Artificial intelligence (AI)
Case study of other countries and the suggestion to Vietnam

1. Overview:

With the outbreak of the industrial revolution 4.0 (IR4.0) and technologies such as Artificial Intelligence (AI) and the Internet of Things (IoT) which have the ability to make significant changes in the global ecosystem, the world is standing in front of a new "arms race". In this race, the final reward will be a market capable of reaching many lives and labor processes of all nations and global enterprises.

This was the result of previous industrial revolutions. Enterprises that were at the head of those revolutions, are still the world's largest businesses in today, such as Ford in the automotive industry, ABB and Schneider in automation, Intel and Microsoft in the semiconductor and software industry. Facebook, Google, and Apple are also the biggest capital companies which are the first step in the process of human advancement in IoT and AI.

In that context, IR4.0 creates the challenges and opportunities for Vietnam to take off. For many reasons, we have missed three earlier revolutions. As a result, we set off at the least desirable stages in the global value chain such as processing production. South Korea started later, but they did not miss the third industrial revolution of computers and automation. China is a global powerhouse in manufacturing and AI investment. China's progress is truly noteworthy, making technology superpowers such as the US and Europe to be wary. All this success has been the reason leading to the magic development of China, as well as the creation of world’s leading technology companies.

IR4.0 also presents a late comer such as Vietnam with opportunities. Besides the difficulties, we also have some advantages. A youthful and dynamic economy will help Vietnamese companies to be ready to approach new technology and try out potential fields. A process of outsourcing industry (both hardware and software) provides us with a workforce that have access to the latest technologies and products of the world. An open economy and friendly policies are reaching a wider marketplace. With a great number of international students and Vietnamese people all around the world, we receive better exposure to the newest, most complex technologies and products.

2. Why do businesses need to deploy AI-Driven systems quickly? Opportunities and challenges

Like any other opportunities, the chance to participate in the AI and IoT eco-system of the world requires a high concentration on a number of niche market segments, particularly under conditions of deprivation resources and human resources such as Vietnam. Besides, technology applications in particular and AI in general often bring all for the winner (a winner takes all), meaning that they bring in huge profits for the pioneers, and much lower profits for late comers. The AI algorithm only operates easily when there are large amounts of data to the algorithm to learn. This means that companies are among the first to launch a product will receive greater advantages (data network effect), as users are more willing to try during the first launching stage. During this period, application users will generate mass data, thereby helping companies to improve product quality and entice the next potential customer.

Understanding the importance of being the pioneers or "Winner takes all" concept, many countries soon introduce national policies to foster the development of AI. China, Canada, France, and the United States are pioneering countries. In 2017, China announced a national strategy about AI (A New Generation Artificial Intelligence Development Plan-AIDP)[1], in which huge investment commitment made in China is guaranteed. Although the numbers are not disclosed, there are at least two Chinese provinces have announced an investment of 14 billion dollars each for AI[2], with the statement: *AI has become the new subject of international competition. AI is a strategic technology to create the future; Developed countries are promoting AI as a key strategy to increase national competitiveness and security protection*[3].

This investment strategy has ranked China take the No. 1 or No. 2 in all 5 competitive aspects related to AI: scientific research and the article cited, patents, investment and innovation, the technology company, and highly qualified human resources. Chinese company SenseTime becomes one of the largest AI companies in the world, with the amount of capital of up to nearly 3 billion dollars and the value of more than 6 billion dollars in less than 5 years of operation. DJI becomes the biggest company in the world of drone with about 75% of market share[4].

Besides China, France is also a country that soon launched an AI development strategy by mathematicians, who was awarded the Fields Villani prize editor. France's strategy is to create the data source for the State management, similar to the goods or services to other public interest, this is to manage the open data and data security. The Government will focus on strategic applications related to medical, transport, the environment, and national defense[5]. With every industry, there will be mechanisms to create the platforms to help the various constituents in the contributions and data mining. In addition, the government will create a multidisciplinary research institute as well as encourage small and medium enterprises to engage in research and development of technology and products related to AI. Besides, transparency and fairness are also taken into account in order to ensure sustainable development of the product and membership in the society.

About Vietnam, an urgent task now is adopting consistent and drastic policies in favor of the development of AI industry and the related application to further boost social-economic development. To do this, Vietnam needs to quickly define goals and invest in this application in order to promote the ability of science and technology industries that strongly influence the success of AI technologies. It is crucial to create high-quality human resources in the context of severe human resources shortages on global scale.

Besides, it is important to introduce policies to develop some applications related to Vietnam's defense security. With that, Vietnam is not only to storage the important data and information, also creates a series of companies AI which have the ability to research and develop the technology and high quality products, go with the flow of the advancement of

[1] Reference source: https://www.cnas.org/publications/reports/understanding-chinas-ai-strategy.
China's 'A New Generation Artificial Intelligence Development Plan' is available in English at Graham Webster, Rogier Creemers, Paul Triolo và Elsa Kania at website:
https://www.newamerica.org/cybersecurity-initiative/digichina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/

[2] Meng Jing, "This Chinese City Plans a US$16 Billion Fund for AI Development" South China Morning Post, May 16, 2018.
https://www.scmp.com/tech/innovation/article/2146428/tianjin-city-china-eyes-us16-billion-fund-ai-work-dwarfing-eus-plan

[3] Reference source: https://www.cnas.org/publications/reports/understanding-chinas-ai-strategy

[4] Reference source: https://www.geospatialworld.net/blogs/top-drone-industry-trends-for-2019/

[5] Reference source: https://www.aiforhumanity.fr/pdfs/MissionVillani_Report_ENG-VF.pdf

the universe. The companies will reach out to the world market, helping Vietnam join the global ecosystem which is particularly important.

3. Technology structure:

To determine the applications and core technology, we will start with some applications have great potential, particularly as circumstances and priorities for Vietnam. Most of the technologies available today still take much effort of researchers and engineers in the world, which means we have the opportunity to learn and catch up with.

Based on the data requirement for the machine learning, the first developed AI applications relate to information such as photos and videos (Computer Vision). Image data is one of the largest resources in a digital era. The human eyes and brain are especially effective in extracting information from even the lowest resolution images. The synthesis of this information for smart decisions is also complicated, even for the most advanced technologies as Deep Learning.

Some applications use high-tech sensors such as remote sensing, satellite image, photo of prussia are potential for building the applications. As Computer Vision, we can solve particular problems of Vietnam. The application would be focusing the Vietnam industry strengths like fisheries, agriculture and so on. These technology can increase productivity and the quality of the products of Vietnam, contributing to rapid economic growth in a sustainable way.

Different from technologies image and video processing, where we can apply the world's technology, applications related to voice and language require a personnel force tech particularities of Vietnam. We cannot expect to engineers and researchers in the world solve Vietnam’s problem with total determination and passion same as Vietnamese engineer. The universalization of smartphones and social network, this data can be collected with the big number of every day, every time, everywhere. The master related technology will help Vietnam’s application able to compete with foreign products in Vietnam.

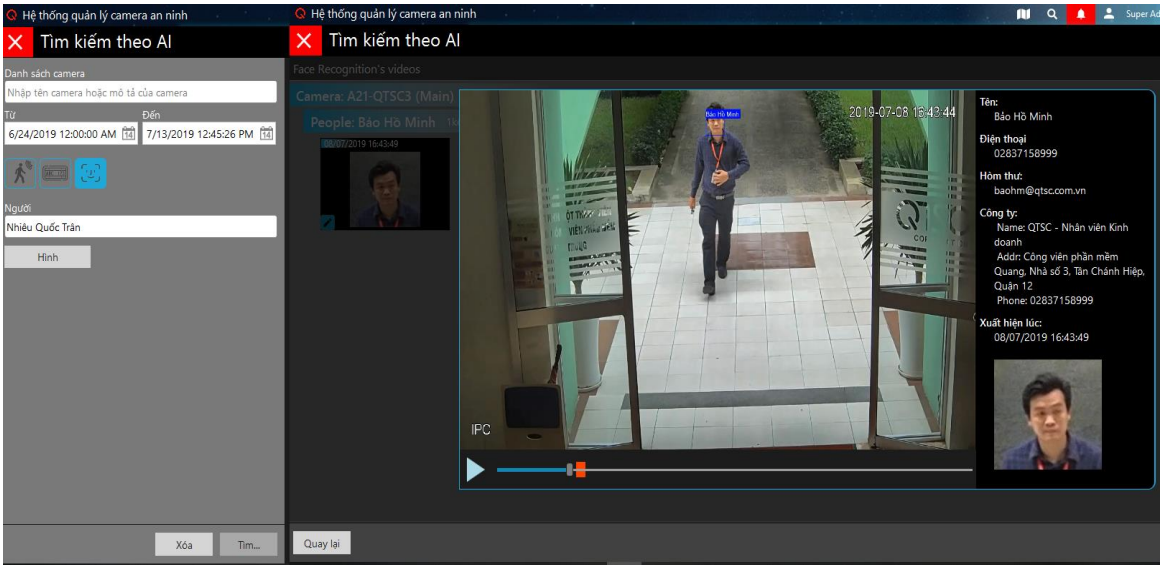
To develop technologies and AI application quickly and effectively, we need to focus on training and developing some skills and core technology such as: software development, product development, embedded systems, cloud computing, big data, linear algebra, probability, mathematical statistics, optimization, control, and security network, etc.

4. Practical experience and initial steps:

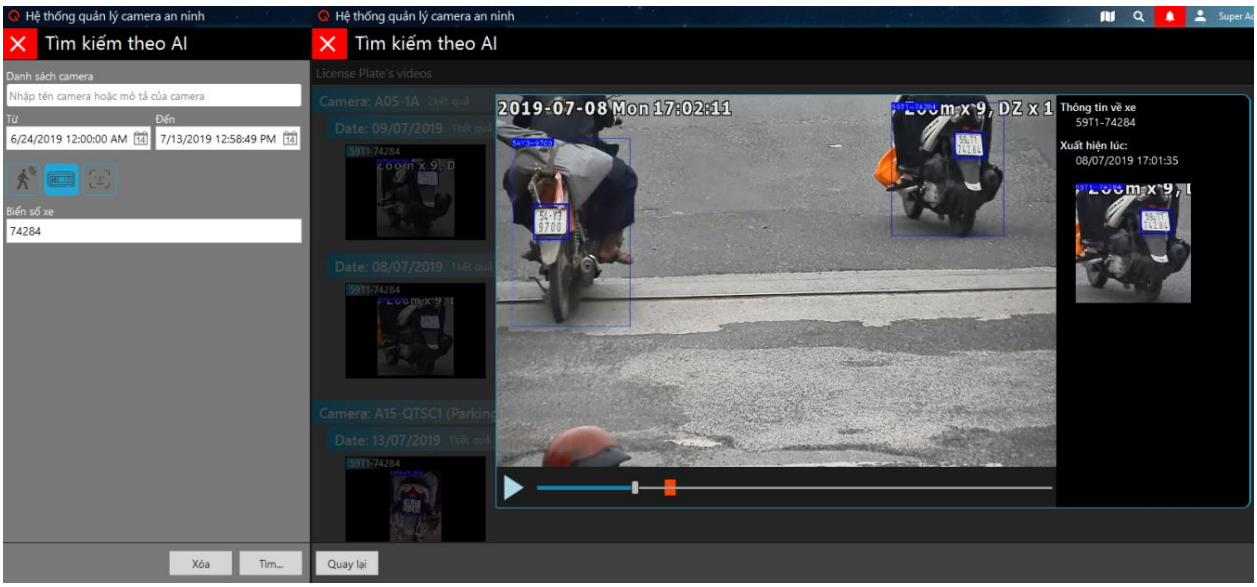
In this document, we would like to share a case study for video management systems (VMS) in Quang Trung Software City (QTSC). VMS system was developed with the purpose to collect video data from thousands of different cameras effectively in real time. The collection requires of data from most of the camera are available on the market, because there will not be feasible if the investor requirements assemble the camera that they have been invested over time and are performing well. The variety of types and location of such cameras, require transmission and real time data analysis also not to be missed, especially as the data in the form of videos, with very large data volumes and users expect quality requirements like what they still experience through regular video applications.

Figured 1: qVMS systems connect many camera signals on the same platform

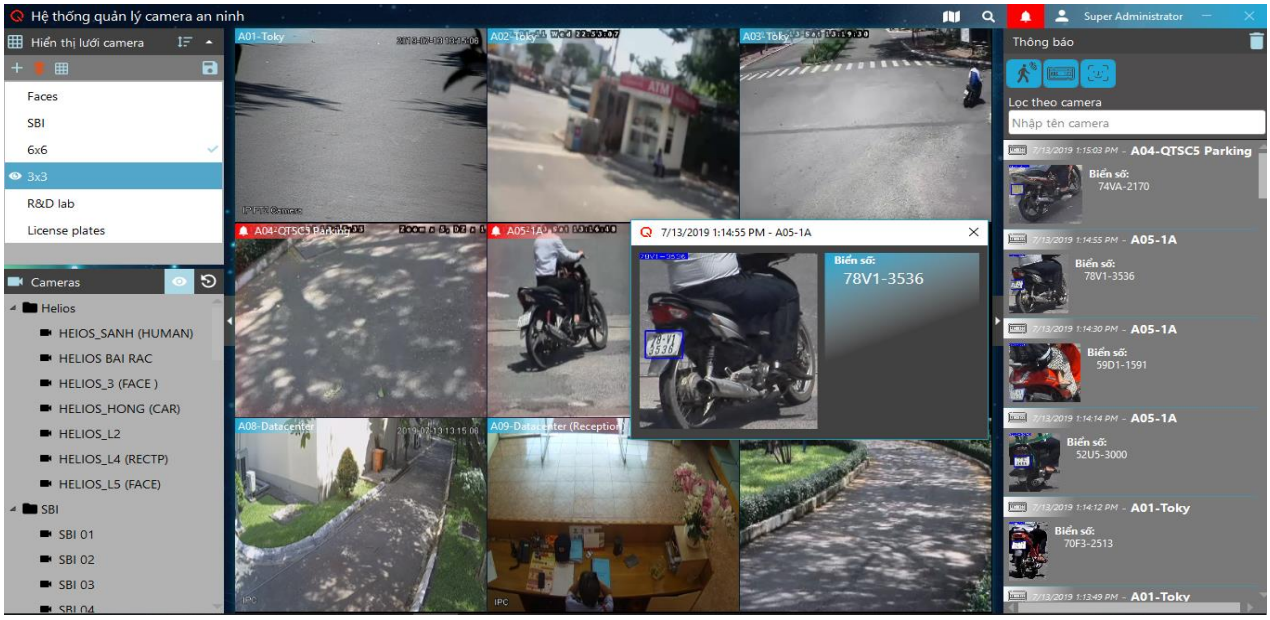
After the camera collect and transfer data to servers, the data analysis process turn on such as license plate recognition, face recognition, object recognition, identification in real time to extract the information service of the application. Being able to synthesize this information effectively is also an aspect challenge about the technological aspect of design and system architecture. Besides, searching and retrieving data are also a high demand from the person operating the system. The search engine will very different sets of regular search users still experience on the Internet (such as Google), where the data are primarily in the form of text.



Figured 2: The face recognition feature



Figured 3: The license plate recognition feature



Figured 4: Alert vehicles in the blacklist

After collecting large quantities of such information, the next natural problem is how can store data in a stable way to retrieve data quickly and accurately, while the price of computing server and storage parts need more inexpensively and easily upgraded or increased the capacity. This requires a system with data lake, according to the highest standards and technologies.

In the process of research and development VMS, the biggest difficulty that we are facing such as the test environment, the recruitment and training of personnel, the investment and buy the equipment testing and research, as well as the collection of data is very expensive and not high quality.

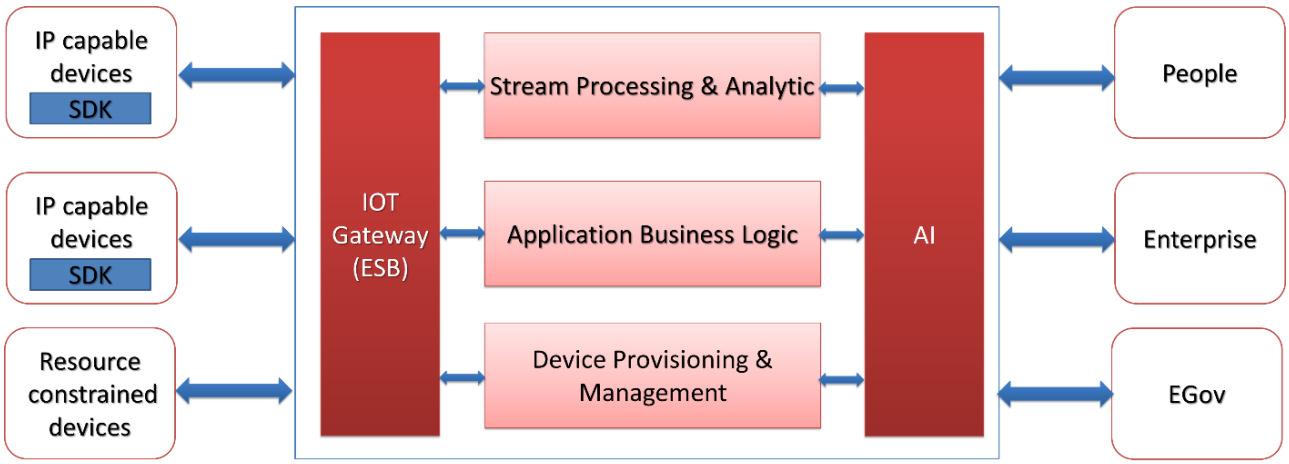
5. The recommended architecture for smart cities:

From vision for Vietnam and practices in building applications AI in Vietnam, we found a model that can help us to focus our resources, it is used to develop little the advantage of ours, as well as may create practical applications very quickly, bringing success to both the government and enterprises, which is the public private partnership model with application

follow tier technologies. In this model, we recommend creating the applications related to the camera in the city, specifically the following:

Data: start with the video data in all the security cameras in the city, along with the other data like land and infrastructure. At first, we can start with the camera is installed by the government. After the good development projects, we can create benefits in order to encourage the social components to share data from the camera mounting (note this is encouraged but not required). Collect this information helps us to have a big data, may contain a lot of information about what events are happening in the city.

Networking infrastructure: to be able to collect data from the camera, we will need to build a good enough infrastructure, can serve in real time with the cost of the suit. The government should to do this, because the infrastructure investment may exceed the appropriate level of private businesses. Besides this investment also helps the State to master this data, avoid leaks affecting the social activities as well as believe of the people.



Figured 5: IoT applications layer model proposed for the Smart City[6].

Information sharing based on API: After the data is moved to the control center, there will be applications that analyze this data to extract information from data in a real time manner or not. This data will be very important in the building of the application AI. The information can be extracted such as car number plates, traffic, traffic information, criminal identification, etc, This technology tier is also in the best by State management, can give some bidding companies and operate under the supervision of the State. So the state can ensure information security requirements, as well as basic investment that helps private companies AI do not need to re-invest in these basic technologies.

Applications: after we have the information on the camera and extract, the information was brought up the APIs to help companies and software Vietnam develop technology applications on it. The opening of this API can be completed public or licensed for some company match. These companies may have to pay some fees for certain to help the State can invest and the infrastructure and the technology of extracting information.

6. Proposals:

We would like to suggest some solutions and policies:

Firstly, in the perspective of the Government needs to devise a national strategy on AI about the gathering human resources and resources into a number of important applications

[6] Reference source: Smart city_Microsoft

to the development of the country related to security, defense, agriculture, and so on, and the field of Vietnam is being had strengths.

Secondly, the State needs to invest and create some key research lab. They need to devise policies to encourage enterprises, especially technology associations to participate in the training process. The lab should follow the State policies or forms of general – private to ensure sustainability of the lab. The lab should put in some universities or massive technology areas to be able together, promote enterprises involved technology, sharing of research results.

Thirdly, focus on a number of policies to prioritize AI-based, which using as one of the conditions of the project have used the State budget resources or incentive conditions to bid technology projects.

Fourly, organize, develop an application built national stature, high value to society, with the purpose of creating an perfect AI eco-system.

Finally, we need to enact the standard connection, data standards in the activities related to the application of AI to the State service system.

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