Skill Standards for IT Professionals, Version 3

Part 1: Overview

English Edition Draft 2.0   March   2008

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Contents

Preface

The skill standard for IT professionals (hereafter the skill standards) was published by the Ministry of Economy, Trade and Industry (METI) in December 2002.

Since then, it has come into widespread use among companies not only in the IT service industry but also in other industries.

In order to promote the spreading and utilization of the skill standards, the IT skill standards center was established by METI in the INFORMATION TECHNOLOGY PROMOTION AGENCY (IPA) in July 2003. With the cooperation of professional communities, IPA continues to reinforce enrichment of the skill standards, training and development, and evaluation of professionals via the skill standards. In April 2006, it released a major revision, the skill standards for IT professionals V2 that greatly improved its ease of use and comprehensibility. A minor revision, V2 2006, is planned in October 2006.

The main points of the revisions are listed below.

- Clarification of basic structure: Divided into "Career" specification and "Skill" specification
- Restructuring the document contents: Referenced with the directives, such as public ISO documents, and restructured the contents
- Clarification of evaluation criteria: Redefined evaluation criteria as entry-requirements, and enriched information in the description formats for easy understanding and information on the number experiences in KPI[1]
- Skill description: Created a skill dictionary as at-a-glance table
- Area of specialty fields: Redefined area of specialty in some careers, that is IT architect, project management, and operations

The skill standards is requested to improve and/or to add for changing business situations and technology in consideration of international acceptability. As it is not convenient for the user that the skill standards upgrade at irregular intervals, it is considered to upgrade regularly every year according to the revision cycle in Figure 1-1.

The time schedule of each revision cycle is basically that, revision proposal drafts developed by professional communities are submitted every March, and a revison document will be published in Octorber by taking in account these porposals and other improvement requirements.

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[1] The entry criteria standards for minimum and indispensable requirements used to evaluate different levels. The index defined in the skill standards stands for the criteria of value that sets condition value and number of performances etc. that are required in order to make an evaluation.

[Image of Revision cycle]
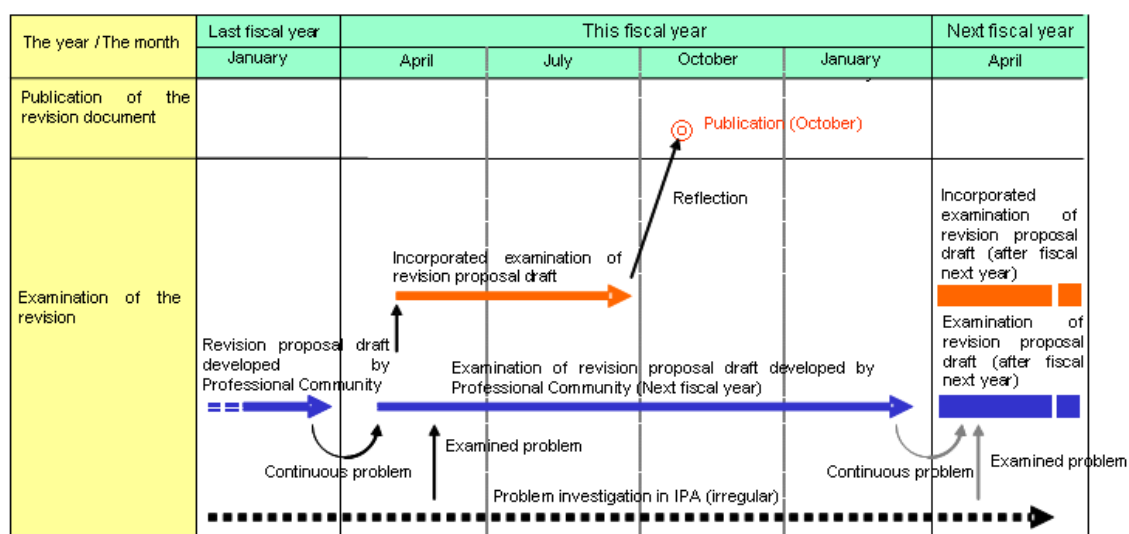
Figure 1-1. The Revision Cycle

New version should be released for major change. For minor change such as skill or knowledge items change, revision will be released by adding revised year after version..

April, 2006

●For the revision in ITSS V2 2006

For the first revision, changes to ITSS V2 are as follows:

(1)The job category "Operation" was changed to "IT Service Management".
(2)"IT Service Management" has four Specialty Fields, and there are 36 fields for ITSS in total.

The formal name of this revision is "Skill Standards for IT Professionals V2 2006" and should be published.

October, 2006

●For the revision in ITSS V3

"Human Resource Development Working Group" (hereafter "HRD WG")[2] was set up by the Information Service and Software Subcommittee in Information Economy Committee of Industrial Structure Council in METI in October 2006. HRD in advanced information technology of future Japan has been discussed. The result was reported in "Human Resource Development in Advanced Information Technology" (hereafter "HRD WG Report")[2] in July 20, 2007.

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[2] A report by Human Resource Development Working Group in Information Service and Software Subcommittee in Information Economy Committee of Industrial Structure Council in METI: Development of Human Resource in Advanced Information Technology"(July 20, 2007): http://www.meti.go.jp/press/20070720006/10070720006.html

HRD WG Report proposed to develop the common career and skill framework. The framework shows the careers and skills required for advanced information technology.

To develop the objective human resources assessment mechanism compliant with the common career and skill framework, the Information Technology Engineer Examination (hereafter "ITEE") will be changed drastically. ITSS, ETSS[2] and UISS[3] should be revised to be consistent with the common career and skill framework. Consequently, a level will be determined by this mechanism.

Of seven levels in common career and skill framework, level 1, 2 and 3 are determined by passing ITEE. Level 4 is determined by as such work experience further to pass the exam (Figure 1-2).

Note : ⬭ shows the scope of the revised examination system
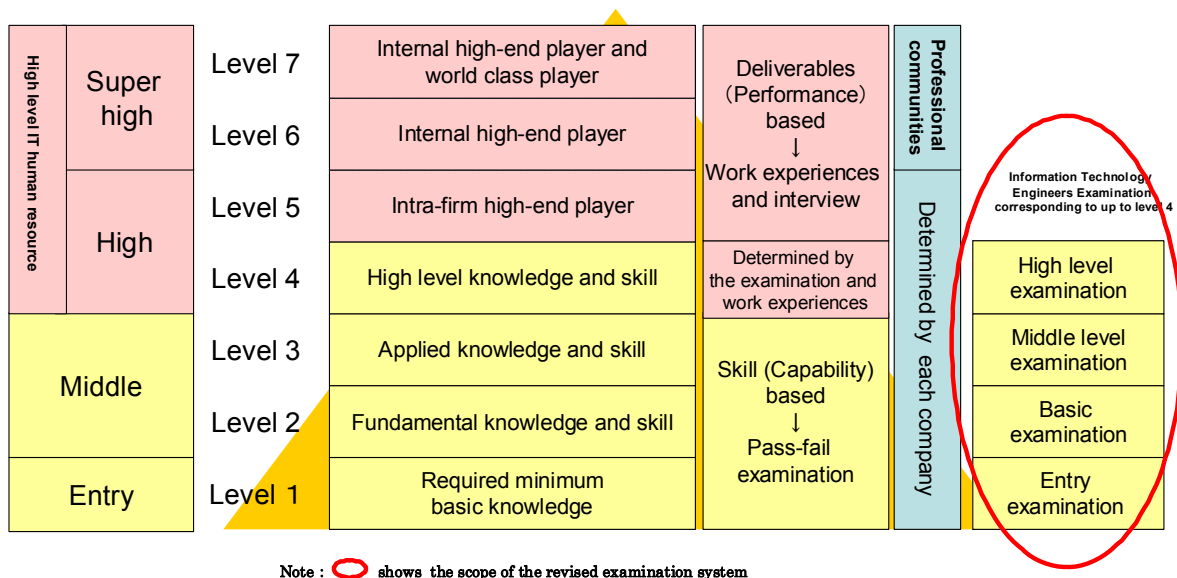
Figure 1-2. Level determination based on the common career and skill framework

According to HRD WG discussion, ITSS Center has revised ITSS based on the 2006 improvement proposal by Professional Communities.

【Highlights in ITSS Ver.3】
   (1)In level 1 and 2, job categories are integrated into one category.
   (2)Level 1, 2 and 3 will be determined by passing ITEE.
   (3)Change for Specialty fields
      Redefined specialty fields in Consultant, IT Specialist and Application

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[2] ETSS: Embedded Technology Skill Standards is the clarification and systematization of skills necessary to develop embedded software, and provide "measures"(common standards) useful for developing and utilizing engineers with embedded software skills.
[3] UISS: Users' Information Systems Skill Standards is for the optimum deployment of information system function in business organizations, and for understanding and developing specifically human resources necessary for that.

Specialist based on the 2006 improvement proposal by Professional Communities.

This revision mainly dealt with level 1, 2 and 3. In level 1 and 2, job categories are integrated into one category. Profiles in level 1,2 and 3.are changed to be consistent with ITEE
Individuals should develop themselves from low levels, to higher levels referring to ITSS. It is important for them to acquire basic skills in their daily duties before learning specialized skills after.
The consistency in levels between ITEE and ITSS made ITEE available as assessment means for level 1, 2 and 3. Consequently, this is the first step to increase transparency and objectivity of the assessment.

March, 2008

●Revision history
-1 April 1 2006   First version
-31 October 2006   Version 2 2006 released
-31 March 2008   Version 3 released

Introduction

(1) Background of developing skill standards

A background of developing the skill standards for IT Professionals (hereafter the skill standards) was the situation where human resources were recognized as a more significant factor in business and management along with the remarkable changing of the business environment.

"Offering" that the IT industry provided has been shifting from "product", such as hardware and/or software, alone, to "services," such as providing from proposals for business strategies to solutions for business issues that a company needs to solve. The quality of the "service" is dependent on the skills of the human resources. As the ratio of service business to the total amount of sale and profits became higher, the IT service industry faced the situation in which the competitiveness of the company was directly connected to schemes of development and management of individual skills in order to provide services.

The various usages of information technology were on the increase along with the spreading of internet technology, then customer needs became also more various and complex. What currently customer desire is systematization with wide business perspectives using information technology, which includes operation process improvements based on understanding of the customer's business characteristics and sophisticated outsourcing such as Business Process Outsourcing (BPO). The IT service company needs to be not merely a provider of products, but be a partner that creates business value with their customers.

In such business circumstance, the demand for experts with high specialties has been increasing. It reinforces the importance of human resource development in the strategic and systematic way to improve company competitiveness.

It is important to companies to establish the business strategy, which is able to exploit own strength, by foreseeing environment changes and its future directions, and based on the strategy, to proceed human resources development and reorganization of internal structure. To do so, it is necessary to achieve detail objectives by combining skills to meet the customer needs adaptively while taking into consideration of environment changes such as technological innovation.

The importance of human resources development (hereafter HRD) is recognized well, however, it is difficult to realize an effective HRD. Although many companies, especially in the IT service industry, have needed a concrete reference and/or indicator for clarifying necessary skills and procurement policy in order to achieve the strategic objectives, there was no practical index available with some exceptions abroad.

On the other hand, the environment for individuals related to providing IT services also changed significantly. Individuals not only need to have values within their companies but also need to have the expertise in the market and/or

industry. Then it is necessary to individuals to imagine their career in the early career stage, and to develop their expertise through experiences. However, in the past, it was difficult to identify the aim for their career and the skills an individual needs to acquire. This issue is also caused by a lack of concrete and objective skill indicators.

The skill standards was developed in order to solve these issues related to skill indicators. Of course, the issues of human resources were varied and wide, it was not enough to solve the issues from the perspective of the company and the individual. To be a high level professional occupation, it is necessary to clarify work values and ethics, and to promote social recognition for the necessity of these occupations, and to establish high-status as advanced profession. It is also necessary to establish support structures to transfer their expertise to their successors in order to bring up future experts. To realize these things, it is indispensable to make well organized measures and policies among industry, government, and academia. The cooperation among industry, government and academia is expected to go step further by the introduction of the skill standards.

(2) Overall structure of the skill standards

The skill standards consists of three parts as shown in figure 2. The composition of ITSS referred to ISO and JIS form and description methods.

- The skill standards, that merge Part 1 – Part3, are controlled with the official version.
- Appendix is updated and added at any time.
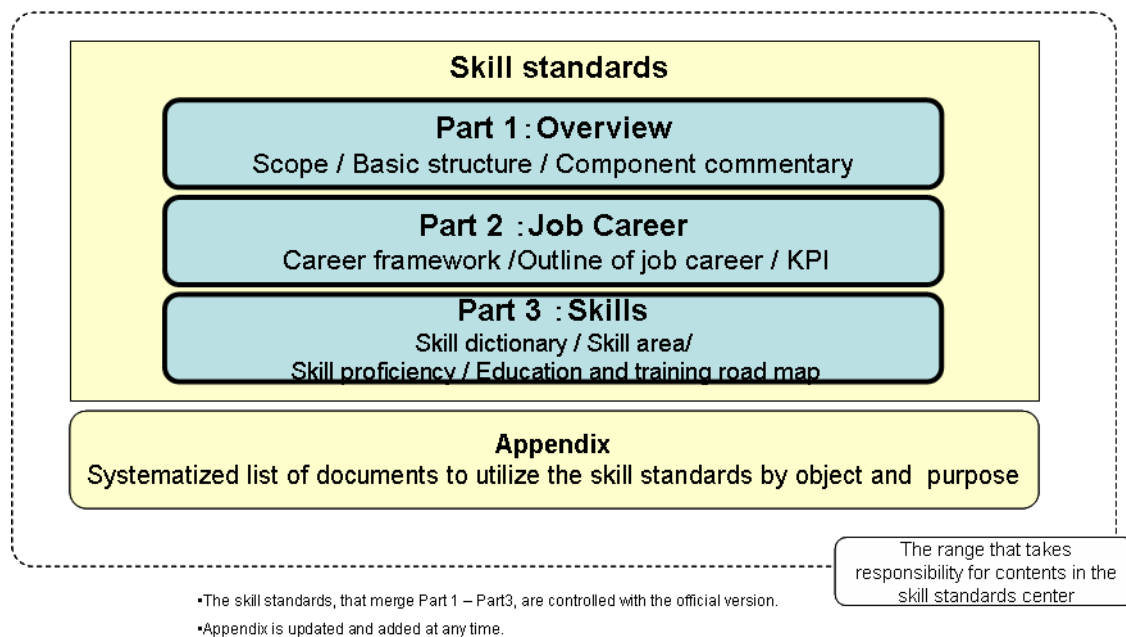
Figure 2. Whole structure of skill standards

The contents of Part 1, "Overview," have been enriched compared to the previous version of the skill standards, and it provides instructions on how to read the structure and documents and how to interpret the contents of the skill standards. "Overview" describes "business performance" and "proficiency" as

two perspectives to view human abilities in the business context in detail.

"Job Category" in Part 2 addresses "business performance", and "Skills" in Part 3 addresses "proficiency". These three parts are the basic components of the new skill standards version, and are controlled with the official version.

In addition to above, significant and sophisticated complementary materials are introduced in the "Appendix". The "Appendix" includes already-existing reports, output of professional communities, and practical cases in some companies. It will be arranged systematically from the viewpoints of users who are management, personnel staff, and individuals..

(3) Position of Part 1, Overview

Part 1, "Overview," describes the structure, definitions, and meaning of the skill standards in order to develop a correct understanding and promote adaptive use within companies.

The skill standards has received a great deal of attention from the IT industry itself, however, a kind of misunderstandings have occurred with its practical applications in the real world. This comes from the facts that the skill standards was designed with a general and widespread use in mind, and that it uses abstract concepts and expressions in order to keep the system general.

For example, when the skill standards is being introduced in practice, it is necessary to link (or replace) its terminology to the specific product names. Such company-specific terminology has been excluded from the skill standards. It is one of important roles of this overview part to clarify the actual scope of application and positioning of the skill standards

In another case, the purpose of the skill standards has not been properly recognized. Such as, it merely is used to personnel evaluation or skill level assessment but without business strategy.

It is one of purposes of this overview to provide complementary explanations to avoid these confusions.

The contents of Part 1 are shown below, see figure 3.

1. Scope
2. Utilization of skill standards
3. Terminology and definitions
4. Fundamental Structure of skill standards

Figure 3. The contents of Part 1：Overview

1. Scope

The skill standards is the index, which identifies and systematizes business capability required to provide IT services. The widths and the heights for the job categories and specialty fields were set, and then the measurement indexes for the entry criteria for each level were defined.

1.1 Purpose

- Capital investment is a key issue for management. When considering capital investment for human resources development, it is insufficient to focus only on individual or specific skills. It is important to clarify the roles, value, and skills exercised by human resources as professionals from the viewpoint of "business success". The skill standards provides an objective guideline with a clear organization and systematized structure. The purposes of the skill standards is to promote effective capital investment for human resources development in the IT service industry by utilizing the index provided by the skill standards .
- ITSS promotes to develop high level IT professionals with market value. ITSS also promotes to develop lower- level IT engineers required for markets..

1.2 Application Field

The skill standards targets on the business capability of IT human resources as professionals engaged in the IT service industry. It focuses on mainly the IT service industry facing customers, but it is applicable to the IT department in companies in general.

Companies, individuals, and educational institutions are major targets, which are expected to use the skill standards.
- IT service companies (including IT departments in user companies): The skill standards will serve as a guideline for HRD and procurement along with the company strategy, and as a common language to indicate HR portfolio necessary to the company. Companies, who already have their original systems and criteria for skills and careers in place, are able to locate and recognize their position objectively in the outside world by defining their relationships to the skill standards.

- Individual as a professional: The skill standards will serve as a guideline for designing career paths and determining methods for skill development. Moreover, individuals who may consider changing career are able to recognize necessary experiences and business performance of target career in detail. Using the indicators of ITSS is a good way to acquire engineering skill.

- Various institutions provide training and development courses and services (including higher education institution): The skill standards will serve as a guideline to explain the rational

reasons for the design and method of skill development in the institution's curriculum and services. The standards is expected to be common guidelines for human resources development for cooperation between industry and academia.

The skill standards intends to form a common framework (value criteria) which is needed for the effective cooperation among various parties related to IT human resources, and to make the value of HR accepted across companies.

1.3 General Versatility of skill standards[5]

The knowledge and skills used in the skill standards are designed as a general concept in order to promote widespread use and to have a certain level of versatility. The knowledge and skill concepts are divided into layers from the perspective of generality and specialty (see figure 4). The characteristics of knowledge and skill are more general and transferable in the lower layers and more concrete and specific in the upper layers.
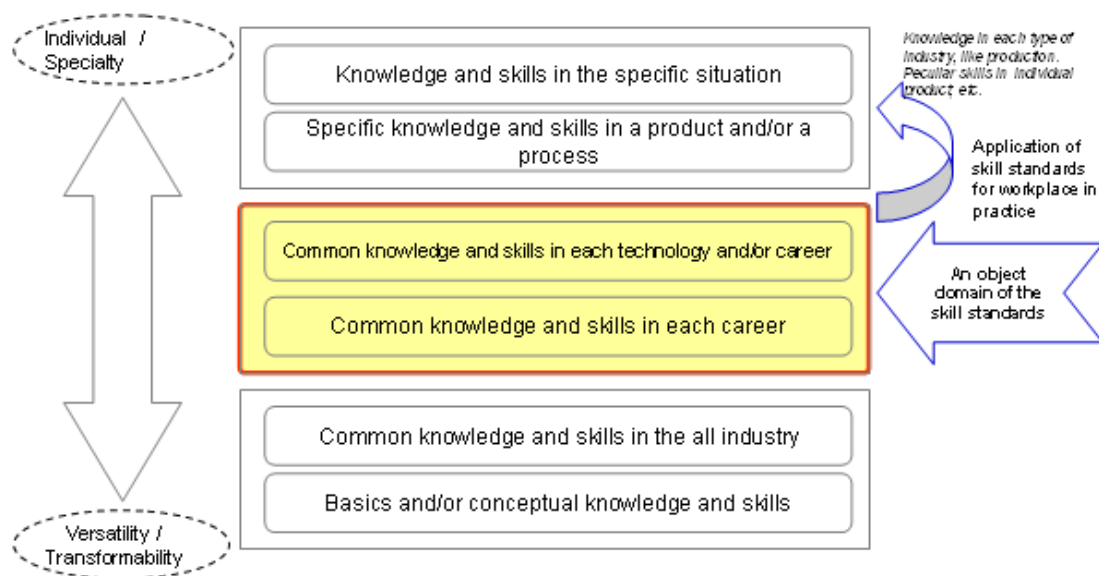
Figure 4. Versatility level of skill standards

The skill standards was developed as to be a common index within the IT service industry. The skill standards is a general level index as shown in the middle layers (see figure 4). This means the skill standards is positioned as a level common to various technology areas and applications. When introducing the skill standards in real fields, more detail contents are needed. For example, company or products specific contents are to be adapted to skills derived from the characteristics and definitions of capability, and the job descriptions in each company. Increasing the generality attains transformability, transferability, reduction of cognitive workload, and common understanding, and so on. ITSS

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[5] The reference in this paragraph has been made to Editor, Hirata, K., Authors, Hirata, K., Seta, K., & Ikeda, M. The Ministry of Economy, Trade, and Industry, 2004.

was developed to provide common indexes in IT service industry.

1.4 Application of skill standards for companies

Just as companies employ a variety of business strategies, companies invest capital in different careers and vocations. At the application of the skill standards in a company, a company need to use the definitions of the skill standards as a common index, and then settles own index on it, which reflects company specific career and skill requirements along their business strategy (see figure 5).
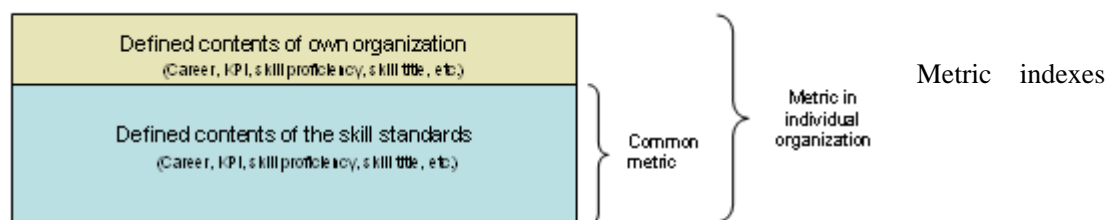
Figure 5. Viewpoint of utilization

Each company interprets or redefines the skill standards into company common specific internal guidelines that are understood at the workplace in practice. In this way, the differences of interpretation among companies can be reduced.
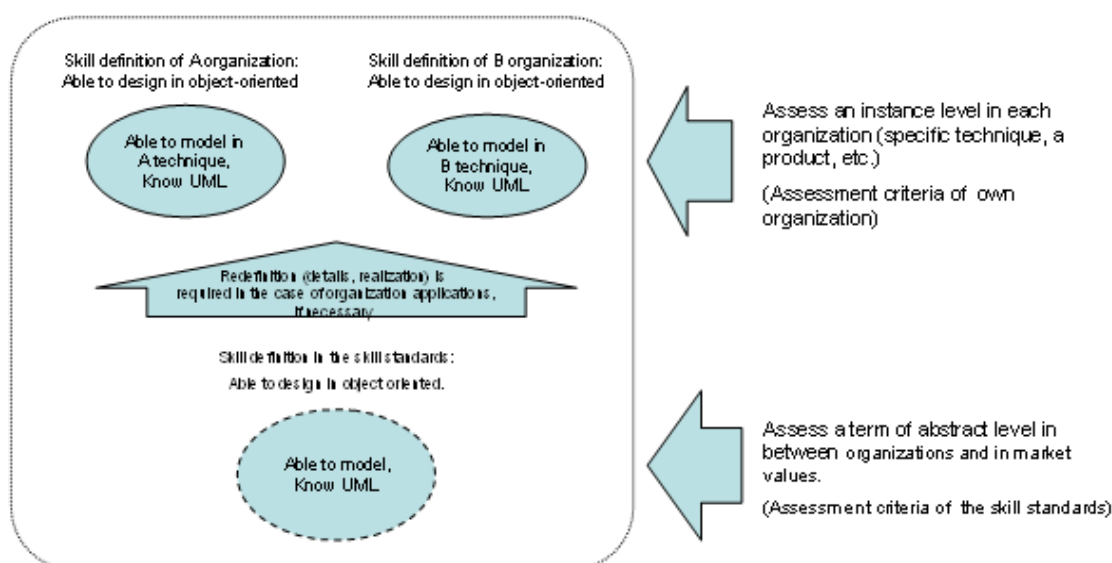
Figure 6. The application image of skill standards for workplace in practice

1.5 Consideration for applying skill standards

The skill standards should be used to measure individual contributions to business activities adequately. The introduction of the skill standards without a strategy and management decisions on capital investment for human resources will not realize the development of IT human resources, who lead the business

and technology and competitiveness advantage. Introduction focusing only on convenience of personnel management or for a revision of the reward system may result in decreasing individual motivation.

The skill standards should be recognized as a referenced model, not a criterion or a specification. It is an index to share a common understanding among parties engaged in development and training of human resources in various aspects. Although the skill standards is called "standard.", there is no need to deploy the full specification and exact adaptation, rather it allows the use of only those parts that are needed for realizing the business strategies.

Some terms in the skill standards may have different meanings depending on the context. For example, the term "communication skill" has somewhat different meanings in terms of contents and degree of performance among job categories. The terms for expressing degree, such as complex, sophisticated, advanced, and successful have different meanings with regard to contents and baseline among job categories and specialty fields.

1.6 Reference

 - METI Research Report: The skills trend survey for IT service industry in Japan. Editor, Hirata, K.; Authors, Hirata, K., Ohta, M., Matsuo, M., & Suehiro, J. The Ministry of Economy, Trade, and Industry, 2003.

 - METI Research Report: Knowledge engineering approach for the skill standards. Editor, Hirata, K., Authors, Hirata, K., Seta, K., & Ikeda, M. The Ministry of Economy, Trade, and Industry, 2004.

 - METI Report: Introduction of skills standard for IT professionals. Editor, The council of skills standard for IT professionals. The Ministry of Economy, Trade, and Industry, 2002.

2. Utilization of skill standards

2.1 Utilization of skill standards

(1) Responding to diversification of skill requirements

The specialization and segmentation in the IT industry have steadily increased, corresponding to broadening of the application domain using IT and to rapid progress and diversification of technology. In these circumstances, it is no longer adequate to assume a "super-SE," who understands both wide range of business operations and technologies and is able to cope with them alone.

In order to deal with the variety of the IT investment opportunities, there is a need to promote training and development of human resources as professionals for each diversified technology field.

In the previous IT human resources market, there was a typical linear career path from programmer to systems engineer to project leader. Most IT engineers in Japan are populated in the intermediate-level or below. Consequently, the industry needs to develop expert engineers as "professionals" who can handle each solution and the latest technologies in order to meet customer equirements and ensure customer satisfaction.

The skill standards provides a guideline for markets, which is described as the direction and contents of a variety of skills.

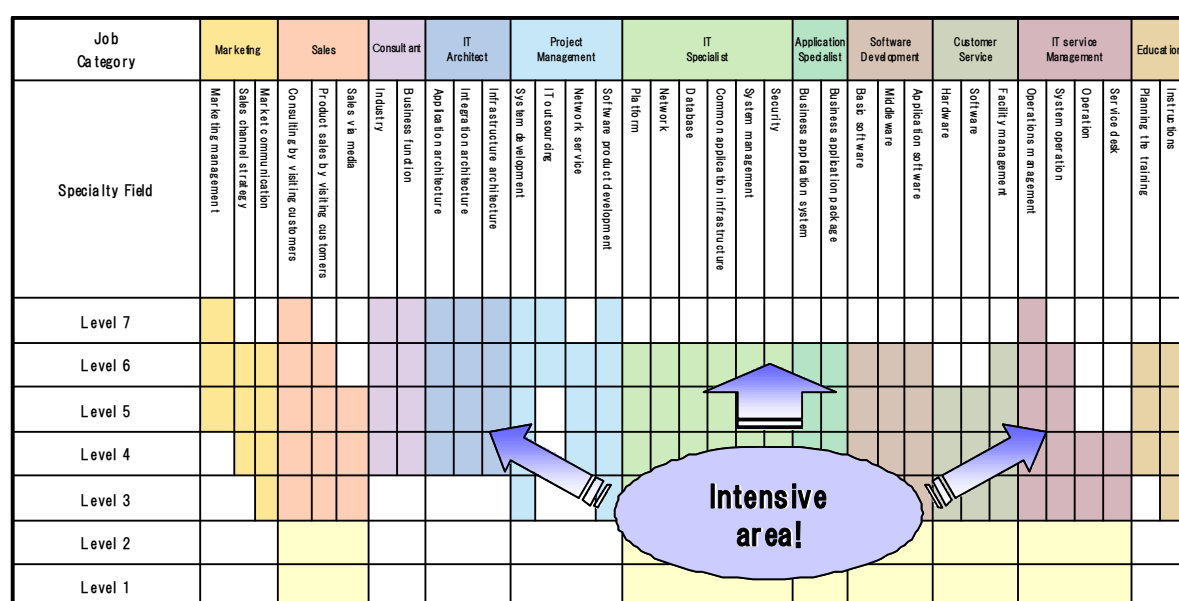| Job Category	Marketing			Sales			Consultant		IT Architect			Project Management				IT Specialist						Application Specialist		Software Development			Customer Service			IT service Management				Education	
Specialty Field	Marketing management	Sales channel strategy	Market communication	Consulting by visiting customers	Product sales by visiting customers	Sales via media	Industry	Business function	Application architecture	Integration architecture	Infrastructure architecture	System development	IT outsourcing	Network service	Software product development	Platform	Network	Database	Common application infrastructure	System management	Security	Business application system	Business application package	Basic software	Middleware	Application software	Hardware	Software	Facility management	Operations management	System operation	Operation	Service desk	Planning the training	Instructions
Level 7																																			
Level 6																																			
Level 5																																			
Level 4																																			
Level 3																																			
Level 2																																			
Level 1																																			

Intensive area!

Figure 7. The image about uneven distribution of IT human resources

(2) Promotion of skill proficiency

The skill standards has important functions that indicate not only the variety

need for skills on the horizontal axis, but also skill proficiency on the vertical axis. To indicate level of skill proficiency as metrics means to indicate goals and objectives, and alternatives to IT human resources with an intention to be professional in early career stage. There are many works, which require higher-maturity skill level, such as a project management of a large scale project, an architect of the most complex system, the system with superior safety, and so on. Expert engineers who emerge with their higher-maturity skill level on practice, such as shown above, will create new information technologies, methodologies, and solutions required in next decade. By utilizing these newly created solutions and technologies, more IT human resources are developed. Moreover, their skill proficiency is enhanced.

(3) Common guidelines for planning and realizing skill strategy

IT service companies need to have business strategies to develop the medium and long term skill development strategy. It is necessary to make decision, for example, whether to strengthen upper stream business such as consulting, to focus on a specific area such as data base or network technology, or to shift to financial sector business or public sector business, and so on. By having a clear business strategy, a company becomes to be able to formulate own skill strategy to take competitive advantage, which includes focusing skills needed to develop, rearrangement of infrastructure for developing skills, and setting motivation for training and development, and so on. In this way, the skill standards is a useful guideline for designing and planning skill strategy.

Likewise, individuals are necessary to design and to realize their own career path as independent professionals. To improve skill proficiency, it is important for individuals to find out the possible career path in their companies. The skill standards is, as a common framework, a valuable tool for individual to ensure own career path.

As shown above, the skill standards provides common framework for individuals and companies to design strategies for careers and skills. The entirety of the framework leads to obvious mutual recognition between individuals and companies on which skills and levels to focus.

(4) Providing guidelines for IT human resources development

Another important purpose of the skill standards is to provide an index for trading information services and training courses in market.
Of course, the skill standards does not determine the unit price of a specific service nor certify the quality. The skill standards is simply an index used by individuals and companies for considering skill strategies. The purpose of the skill standards is to define a common index for a skill building roadmap, and to make it possible to confirm the relative positions among in-house training, in-house qualifications, official qualifications, public licenses, and training courses.

For example, it is possible to recognize the relative level of consultants among companies who introduced their own professional qualification system for

consultant by comparing their level of the skill standards.

The common index offers a significant advantage for understanding the skill levels of other companies. It improves procurement convenience. When a company is not able to fulfill their requirements for human resources in-house, the company may easily make appropriate procurement of human resources in the market.

The skill standards is an effective common index to confirm each individual's skill level for optimizing resource assignment to improve overall service quality. It is valuable as a complementary tool to evaluate vendors' service affordability.

The skill standards is used as a common index for HRD. By using this common index commonly among variety types of parties related to human resource development, such as IT service companies, individuals, training institutions, and universities, they are able to collaborate with each other closely. Consequently, the development of IT human resources becomes more efficient and effective.

2.2 Skill standards and Developing Professionals

HRD without a proper business strategy does not lead to a critical HRD policy for developing professionals, who have a significant role in the technology and business for their own company and who support company competitiveness. The skill standards is effective and meaningful when it is utilized based on the human resources development process to support business strategy as shown in figure 8.
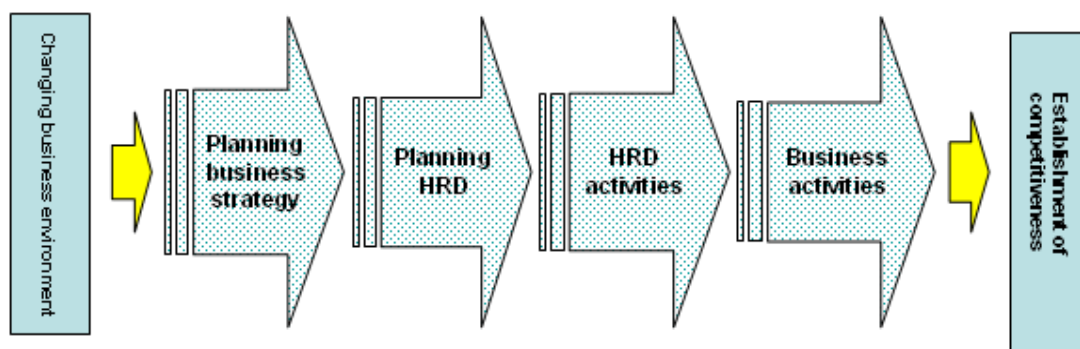
Figure 8. Process of Human Resource investment

Companies need to define the direction and policies according to their business issues. The "Planning business strategy" is the first step in the process to identify investments of company resources. The second step is "Planning HRD strategy". In this step, necessary skills are identified for business strategy realization. This step includes identification of the skills requirement for business needs, analysis

of the skills level of current human resources, and determination of ways to fill the gaps. The third step is "HRD activity" to implement the HRD strategy. In this step, actual HRD is executed and its progress is managed. The last step is "Business activity" to utilize developed human resources in business, and to establish competitiveness advantages.

The next section discusses the human resources investment process from the perspective of utilization of the skill standards.

2.3 Planning business strategy

In the "Planning business strategy" step, the future orientation of the business domain is discussed. For example, the primary weight of business will shift from system development to system consulting. Successful utilization of the skill standards is dependent on whether the business strategy is clear. The identification of the human resources and skills needed for strategy implementation is possible only after a clear business strategy is in place. The skill standards is effective only when it is recognized and used as a guideline for achievement of the business strategy and objectives.

2.4 Planning human resources strategy

This step has the following process sequence, identification of IT human resources for the business strategy, gap analysis between the current status and the desired status, development of skill acquisition policy, and planning of human resources development.

(1) Identification of IT human resources for the business strategy

The step analyzes the skills for realizing the business strategy and identifies the required human resources. In this step, each company should identify job categories and levels by referencing the skill standards and indicate career paths for individuals using the skill standards.

1. Identification of the required skills based on the business strategy
   Companies need develop and procure human resources to perform business activities. The identification of "required skills for business attainment" is derived from the business strategy. Companies need to make effective human resources investment by selection and concentration based on their own requirements.

2. Indicating careers and career paths
   Once the required skills are clarified, it is necessary to indicate career paths for systematic skills acquisition. The skill standards is useful for indicating specific career paths. By utilizing levels and job categories, it is possible to match the company strategy and individual development. The skill standards promote effective HRD with the common objectives shared

by companies and individuals.

 Figure 9 shows a typical career path in project management. In this illustration, the career levels between job categories are same to avoid complex expressions. However, in actuality, the required skill levels and experiences are different before and after the switch. To keep the same level after the switch of job category, training and development as well as gaining experiences are needed.

Project Management

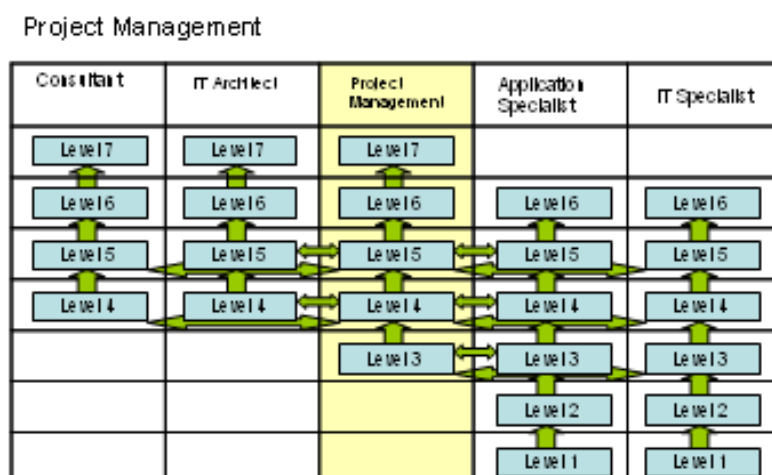| Consultant	IT Architect	Project Management	Application Specialist	IT Specialist
Level7	Level7	Level7		
Level6	Level6	Level6	Level6	Level6
Level5	Level5	Level5	Level5	Level5
Level4	Level4	Level4	Level4	Level4
		Level3	Level3	Level3
			Level2	Level2
			Level1	Level1

Figure 9. Image of typical career path

(2) Gap analysis between current status and desired status

When required and desired skills are defined and targeted, it is necessary to ascertain the current status of the skills demonstrated by the company's human resources. Individuals can clearly imagine their career paths along the skill standards as a guideline. Therefore, individuals can recognize the distance from the current status to future skills and career objectives. Also, ascertaining the current status of skills is important for companies. Ascertaining the skills possessed by the company in detail based on the skill standards is valuable for planning of the career and skills development plan.

(3) Making policy of skill acquisition

When the current status of skills is ascertained, a policy to bridge the gap needs to be clarified. Various cases are considered, such as employee development, recruitment of experienced staff, and outsourcing of operations. In every case, the skill standards is useful as an index of decision criteria.

(4) Planning for human resources development

To promote HRD in effective way, it is important to make the HRD strategy and direction of each individual development consistent. Based on the policy of skills acquisition, companies need to clarify target job categories, target the number of

workforce in each job career and target date, and then map each individual to find the gap. It is important to identify the HRD issues, after companies ascertain the gap between the current status of skills possession and the desired status by referencing the skill standards.

2.5 Human Resources Development Activities

The next step after mapping the assessment of HRD planning of the company into individuals is training and development for individuals. The company determines the target careers (job categories, specialty field, level), means of HRD, and achievement target date.

HRD planning needs medium to long-term plans and short-term plans. For example, HRD plan in medium to long-term, by considering career path, targets to develop the skills, which are difficult to fulfill in short term, in planned and intensive manner.
At the implementation of the HRD plan, it is necessary to ascertain the status of progress organizationally and to feed it back to individuals.

(1) Human Resource Development Planning

The next two points of view need to be considered together at the development of HRD plans.

1. Career Development
The HRD issue in the medium and long term needs to consider the current status of the careers of professionals (career, field of specialty, and level) and target career to be aimed. The HRD plan is developed by considering systematic skills acquisition, which is based on career paths.

2. Skill Development
The HRD issue for the short term is to make clear the sufficiency of each necessary skill element necessary for the current and near future careers. The HRD plan needs to consider the development of the skills in planned and intensive manner, which are not fulfilled sufficiently.

In order to move up to higher levels, individuals should consider designing their career paths, referring to ITSS. They should acquire specialized skills with basic skills in their assigned duties. Individuals should understand that acquiring specialized skill leads them to higher market value.

(2) Implementation and Promotion of HRD

For implementation of HRD, it is important to designate training and development based on business practice by combining OFF-JT (training course participation, conferences, and community activities) and OJT (mentoring, coaching, and job assignments in an actual project).
In order to promote training and development inside the company as a human resource investment activity, it is necessary to organize and promote the system

on an activity basis.

Furthermore, in order to advance training and development effectively, each company needs to support individuals to develop skills easily, for example, providing incentives to make the effort actively and voluntarily for skill development.

ITSS performance definition shows individuals how to acquire knowledge, skill and professional mind for IT professionals.

The lower levels of ITSS define typical basic skills and provide the foundation of IT HRD. Individuals are encouraged to acquire wide knowledge not bound by their assigned duties.

To attain this, it is important to motivate individuals to move up to higher levels by showing concrete goals such as passing ITEE.

(3) HRD and Assessment

The skill standards has two aspects of evaluation. One is the evaluation from the aspect of experience and achievement, and the other one is the evaluation from the aspect of product specific technologies and methodologies, and so on. Both are necessary for HRD and evaluation. It is necessary to manage the focused skills to develop, but it is not enough for the overall assessment.

.It is important not only to have domain specific skills independently but also to have the business capability to select the necessary technology and to combine the optimum to solve the various aspects of business issues. The skill standards is designed based on the idea of assessing it as the skill of professionals.

The skill assessment of human resources is an issue that needs to be addressed across the internal organization from top management to corporate information services. In particular, it is necessary to recognize that skill assessment is connected to reconfirming the own technologies and services.

Skills are mainly acquired through experience. Therefore, the assessment needs to be done by higher ranked professionals with high-level skills in the same job category.

However, higher ranked professionals in the field are busy, and in reality, they cannot afford the time for assessment. The development of subordinates and assessment are important in the skill standards. Because of this, the skill standards include the requirement to train subordinates or colleagues and community activities as a condition for a high-level ranking as professionals. The aim is to contribute to HRD and assessment by handing down the high-level skills possessed by higher-level professionals.

High-level professionals are requested to assess strictly how one executes the skills and contributes to the project as a real professional. The assessment

methods assume document reviews, which describe project experiences and performance in detail, and interviews if the assessment needs to be a more rigorous examination.

In the lower levels, on the other hand, the effort to acquire skills is emphasized. This is because learning in the lower level stages will be essential to grow toward the higher level in the future. Records of participation in training courses and judgment of individual skills are assumed to be used at the assessment.

It is necessary to position the certification system for the information service industry, not as a closed system within a company. This makes possible to motivate individuals to raise their skill levels with the broader perspective.

In addition to the certifications, certified professionals can be motivated by extra pay or benefits, by linking their performance assessments to promotions in the rank, and by rewards or compensation system.

HRD and assessment cannot be isolated like the wheels of a car. It is important to connect evaluation of training results to the next career step. In order to accomplish this, it is important to provide an opportunity for experience and performance utilizing the job assignment after the circumstances of assessing skill acquisition. This idea also leads to the employment and application of new graduate human resources. It is a major incentive to those with effective specialized vocational training in school to provide early opportunities for experience and performance according to the level of learning..

2.6 Business Activities

The skill standards as a common guideline can be applied to the following business activities.

(1) Human Resources Procurement on Project

Personnel planning is developed according to the necessary human resources based on the responsibility range, complexity, and size in the skill standards. However, in the real world, it is often difficult to procure human resources to fulfill all the requirements. In such occasion, one way is to assign human resources to the project from career development point of view by referring the skill standards.

(2) Common Understanding of Human Resources across companies

It is important to minimize the gap between the human resources sought by the company and the personnel provided by the information service company. The skill standards is effective to share the same image of human resources between both companies. The skill standards can be utilized as the reference model for professional requirements to describe them in detail with clear, specific job categories and levels, not just like such conventional requirements as asking for the number of workforce needed from each "the low ranked, middle ranked, and

high ranked SE."

2.7 Promotion of Human Resource Investment

(1) Necessity of the Management Commitment

Human resources investment is an essential issue of corporate management more than traditional human affair. The top management needs to recognize its importance. The commitment and participation from the top management is essential to the promotion of investment into human resources within the company.

(2) Necessary Effort for Cross Intersection in an Company

In addition to the commitment by top management, the organizational effort beyond the boarder of divisions is necessary. Traditionally HRD tends to be left entirely up to the personnel or training division. However, the collaboration of business operation divisions is essential for investment to human resources development. In other words, a "cross divisional type" of effort is necessary, involving all related divisions not only top management and the personnel division. Top management, personnel division, and business operations divisions need to be organically cooperative beyond the existing framework.

In order to formulate a structure that differs from the traditional structure, such as establishment of a new career certification system, the reformation related to the whole organization is necessary. Human resource investment activities can be promoted by the unit that assumes the cross divisional role by performing planning of human resource investment, as well as management and promotion of activities. What is important is that top management takes into account the various opinions of the business operations divisions.

3. Terminology and definitions

Basically, the terms and definitions of the skill standards are compliant with existing standards and the bodies of knowledge. The following terms and definitions are unique to the skill standards. They have special meanings and it is important to understand them for proper understanding and utilization of the skill standards.

3.1 Skills (business capability)

Skill in the skill standards is defined as business capability[6]. Skill does not mean a set of individual technology elements. Skill is a business capability to realize solving of problems by selecting and applying technology elements.

3.2 Professional

A professional is a person who successfully achieves business result in practice and contributes to the industry growth. The necessary criteria for a professional are listed below.
- Achieve commitment to the customer and the company
- Trains and develops subordinates who succeed experience and knowledge
- Performs activities continuously to improves own business capability
- Holds social responsibility and commitment to ethical standards as a professional

A professional attains business outcomes, which fulfills customers' requirements by utilizing a combination of appropriate skills. Possessing advanced skills means providing great value for customers, project members, partners, and the own company as a professional. To achieve a commitment to customers and the company, a professional needs to possess not only high technological skills, but also high level personal skills such as communication, negotiation, and leadership, and also business related skills. Moreover, for the succession of technology, a professional needs to contribute to training and development of subordinates such as by mentoring or coaching.

3.3 Job Category

Job category in the skill standards means the specialized domain professional stands on. Job category does not indicate the roles within a company or project.

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[6] In general, "skill" is often referred to as knowledge and expertise on element technology of a specific product, know-how on the application of service, and specific programming language etc. However, it is difficult to judge "skill" as an ability to make customer's business successful by relying only on knowledge and expertise of individuals.

3.4 Responsible person

Responsible person is a person having responsibility in a service provider in charge of whole pertinent activity processes and phases. The destination to which the responsible person delivers value directly is the person in charge in the customer.

3.5 Leader

Leader is a person having responsibility for promoting execution in particular pertinent activity processes and phases assigned. The destination to which the leader delivers value directly is the responsible person.

3.6 Member

Member is a person creating deliverables and business outcomes. The destination to which a member delivers value directly is the leader.

4. Fundamental Structure of skill standards [7]

This chapter explains the basic idea and the general outline of the skill standards components in order to understand the structure of the skill standards. Part 2, Job categories, and part 3, Skills, have the body of the skill standards and their explanation in a narrative style.

4.1 Structural View of human capability and competency

There are two perspectives to human capability. One is actual achievement and the other one is ability possessed by an individual. They are shown in Figure 10.
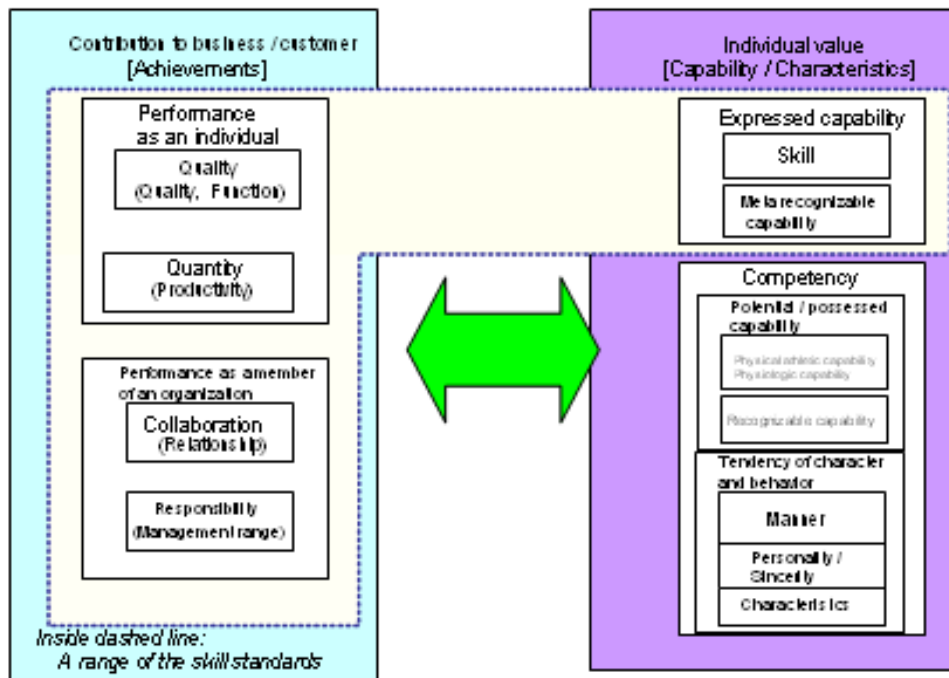

Figure 10. Structural View of human capability and competency

The left hand side of the figure shows the assessment of the value of individual from two aspects, achievement of individual and contribution to business. The evaluation of the capability is based on the problem needed to be resolved or the requirement at performing assigned duties
The right hand side of the figure shows the assessment of the value of individual mainly from the aspect of value of an individual. The evaluation of the capability is based on the ability possessed by an individual.

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[7] The reference in this paragraph has been made to METI Research Report: The skills trend survey for IT service industry in Japan. Editor, Hirata, K.; Authors, Hirata, K., Ohta, M., Matsuo, M., & Suehiro, J. The Ministry of Economy, Trade, and Industry, 2003. And METI Research Report: Knowledge engineering approach for the skill standards. Editor, Hirata, K., Authors, Hirata, K., Seta, K., & Ikeda, M. The Ministry of Economy, Trade, and Industry, 2004.

From the viewpoint on the left hand side, there are four elements in the evaluation dimension: quality, quantity, relationship, and responsibility. The four elements are evaluated with regard to business performance and outcomes, such as degree of fulfillment of the quality requirement, degree of productivity, executing assigned duties as an company in a cooperative and collaborative way with others and achievement of business outcome in a responsible role.

These two viewpoints are differentiated by the evaluation activities. The evaluation on the left hand side is called performance assessment, which depends on an evaluation of the difficulty of business issues and the degree of business performance or contribution as outcomes. After execution of assigned duties, the outcomes are measured as to the degree of effectiveness, usefulness, or satisfaction internally to company or externally to customer.
The evaluation on the right hand side is called capability assessment, which depends on an evaluation of the capabilities exposed by an individual. It aims for realization of desired human resources, and for stability in business execution or job implementation. It is also useful information at the reassignment in future.

4.2 Skill standards structure and concepts

Based on the idea above, the skill standards is designed in a conceptual structure as shown in figure 11.
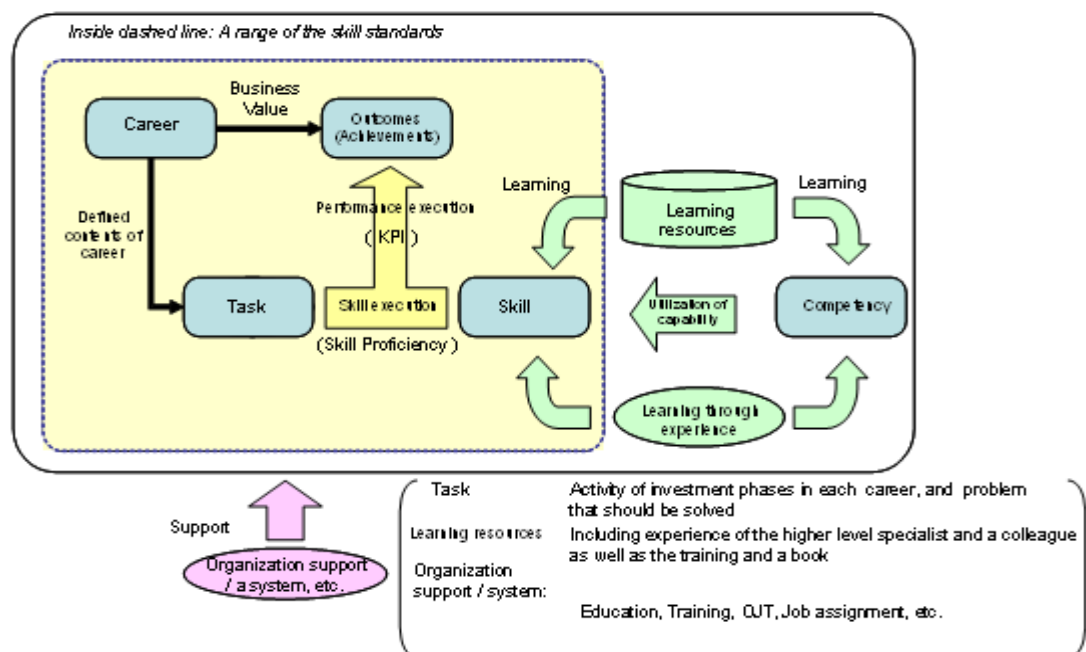

Figure 11. Skill standards concepts and each relations

Issues that need to be solved are indicated as tasks. The content of a particular task is different for each job, and is defined for each job category. Task is executed by utilizing skills, and the business outcome is achieved.
Business outcome that satisfies customer requirements is achieved by the

execution of a task with best performance according to the level of proficiency of skills. Depending on the degree of skill utilization, the achievement of an assigned task is desirably high performance or less performance.

The skill standards describes the measurable assessment of human capabilities in two forms. One is skill proficiency, which indicates skill execution as a level of capability, and another one is key performance indicator (KPI), which indicates the degree of business performance as a level of outcomes or results.

The skill standards targets especially measurable and observable capabilities in practice, and skills acquirable posteriori by obtaining necessary knowledge through education and training, and by developing mainly through learning from real experience.

This learning-performance cycle is recognized as experience and business performance. The accumulation of this cycle makes advancement to the next step possible.

4.3 Basic structure of skill standards

The skill standards has two major parts, the document specification of careers and the document specification of skills. Career framework[8] is an at-a-glance chart, which represents the requirement index as business performance. The skill dictionary is another at-a-glance chart, which represents the skill index necessary for business performance.
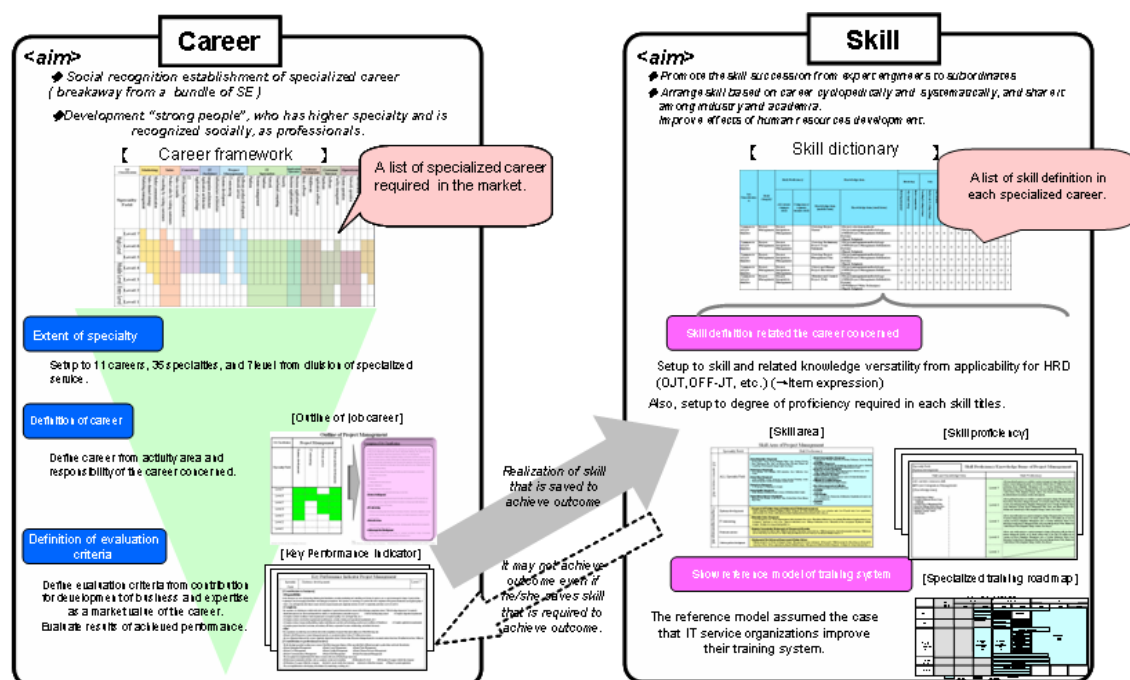

Figure 12. Basic structure of skill standards

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[8] The reference in this paragraph has been made to METI Research Report: The skills trend survey for IT service industry in Japan. Editor, Hirata, K.; Authors, Hirata, K., Ohta, M., Matsuo, M., & Suehiro, J. The Ministry of Economy, Trade, and Industry, 2003. And METI Research Report: Knowledge engineering approach for the skill standards. Editor, Hirata, K., Authors, Hirata, K., Seta, K., & Ikeda, M. The Ministry of Economy, Trade, and Industry, 2004.

(1) Document specification of job categories

Activity domains of each job categories are identified, and based on it, job categories and specialty fields are classified. KPI is settled for each job career and specialty field, which describes the experience and business performance with metrics to assess capability objectively.

(2) Document specification of skills

The skills necessary for each job career and specialty field are broken down to elements, called "skill item". "Skill proficiency" is defined which indicates the maturity of each skill item. Furthermore, for each skill item a set of "knowledge items" needed for skill execution is identified and defined in a hierarchical structure.
Skills are organized from the points of the objective observation and the possibility of utilization for training and development for subordinates.

4.4 Components of skill standards

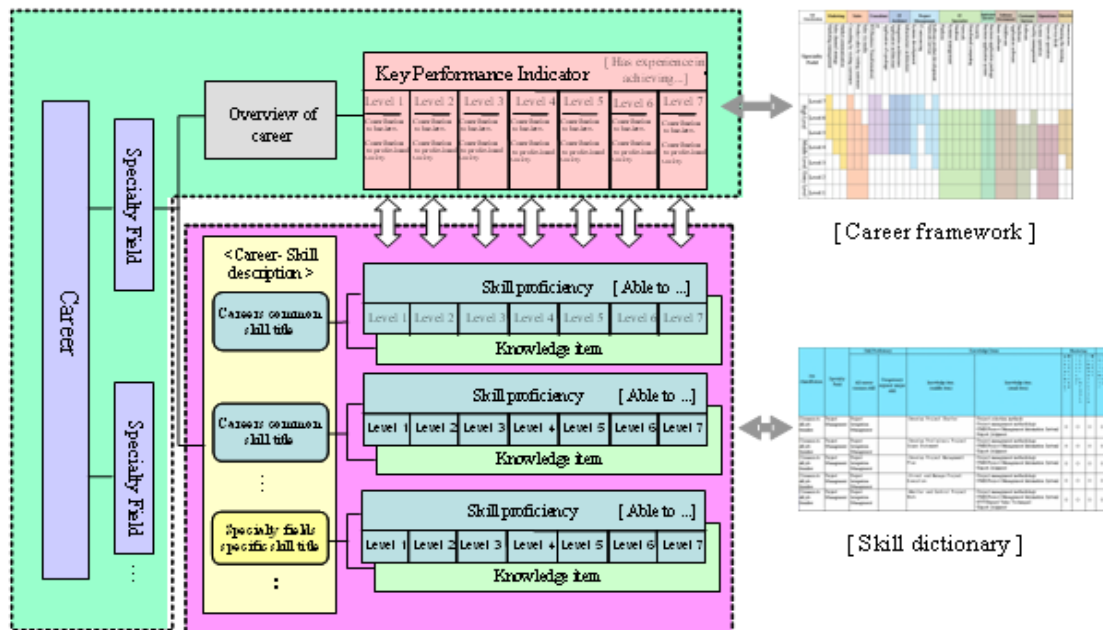Components of the skill standards is shown below.

Figure 13. Components of the skill standards

(1) Career framework

The career framework provides an overall view of the skill standards, which is indicated on two axes; the horizontal axis represents the job categories, and the

vertical axis represents the depth of the capabilities. It provides a common framework to design and plan skill strategies and career paths for individuals and companies. The skill standards is divided into 11 careers and 35 specialties and 7 levels in consideration of business needs, technological specialty, originality, responsibility for customers, and global recognition.

(2) Outline of job categories

Outline of job categories describes the activities required for each job category. It indicates the pertinent IT investment phases and the values to be provided in these phases.

(3) Key performance indicator (KPI)

KPI is defined as the metrics for each job category and specialty that assess and identify the levels of business capability objectively based on experience and business performance. The distinctive feature of the skill standards is the assessment of the capability level by KPI, which are based on real experience and business performance.

Two types of contribution are defined in KPI, One is contribution to business contribution, which is the individual direct contribution to business, and the other one is contribution to professional society, which is the contribution to the company internally as well as to the information service industry as a professional. Assessing levels for human resources is performed by judging both of these contributions in a comprehensive manner.

(4) Skill dictionary

Skill dictionary covers all the skill items and knowledge items that are used in the skill standards. Skill items and knowledge items are hierarchically structured and indicated on an at-a-glance chart, and made clear their connection to job categories and specialty fields.

(5) Skill item and knowledge item

Skill items are defined as the capability elements necessary for business performance and achievement. Skill items indicate the required knowledge to acquire a skill. They are utilized as guidelines for acquisition of knowledge for each skill.

(6) Skill area

Skill areas are descriptions of the skill items and knowledge items necessary for each job category and specialty field. Skill area descriptions consist of job category common skills and specialty field-specific skills for each category.

(7) Skill proficiency

Skill proficiency is defined as a necessary degree of maturity for performing

business activities. Skill proficiency is described in the criteria as "able to do so," and it is an evidence of reaching a certain level of capability in a specific job category. In other words, it provides a guideline that an individual who is assessed at a specific level in a job category is able to perform a certain degree of work for this particular skill item.

(8)Education and training road map

Education and training roadmap contains the training subjects necessary to be acquired in training for each job category in accordance with the skill standards. It constituted by "Systematic chart" and "List of courses" which show a group of training courses at a glance for each category, and "Course description" describing each course, and "Matrix of knowledge items" showing relationship with knowledge items for each course.

4.5 Relationship among components

This section explains the relationship among components from the perspective of business performance and capability.
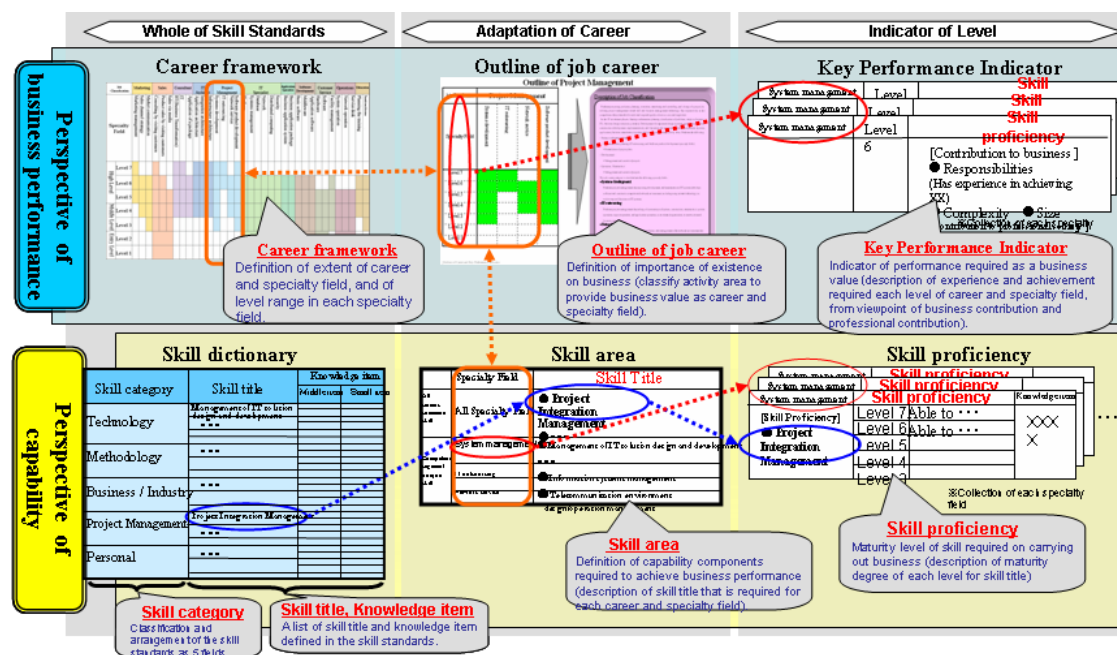

Figure 14. Relationship between components

(1) Document from business performance view

There is the job category overview for each job category shown in the career framework. It consists of descriptions of the level, job category, and specialty field. KPI is defined for each specialty field and level.

(2) Document of capability view

All the skill items defined in the skill standards are organized in the skill dictionary. Among all skills, a set of skills necessary to perform business activities as professionals is categorized into a skill area　Skill area is defined for each job category.

For each specialty field all necessary skill items are defined with skill proficiency. Skill proficiency indicates the degree of maturity necessary to the achievement levels defined in the KPI.

4.6 Level assessment

(1) Level assessment by KPI

KPI is an assessment index for an individual as a professional. Skill proficiency is an assessment index for a single skill. It is noted that KPI and skill proficiency tend to be mixed up because both have the level concept.

KPI defines the level of experience and achievement to accomplish the required outcomes for external or internal customers by integration of skills and knowledge based on the premise that an individual possesses a pertinent level of skill proficiency in a certain specialty,

The skill standards systematically organizes the components of business capabilities required for realizing value that professionals provide to customers in practice from the standpoint of business success. Assessment of professionals needs to be measured with KPI, which identifies the metrics of experience and business performance.

Skill proficiency measures a limited range of capability. Skill proficiency is a necessary condition, but not a sufficient condition for assessment of KPI. It is because skill proficiency is not the final goal for human resources. The skill standards targets professional human resources who are able to achieve outcome to fulfill customer business requirements by utilizing the proficiency of skills.

The level used in KPI has seven stages representing the degree of experience and business performance required for solving problems as a professional in a particular job category and specialty field. Figure 15 provides its general perspective without considerations for particular job categories or specialty fields.

Level	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
Contribution for value creation	Able to find out and resolve a problem on-the-job problem (utilization)				Lead (creation) business, technology and methodology		
	Carry out under the guidance		Lead in the scope of work (project)		Contribute to the company	Contribute to the industry	Lead the industry
							Has an influence for the market
						Recognized in the market	
					Recognized in the company		
				Guides subordinates			
			Practice by him/her-self				
Achievement of required works		Able to…by him/her-self constant degree					
	Able to…under the guidance						
Assessment range / Assessment object						Result as a member of the industry	
				Results as a member of an organization			
	Results as an individual						

Figure 15. The concept of level and assessment

Level 7

Individuals at this level have established their specialty fields as professional, and are able to create and lead technologies, methodologies and business inside and outside of the company. Recognized as world-class professionals with experience and business performance to lead advanced service development and commercialization with respect to the whole market.

Level 6

Individuals at this level have established their specialty fields as professional, and are able to create and lead technologies, methodologies and business inside and outside of the company. Recognized as high-end players in their country with sufficient experience and business performance in the company and in the market as well.

Level 5

Individuals at this level have established their specialty fields as professional, and are able to create and lead technologies, methodologies and business inside the company. Recognized by oneself and others as high-end players with sufficient experience and business performance within the company.

Level 4

Individuals at this level have established their specialty fields as professional, and are able to clarify issues and lead to solve them with their own skills without supervisor's assistance. Recognized as high level players within the company and contributing to the knowledge creation based on their experiences and its application (e.g. the development of subordinates). Also, individuals are requested to improve skills continuously in career development.

Level 3

Individuals at this level perform all assigned duties independently. They aim to establish their specialty field, and have applicable knowledge and skills necessary to be professionals. Individuals are requested to improve their skills continuously in career development.

Level 2

Individuals at this level perform assigned duties under the direction of higher -level professionals. They have basic knowledge and skills necessary to be professionals. They are requested to improve their skills actively in order to find their career paths in career development.

Level 1

Individuals engaging in IT have minimum basic knowledge. They are requested to improve their skills actively in order to find their career paths in career development.

There is a wide gap of required capabilities between level 3 and below, and level 4 of KPI..Namely, the description of "KPI" in level 3 and below means "individuals have experience of taking part in projects as team members." It emphasizes responsibility for the performance of their assigned duties. However, it does not require responsibility as high-level professionals such as development of subordinates and project achievement capability. Meanwhile, the description in level 4 and above requires "individuals have experience of achieving projects as a team leader."

Individuals at level 3 are requested to perform "required duties" "independently." They are responsible for the outcomes of the duties as team members. However, they need not to have comprehensive capability of personal skills such as leadership.

Level 1 and 2 of ITSS provide for assigned duties as " be able to do duties under the direction of higher-level professionals." Individuals at those levels are requested to have "knowledge" and "skills" necessary to perform those duties. Level 1 expects individuals "to do part of the duties under the direction of higher-level professionals." It focuses on the "knowledge" as required capability.

(2) Meaning of ITEE in level assessment

ITEE has been highly-valued in many information service companies. It is not only to test the basic knowledge of IT HR, but also to test the business capability based on the project experience and performance. Those companies encourage their employees to take ITEE.

Recently, according to proposed HRD WG Report, ITEE will be changed drastically in order to develop the objective HR assessment mechanism under the common career and skill framework.

All requirements in "KPI" and "skill proficiency" of ITSS are consistent with the project experiences, performance or business capability of successful candidates of ITEE.

Therefore, passing the exam of some level in ITEE is regarded as being at the corresponding level of ITSS[9]. Successful candidates should understand the description of KPI in higher levels. They should acquire experiences needed to develop "business capability" in higher levels

ITSS uses the terms such as "complex", "sophisticated", "advanced", and "successful" as the degree of skills. It is difficult to set up uniform criteria in various companies with respect to the assessment of individual contributions to business activities.

On assessment, companies are required to improve the environment to evaluate HR in information systems with transparency and objectivity. It is necessary to "visualize" the evaluation with measurable numbers for fair evaluation.

The assessment guidelines in ITSS are as follows:

1   ITSS   level 1

ITSS level 1 expects HR to perform assigned duties under the direction of higher-level professionals, regardless of the specialty fields. Individuals at this stage are expected to learn basic "knowledge" widely.

IT Passport Examination is to test the minimum "basic knowledge" necessary for individuals as IT professionals. By passing this exam, individuals are regarded as attaining the minimum capability in ITSS level 1.

2   ITSS   level 2

ITSS level 2 expects HR to understand the skill of assigned duties as team

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[9] Needless to say, "KPI" and "skill proficiency" remain to be available as the level assessment guidelines without ITEE. These are useful for organizations which are not able to take precedence of ITEE depending on the situation. It is also recommenced to assess human resources who have the business outcome and performance without successful achievement of ITEE.

members under the direction of higher-level professionals and to perform part of the duties independently. It is necessary to acquire "knowledge" and to learn application "skill" of "knowledge",

Fundamental ITEE consists of two kinds of tests: "knowledge" test and "skill" test. (subject selection test: designed to select subjects for individuals with relevant experience)
Fundamental ITEE is to test "knowledge" and "skill" necessary to perform work "under the direction of higher-level professionals." Therefore, by passing this exam individuals are regarded as attaining the minimum capability in ITSS level 2 (acquisition of basic "knowledge" and "skill")

3   ITSS   level 3

ITSS level 3 expects HR with "business capability" to perform the assigned duties independently as team members ("business capability" means performance capability as members and so it substantially means applicable "skill"). From this level, specialty in job categories will be gradually formed.

Applied ITEE also consists of two kinds of tests This exam is to test "knowledge" and "skill" necessary to perform work required in ITSS level 3.(it is possible to measure applied skill in short answer questions). Therefore, by passing this exam individuals are regarded as attaining the minimum capability in level 3 (acquisition of applied "knowledge" and "skill")

From ITSS level 3, individuals need to recognize their career formation based on their expertise. Specifying job category and specialty field in ITSS should be made based on their assigned duties and previous experiences.

4   ITSS   level 4

ITSS level 4 expects HR with specialty field to educate team members as a leader and to have enough skills and knowledge to achieve required results. Individuals at this level are also requested to make a contribution as professionals such as development of subordinates.

High-level Examinations (IT Strategist Examination, System Architect Examination, Project Manager Examination, Network Specialist Examination, Database Specialist Examination, Information Security Specialist Examination, and IT Service Manager Examination etc) are to test the "knowledge" and high-level "skill" required in level 4.[4] Therefore, by passing these exams individuals are regarded as almost meeting the minimum degree of skill proficiency required in ITSS.

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[4] "Practical capability" in high-level examinations in level 4 expressed by Japan Information –Technology Engineers Examination Center (JITEC) means high-level "skill" It is measured in test I and II in essay test. Examinees are given questions suitable for the high-level test in essay test (level 4). They are required to answer as high-level HR, with their knowledge and experiences in that context. Questions in short answer have the perspective similar to those of test I. In most essay tests, examinees are required to address their challenges based on their experience, solution to them and so on.

To determine level 4, the overall aspect of performance in real business field should be evaluated. The overall aspect of performance means the past achievement as a manager, technical innovation, development of subordinates besides the business capability. Therefore the determination of level 4 requires to evaluate by "KPI" in addition to pass the high-level examinations.

Appendix（Glossary）

ETSS: Embedded Technology Skill Standards
Embedded Technology Skill Standards is the clarification and systematization of skills necessary to develop embedded software, and provide "measures"(common standards) useful for developing and utilizing engineers with embedded software skills.

HR: Human resources
HRD: Human resource Development
HRD WG: Human Resource Development Working Group
IPA: Information-Technology Promotion Agency, Japan
IT: Information Technology
ITEE: Information Technology Engineer Examination
ITSS: Skill Standards for IT Professionals
KPI: Key Performance Indicator
METI: the Ministry of Economy, Trade and Industry
Off-JT off-the-job training
OJT: on-the-job training
UISS: Users' Information System Skill Standards
Users' Information Systems Skill Standards is for the optimum deployment of information system function in business organizations, and for understanding and developing specifically human resources necessary for that.