1. Introduction
Each era of centralized technological development, also known as the industrial revolution, entails a leap in the development of mankind. Human beings have experienced three Industrial Revolutions over the past 300 years and now we are in the beginning of the Forth Revolution (4.0) which has far-reaching effects on all areas, including education. The industrial revolution 4.0 characterized by increasingly explosion of information technology is changing the face of education not only in developed countries but also in developing countries like Vietnam. Today’s universities need to ensure four main roles: (i) a source of highly qualified human resources, (ii) a source of knowledge creation, (iii) a driving force of innovation at both local and national level, and (iv) an important international integration hub. By doing it, they can act as a driving force for social innovation, contributing to strengthening the knowledge economy.

To adapt with profound changes ignited by the 4th industrial revolution, higher education requires fundamental shifts in pedagogical mindset as well as the way of imparting knowledge. In recent years, the exponential development of information and communication technology (ICT) has signified a revolution in education, especially higher education world wide. The application of information technology in education and training has been becoming increasingly popular as evidenced by the fact that many prestigious universities such as: Harvard, MIT (USA), Cambridge (UK), etc have
applied this model in their training programs. Popular models of online training which have been applied include: Blended Learning, Social and Collaborative Learning, Gamification, Micro-Learning, etc.

Moreover, in education 4.0, fundamental skills are required for all learners, thus learning methods must be flexible in terms of time and space, and tailored to each individual learning condition. Cloud computing applications, wireless devices such as tablets and mobile devices help learners access different sources of knowledge and skills for work, and promote social interaction. Learners need to be equipped with the necessary skills to be able to easily switch careers and adapt to the challenges and demands of contemporary markets. We cannot accurately predict both the speed and application of technology in future life and in education. However, that the educational development must be asymptotically close to technological development is undoubtedly inevitable. Several notable educational technology trends can be pointed out as follows:

(i) **Digitizing classrooms**: Instead of considering information technology as a separate, independent tool, the digitalization trend will emerge and cover all aspects of the modern classroom;

(ii) **Smart devices**: It is the embedding of available programming into physical materials through smart devices which are connecting things via the Internet and having a strong and profound impact on the learning mechanism and information collection process;

(iii) **Virtual Digital Multimedia Room**: A place that connects cyber information between online and offline, providing a tool to present potential information in the future;

(iv) **Mobile Learning**: Mobile Learning is the studying process which undergoes through mobile applications. Mobile is a common digital device with high user adoption. Its applications are normally associated with specific products. Hence, mobile learning has become more and more popular lately.

Building a smart university system is absolutely necessary in the current context. Studies show several advantages of Smart Universities: (i) Using the data collected by others to create various useful applications. Specifically, students learn in an open environment, thus having easy access to a diverse and global source of knowledge; (ii) Create an environment conducive to increasing socialization among all members of the university community; (iii) With the development of IoT, fostering connections not only between students, students and teachers but also universities together, thus creating a comprehensive learning ecosystem; (iv) Easily evaluate the effectiveness of technology and equipment. This is important in improving the quality of student learning at university.

### 2. Smart university system

There have been many studies focused on developing the concept of smart university, smart education and related concepts. One of the most notable studies about this subject is the research by VL Uskov and colleagues at Bradley University (USA). By carrying out a systematic literature review and creative analysis of related research, C. Heinemann & VL Uskov (2018) propose a definition of smart university: "a place where knowledge is shared seamlessly, and a system with flexible learning styles and modes of learning content delivery, ubiquitous access to educational material from any device."

Another study by NA Serdyukova and his partners provide a research output on smart university system as an efficient and innovative system based on innovation. Based on the formal algebraic approach, the authors define a smart university as a set of n components (n-tuple) selected from the main sets of students, training programs, faculty, and training sets. Pedagogical style, class set, software set, hardware set, technology set, and resource set are described by general system theory equality.

**Figure 1.1**: Classification of university systems according to their level and ability to capitalize on knowledge and add value


The most modern smart university model today is a university model that applies real, virtual and IoT systems. Cyber-physical systems (CPS) are typical features of the industrial 4.0 environment, which are the basis for designing and building smart factory models. Although students complete their training programs within the university, they graduate and create value outside of the campus. It can be said
that university 4.0 is an innovation-oriented smart university in which innovation and entrepreneurship serve as the philosophy, goals and approaches are to create added value; while “smartness” acts as the foundation, method and implementation conditions are based on 4.0 technological advancements. Such a 4.0 university model is not only for adaptation, but also let universities compete and lead the industrial revolution 4.0.

In order to adapt to the Fourth Industrial Revolution and new missions of contemporary education, innovation and start-up-oriented trainings should be implemented according to the “5 in 1” model (5 components towards 1 goal), in which 1 outcome standard with many new skillsets of citizens 4.0. The five components include: (1) New training programs of high interdisciplinary and transdisciplinary nature and new training programs associated with 4.0 technology; (2) Traditional training programs switch to an innovative program structure; (3) New technology 4.0; (4) Start-up projects and business linkages; (5) New startup education ecosystem connects all stakeholders: lecturers, learners, lecture halls, laboratories and users.

**Figure 1.2: “5 in 1” model with 1 outcome standard with many new skillsets of citizens 4.0 and 5 elements of the training process**


In Vietnam, a number of higher education institutions have implemented the idea of building a smart university model. Moreover, the application of Information Technology to teaching foreign languages and cultures with smart education orientation has been implemented at Hanoi Law University, Hanoi University of Industry, Hanoi National University, etc. Due to being developed on the basis of modern technologies which converge diverse subjects from computer science, educational sciences and other fields, smart university incurs highly complex content not only in research, model development but also in implementation methods of the very first level in its development ladder. Universities including: Vietnam Agricultural Academy, Hanoi University of Science and Technology, Academy of Posts and Telecommunications and Academy of Politics Region I have been approved by the Ministry of Science and Technology to support research projects to build a digital transformation model for smart schools, and will initially test the latest technologies in education with the expectation that it can create a qualified workforce for the industrial revolution 4.0.

3. **Smart university software systems**

To build a smart university, it is necessary to understand the needed software system, including:

**First, Pre-class content development system:**

The pre-class content development system supports teachers to prepare the necessary content for the lesson and should have the following important features:

1. **Screen capture:** Allows trainers to record dynamic and fixed images from the computer screen;

2. **Recording:** Allows instructors to record audio, narration for video, VoIP calls, music and audio output from other applications on the computer;

3. **Capture from the webcam:** Allow the computer “webcam” to record the instructor while he/she teaches in class or makes videos;

4. **Save files online:** Allows recording video and audio files to save directly to the computer;

5. **Recording schedule:** Allows the instructor to set a time and date for the application to automatically record what’s happening on the computer screen (may display video from other connected resources);

6. **Capture from a mobile device:** Allows the trainer to connect a smartphone or other mobile device to a desktop computer and record what is displayed on the smartphone screen;

7. **Zoom in/out and rotate:** The ability to magnify a part of the computer screen to keep the audience focused on specific segments of the displayed learning content and get a better understanding of it, while the pan effect allows instructors to move smoothly from one part of the computer screen to another;
(8) Additional media: Allows instructors to import video, audio and image files from the computer into the learning content files;

(9) Add Title: Allows instructors to add title information to the beginning and/or end of the video file;

(10) Add Captions: Add comments and text comments to various recordings (note that captions are useful to enhance a video with useful information or comments that are not usually covered in the audio of the video);

(11) Split/join video and audio files: Allows user to trim/remove unwanted (or low quality) video and audio clips from existing audio/video files and insert, if necessary, other parts to the final recording files

**Second, Recording System During Class:** The Class Activity Recording System should have the following important features:

(1) Screen Recording: The ability to capture content on the computer screen such as videos, PPT slides, animations, computer simulations...;

(2) Live TV: Ability to webcast (over the Internet) online classes for remote students;

(3) Multi-Camera Video: Video must be recorded and presented by multiple video cameras;

(4) Mobile Streaming: Allows instructors to stream live video from various mobile devices;

(5) Capture classroom activities: Every activity (teaching, discussion, presentation,...) in a class should be captured and archived (possibly after class replay) to provide providing (current) classroom effects to remote students;

(6) Customization: Instructors should have the opportunity to create and edit customized instructional content.

(7) Automatic sensing and recording: The ability to sense different activities in a smart classroom and start recording automatically.

(8) Video recording management: The ability to record videos from different angles should be done and properly maintained;

(9) Scheduling and automation: Basic and general purpose activities in the smart classroom should be scheduled and automated (e.g. identification and registration of all local and remote students, turn on automatically and set up all necessary devices in the smart classroom to match the profile of a particular instructor or specific class,...)

**Third, Post-Class Support System:** The Post Class Activity Support System should have the following important features:

(1) Online video television: Allows teachers to replay live TV active routes during class hours have been recorded to students;

(2) Placing quizzes and polls: Allows teachers to quickly put quizzes and polls and assign it to the whole class or to a single student in the class;

(3) Mobile Streaming: Allows teachers to play videos directly from mobile devices, then students can access those files with their mobile devices:

(4) Upload media: Allows teachers to upload rich multimedia content;

(5) Interactive distance learning: Facilitate teacher interaction (in the sense of active two-way communication) or audio/video conference;

(6) Secure assignment/submission: Allows teachers to post lessons on the course website allowing students to securely submit assignments;

(7) Automatic publishing: Allows teachers to easily publish the course composition and learning content (recorded lectures, assignments, grades, notes, announcements, ...) on the course website learn;

(8) Online video stream management: Allows teachers to manage camera and recording settings, view complex camera feeds, and set alerts for tampering and motion detection;

(9) Planning and Automating: Regular learning activities can be scheduled and/or automated.

**Fourth, Web-based Audio and Video Conferencing System:** An audio and video conference system should have the following important features:

(1) Recording: Allows users to record audio and/or video conferences and review as needed;

(2) Conversation/text: Allows students and faculty to converse or send instant text messages;

(3) Voice calling: Allows users to make voice calls to other users online;

(4) Video conferencing: Allows users to make video calls to other online users using the Internet;

(5) Web Casting: Allows video meetings to be broadcast live on various media and/or record them for later editing;

(6) Advocacy: Facilitate synchronized voice conversations across various technical platforms such as making or receiving voice or video calls over Wi-Fi with iOS devices and Android;
(7) Screen Sharing: Facilitates faculty and students to share their computer screens with each other and other students (typically, this feature is controlled by the instructor);

(8) File sharing: Allows faculty to share different files with students;

(9) Group chat: Facilitating the creation of various groups of students, one group calls several selected students at the same time and share information between them;

(10) Drawing Tools: Enables users to annotate or highlight certain passages on computer screens and videos to highlight certain things on the screen or video.

Fifth, Collaborative learning system: Collaborative learning system should ensure the following important features:

(1) Flexible web-based meeting: Allows students, learners, lecturers at different locations work as a virtual team, having online meetings/discussions and share content or documents in real time over the Internet;

(2) Shared whiteboard space: Allows in-class and remote students, faculty to work together in real time over the Internet, communicate and share content (using use a dedicated, smart table or board);

(3) Proactive online discussion and communication: Students can openly discuss and share their thoughts with student groups, project team members or everyone in the class;

(4) File upload and sharing: Instructors, students, learners and tutors can upload various files related to groups activity and learning content, and share them online with a group or every classmate;

(5) Problem-based learning: Teamwork on student projects improves student engagement and retention of learning content;

(6) Phone calls and group communications: The student leader or moderator or tutor can call a group virtual meeting and talk to a specific group of students/learners (can be a group member). course project) online using a variety of available web-based communication tools;

(7) Chat, group chat: Students can talk with other students or a group of students and share ideas, thoughts, documents;

(8) Annotate readings: Allows students to add notes to better understand and communicate thoughts/ideas/questions directly to other members of the student’s team or project;

(9) Scheduling: Student group leader or moderator or tutor can schedule different events, meetings, sessions with different groups of students;

(10) Customize the content and materials to be discussed: The student leader or moderator or tutor should be able to customize the content for a group or individual counseling session as needed for each group of students or the individual student;

(11) Collaborative Session Recording: All audio/video collaboration sessions must be recorded for possible playback (if needed later by student group members);

(12) Screen capture: Student leader or moderator or tutor should be able to capture any activity, process, graphic on the main (shared) computer screen or smartboard, record, archiving and replaying them (if needed), which is especially important for meetings or collaborative team-based sessions where students bring, write ideas to the table, virtual desks based on web;

(13) Asking assignments, questions and giving assessment and grading reports: Student group leaders or moderators or tutors should create assignments for different groups of students and provide them with that evaluation results, scoring (such as grading report);

(14) Notice: The student needs to be notified of an upcoming or scheduled event or activity;

(15) Reports: Automatically generate different types of reports on student group activity or individual student learning outcomes (attendance to virtual group meetings, time spent in virtual discussions, test or quiz completion time, number of virtual team meetings attended per week, etc).

Sixth, Context-aware systems: Context-aware systems should have the following important features:

(1) Adaptation: Perceiving learning contexts and adapting learning activities and teaching styles and that the content is appropriate for (a) the current learning environment, (b) the current student’s academic background, (c) the current needs and/or profile of the faculty, (d) the needs of current student, etc;

(2) Dashboard monitoring: Overview, monitor different scenarios and provide metrics. Specifically, monitoring student learning quality, student activities, student performance,...
(3) Face search and recognition: Detecting faces of different people in diverse environmental types school environment: school environment (in class, in laboratory), building environment, campus environment, etc.

(4) Motion detection and recognition: Sensing or detecting movement of people and different objects in classrooms, laboratories, buildings, campus…;

(5) Gesture recognition: Identify the gestures of lecturers, teaching assistants, tutors or students in the learning environment;

(6) Smart supervision: Monitor activities or behavior patterns or any changes in the school environment using different types of smart devices; This feature is important for safety and security in classrooms, labs, buildings, and campus school;

(7) Recording: Automatically record high-quality audio and video from various activities (situations) in classrooms, labs, buildings, and different areas of the campus;

(8) Predictive analytics: Process data obtained from multiple sensors and make predictions about steps, connected actions from learning activities, or location on campus, or safety, security confidentiality…;

(9) Rapid video processing and analysis: Quickly and efficiently process large data from recorded video (for example, video surveillance cameras) and process the resulting data;

(10) Ubiquitous access: Instructors (or safety staff) can easily access to real-time or virtually video, audio, or recorded information from anywhere, anytime.

4. Some recommendations for Academy of Finance

Building a smart university is a development roadmap in the direction of strongly applying information technology to training and scientific research of universities in Vietnam today, which is in line with the trend of university education 4.0. In order for schools to become smart universities, it is necessary to pay attention to the following issues:

First, completing and comprehensively managing the university’s activities on the e-university system. Promoting the application of information technology in management, teaching and learning, implementing digital transformation in education training towards building a smart university model. In addition, diversify training programs associated with businesses, innovate training methods associated with open and market-oriented educational models to meet the requirements of the industrial revolution 4.0.

Second, thoroughly apply information and communication technology in all activities; build an integrated information system, electronic portal, Vietnamese - English bilingual website system according to international standards, inter-connected infrastructure, etc. Furthermore, information technology is widely applied in training activities, scientific research and student activities such as: Smart Online Classroom (DLS); online learning system (LMS); online training management system (Dashboard), etc.

Third, effectively attract a team of educational experts to develop lectures on distance learning modules to quickly apply them to the university’s training model. Particularly, it is necessary to build a group of experts selected from the teaching staff of the course in terms of both experience and technology mastery to give regular advice on strategies and policies for developing simulation models in distant training. Additionally, the university need to restructure the curriculum, content and teaching methods; using simulation model as the main tool to implement distance learning. Also, it is necessary to build a data warehouse and an electronic library large enough to ensure greater interaction with learners than traditional education does.

Fourth, besides investing in advanced technological equipment, it is necessary to have a Business Administration Simulation Center, Accounting Simulation Center etc which use business management softwares in the university infrastructure. Thereby, it would help students to apply specialised knowledge while learning how to tackle problems, developing a handful of essential soft skills, especially the application of information technology in problem solving.

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