Enhancing Vocational Skills through Internet Learning Era

Pornphisud Mongkonvanit
Siam Technology College, Thailand
pornphisud@gmail.com, www.SiamTechU.net

Abstract - In the world of E-Learning, e-skills training always separates itself from others and takes special development pace of its own. Its development pace is rather slow, comparing to other aspects of e-learning [1]. The most essential reason is the difficulty in transforming specific analog skills to digital interpretation. Without accurate digital interpretation of skills, it is difficult to implement the best practice into action. Also, it is very difficult to replicate the best practice to turn into best skills. Although it is considered achievable to interpret most skills to digital form with current technology and it proved to be difficult in real practice for capturing adequate information. To build up digital model for e-skills training needs both enormous time and accuracy. In recent years, after the concept of Internet of things is introduced, many devices with multiple sensors have been dispersing and integrating into many aspects of society, especially skill training and education. Connecting among sensors, equipped devices via internet means are perfect for transforming analog routine action to digital form. So far, there have been many attempts in employing such Internet of Things’ devices to benefit the skill training. This study is focused on development of concept and which enhances vocational skills through internet.

Keywords - E-Skills, Internet of Things

I. “INTERNET OF THINGS” AND EDUCATION

According to Lopez Research, “Internet of Things” is widely known as “a system where items in the physical world, and sensors within or attached to these items, are connected to the internet via wireless and wired internet connections” [2]. As a matter of fact, “Internet of Things” is not a brand new concept [3]. The concept of “Internet of Things” was well described in a 1999 article for RFID Journal as: “If we had computers that knew everything there was to know about things using data they gathered without any help from us - - we would be able to track and count everything, and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling, and whether they were fresh or past their best. We need to empower computers with their own means of gathering information, so they can see, hear and smell the world for themselves, in all its random glory. RFID and sensor technology enable computers to observe, identify and understand the world without the limitations of human-entered data.” [4].

At the time, the concept was far away from reality due to technological limitation [5]. However, technology has been developed in such speed that surpassed all the main previous limitations [6]. Today, the concept has become reality in the name of [7]. Gartner has identified “Internet of Things” as one of ten strategic technology trends for the year of 2015 [8], and Cisco’s Internet of Things Group (IOTG) also predicts there will be over 50 billion connected devices by 2020, nearly five times the number that exist today [9]. While the Internet gave us the opportunity to connect
in ways we could never have dreamed possible, the Internet of Things will take us beyond connection to become part of a living, moving, global digital nervous system [10]. As BCS’s report mentioned “Internet of Things has potential to make impact in every aspect of society,” education is obviously one area with the most impact [11].

The world of education perceives the impact of Internet of Things in positive. Kortuem has described China’s perspective in employing Internet of Things for education system as “Academics are investigating the potential of the Internet of Things for reforming vocational education and University education. The main focus is not on pedagogy but on the application of Internet of Things technologies to improve the teaching system.” [12] While China emphasises the use of Internet of Things in teaching system, UK gives more interest on enhancing practical learning. Eight schools in the UK take part in a well-funded project to find out how Internet of Things can enhance learning in Science, Technology, and Geography [13]. Students and teachers are taught to measure and share data – using new Internet of Things technology – in ways that help make learning fun, link directly to the curriculum, and ultimately inform the design of the next generation of schools. As the Director of Education Practice at Cisco Consulting Services, Dr. Michelle Selinger [14], mentions, “The growth of devices connected to the Internet will give learners access to untold sources of authentic data in an environmentally friendly way. Through their Internet connections on multiple devices, learners will collect these data and work with fellow learners and experts around the world to analyse, interpret, and manipulate the information and so contribute in a meaningful way to the development of social and scientific understanding. Learning will become more contextualised, relevant, and meaningful as a result.” Therefore, it is explicit in the potential of adapting Selinger’s concept to vocational skills education.

Since vocational education emphasises on skill development, it is essential to focus on “how-to-do” more than “what-to-know” [15]. The core of vocational education are the whole process and technique to make the work unique. In most fields of vocational skills, the technique highly involves body movement [16]. Like old style character drawing need unique movement of wrist, most vocational skills need unique way of body movement. Learners can learn unique techniques from experts by observe how experts work and imitate them [17]. However, it is uncertain to rely on just observation without empirical record. It will be far more effective to learn from empirical data of experts’ movement and from meta-recognize of the learners’ movement. It seems impossible until the Internet of Things come along recently [18].

II. “INTERNET OF THINGS” AND SKILLS DIGITALISATION

Vocational skills are used to be perceived only in continuous analog way for it is impractical to convert to digital form [19]. The main reason is the difficulty in attaching sensors to monitor movement of practitioners and also the difficulty in accessing to data from all sensors. However, all problems are solved when the “Internet of Things” technology comes along. Nowadays, there are many kinds of “Internet of Things” wearable-devices that integrate multiple types of sensors to monitor many kinds of activities, mostly include movement sensor [20]. It is also true even with some modern smart phones. Together with computer or even smart phone itself, wearable-devices can record all movement of wearer’s activities and send all data wirelessly to analyse at computer or smart phone near by [21]. After finishing work, the application installed in computer or smart phone analyse data from wearable device, attached to student’s body, and shows result of the working performance in empirical form and advice for improvement. The system can even automatically send performance data to store for comparison others in other location remote servers. Up until now, each skills
training aid has been independent of itself [22]. If all these kinds of students’ skill improvement can be treated together, student can realize their own skill completely and check their own weak points by comparing with others and experts. In addition, instructors can understand which students can not perform correctly and need to be taught selectively with special attention [23]. At the moment, there are many attempts of employing the mentioned concept to enhancing skill training with promising results but without any concrete success yet.

III. A CASE STUDY: “SMART VOCATIONAL LEARNING” PROJECT

“Internet of Things” is recently one of the most-talked-about issues in vocational education. However, the main focus is not on how to employ “Internet of Things” technology to enhance skills education but rather on how to serve the development of “Internet of Things”. Integrating sensors, wearable devices design, and M2M (Machine to Machine) networking are among high-demanded issues, but there is only rare attempts to set up platform of enhancing skills education with new capabilities of “Internet of Things” technology.

One of attempts is established by a group of instructors from Miyagi University of Education in Sendai, Japan. “Smart Vocational Learning” application is developed to deal with learning difficulty of Junior High Schools’ students in Technology education class [24]. It is a requirement for all students in Japanese public educational system to acquire adequate basic vocational skills before complete any certain level of education. Students have to spend very limited time creating useful wooden innovation that involve basic carpenter skills such sawing and planning. To improve students skill of using hand tools, two types of smart phone application are developed. One is for sawing, and another is for planning. Both applications employ capabilities of multi-sensors equipped in smart phone, monitoring rhythm and movement of the work by equipping smart phone on the tools or a student’s body. The application records students’ movement from sensors in a smart phone. The application analyses data and shows a result of the working performance with comparison to working performance from experts and advice for improvement afterward. “Smart Vocational Learning” application is being tested by many junior high schools in Sendai with positive feedback. Although, at the present, the application is limited to deal with difficulty only in sawing and planning, there is plan to expand this concept to many other skills in near future.

IV. CONCLUSION

Although there are not many evidences support the rise of skill education in the world of e-learning, “Internet of Things” technology can pave the new effective path to learn vocational skill in the near future. It is still too soon to conclude its beneficial in skill learning, but the possibility is presented clearly. Wearable devices along with capabilities of modern smart phone gives possibility of turning continuous analog skill working performance to numerical performance data seamlessly, and the data can be utilise to enhance skill learning in multiple ways, as the same way internet enhance theatrical based learning. The case study of “Smart Vocational Learning” project is just one attempt that emerge and potentially success before others. There are also many other projects aim to seek process of enhancing vocational learning with “Internet of Things” technology but in many other aspects. Only time will tell whether “Internet of Things” can bring about the rise of vocational education, but it is certain the Huge potential is there.
REFERENCES

(Arranged in the order of citation in the same fashion as the case of Footnotes.)


