which could be reliably recorded <u>as either present or absent, a yes or a no</u>. This practice is still in place today and in fact is experiencing a resurgence with the support of new technologies has increased usage markedly.

The behavioral objectives movement of the late 1950s and 1960s gave rise in the 1970s to four related developments: mastery learning (Bloom 1974); criterion-referenced testing (Popham 1978); and ultimately competency-based learning (Dubois 1993) (Shandler, 2000).

Although the imperatives for the introduction of competency-based learning have been different in different countries at different times, and the ways in which this concept has been operationalised have changed over time. The basic principles and intentions of competency-based learning have however remained essentially unchanged since the 1960s. They are:

- a focus on outcomes
- greater workplace relevance
- outcomes as observable competencies
- assessments as judgments of competence
- improved skills recognition
- improved articulation and credit transfer

Mastery Learning

Benjamin Bloom is credited with fully developing the concept now known as *Mastery Learning*. Mastery Learning is an instructional strategy based on the principle that <u>all</u> students can learn a set of reasonable objectives if given appropriate instruction and sufficient time to learn. In the 1960s, Bloom was involved in research on individual differences as applied to learning. Based on his research he concluded that if aptitude could predict a learner's learning rate, then he believed that it should be able to set the degree of learning expected of a student to some level of mastery performance. This is operationalised as achieving 100% on a knowledge test or all correct on a practical/ attitudinal evaluation. Two variables would help to ensure

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[2] Dr. Benjamin Bloom (1913– 1999) He received a bachelor's and master's degree from Pennsylvania State University in 1935 and a Ph.D. in Education from the University of Chicago in March 1942. He became a staff member of the Board of Examinations at the University of Chicago in 1940 and served in that capacity until 1943, at which time he became university examiner, a position he held until 1959. Following a 1948 Convention of the American Psychological Association, B S Bloom took a lead in formulating a classification of "the goals of the educational process". Three "domains" of educational activities were identified: cognitive, affective and psychomotor.

[3] See Bloom et al. *Handbook on Formative and Summative Evaluation of Student Learning.* 1971.

the learner attain mastery of the objectives: 1) quality of the instruction, and 2) the opportunity to learn. Bloom concluded that given sufficient time and quality instruction, nearly all students could attain the specified objectives.[4]

The mastery learning model is closely aligned with the use of instructional objectives and the systematic design of instructional (ISD) programs (see Gagne, et al). The *Criterion Referenced Instruction* (CRI) model of Mager of evaluating terminal behaviors is required to implement the mastery learning model.

Criterion-Referenced Instruction

The Criterion Referenced Instruction (CRI) framework developed by Robert Mager[5] is a comprehensive set of methods for the design and delivery of training programs. Some of the critical aspects include: 1) goal/task analysis -- to identify what needs to be learned, 2) performance objectives -- exact specification of the outcomes to be accomplished and how they are to be evaluated (the criterion), 3) development of learning modules tied to specific objectives, 4) criterion referenced testing -- evaluation of learning in terms of the knowledge/skills specified in the objectives.

Training programs developed in CRI format tend to be self-paced courses involving a variety of different media (e.g., workbooks, videotapes, small group discussions, computer-based instruction). Students learn at their own pace and take tests to determine if they have mastered a module.

CRI is based upon the ideas of mastery learning and performance-oriented instruction. It also incorporates many of the ideas found in Gagne's theory of learning[6] (e.g., task hierarchies, objectives) and is compatible with most theories of adult learning (e.g., Knowles, Rogers) because of its emphasis on learner initiative and self-management.

Criterion referenced instruction is applicable to any form of learning; however, it has been applied most extensively in competency-based learning systems.

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[4] See Robert Gagné's *Instructional Technology Foundations* 1987.

[5] Dr. Robert F. Mager is an accomplished author and world-renowned expert on training and human performance improvement issues. Arguably the most well-known and respected figure in his field, he is credited with revolutionizing the performance improvement industry with his groundbreaking work. Dr. Mager holds a doctorate in psychology. One of Dr. Mager's most significant contributions to the performance improvement field is his work on the Criterion-Referenced Instruction (CRI) training methodology. Developed by Dr. Mager in conjunction with Peter Pipe, CRI is used to develop training guaranteed to work and has become the standard for excellence in training and performance improvement. To teach this methodology to others, Dr. Mager has authored or co-authored three train-the-trainer workshops. To date, thousands of training professionals worldwide have been trained.

[6] Dr. Robert Gagné (1916-2002). After receiving his bachelor of arts degree from Yale University in 1937, he went to Brown University to earn a doctoral degree in experimental psychology in 1940. He spent much of his 50-year career in academic positions at Connecticut College for Women (1940); Princeton University (1958 to 1962); University of California at Berkeley (1966 to 1969); and Florida State University (1969 to 1985). From 1962 to 1966, he was director of research at the American Institutes for Research in Pittsburgh, Pa. Gagne also spent a good portion of his career working on military training problems. During World War II, Gagne served as an aviation psychologist, developing tests for classification of air crew. From 1950 to 1958, he was technical director for Lackland and Lowry Air Force Laboratories, where he conducted numerous studies of human learning and performance. At the end of his career (1990-91), he worked on instructional design models for military training at Armstrong Air Force Base in San Antonio, Texas. In 1965, Robert Gagne published *The Conditions of Learning*, a milestone that elaborated the analysis of learning objectives and went on to relate different classes of learning objectives to appropriate instructional designs.

Principles of criterion-referenced instruction:

1. Instructional objectives are derived from job performance and reflect the competencies (knowledge/skills/attitudes) that need to be learned and demonstrated.

2. Students study and practice only those skills not yet mastered to the level required by the standards set out in the objectives.

3. Students are given opportunities to practice each objective and obtain feedback about the quality of their knowledge acquisition and performance.

4. Students should receive repeated practice in skills that are used often or are difficult to learn.

5. Students are free to sequence their own instruction within the constraints imposed by the pre-requisites and progress is controlled by their own competence (mastery of objectives).

Fixed Time Variable Performance vs. Fixed Performance Variable Time

Another way to increase understanding of CRI is to compare the Fixed Time Variable Performance or traditional method of instruction to the Fixed Performance Variable Time Model or criterion-referenced model.
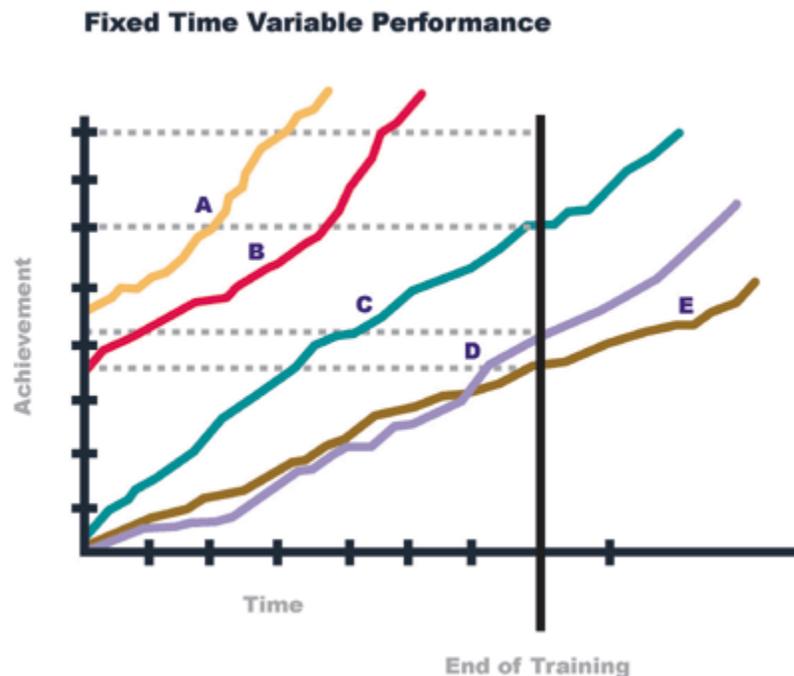

Graph A

Graph A plots the X-axis as time and the Y-axis as achievement. In a typical traditional instructional model learners enter the training event with various levels of ability and skill. The learners are graphed as A through E proceeding through the course. Some of the learners A and B are advanced relative to the other learners C through E.

As the course progresses along the X-axis time, the advanced learners complete the course requirements prior to the targeted course completion, rendering learner and instructional time as not necessary along with associated frustrations and costs. Learners C through E continue through the course but unfortunately at course completion they have varying degrees of success. In fact, Learner E has probably not had a successful experience in terms of learning outcomes because he or she ran out of time.

Contrast the above model **Graph A** with **Graph B** the Fixed Performance Variable Time model.

Fixed Performance Variable Time
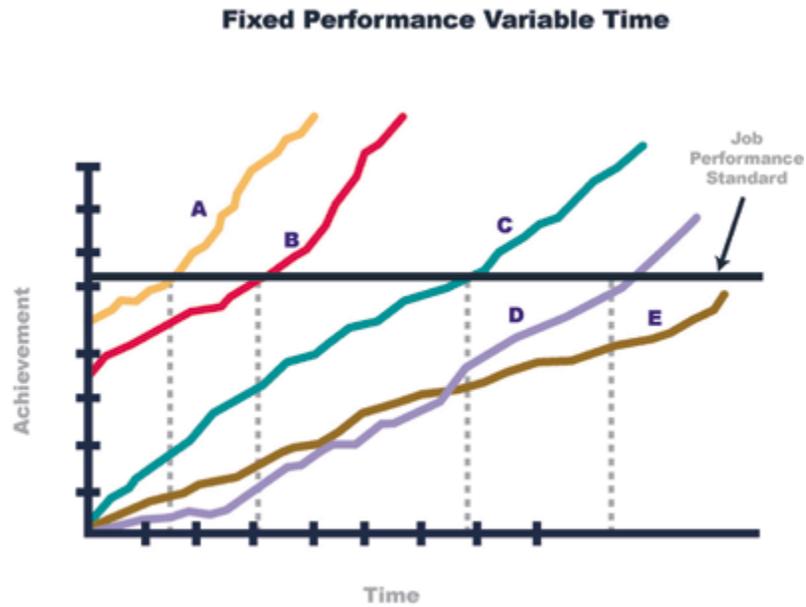
Graph B

As in Graph A, Graph B plots the X-axis as time and the Y-axis as achievement. Prior to course delivery, the standard or success level of achievement has been determined. As in the previous diagram different learners enter the training event again with various levels of ability and skill. In the Fixed Performance Variable Time or Criterion-Referenced model learner A and B complete in a shorter period of time than the other learners. They are able to exit the course in less time than the rest. Further we can state that learners that meet the standard are competent, assuming that the learning event meets the learning requirements for competency. In this model, the other learners have the opportunity to meet the standard but require additional time and support. There is an additional outcome, Learner E in Graph B may not meet the standard. Corporations today need to know which of their employees can successfully complete their required duties.

Bloom's Taxonomy

A competency-based learning system demands that competencies be identified and defined. Learning resources and evaluation instruments are required to support these competencies.

The instructional systems design (ISD) process implements practices designed to identify and structure workplace competencies. While several models of ISD exist[7], Bloom's taxonomy is the most widely subscribed guiding model in use in training today.

Bloom's taxonomy[8] is a classification system that captures the intellectual behavior important in learning and delineates the "intended behaviors" of learners. This taxonomy of learning behaviors is typically thought of as the goals of the training process and is the most widely applied one used in instructional design today. In short, he identified three domains of educational activities, cognitive, psychomotor and affective; the way individuals think, act or feel as a result of participating in a unit of instruction expressed in measurable observable formats (learning objectives). The three domains are often thought of as the knowledge component, the practical application, and attitudinal aspects of learning or as practitioners sometimes say, the head, the hand, and the heart. Each of the three domains is broken down into sub-divisions starting from the simplest behavior to the most complex as described below.

The *cognitive domain* involves knowledge and the development of intellectual skills. This includes the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills. There are six major categories, which are listed in order below, starting from the simplest behavior to the most complex. The categories can be thought of as degrees of difficulties. That is, the first one must be mastered before the next one can take place.

Knowledge: Recall of data.

Comprehension: Understand the meaning, translation, interpolation, and interpretation of instructions and problems. State a problem in one's own words.

Application: Use a concept in a new situation or unprompted use of an abstraction. Applies what was learned into novel situations in the workplace.

Analysis: Separates material or concepts into component parts so that its organizational structure may be understood. Distinguishes between facts and inferences.

Synthesis: Builds a structure or pattern from diverse elements. Put parts together to form a whole, with emphasis on creating a new meaning or structure.

Evaluation: Make judgments about the value of ideas or materials.

The *psychomotor domain* includes physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution. The seven major categories listed in order are:

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[7] See Dick W. & Carey L., *The Systematic Design of Instruction* 1985 and, Seels, B. & Glasgow Z., *Making Instructional Design Decisions* 1998.

[8] See Bloom et al. in *Taxonomy of Educational Objectives* 1964.
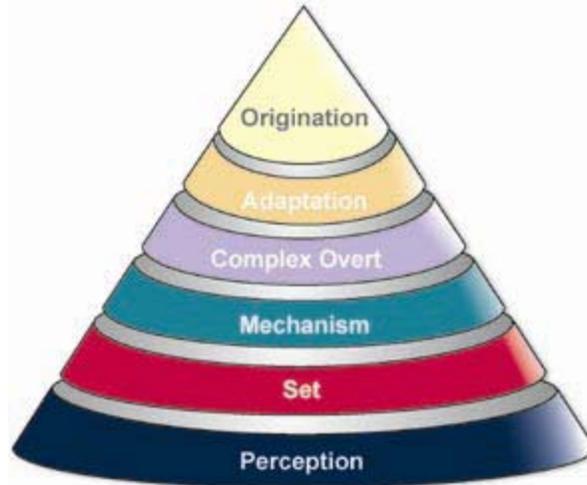
Perception: The ability to use sensory cues to guide motor activity. This ranges from sensory stimulation, through cue selection, to translation.

Set: Readiness to act. It includes mental, physical, and emotional sets. These three sets are dispositions that predetermine a person¹s response to different situations (sometimes called mindsets).

Mechanism: This is the intermediate stage in learning a complex skill. Learned responses have become habitual and the movements can be performed with some confidence and proficiency.

Complex Overt Response: The skillful performance of motor acts that involve complex movement patterns. Proficiency is indicated by a quick, accurate, and highly coordinated performance, requiring a minimum of energy. This category includes performing without hesitation, and automatic performance. For example, players are often utter sounds of satisfaction or expletives as soon as they hit a tennis ball or throw a football, because they can tell by the feel of the act what the result will produce.

Adaptation: Skills are well developed and the individual can modify movement patterns to fit special requirements.

Origination: Creating new movement patterns to fit a particular situation or specific problem. Learning outcomes emphasize creativity based upon highly developed skills.

The *affective domain* includes the manner in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes. The five major categories listed in order are:

Receiving Phenomena: Awareness, willingness to hear, selected attention.

Responding to Phenomena: Active participation on the part of the learners. Attends and reacts to a particular phenomenon. Learning outcomes may emphasize compliance in responding, willingness to respond, or satisfaction in responding (motivation).

Valuing: The worth or value a person attaches to a particular object, phenomenon, or behavior. This ranges from simple acceptance to the more complex state of commitment. Valuing is based on the internalization of a set of specified values, while clues to these values are expressed in the learner's overt behavior and are often identifiable.
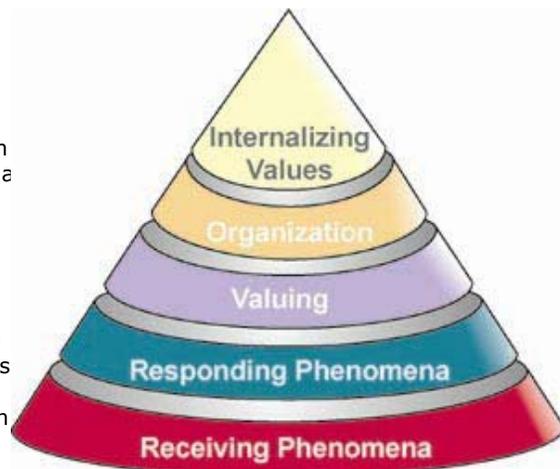
Organization: Organizes values into priorities by contrasting different values, resolving conflicts between them, and creating an unique value system. The emphasis is on comparing, relating, and synthesizing values.

Internalizing Values (characterization): Has a value system that controls their behavior. The behavior is pervasive, consistent, predictable, and most importantly, characteristic of the learner. Instructional objectives are concerned with the student's general patterns of adjustment (personal, social, emotional).

Important to note is that this taxonomy is based on the assumption that a hierarchy of learning is important to acquire competency at one level before can acquire competency at next, each becomes a pre-requisite for the next level. Bloom's taxonomy is important to us because one of the first steps in the development of a competency-based learning system is the development of the supporting learning resources. These resources include learning objectives, content, and evaluation. Furthermore, learning resources and evaluations are developed for each of the three learning domains.

Learning Resource Development and Validation

Competency-based learning systems are founded on the idea that any job is composed primarily of a discrete set of performances or skills. The competencies of a given job posting include the set of skills or knowledge that the individual must demonstrate to successfully complete tasks.

The documentation of competencies using a skill listing provides an overall view of the required skills at a particular organization. A sub-set or collection of these skills provides the curriculum of training for individual employees.

A competency-based learning system demands that competencies be identified, described, and documented.

In a competency-based learning system there are two primary areas of focus: 1) learning resource development and, 2) the learning methodology or competency-based learning cycle.

Appropriate learning resource development is critical, if the content of the course is flawed, regardless of the learning success, the performance expectations will not be achieved. Stated another way, if the learner learns the wrong thing he or she will perform poorly. Poor employee performance invariably leads to poor organizational performance.

While there are many learning resource or learning content development processes, most boil down to five main steps[9]. These include:

1. Determine Competencies/ Skills
2. Specify Job Performance Standards
3. Identify and Develop Learning Resources
4. Develop Evaluation Items
5. Validate Learning Resources

1) Determine Competencies/ Skills

There are many was to identify the skills required for the competency-based learning system. Often the design engineers or experts can provide the required skill listing. Practitioners or SME's associated with the process or systems through facilitated working sessions can also identify the required skills. Participants should be employees at all levels who perform the work of the facility, department or organization being profiled. They are people directly engaged in the work of their area, and are therefore the Subject-Matter-Experts (SMEs) for the identification of skills, and later on for the development of competency-based learning resources including the evaluation and validation.

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[9] See Dick W. & Carey L., *The Systematic Design of Instruction* 1985 and, Seels, B. & Glasgow Z., *Making Instructional Design Decisions* 1998.

There are formal and not so formal methodologies for the identification of skills (e.g., DACUM-Design a Curriculum, Skill Profiling, Skill Bank Analysis, etc.)

Regardless of the methodology used to identify the skills the main purpose is to identify, analyze and organize competencies within an organization.

This listing of skills, the results often called a skill profile or skill map, after a reliable validation, is the first step in designing a competency-based learning program. The development of a skill listing often helps to achieve:

- group consensus regarding learning needs
- buy-in and commitment to the development process
- employer and employee communication about what should be done to improve the workplace
- structure for the development of a competency-based learning system

The skill names are often written as competency statements which define a skill in measurable terms. Each skill title usually begins with an observable verb which describes what and employee must "know" or "do" to be competent in the skill. Competency statements are clearly written and often look like; "Describe Competency-based Learning Principles ". They are the first level of criteria by which the learner can be evaluated.

2) Specify Job Performance Standards

Performance standards are developed for each skill or competency. They are developed with practitioner or System designer input to document best practice expectations for job performance. Validated performance standards will give direction and structure to the learning program. For clarification, the term "performance standard" is used interchangeably with the term "objective".

Performance standards are enabling objectives which outline the cognitive, attitudinal and practical behaviors to demonstrate competence. They specify:

- what will be learned,
- what criteria will be evaluated, and
- the learning domains of the competency.

The components of performance standards should include at least:
- a rationale statement,
- conditions of performance,
- performance objectives, and
- standards of performance.

A rationale statement summarizes why a skill is important.

The condition statements describe under what circumstances a task is performed. They "set the stage" for learning. The four most common types of conditions describe:

- when a skill is performed; frequency,
- the aids, tools or materials needed to perform the skill,
- restrictions or limitations of performance, and
- pre-requisite skills.

The performance objectives describe, in behavioral terms, the steps required to perform a competency or job task. Steps are sequenced from simple to complex, or in the order that the task is done. They are enabling objectives required to perform the terminal performance (e.g., the competency or job task).

The standards elaborate on the performance objectives and provide the level of detail to produce learning resources and evaluation materials. Standards specify how well a performance is to be done and how the performance will be measured. They are the criteria used to determine whether the acceptable performance was met. Remember, in a CRI environment the result of the evaluation is *yes* they are competent or *no* they are not.

When experienced employees help identify and validate standards to set learning objectives, job relevance is assured. Performance standards are validated for completeness, relevancy, and accuracy.

Job performance standards form the foundation of a competency-based learning system. While sometimes onerous to complete for each competency, appropriate learning resource development cannot be accomplished without concise standards. Resource development is involved and resource-dependent, so ensuring that only those learning resources that meet the competency standard requirements are developed is critical. Targeted learning resources need to be designed and developed with the end audience in mind, in order to guide learners and assist them in acquiring the required competencies.

3) Identify and Develop Learning Resources

Learning resources are developed using the information from the documented standards. In some organizations the development of the learning resources are done at the same time as the performance standards. It is important to understand that each different learning objective will provide hints as to the appropriate learning resource treatment. These individual treatments can include, paper-based learning modules, courses provided by external organizations, CBT, instructor-led classroom instruction or any combination of the above.

The best learning resources are often developed by the current practitioners or employees. These people are usually in the best position to describe how things are done. With facilitation by competent learning system developers and appropriate validation from appropriate supervisors and other subject matter experts (SMEs), high quality learning resources can be developed.

4) Develop Evaluation Items

In addition to the mapping of skill sets, developing standards and creating learning content, defined standards of performance must be reflected in evaluation tools such as examinations, practical checklists, procedures, final tests, on-job checkouts, learning exercises, observation over time and learning exercises. These evaluation tools allow workers to be objectively evaluated against these standards, which they must be able to consistently meet.

Competency-based learning methods assist the learners in mastering the key concepts or practices required for competency in the skill. Competency-based evaluation materials:
- ensure objectivity,
- test only "need to know" information, concepts or practices,
- test against learning objectives,
- are relevant to the learning objectives, and
- determine competency.

The knowledge skills can usually be evaluated using some form of test, paper based, online, verbal, or other.

The practical skills are evaluated using an on-job checkout. These are conducted by the supervisor, coach or a designated evaluator and are guided by the written materials provided for that purpose. These are usually evaluation checklists or procedures, but can be other instruments as required.

Providing documentation to guide on-job checkouts helps to ensure objectivity. The requirements of the evaluation are documented and not negotiable.

Observation over time is also guided by requirements specified in supporting documentation.

Evaluation in a competency-based learning system corresponds to the performance standards and learning resources developed for the specific skill. The evaluation materials that are developed to test learner competency for a specific skill ensure objectivity by relying on predefined learning objectives that the learner is aware of, rather than the subjective overall impression of a supervisor. Each evaluation should test only 'need-to-know' information, concepts, or practices. Competency-based learning systems therefore test against learning objectives.

5) Validate Learning Resources

Validation at each stage of the learning resource development process is critical. The strength of the learning resources rests on the expertise of the system designers or the SME's.

During the validation process the participants in the learning system design are asked to check accuracy, completeness and sequencing, and to agree on one set of changes before returning the individual components.

Often organizations get stalled at this step. It is important to note that the competency-based learning system must reflect the current state of the system or process. As systems and processes often change or are improved, an acknowledgement that the learning system needs to adapt is critical.

Competency-based Learning Process

Using the developed curriculum the learner has access to the required skills or learning modules. This curriculum is supported by the appropriate learning resources and evaluation instrucments.

A competency-based learning on-job process is based on the development of appropriate learning resources.

Consider the three domians of learning described previously, Knowledge (Cognitive), Application(Psychomotor) and Attidute(Affective). A competency-based learning process needs to address these three domains.

Competency-based Learning Cycle
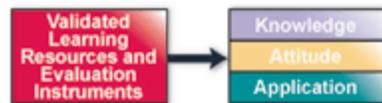
Using the developed curriculum and learning resources the learner has access to the required skills or learning modules. These learning resources are developed using a systematic design process[10] and have been validated and approved by the appropriate SME's.

Learners begin by selecting a place to start. Most often this is one of the beginning skills or prerequisties prior to moving on to the advanced skills.

The learning resources help learners meet the learning objectives and prepare for the knowledge evaluation. Learners are encouraged to read descriptions, review procedures or other documents, and consult with experienced personnel. Often there are alternative learning reosuces that support differing learning styles, these other resources may include coaches, technical descriptions, standard operation procedures, computer-based training with multiple treatments, institutional courses, in-service delivery or other.

A period of time is allowed for learners to prepare for further instruction and evalution. Furthermore, the opportunity to practice the knowledge evalution is provided in the form of self-checks or self test. These pre-final evaluation instruments are also learning tools that enable learners to confirm their understanding of the main learning points.

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[10] See Dick W. & Carey L., *The Systematic Design of Instruction* 1985 and, Seels, B. & Glasgow Z., *Making Instructional Design Decisions* 1998.

Competency-based Learning Cycle
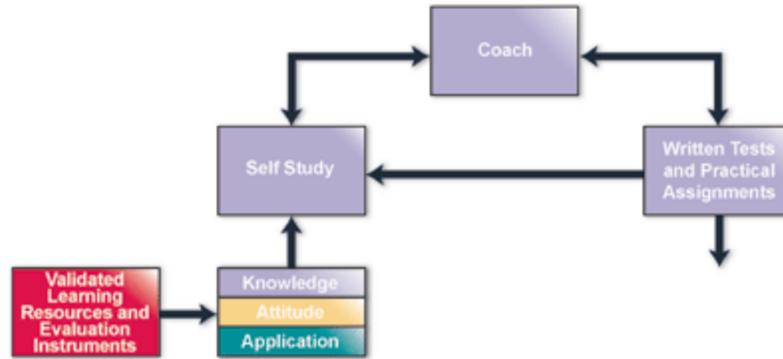
Above is a pictorial represenation of the knowledge portion of a competency-based learning cycle.

This stage is critical to an efficient competency-based learning process. A final evaluation or final test of the described knowldege is required prior to moving to the next step in the process. By completing some pre-work, prior to hands on instruction or practice, a basic undersanting of the concepts can be assured. Valuable time and cost of instructors or supervisers is reduced because the learners arrive to their job tasks ready to apply their knowledge. As well, the instructors can be assured that a basic or pre-requiresite amount of knowledge is in place prior to moving forward with instruction. Confidence to allow the learners to practice is increased when the instructor is assured a pre-requistise amount of knowledge is in place.

Competency-based Learning Cycle
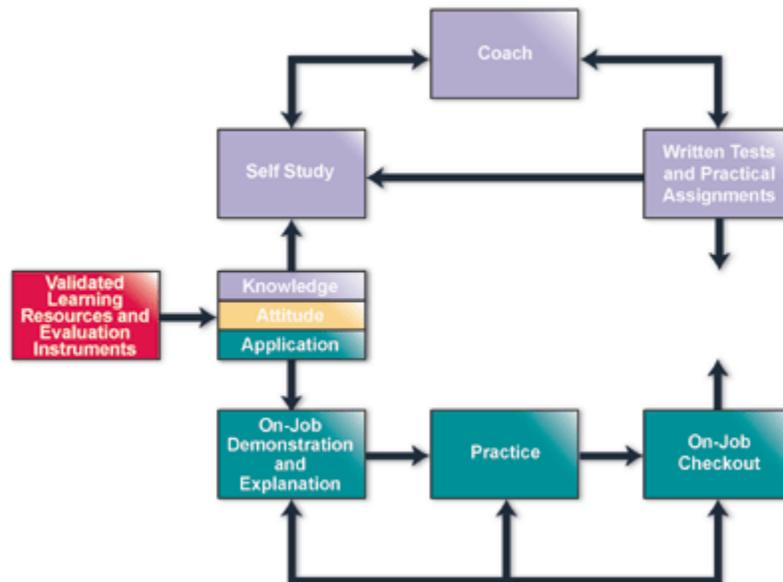
The next step of the process is represented above.

With the knowldege portion of the learning cycle complete the learner approaches a designated coach for the practical demonstration. This on-job demonstration and explanation

is completed using the target performance standard, along with the learning information and any other relevant learning resources.

The learner is allowed tiime to practice with supervison from the instructor or supervisor. This practice time is established according to the type of task or the skill required. Practice is required to develop the learner's ability to perform the skill, operate safely, compare new presentaiton of material with previous knowledge and reinforce best practices on the job. Learners are encouraged to get feedback and input from peers as they practice.

At the conclusion of the application learning process the learners are evaluated. This evaluation includes a review of the important knowledge requirements and the learner's capability to perform the skill to the previously established standard. The practical portion of the evaluation will be completed by a competent team member or supervisor with direct reference to evelution instruments developed to support a criterion-referenced evaluation.

Competency-based Learning Cycle
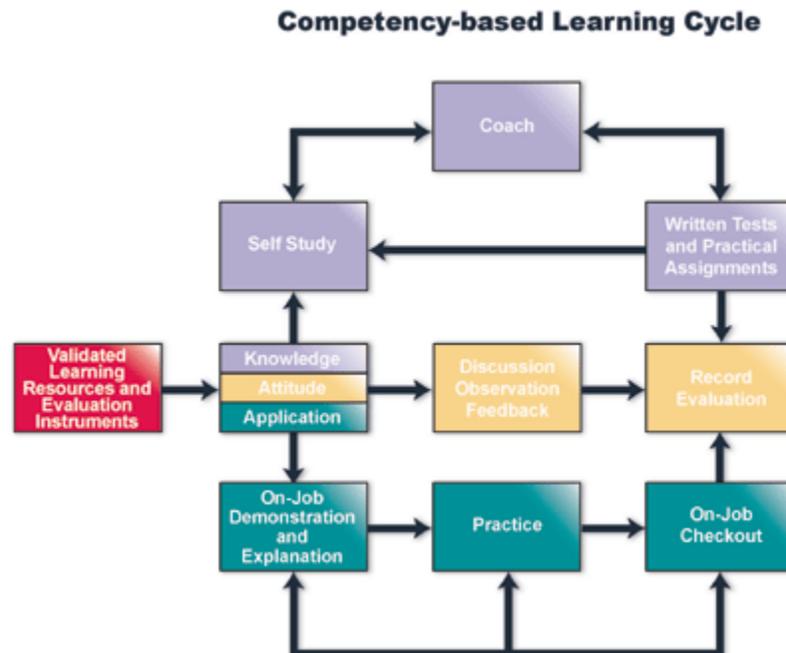
The above represents the third and final process within a competency-based learning cycle.

At this point in the learning process the learner can demonstrate the required knowledge and the appropriate skill to a specified standard. Interestingly, this is often where the learning cycle ends. At this point there is no assurance that the new knowledge or skill will be applied. If the learner has the knowldege and skill but does not use or apply the new knowldege and skill is he or she considered competent? We would argue not, for performance to improve, or the expected results to be accomplished the new knowledge and skill must be applied.

Evalution of the affective or attitudianl skills is accomplished through an on-going evaluation process associated with a method to record the outcomes on a continuing basis.

Regrettably, while many organizations are exceptional at the implementation of the learning program, they do not continue to evaluate on-going performance. As good as the learning program is, without application of the new knowledge and skills learners will not improve the process or performance of the organization.

Having reviewed the learning resource development process and the competency-based learning cycle, one critical aspect of the implementation process not often taken into consideration is the impact on the organizational culture.

ORGANIZATIONAL CULTURE AND CHANGE

A major factor in the successful implementation of a competency-based approach to learning is its acceptance within an organization's culture. Implementation of any learning system will impact cultural forces and may have unanticipated and undesirable consequences. Managing learning system implementations has traditionally been a demanding process that requires understanding of the mechanisms of organization culture and organization culture change. This process has been further complicated in recent years with the rapid influx and need for application of new learning technologies.

Organizational culture is generally defined as the shared system of values, beliefs, and behaviors characterizing a group of people.[11] Small or large, organizations are made up of groups of people that represent *the way things are done*.

Does corporate culture matter? Absolutely! Corporate culture impacts the norms that evolve amongst working groups, for example it defines:

- the attitude of what is a *fair day's work for a fair day's pay*;
- the feeling or climate that is conveyed through the interaction of employees with customers or other outsiders;
- the dominant values espoused by the organization such as quality and leadership;
- the philosophy that guides the organization's policy toward employees and/ or customers; and,
- the rules of the game of getting along in the organization -- the *ropes* that a newcomer must learn to become a trusted and accepted member of the group.

> *"People are the architects of organizational culture – culture is manifested on a day-to-day basis."*
>
> *By Price Prichett*

In short, organizational culture is defined as "the way we do things around here".

> "Change in the culture of organizations happens as a result of shifts in the values, beliefs, and behavior systems, based on the shared experience of the group or groups within the organization, or as the result of planned and intended interventions by the leaders of the organization, to alter those values, beliefs, and behaviors." [12]

External or internal decisions to change the way things are done have consequences on cultural forces. Decisions often require the unlearning or relearning of new ways of doing things and groups of people or people in groups will make judgments on the desirability of the change that will ultimately impact employee performance, employee safety and product quality control. Change can be complicated and people will resist change because it is uncomfortable and anxiety-producing. They ask themselves the question, "How can I be successful in this new paradigm?" Organizations are responsible to provide the pathway and support to help their employees succeed. If coerced into changing overt behaviors, behavior change is not stable unless deeper levels undergo some kind of transformation. Transformation takes time continuous communication.

Critical events in an organization's external environment may determine the need for culture change, but the process of change itself is evolutionary, not revolutionary, and requires long-term commitment from the organization's leaders. The process of implementing a

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[11] See *The Corporate Culture Survival Guide* by Edgar H.Schein 1999 and "Culture Change" by Claude Lineberry and J. Robert Carleton in *Handbook of Human Performance Technology* 1992.

[12] See "Culture Change" by Claude Lineberry and J. Robert Carleton in *Handbook of Human Performance Technology* 1992.

competency-based training system is an evolutionary process. Forward movement in this evolutionary process is ensured through on-going evaluation and validation.

CONCLUSION

Competency-based learning systems are back. Why? Unlike a traditional instructional environment, competency-based learning systems answer the question, "Are these people competent or not?" As indicated, in a traditional system, the performance is variable. Using a competency-based learning system we know that employees are capable of performing their required duties safely and to the standards specified.

Skills are identified, learning resources and evaluation instruments developed to meet the standards set out the organization. Learners use a well-tested learning process that ensures they are competent. We are often asked, "Why is an evaluation set to 100% or *all correct* for a pass?". Our response is simple, "If it is not 100%, but rather 80% -- what 20% of the material did the learner fail to acquire and, what impact will that lack of competency have on performance of both the employee and organization?"

New technologies are making competency-based learning systems operational. The science of competency-based learning remains strong and has been proven over time. While these systems require multiple processes and increased effort to implement, they do provide an organization with tangible results.

> *Resistance is the most common side effect of change. If you don't encounter it, you have to wonder if you've really changed things much.*
>
> by Price Pritchett in
> *Resistance: Moving Beyond the Barriers to Change*

affective domain: A classification of objectives that focus on the development of attitudes, beliefs, and values. Affective learning is about gaining new perceptions (e.g., self-confidence, responsibility, respect, dependability, and personal relations).

- Receiving: Aware of, passively attending to certain stimuli.
- Responding: Complies to given expectations by reacting to stimuli.
- Valuing: Displays behavior consistent with single belief or attitude in situations where not forced to obey.
- Organizing: Committed to a set of values as displayed by behavior.
- Characterizing: Total behavior consistent with internalized values.

cognitive domain: Involves mental processes. The Taxonomy of categories arranged in ascending order of difficulty are:

- Knowledge: Recognition and recall of information.
- Comprehension: Interprets, translates or summarizes given information.
- Application: Uses information in a situation different from original learning context.
- Analysis: Separates wholes into parts until relationships are clear.
- Synthesis: Combines elements to form new entity from the original one.
- Evaluation: Involves acts of decision making based on criteria or rationale.

competency: a skill performed to a specific standard under specific conditions.

computer-assisted instruction (CAI): A method of learning in which the computer is directly used for the facilitation and certification of learning. Comparatively, the computer only "manages" the delivery system in a Computer-managed Instruction (CMI) application. See also Computer-based Learning (CBL), Computer-managed Instruction (CMI)

computer-assisted learning (CAL): See also Computer-based Learning (CBL)

computer-based education (CBE): See Computer-based Learning (CBL)

computer-based instruction (CBI): Similar to Computer-assisted Learning (CAL); however, it generally refers to situations where there is less direct interaction with the computer. See also Computer-based Learning (CBL)

computer-based learning (CBL): Computer-based Learning (CBL) is divided into two categories:

- Computer-assisted Learning (CAL)
- Computer-managed Learning (CML).

In a CAL situation, the Learner is directly occupied in an interactive dialogue with the computer. The CML system "routes" the Learner by recording/ tracking learning performance and history.

computer-managed instruction (CMI): A systematic control of instruction by the computer that typically includes testing, diagnosis, learning prescriptions (i.e., collections), and record-keeping (e.g., TRACCESS). In certain CMI applications, the actual instruction may be provided other means (e.g., class lecture, reading assignments, etc.) other than a computer. See also Computer-based Learning (CBL).

content: What's being learned, information. If it does not cause change, it's not information. The challenge is how to get the right content to the right person, at the right time. This involves media choice (e.g., paper versus digital), speed, accessibility, delivery costs, relevance, learner motivation, and other factors.

courseware: Instructional computer programs such as CAI, CAL, CBI and CBL.

criterion: a standard against which a performance or product is measured.

criterion-referenced test instruments: instruments designed to measure performance on an explicit set of objectives; also known as objective-reference test instruments.

evaluation: the process of providing timely, accurate information that will contribute to decisions about the improvement, continuance, and/ or expansion of instruction and instructional products.

informal/formal learning: Formal learning occurs in a class, a seminar, a self-study course, or other environment that is generally recognized as a learning event. Informal learning is all other learning that occurs; it is also know as "working" and "living".

learning: The process of gaining knowledge or information; ascertaining by inquire, study, or investigation; acquiring understanding of, or skill, as in learning the way; learning to dance; learning the truth about something.

learning outcomes: strictly, the concept that learning tasks can be categorized and that the accomplishment of those tasks can be measured. In a more generalized sense, learning outcomes are the result of any instruction.

mastery learning: systematic approach to instruction based on learners performing to a pre-specified criterion level on a given unit of instruction before moving to the next unit of instruction.

norm-reference test: a test who scores are interpreted by comparing learners with eachother.

objectives: a statement of what the learners will be expected to do when they have completed a specified course of instruction, stated in terms of observable performances. Also known as: performance objectives; behavioral objectives; instructional objectives.

performance: The goal of work related learning; productivity; results.

psychomotor domain: Involves physical movement and coordination. The Taxonomies major categories in order of ascending difficulty are:
- Imitation: Observes skill and tries to repeat it.
- Manipulation: Performs skill according to instruction rather than observation.
- Precision: Reproduces a skill with accuracy, proportion and exactness. Usually performed independent of original source.
- Articulation: Combines one or more skills in sequence with harmony and consistency.
- Naturalization: Completes one or more skills with ease and becomes automatic.

standards: referring to specifications which are approved by open, accredited standards body and organizations related to the learning subjects.

skill: a task or group of tasks performed to a specific level of competency or proficiency which often use motor functions and typically require the manipulation of instruments and equipment. Some skills, however such as counseling, are knowledge- and attitude- based.

skills gap: An enduring and ubiquitous characteristic of all those working in the new economy. The result of new technology and opportunity being created at a rate faster than adults can learn it. The skills gap as a ubiquitous feature of society is addressed through lifelong learning.

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