

## **A Study on the Development and Operation of Integrated Assessment System for National Competency Standard Professional Basic**

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### ***Abstract***

*This paper develops and builds an Integrated Assessment System for National Competency Standard Professional Basic. The integrated evaluation system for basic job competency in the National Competency Standards is developed to conduct examination by means of computers, smartphones and tablet PCs. The system can be used for the basic job competency test, examination for online cyber universities, job competency examination for enterprises, and the listening, reading, and speaking test in the foreign language proficiency examination and is even better in terms of facility investment and saved operating costs as well as efficient use of spaces in comparison with conventional evaluation schemes. Even greater synergy effects can be achieved by providing support for the integrated evaluation system for basic job competency in connection with the NCS qualification system. The evaluation system has been tested and practiced at a specialized high school and can be applied to the NCS education evaluation of the college and four-year college and to the selection examination of new employees of the company.*

**Keywords:** *Assessment System, National Competency Standard Professional Basic, Monitoring examination progress, Job Competency, Theoretical Knowledge, Practical Competency, Language Proficiency.*

### **1. Introduction**

The One of recent megatrends is integrative thinking adopted in all fields. Recent development of IT industry including smart phones and communication technologies has resulted in rapid growth of Internet of Things (IoT) technology and relevant markets[1]. The Internet of Things is a kind of integration, referring to intelligent technology and services for integrating disciplines and connecting all things based on the Internet for communication between people and things, and things and things. Various contents are utilized and accessed using smart phones[2]. From 2010, smartphones started to be widely distributed, and with the increase of SNS users, the trends of consuming media changed dramatically[3]. Likewise, Fast changes to the integrative system are in progress in the field of qualification, examination and evaluation. Computer-based evaluation refers to the evaluation conducted by using monitors, mouses and keyboards based on computers to provide simulation, video and voice data which can be hard to be implemented with paper examination for providing questions of dynamic features to solve actual on-site situational questions.

Computer-based evaluation compared with paper-based evaluation is an innovative evaluation scheme not requiring examination paper printing and storage, and even better in terms of efficient evaluation management and cost saving, and is recognized as an evaluation tool replacing conventional paper-based evaluation not just as an assistant tool for accurate records. Testing one's programming ability is very important for one's academic achievement assessment or job competitiveness. Likewise, the development of assessment tools is also important[4]. The system can be used for the basic job competency test, examination for online cyber universities, job competency examination for enterprises, and the listening, reading, and speaking test in the foreign language proficiency examination, and is even better in terms of facility investment and saved operating costs as well as efficient use of spaces in comparison with conventional evaluation schemes.

## **2. IBT Evaluation System**

It is a computer-based examination through the Internet, and almost the same as the conventional CBT examination scheme, but it is not necessary to provide questions in proctor's concerned PC in advance. Just before the test, the proctor needs to download the questions for examination from the central server to send them to examinee's PC, and the examinees send answers for the questions. The answers are sent to the central server through the proctor's PC for efficient and safe management of questions and answers for examination. However, it can be implemented in a computer room with computers and an Internet network, which require high costs for initial construction.

### **2.1 Common Preparation and Future Development for Basic Job Competency**

With respect to basic job competency in Korea and other countries, the governments are a project leader related thereto in advanced countries, and put more values on communication competency rather than other fields. Putting more values on communication between teams or team members is based on efficient job skills or the significance of information sharing. The current paper-based evaluation scheme is not fully satisfactory for evaluating writing skills, listening competency and language proficiency as elements of communication skills. For appropriate evaluation, an automated verification method is required, which is based on various devices and multimedia for listening to and reading verbal questions, giving and recording verbal answers for the questions or situations, and writing answers for the provided questions in sentences.

### **2.2 Using Various Smart Devices**

The rapidly growing market of smart devices means that the applied technology has also advanced[5]. As the society focuses on job competency and performance, the NCS examination is used for a large-scale evaluation method without any temporal and spacial limitations, by using multi-devices (desktop computer, smartphone, tablet PC) instead of the OMR answer paper.

### **2.3 Objective Job Competency Evaluation**

Examinees watch, listen to and touch video for the on-site situation through multimedia with smart devices, record opinions or answers, write essay-type answers to verify their job competency.

### **2.4 System for Preventing Exam Question Leak and Cheating**

During examination, examinee's screen is automatically controlled by a proctor program, to prevent screen captures and implement optimized management in evaluation, and examinee's answers provided in the examination are encrypted and collected by the proctor's PC in real time. The question and answer information after competing the concerned examination is deleted to prevent examination question leaks.

## **2.5 Refined Question Contents**

As more and more people use smartphone to vitalize the app market, it is now possible to implement any questions by watching, listening to, speaking and touching questions and answers to result in diversified and refined question types. Accordingly, unimaginable type of questions will be able to be developed and used.

## **2.6 Cheap but Very Efficient Examination**

Using spaces without limitation out of a limited space of computer rooms can contribute to greatly reducing costs for examination paper printing, and computer room construction, for example, facility investment and examination management operation costs. Because mobile phones and the wireless Internet already being used sometimes enable evaluation depending on the case, operation costs which are a fixed cost will be minimized or not required.

## **2.7 Applicability to Older People**

The IT Competition for Happy Living was held for 168 people older than 55 years who were the winners in local semi-final competition in 17 cities and do provinces. In particular, the participants of the third age group (55 to 65 years old) downloaded apps into their smartphone, answered the questions and submitted the answers for the questions online. They proved that older people could use smart devices although they are not young .

# **3. Integrated Assessment System for National Competency Standard Professional Basic**

The integrated evaluation system for basic job competency in the National Competency Standards is developed to conduct examination by means of computers, smartphones and tablet PCs. The first step is development and upgrade based on evaluation for objectively measuring job competency levels required for the concerned job of specialized and mister high school students through the Internet, and the next step is planned to conduct simulated pilot evaluation for university students.

## **3.1 Connection to System**

### **3.1.1 Proctor login and downloading questions**

Proctors execute the program for login to download questions and examinee lists for the concerned examination from the central server.

### **3.1.2 Setting up communication for devices of each proctor and examinee**

The examinee evaluation program is executed to set up proctor PC's IP address or use Discovery through multicasting for communication with smart devices installed with examinee's program at the IP address of the same band.

## **3.2 Preparation for examination**

### **3.2.1 Distribution of questions to examinee's smart devices**

An encrypted question file is sent to the examinee's smart devices in communication with the proctor program.

### **3.2.2 Optimizing executed evaluation for each terminal (screen protection, prevention of screen captures)**

The evaluation is optimized when the examinee's smart device is in communication with the proctor's PC. (Functions: firewall, screen protection, power save mode, deactivation of mute mode, operation of preventing screen captures)

### **3.2.3 Video, sound level and recording test**

Examinees check normal video play, voice levels and play after recording to confirm normal operation of their devices before their examination.

### **3.2.4 Preparation for examination and guidance**

Examinees can start their examination, provided that they fully understand the notice including notes for examinees, no cheating, pledge of confidentiality, and description of program functions, before conducting the examination.

## **3.3 Initiation of examination**

### **3.3.1 Controlling screen of examinee smart device**

The examinee's screen is displayed as a full top screen in the concerned smart device and screen switch to another screen by using shortcut keys, Windows keys or the home button, etc. is totally blocked.

### **3.3.2 Classification of presence/absence at/from examination**

Each examinee's progress is displayed in the proctor program according to the notice for examinees, and the examinees ready for examination can initiate examination when they complete preparation, and the examinees not ready for examination are classified into absence in the Presence/Absence category.

### **3.3.3 Monitoring examination progress**

The proctor program is provided with examinee's examination progress. The examinee's state in examination progress displayed in the proctor program is monitored, including the number of solved questions among total questions, communication connection to the proctor program, battery levels, real-time transmission of answers.

### **3.3.4 Using calculator and note**

This is a function for allowing examinees to calculate simple equations during examination, or note down important details while solving listening test questions to use them for answering the questions.

### **3.3.5 Touch slide to go to next/previous questions**

This is a function for allowing examinees to touch and slide the screen right and left with their fingers to go to the previous or next questions during examination.

### **3.3.6 Real-time transmission and encryption of answers**

The encrypted answers are transmitted to the proctor program in real time whenever the examinees select answers to be prepared for sudden smart device failure.

### 3.4 Ending examination

#### 3.4.1 Forced collection of poor answers

Although the examinee's answers are collected in real time, the answers not collected due to communication error are marked as Bad to collect individual answers or recollect all answers in a forced manner when the concerned examination is ended.

#### 3.4.2 Screen exit, question data and answer data deletion

When the collected answers are checked to exit the examination, the questions distributed to examinee's devices and transmitted answer information are automatically deleted to prevent question leaks and terminate the screen.

#### 3.4.3 Recovery from optimized state for evaluation

When the examination is ended, the examinee's smart device or desktop PC is recovered to its original state before evaluation from the optimized state for evaluation.

### 3.5 Tackling failures

#### 3.5.1 Continue when replacing smart device

Where a smart device is replaced due to a failure, examinee's final progress and remaining time information is sent to the replaced smart device to continue the examination in the replaced device.

#### 3.5.2 Cheating and giving up examination

Where an examinee conducts cheating or does not finish the examination to give up, the proctor program marks the examinee as a person of special attention who is never allowed to apply for the examination again. Overall system flow chart and integrated assessment system to be implemented in this paper is shown in Figure 1. and Figure 2.

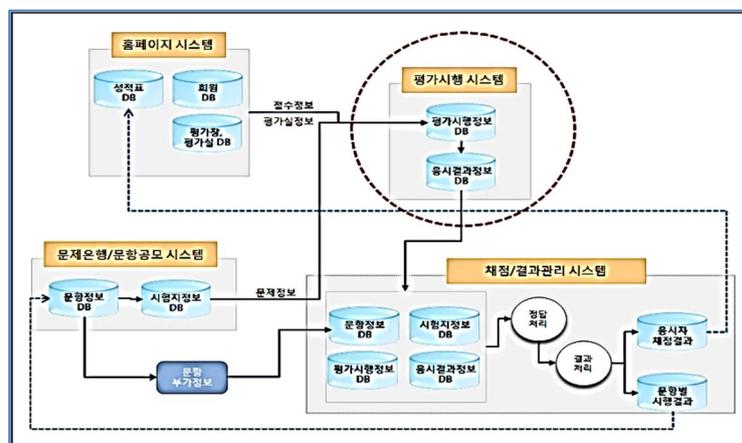


Figure 1. Overall system flow chart

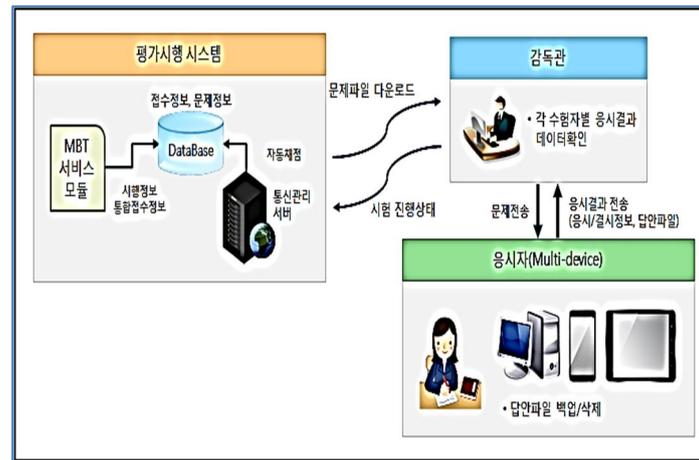


Figure 2. Integrated Assessment System(IAS)

#### 4. Conclusion

The integrated evaluation system for basic job competency can be used for describing situations shown in video to evaluate job competency required in the industry, or verifying job competency, for example, recording verbal answers for public grievance and evaluating foreign language proficiency by listening to and reading questions in foreign language to answer the questions or situational questions, record the answers, and write answers for the suggested sentences. For the real-time online examination in cyber universities, this can be used for evaluations free of spatial restrictions by using smart devices outside the examination rooms or during traveling, not using a desktop PC after identifying examinees at a specified time. Twelve countries in the Central and South America requested Korea to share the experience about National Competency Standards (NCS) and the qualification system of Korea. To respond to this request, Korea has a plan for a joint project to provide support for construction of the qualification system by using the NCS, and share experiences for operating job training centers in developing countries who need technical support. Even greater synergy effects can be achieved by providing support for the integrated evaluation system for basic job competency in connection with the NCS qualification system.

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