

White Paper

Optimizing IT Skills Management Initiatives

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White Paper Summary

As technologies have become more complex, it is often difficult to find qualified IT professionals who have the desired knowledge, better skills and specialization capabilities. Successful organizations will recognize the critical importance of effectively managing the skills of their current IT professionals. They will also recognize that the first step in managing those IT skills is to have a detailed, objective and accurate inventory of the skills of their current staff as well as the skills required for their future projects. With the proper evaluation of detailed IT skills, organizations will be able to save time, money and optimize their hiring, training, project staffing and career development initiatives.

To conduct the adequate level of skills or knowledge evaluation, sub-topic assessment with a sophisticated methodology is required. This paper identifies the type of skills management initiatives an organization may embark on and demonstrates the importance of assessment methodology on the success of these outcomes.

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Introduction

As technology continues to advance at an ever-increasing pace, more organizations will come to recognize the importance of IT Skills Management Programs. It will become evident that, more than ever, a corporation's success will depend on the success of its Information Technology initiatives. Yet, the new rules of corporate success brought on by the rapid advancement of technology will dictate that IT initiatives depend not so much on the hardware chosen or software technology selected, but more on the skills of the individuals responsible for implementing the systems and applications.

Why assess IT skills?

The answer is simple. You can't afford not to. Today, technology impacts nearly every facet of the organization. From customer service levels and staff remunerations through to supply and billing. Technology is so deep-rooted across the enterprise that it is critical to a company's overall success. Without assessing the skill sets of your current and future IT professionals, it is impossible to balance IT performance with business objectives and corporate strategy. IT skills assessments will allow you to strive for best IT practices and achieve optimal output from your team. Make sure you know the answers.

- ▶ Do I have the right balance of skills in my IT team to meet our objectives?
- ▶ Are my project teams equipped to get the job done?
- ▶ Do I need more skills on the team, and if so, who should I employ?
- ▶ Do any of my team need training?
- ▶ Are the current training programs meeting the needs of my team?
- ▶ Are any team members candidates for skill sharing and mentoring?

And the benefits are clear. Assessing your IT staff will positively impact your bottom line.

- ▶ Reduce hiring time and costs
- ▶ Improve training ROI
- ▶ Maximize productivity of project teams
- ▶ Improve skill-gap analysis for workforce planning
- ▶ Optimize career development
- ▶ Reduce staff attrition
- ▶ Improve corporate standards

Corporation's success will depend on the success of its IT initiatives.

It is impossible to balance and match IT performance with business objectives and corporate strategy without assessing IT skills.

Identifying IT Skills Management Initiatives

Initiatives used to manage IT skills can take many forms. The challenge is, doing them well. Base initiatives include:

- ▶ Project staffing
- ▶ Skill audits
- ▶ Skill benchmarking
- ▶ Pre-hire testing
- ▶ Pre-training and post-training testing
- ▶ Group and individualized training programs
- ▶ Mentor programs
- ▶ Certification programs

The Problem With Standard Skills Assessments

Long before the existence of today's massive IT departments, industrial psychologists were assessing employee soft skills by treating each personality trait as a unique measurable attribute. In the 1990's, as IT's critical importance to overall corporate success was recognized more than ever, attention began to turn towards assessing IT Technical skills. Following the experience in assessing soft-skills, it was only natural to treat each technology as a singular unique attribute. However, this brought about a false start to IT skills management as the real power behind an IT technical assessment lies in the evaluation of the many detailed skill sub-topics comprising the scope of a given technology. Analysis at this detailed sub-topic level harness the full power of IT skills assessment and open the door to dynamic and effective skill management systems.

Most Learning Management Systems (LMS) and/or Skills Management Systems treat IT skills like they do soft-skills; they assign a number on a scale representing the individual's success in achieving that particular soft-skill (ex. 'works well as a team player' or 'shows initiative') . This treatment of each soft-skill as a unique attribute to be numerically evaluated was passed down to IT skill assessments. Each IT Technology (i.e. Cobol, Oracle, Network Administration....) was treated as a single attribute to be numerically evaluated. Thus an individual's IT skill profile would contain a series of numerical ratings corresponding to his/her skill level in various technologies (5 in Oracle Programming, 4 in Powerbuilder and 2 in Windows Programming).

Hard-skills in technologies are comprised of many different areas of knowledge. Sub-topic level assessments are critical to IT skills testing.

The problem inherent in treating a given IT technology, such as Oracle, as a single skill to be assessed is that, unlike soft-skills, hard-skills in technologies are comprised of many different areas of knowledge. A professional working in a given technology may have very senior skills in certain aspects of the technology that he uses often on his current project and almost no knowledge in other sub-topics of the same technology that he has not used in his current or prior projects.

This multi-faceted aspect of an IT Technology requires that a truly valuable assessment tool in that technology incorporate a more detailed analysis than can be determined from a single score. An assessment that analyzes skills at the detailed sub-topic level can provide the insight needed by the skills management program to optimize many IT functions including:

Project Staffing - Why build project teams in which every team member has the same weakness? With sub-topic assessments you can build teams with synergistic and complementary skills.

IT Skill Gap Analysis - aggregate individual results to gain unparalleled insight into the proficiency of your organization in a given technology. Determine the specific areas that need to be built up through hiring, training or transfer within the enterprise.

Training - Why include topics in the curriculum in which the class already is proficient? Use sub-topic assessments to customize course content to the specific needs of the class. Trim a course from 5 days down to 2 days!

Hiring – If a determination has been made that the skill gaps cannot be closed internally, focus your candidate search on those individuals who have the specific skills to plug the skill gaps in your organization.

Unfortunately, obtaining objective and reliable skill assessment at such a detailed sub-topic level is not easy. Determining proficiency in any single topic can require asking the test-taker many questions to obtain the required amount of feedback. Multiply this number of questions over all the important sub-topics within a given technology and you have an assessment process that can last for several hours (if not days!). Many of the commercially available assessments avoid this time issue by simply ignoring sub-topic analysis entirely. The resulting analysis provided by these assessments is typically a single number representing the individual's overall proficiency in the technology. Such assessments will not be a significantly useful tool in effective skills management.

Sub-topic assessments provide the necessary insight into skills management programs to optimize many IT functions.

Relative Versus Absolute Scoring

Some assessments will claim to provide the needed sub-topic analysis, but their testing methodology limits their analysis to 'relative' scoring as opposed to 'absolute' scoring. Relative scoring would imply that an individual is strong in a particular sub-topic relative to his or her proficiency in other sub-topics within the technology. A 'relative' skill analysis such as this can actually undermine the success of skills management initiatives. To illustrate this point imagine you are the manager of a baseball team that needs a quality first baseman. You ask a friend for help and he suggests that you try Bob at first base. "First base is Bob's strongest position". You play Bob at first base and he can't even catch the ball. You turn to your friend and say, "I thought you said first base was his best position?". "It is", he replies. "You should see how bad he plays third base!".

The above scenario illustrates the problems of 'relative' skill analysis. Now consider this scenario playing out in the IT department's search for a lead Java programmer on a critical project. A relative assessment of skills might imply a candidate is strong in Java, but what it could be saying is that this candidate's Java skills are stronger than his Cobol skills but in reality both skills are pretty weak. It should be clear that relative skills assessment could have disastrous effects on the success of skills management initiatives.

Objectively and Reliably Determining Sub-topic Skills

With the success of skills management programs dependent upon the quality and detail of the incorporated skills assessment and given the difficulty involved in assessing detailed sub-topic skills, it is evident that the choice of an assessment tool is one of the critical first steps in establishing an effective skills management program.

To fully realize the true value of sub-topic assessment in effective skills management one only needs to review the types of feedback that can be provided by a skill assessment tool. We will begin with the simplest type of feedback; the quantity of questions answered correctly. Consider the assessment results of a C++ exam shown below.

C++ Assessment Results

Test-taker: John Smith total questions: 45 correct: 30 incorrect: 15

Relative skill analysis can undermine the success of skills management initiatives.

Choosing an assessment tool is one of the first critical steps in establishing an effective management program.

Clearly the above feedback leaves a lot to be desired. Among its drawbacks, it fails to provide insight into the degree of skill indicated. Is 30 correct answers a bad score or a good score? What is the average score?

To some extent additional insight into the quality of a score can be obtained from a percentile. A percentile will identify where a given score falls among the scores of all test-takers. For example, if a score of 80 (on a scale of 1- 100) is associated with a percentile of 65 it means that the score of 80 was higher than 65% of all scores. Consider our improved result as shown below:

	C++ Assessment Results	
Test-taker: John Smith	Score: 80	Percentile: 65

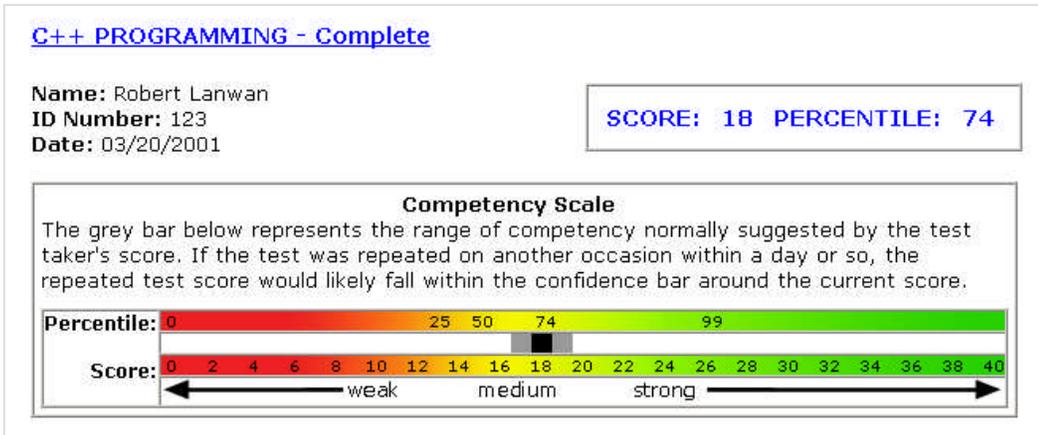
The percentile provides valuable insight into the skill level of the test-taker. The score of 80, while above average (50th percentile) is not quite indicative of a truly senior individual. A percentile of, say, 90 would identify the test-taker as in the top 10% of all test-takers.

While the percentile provides additional insight into the test-takers skill or knowledge, it is still not the level of feedback needed for effective skills management. The above result does not indicate the true level of skill. Is 80 indicative of a senior level individual or an entry level individual? The percentile can provide some indication of the true skill level, but it will vary by the technology being tested. For example, the Cobol language has been a programming staple for nearly 40 years. Those professionals who work in the Cobol language have had a great deal of time to develop their expertise. Accordingly, a score of 80 on a Cobol assessment (which may be indicative of a very senior individual) may only correlate to a percentile of 50!

On the other end of the spectrum, consider a brand new technology, which has only been available for use for a few months. The industry professionals have not yet had the time to develop a great deal of expertise in this latest technology. A score of 45 on an assessment in such an emerging technology might be in the 90th percentile!

Additional insight into the quality of a score can be obtained from a percentile, but will vary by the technology being tested.

While the scaled score and percentile combination offer more insight than the scaled score alone they still lack an absolute measure of skill. Consider the assessment result shown below (fig. 1).



Ensure assessment reports include a graphical display of results as well as data and descriptions for easy interpretation and analysis.

FIG 1: Chart produced by IKM TeckChek™

The above result not only shows a scaled score of 18 (on a scale of 1- 40) and the associated percentile of 74, but also indicates that this score of 18 is a medium level score. In other words, 74% of the professionals who have taken this assessment score at a medium or lower level of knowledge. Thus, 26% of test-takers demonstrate knowledge above a medium level. This insight might inform a recruiter, looking to hire a senior level individual, that they might have trouble locating viable senior candidates and perhaps should consider the candidate with a medium score. This would be indicative of a relatively new technology in which the IT industry has not yet had the opportunity to develop a great deal of expertise. Compare this assessment result to the one shown below (fig. 2) in a mature technology such as Cobol II.

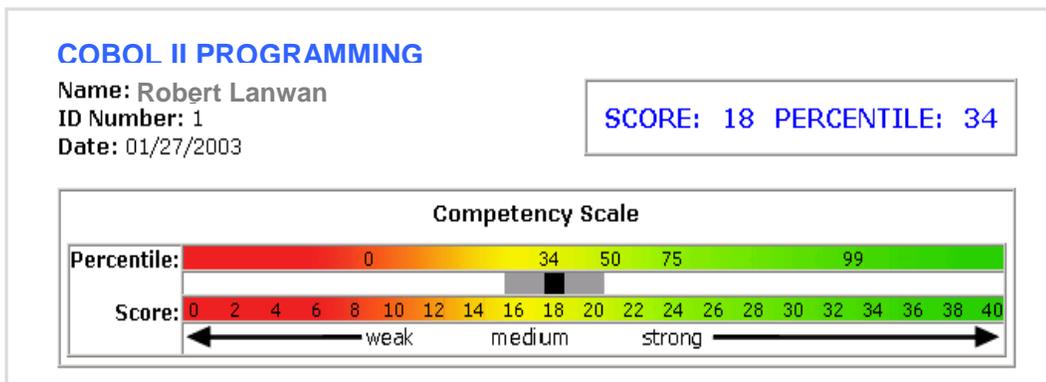


FIG 2: Chart produced by IKM TeckChek™

In the mature technology of Cobol II, the score of 18, while still indicating a medium level of knowledge, is in the 34rd percentile. This means that 66% of the test-takers score above the medium level. Thus, the recruiter looking to hire a senior level Cobol II programmer might pass on the medium level candidate with the knowledge that they most likely will be able to locate a candidate with the higher desired senior level skill. Is this then the complete assessment result we seek? No, it still lacks the detailed insight required of an effective skills management tool.

To see how we can improve the value of an assessment consider the following C++ result (fig. 3) on the next page.

This result (Fig. 3) not only provides the insights of a score and percentile but also provides the detailed sub-topic evaluation required for IT skills management. With these sub-topic evaluations done for the entire IT staff one can customize individual and group training, identify enterprise-wide skill gaps, target hiring to fill the skill gaps, ensure the availability of specific skill sets needed within the organization and build project teams with synergistic and complementary skills.

In short, detailed sub-topic assessments will enable the IT organization to optimize the management of the current skills of employees as well as those of perspective employees.

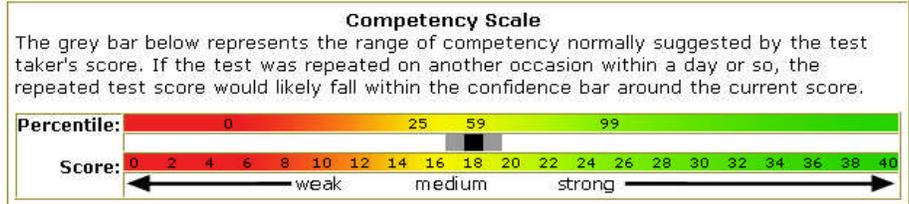
The issue now is to identify the proper assessment tool that is structured to provide this level of reliable, objective analysis.

You can customize individual and group training, identify enterprise-wide skill gaps, target hiring to fill the gaps, create qualified resource pools and build optimal project teams.

ACTIVE SERVER PAGES 3 PROGRAMMING - Secure

Name: John Programmer
ID Number: 123456789
Date 01/26/2006

SCORE: 18 PERCENTILE: 59



Sub-Topics Analysis

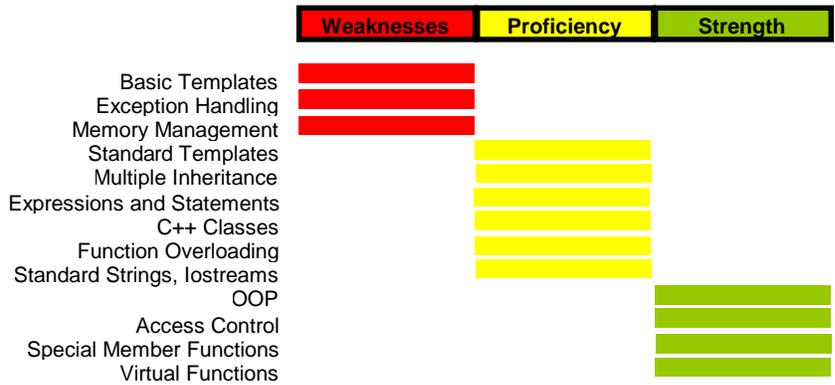


FIG 3: Chart produced by IKM TeckChek™

Selecting the right skill evaluation tool

Without question, you need to look for a solution that offers power and flexibility that is easy to use and customize. Assessment methodology is key, as it is this that determines the quality, integrity and detail of the assessment results. It also determines how many questions are required to get the level of detail you need to make the right decisions in your skills management initiative. This greatly impacts the time required by the administrator and the assessment-taker.

The assessment methodology determines the quality, integrity and detail of the assessment results.

a. Adaptive Questioning

Determining sub-topic proficiencies requires significantly more feedback (numbers of test questions) from the test-taker than would a simple assessment of overall knowledge in a given technology. Each sub-topic must be assessed. This means sub-topic assessments could require hundreds of questions depending upon the number of sub-topics being evaluated. It is apparent that the traditional method of static testing (tests with fixed questions) will not be practical in determining sub-topic skills.

In the early Twentieth century, Alfred Binet created an IQ test in which the questions were selected, by the test interviewer, as the test proceeded. Specific question selection rules were applied by the interviewer to select the most appropriate questions for the test-taker based upon their prior answers. In this manner the test was designed to 'adapt' to the knowledge level of the test-taker. However, it took over half a century for the advent of computers to capitalize on advantages of Adaptive testing and make it a commonly used methodology.

In Adaptive testing the questions are not fixed, but are determined as the test progresses based upon the prior answers given by the test-taker. The more correct the prior answer is the more difficult the next question, conversely, the less correct the prior answer is the easier the next question will be. In this manner the test 'adapts' to the demonstrated knowledge of the test-taker. Thus, stronger test-takers will receive harder questions while less knowledgeable test-takers will receive easier questions effectively eliminating questions that are pre-determined to be too easy or too hard for the test-taker.

Adaptive testing can be compared to a high jump. If the jumper can clear a height of 5 feet then the bar is raised to 7 feet. If he is unable to jump over the 7-foot bar then the bar is lowered to 6 feet. If he jumps over the 6-foot bar then it is raised to 6.5 feet. The bar continues to be adjusted in increasingly smaller increments until the maximum height that can be cleared is determined. In this manner, an adaptive test determines the maximum level of knowledge demonstrated by the test-taker.

Adaptive questioning eliminates questions that are pre-determined to be too easy or too hard for the test-taker, reducing the overall number of questions required.

Obviously, this method of questioning would prohibit the score from being a simple function of the number of correct answers; that would not be fair to those candidates receiving the harder questions. Instead, an adaptive test will assign a 'weight of difficulty' to each question; much like a 'degree of difficulty' is assigned to every dive in a diving contest. The more difficult the dive (or the test question) the more credit is given for its successful completion and the less credit is lost for failing the dive (or test question). Losing credit for failing to answer a question correctly is the same as the bar being lowered when a jump is unsuccessful. How much credit is gained or loss is a function of both the difficulty of the question and the extent to which the question was answered correctly or incorrectly (some wrong answers can demonstrate more partial knowledge than other wrong answers and will not lose as much credit if selected).

So what is the benefit of adaptive testing? There is a security benefit (test-takers do not receive the same questions) as well as a test reliability component in that prior exposure to the test questions, resulting in correct answers the second time the test is taken, will only produce more difficult follow-up questions than were received the first time. However, the major benefit of adaptive testing is that it greatly reduces the number of required questions (and thus test time) by eliminating questions that are determined to be too hard or too easy for the test-taker based upon their prior answers.

For example, if a test-taker has just successfully answered a question on Einstein's Theory of Relativity it makes no sense to ask a follow-up question "How much is $2 + 2$ ". Similarly, if a question to identify the current president of the United States is answered incorrectly there is no value in asking a follow-up question to identify the 11th Vice President. In both cases, success on the follow-up question can be accurately predicted without even asking the question. In this manner, eliminating questions before they are asked, adaptive testing can provide the required feedback in far fewer questions. This makes adaptive testing the perfect solution to the large amount of feedback required for sub-topic assessment.

b. Adapting Sub-topics

Traditional Adaptive methods are just one step towards the solution of attaining assessments at the sub-topic level. To better understand this we need to examine a scenario in which a test subject has been broken down into 16 sub-topics.

Suppose a test-taker is an expert in sub-topic X but is fairly weak in the other 15 sub-topics due to lack of exposure to them.

Adaptive questioning improves security, as test-takers do not receive the same questions.

As the topic X expert takes the test his incorrect responses to the majority of questions, outside of his specific area of expertise, would cause the adaptive testing engine to select easier and easier questions.

Even though he might answer the questions in sub-topic X correctly, they will always be easy questions and he will never have the opportunity to demonstrate his superior knowledge of sub-topic X with difficult questions.

The clear solution would be to use the adaptive method independently within each sub-topic. In this manner, knowledge in one sub-topic would not impact the difficulty level of questions in another sub-topic enabling a reliable and independent assessment in each sub-topic. Adapting the test independently within the sub-topics is a fundamental and critical component of any attempt to provide detailed sub-topic assessment in a reasonable time frame. Unfortunately, most IT assessments, with a few notable exceptions, do not employ their adaptive methods independently within sub-topics making them imperfect tools for skills management programs.

In summary, it is apparent that due to practical time limits an assessment must employ adaptive methodology to reduce the number of required questions on the test. Further, the test should adapt independently within sub-topics to provide the reliable sub-topic detail assessment required for optimizing the skills management process. But is this the final solution for a skills assessment in an effective IT skills management program? Not quite.

Although adapting within sub-topics will reduce the number of questions required in each sub-topic, a great amount of detailed feedback is still needed to make a determination of the test-takers knowledge in each sub-topic. How many questions would such an analysis require in each sub-topic? Five? Six? Ten? In a technology that has been broken down into 16 sub-topics this could easily result in a test of over 100 questions!

The problem is that each question is basically providing binary feedback; it was answered either correct or incorrect. It does not provide enough insight (how much correct or how much incorrect) to optimally determine the level of the next question. If a high jumper can clear a bar at 5 feet how high do you place the bar for the next jump?

Adaptive questioning improves security, as test-takers do not receive the same questions.

If you had more information than simple binary feedback (cleared or did not clear the previous height) you would be able to make a more optimal placement of the bar for the next jump. If, for example, you knew the jumper had actually cleared the five-foot bar by three feet you might place the bar for the next jump at 7 or 8 feet rather than a smaller increase to 6 feet. This insight into how much the jumper cleared or failed to clear the bar helps to determine the optimal placement of the bar for the next jump and thus reduces the number of required jumps to determine the maximum level the jumper can attain. By the same reasoning, greater insight into just how correct or incorrect an answer is can help to determine a more optimal level of difficulty for the next question and thus deduce the number of required questions.

c. Weighted Questions and Answers

The issue then is how to get more insight out of the answer to a given question. At first glance this might seem to be a futile task; after all, an answer is either correct or incorrect. But not all incorrect answers are equally incorrect! Some wrong answers can be completely off the mark while others can at least demonstrate some partial knowledge. Even among the correct answers, some can demonstrate more insight and knowledge than other correct answers. Each answer should be provided a weight, which indicates the extent to which it is correct or incorrect. The weight associated to the selected answer can then be used to determine a more appropriate level of difficulty for the follow-up question.

d. Multiple Correct Answers

Weighted answers are a common component of adaptive testing. However, the real leap in maximizing the value and the feedback derived from a question is for the question to allow for more than one correct answer. Consider a test where each question can have up to three correct answers; the test-taker is not told how many correct answers there are but they are instructed to select all the correct answers they find up to a maximum of three. Credit is gained for each correct answer selected. Credit is lost for each incorrect answer selected. And credit is also lost for each correct answer not selected! How much credit is gained or lost by each answer is determined by how correct or incorrect the answer is.

Answers should be provided a weight to indicate the extent to which is its correct or incorrect.

Multiple correct answers maximizes the value and feedback derived from a question.

By presenting five possible answers and allowing the selection of up to three of them, the mathematicians among us will recognize that there are twenty-five (25) possible answer combinations. Each one of those combinations demonstrates a different level of knowledge. Each combination has a different amount of credit (positive or negative) depending upon the answers it comprises and each combination leads to a different level of follow-up question within the adaptive algorithm.

Twenty-five distinct answer combinations allow the test-taker to pinpoint his or her exact level of knowledge posed by the question. This precision will allow for the selection of a more optimal difficulty level for the follow-up question. This concept is best grasped by seeing an example. Consider the following question on US geography:

Which of the following are states in the United States?

- A. Texas
- B. Paris
- C. California
- D. Jupiter
- E. Washington D.C.

Let's review just five of the possible twenty-five answer combinations and see how they provide different levels of insight into the respondent's knowledge on this question.

1. Texas, California - This is the correct answer. Respondent receives the maximum credit and the most difficult follow-up question.
2. Texas - Credit is given for selecting Texas but some credit is lost for failing to select California. The follow-up question will not be as difficult.
3. Jupiter - Respondent has no clue about U.S. geography and is most likely guessing. This response will lose a lot of credit and result in a very easy follow-up question.
4. Jupiter, Paris, Washington D.C. - This is the worst of the 25 possible responses. Credit is lost for selecting Paris and Washington; a lot of credit is lost for selecting Jupiter and credit is also lost for failing to select Texas and California. This will result in the easiest possible follow-up question.

5. Texas, Washington D.C. - This combination would provide more credit than Texas and Paris because although Washington D.C. is not correct (it is a District and not a State) it does demonstrate some partial understanding of U.S. geography, more so than Paris would.

The above example should help you to realize the extent to which the test-taker is provided the opportunity to pinpoint their exact understanding on the subject questioned. This level of detail, when combined with the efficiencies of adaptive testing, maximizes the feedback obtained from the test-taker and provides the detailed insight into sub-topic proficiency that is required for effective skills management.

Now that we have identified what to look for in an assessment tool that can be of value in a skills management program, the next step is to review what to do with the information provided by the assessment tool. Exactly, how does a skills management program utilize the sub-topic assessments to optimize its hiring, training and IT development efforts?

Optimizing Skills Management

Now that the criteria for selecting an appropriate assessment tool have been identified, the assessment tool has been acquired, and all the employees have been assessed in the appropriate technology, how is the detailed data provided by the assessment results used in skills management? How do we effectively use this detailed insight of the sub-topic skills of employees to improve hiring, team building, training and increase the overall success of IT initiatives?

First, the assessment results must be placed into a database that makes results accessible, searchable and provides for aggregation and reporting. Some organizations will build their own in-house applications while others might purchase off the shelf skills management systems. The better assessment products will provide their own database with tools for searching, aggregation and analysis. Whichever option the organization chooses, once the database is established and populated with sub-topic skill assessments the real skills management can begin.

Assessment results must be placed into a database for future searches, aggregation, analysis and reporting.

The simplest use of this information is providing the individual with objective insight into his/her sub-topics of strengths and weaknesses. This insight can help guide further training for the individual. In fact, some assessment tools, such as TeckChek, will provide a facility to map the assessment sub-topics to the training curriculum of an organization or 3rd party training vendor (see Fig. 4). This allows the individual to quickly obtain a learning prescription, which directs them to specific modules in the curriculum to address their specific weaknesses. A custom training prescription based upon a detailed assessment of sub-topic skills can save a great deal of time and money in the upgrading of employee skills.

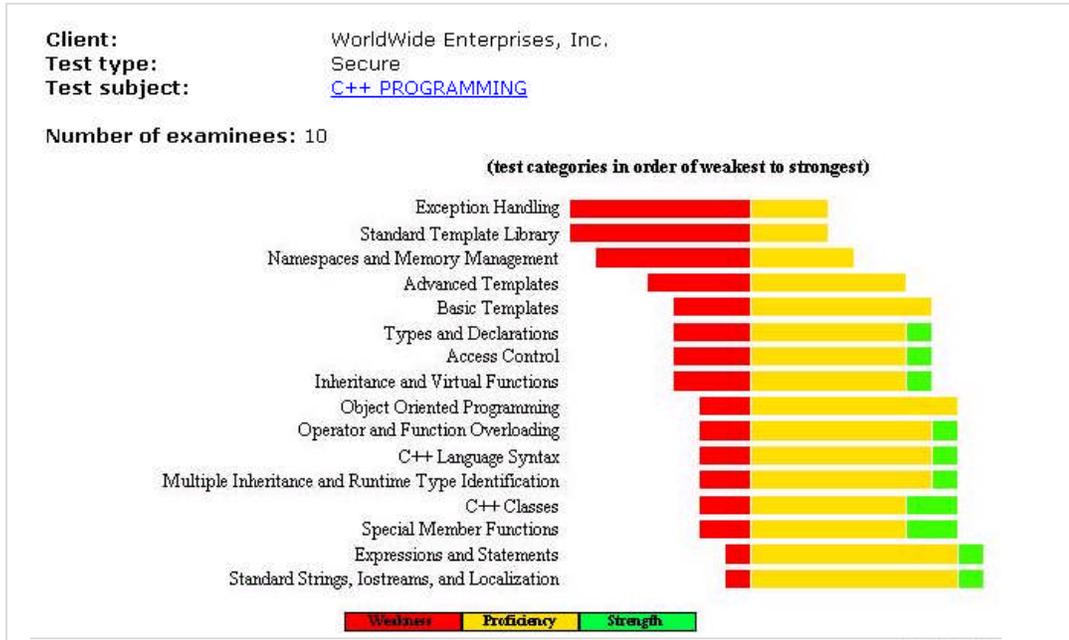
Training Prescription Robert Lanwan Based upon assessment results in C++				
Sub-Topic	Vendor	Course Title	Module #	URL
Inheritance and Virtual Functions	XYZ Training Co.	Advanced C++ Programming	1,3	http://xyz.com
Memory Mgmt	XYZ Training Co.	Advanced C++ Programming	6	http://xyz.com
	TrainOnline	C++ Programming	4,7	http://trainonline.com
Special Member Functions	XYZ Training Co.	Introduction to C++	9,10	http://xyz.com

FIG 4: Training Prescription Example

While custom training prescriptions are a valuable product of detailed sub-topic evaluations, the real impact on IT initiatives is the information the assessments provide through aggregation. By combining the strengths and weaknesses of a designated group of individuals, several IT related functions (hiring, training, team building...) can be significantly enhanced and optimized, including the formation of homogenous learning groups for enhanced knowledge transfer.

Form homogenous learning groups to enhance knowledge transfer.

This means the assessment tool must have, or you need to create, an aggregation report. These reports are often referred to as Skill Gap Analysis. Consider the skill gap analysis chart shown below (fig. 5).



Look for reports that include graphic displays for easy analysis and interpretation.

FIG 5: Chart produced by IKM TeckChek™

The above chart visually displays the aggregate proficiency of the group in each sub-topic of the tested technology (C++). Each row represents another sub-topic within C++.

 The length of the red bar on a row represents that portion of the group that had a weakness in that sub-topic.

 The length of the yellow bar portion indicates the portion of the group that had neither a weakness nor a strength in that sub-topic.

 The length of the green bar represents the portion of the group that had strength in that sub-topic.

To illustrate the information provided in this chart let us exam the bottom row, Standard Strings, Iostreams and Localization. According to the relative sizes of the bars, about 10% (red bar) of the group is weak in this sub-topic, approximately 80% (yellow bar) are proficient and 10% (green bar) are strong.

The insight provided by the skill gap analysis is the true catalyst in effective skills management. It will provide benefits in many human resource functions including focused hiring, team building and custom training. First we will examine its use in **Project Team Building**.

If the previous skill analysis chart (Fig. 5) represents the collective skills of a proposed project team, is this a well-rounded team as currently staffed? Can a more effective team be put together? The answer depends upon the relative importance of each sub-topic to the project objectives. If the top two sub-topics, Exception Handling and Standard Template Library, are critical components of the project objective then this proposed team might not be ideal. Approximately 75% of the team is weak in these topics (as shown in the relative length of the red bar) and there is no guru on the team to provide senior level guidance in this sub-topic (absence of a green bar).

There are several responses to address the weaknesses in the make-up of the proposed team. First, 'what-if' analysis can be done to try to arrive at a more balanced and synergistic team. What if persons X and Y were replaced with persons A and B from the pool of employees? How would the proposed team look now? A second skill gap analysis would be produced for the new proposed team and evaluated to determine if the new mix of skills is more complementary and proficient in the required sub-topics. This 'what-if' analysis can be done repeatedly until a compatible team is identified or until it is obvious that certain skills are lacking in the employee pool preventing the creation of a more effective team.

A shortcut approach to finding a more optimal team composition would be a direct **skills search** through the database of assessment results looking for an individual(s) with the appropriate skills to plug the identified skill gaps on the team. In addition to searching for the specific sub-topics required for the project, a good search facility might also allow for additional search criteria based upon the areas of analysis provided by the assessment tool. In addition to an overall score and percentile, more sophisticated assessment tools will provide scores for additional criteria including work speed, book knowledge, practical experience and other parameters that may be measured by the assessment. These additional parameters allow searches to be more focused in their hunt for appropriate team members.

Assessment tools need to provide scores for additional criteria including work speed, book knowledge, practical experience and other parameters that may be measured.

For example, a high work speed score may be desirable for individuals who will be working on a time-critical project.

Consider the search below (Fig. 6) for a candidate for the hypothetical project team. The project manager has decided to search for someone to fill the skill gap in Standard Template Library on the proposed team. The project manager wants a mid-level person (Overall percentile above 60). Since this person will be the project team guru in this subtopic it is desirable to find someone who has solid experience in this sub-topic not someone who has obtained their knowledge through reading or training. Therefore, one of the search criteria is that the candidate be over the 80th percentile in practical experience (Note: higher quality assessments will distinguish between book knowledge and proficiency gained through practical experience). Since this is a time-critical project, the ideal candidate will have demonstrated an ability to think and resolve issues quickly. Therefore, another search criteria is that the individual be above the 60th percentile in work speed.

Naturally the search requires that the candidate have a strength in the target sub-topic of Standard Template Library. However, the project manager has also suggested that knowledge in Advanced Templates would be a plus for a team member. This doesn't mean that the individual must necessarily have a strength in Advanced Templates but it does imply that the individual should not have a weakness in the sub-topic.

All of the above criteria have been supplied in the search below (fig. 6).

SkillsSearch™: Report Specification

Client: WorldWide Enterprises, Inc.
Test type: Secure
Test subject: C++ PROGRAMMING
Date Range: 06/18/2002 - 09/19/2002
Routing Code: All Routing Codes

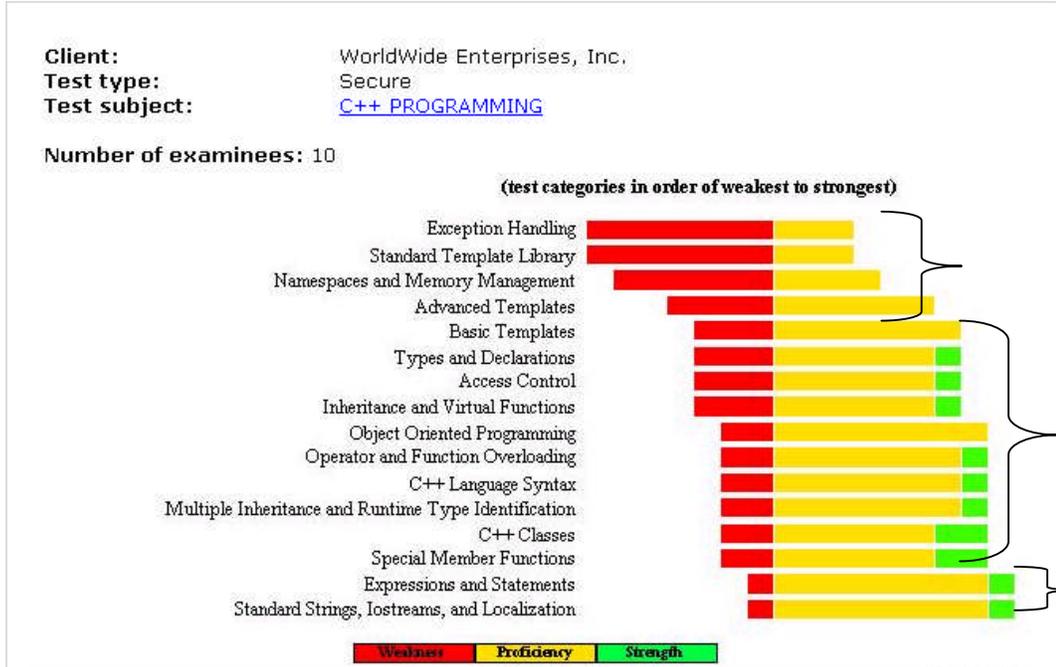
Overall	Percentile is greater than	60
Practical Experience	Percentile is greater than	80
Workspeed	Percentile is greater than	50
Strengths	include	Standard Template Library
Weakness	do not include	Advanced Templates

FIG 6: IKM SkillSearch™ screen shot

Individuals who are identified in the above search can then be added to the proposed team and a new skill gap analysis produced. Since the individuals identified in the search will also have additional strengths and/or weaknesses that were not necessarily part of the search criteria, some of them may be better fits than others into the overall project team composition. By trying various team combinations the optimal team for the specific project can be put together.

If a search through the enterprise fails to turn up candidates with the appropriate target sub-topic, **skills training** to develop those skills can be one solution. The value of sub-topic assessment in group training is to reduce the time and cost of the training. Using sub-topic assessments, the training need not involved the entire technology but can focus on the training modules dealing with those sub-topics in which the group has demonstrated a collective weakness. This provides a huge savings of training time and budget by eliminating superfluous curriculum while concentrating on the desired skills.

To optimize **Custom Training Content** a skill gap report is produced representing the aggregated skills of the student body (figure 7). This information is provided to the instructor who can then customize the curriculum to the needs of that specific group of students. Consider the skill gap report in figure 7 below.



Concentrate course in these topics

De-emphasize in curriculum

Remove from curriculum

FIG 7: Chart produced by IKM TeckChek™

Upon reviewing this chart the instructor might choose to entirely eliminate the bottom two topics from the curriculum because 90% of the class is already proficient in them. Instead, the course would concentrate on the top four topics for which a majority of the class has shown a weakness. This type of custom focused training can help to significantly reduce class time as well as the cost of classroom training.

Case Study

In 2000, a major Resort/Hotel chain wanted to improve the knowledge of its Windows 95 Help Desk team. The team consisted of 20 employees. The training vendor offered a 5-day course, which they would deliver in their classroom for \$300 per student per day. Thus retooling the skills of the entire department would have cost \$30,000. One issue was the Hotel's concern that not all team members be in training at the same time so that the Help Desk would not be closed.

The Hotel first gave each team member a detailed sub-topic assessment in Windows 95. The overall assessment results were used to break the class into two groups; a group of more senior members and a group of the more junior. A skills gap analysis using the sub-topic assessments was performed for each group. The skills gap report was then given to the vendor so the vendor could eliminate from the curriculum those topics that were unnecessary for each group. The reduced curriculum resulted in two custom classes that each covered four (4) half days. By training the juniors in the morning and the seniors in the afternoon the entire department completed their targeted training in just 4 days with each employee spending 2 man-days in training. The total cost was reduced to \$12,000 for the 40 man-days of training and a \$2,000

The value behind sub-topic assessment is also evident in the hiring process. Unable to locate the appropriate sub-topic skills in the employee population or provide training to develop those skills, the HR department can be alerted to look for employment candidates with a strength in the desired skills. By extending the sub-topic assessment process to employment candidates, a new level of depth is brought to the **Hiring Process** to optimize the match between job candidates and project needs.

**Extending the sub-
topic assessment
process to
employment
candidates optimizes
the match between job
candidate and project
needs.**

By having candidates take the assessment, not only can qualified candidates be objectively identified with enterprise-wide standards, but also candidates with appropriate skills can be found to fit into the exact needs of projects. In fact, expanding the skill gap analysis from project team to all employees will provide insight into enterprise-wide skill gaps. This insight can then be translated into more efficient and productive selection of new employees.

Use objective assessments with enterprise-wide standards to identify individuals with the exact skills required for the project.

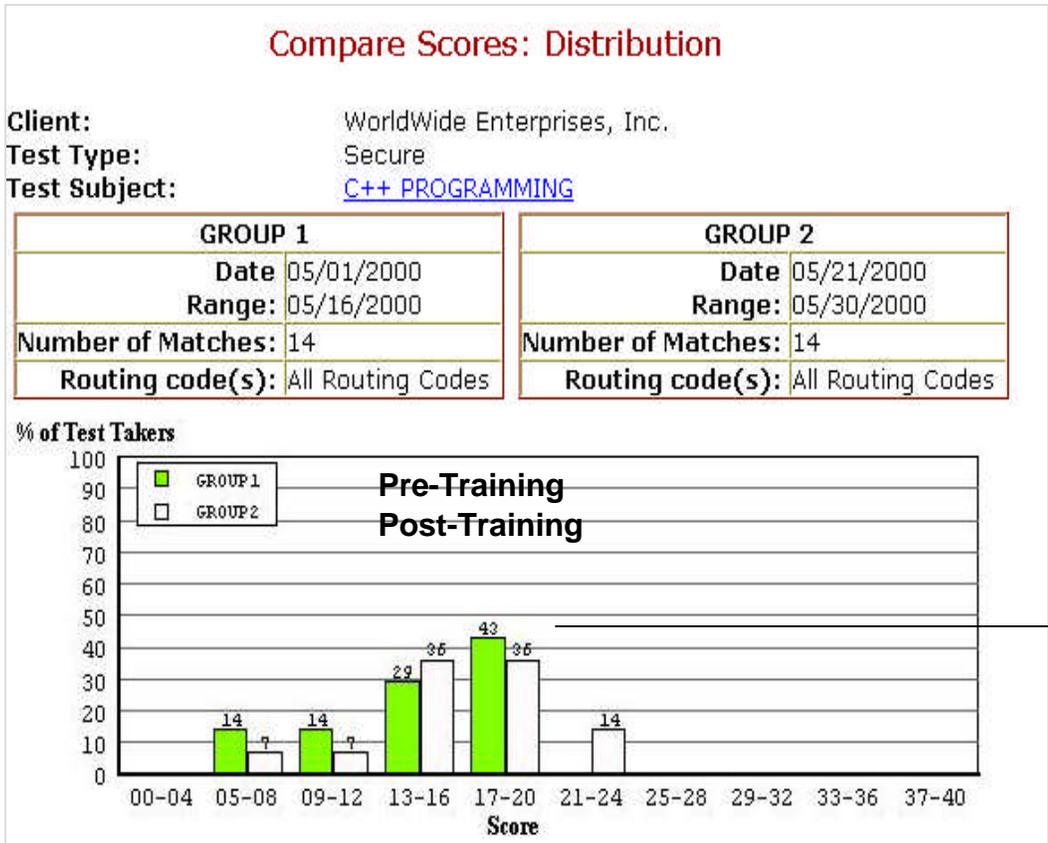
Case Study

A major communications firm was undertaking a critical project for its Billing department. The principle technology being used in the project was Oracle. Accordingly, all employees who were to be on the project team were assessed in Oracle sub-topics. The results of the subsequent Skill Gap Analysis indicated that the group was weak in the sub-topic PL/SQL Packages. The project manager indicated that this was a fairly crucial aspect of Oracle relative to their project requirements. The HR department was instructed to begin a search for a new IT employee with Oracle experience and specifically with expertise in PL/SQL Packages.

In response to their job offering, the HR department received over 100 resumes. A short Oracle assessment was used as a screening tool to narrow the field of candidates down to the top 20% of scorers on this short assessment. The twenty candidates with the highest scores then proceeded to the next step in the hiring process, which included a background review, reference check, introductory interview and full Oracle sub-topic assessment. The sub-topic assessment identified 3 of the candidates as having superior expertise in PL/SQL Packages. While these 3 candidates were then given an in-depth technical interview, the remaining 17 candidates and their assessment results were stored in the candidate database for consideration in future opportunities.

One of the three candidates was selected for hire and was placed on the Oracle project team where his areas of expertise help to round out the teams Oracle knowledge base. The sub-topic assessment had not only identified the skill gaps of the project team but had helped the organization to successfully plug those gaps through targeted hiring.

If the skill assessment tool allows for the grouping of candidate test results then additional analysis can be done through group comparisons. Consider the chart below (fig. 8), which represents a comparison between the pre-training and post-training assessments of 14 students. The particular assessment tool used provided scores in a range of 1-40. This particular analysis shows a significant increase in the scores of the post-training assessments thus confirming the training's transfer of knowledge.



● **Dramatic shift to higher scores for post-training**

FIG 8: Chart produced by IKM TeckChek™

The above type of comparative analysis can serve many functions. Such comparisons can also be done between the scores of test-takers in different locations (“where is our stronger development group - Boston or New York?”) or to help identify the best use of recruiting budgets (“where do we get our best applicants - job fairs or newspaper ads?”).



This chapter has shown examples of how skill analysis can benefit IT initiatives in several ways. The key component to successful implementation of these benefits is assessing skills at the detail sub-topic level. With such detail feedback available, creative HR managers will be able to find even more applications to improve the overall efficiency of IT skills management.

Certification Versus Assessment

One of the steps in locating the proper assessment tool is to recognize the difference between Certification and Assessment tools. Certification tools offer an official certification, degree or other badge of merit to indicate that the test-taker has scored at or above a predetermined level. Most certifications are a form of pass or fail exam that often do not indicate the extent to which the individual exceeded the certification level or fell short of it. They also do not typically provide the detailed sub-topic analysis required for IT skills management programs. Certifications are used by the test-taker to establish his/her credentials. In essence, a Certification exam is a marketing tool for the individual test-taker.

Assessments, on the other hand, typically do not provide a pass/fail level but are designed to provide a detailed analysis of the test-takers proficiency in a given IT technology. Most assessments will provide percentile scores showing where the test-taker ranks among all test-takers. These percentiles provide insight into the test-taker's relative level of proficiency among the larger test population. Some of the higher quality assessments will even provide specific scores/percentiles in different areas such as 'book knowledge' and 'practical experience' to offer further insight into the test-taker's proficiency. The best assessment tools for skills management programs are those that identify sub-topic proficiencies. It is this detailed sub-topic evaluation that distinguishes the assessment product as a critical component of a successful skills management initiative. *While a certification exam is a marketing tool for the individual test-taker, a skills assessment is a fundamental skills management tool for corporate use.* In fact, to ensure the integrity of the assessment results a good assessment tool will not be available in the open market to the individual IT professional but only available to Corporations for use with current employees or employment candidates.

Certifications do not indicate the extent to which the individual exceeded the certification level or fell short of it.

Conclusion

As virtually all industries progress towards a future that is driven by technology, a corporation's success will in large part be dependent upon the success of its IT initiatives. As software to drive that technology becomes more complex, the success of those IT initiatives will depend less on the selected hardware and software and more upon the skills of the people who implement the initiatives.

The most successful companies will be those who have gained the ability to effectively manage their IT skills. In their drive to succeed, more and more companies will begin to implement skills management initiatives incorporating skills inventory databases. Populating the skills database with objective skill assessments will be critical to the effectiveness of any skills management process. Thus the selection of a reliable objective assessment tool will play a vital role in the skills management process and ultimately in the overall success of IT initiatives. To optimize the skills management function the selected assessment tool, for IT skills in particular, must provide insight into detailed sub-topic skills. It is these insights into sub-topic skills that will determine the practical value of the skills management process. Sub-topic skills will enhance many of the skill management functions including training, hiring, skill gap analysis and team building. Those assessment products that can provide these insights will become the cornerstone of successful IT skills management programs.

So, the bottom line?

Successful IT initiatives will depend upon the effective management of IT human resources.

Effective management of IT human resources will require a detailed insight into sub-topic skills.

Due to time and resource constraints, a practical assessment that can deliver objective and reliable sub-topic skill assessments should employ:

- ▶ Adaptive questioning methodology
- ▶ Adapting independently within sub-topics
- ▶ Weighted questions and answers
- ▶ Multiple correct answers

Sub-topic assessments will enhance the management of skills for various initiatives including training, hiring, skill gap analysis and team building.