

IET Wireless Symposium 2024
“Ubiquitous I&T Networks and Applications for
Security, Sustainability and Mobility”
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Ir Raymond POON, JP, Director, EMSD
“Unleashing the Forces”

Introduction

Good morning, Dr. KF Tsang (General Chair), Prof. Jolly Wong (General Co-Chair), (EUR ING) Ir Henry Au (Chairman, IET Hong Kong), esteemed guests, ladies and gentlemen, I am deeply honoured to be invited to give the keynote speech for our professionals from the wireless industry at this symposium.

2. In the last decade, technology has been progressing very quickly. There are lots of imaginary technologies happened in science fiction movies, like Star Wars. Now some of them become reality in our life. For example, Bipedal Robot, Laser Weapon, Jet Suit, and Hologram. Not only those military technologies came true, a lot of imaginary technologies in the past also come true in our daily life today.

Definition of New Quality Productive Forces (NQPF)

3. In the past, real-time speech translation device was also one of the electronic gadgets appeared in science fiction. However, with our mobile app today, real-time speech translation is easily accessible. In fact, wireless technologies and mobile app have largely changed our lives in the last decade. The number of mobile applications downloads have increased 80% in the past few years, showing an exponential growth in demands to rely on usage of mobile phones to complete daily tasks, communications, and entertainments.

4. On the other hand, starting from last year, the term “New Quality Productive Forces” has been a buzzword attracting global attention. It refers to advanced productivity freed from traditional economic growth modes and productivity development paths and features high technology, high efficiency and high quality. How wireless technologies can be integrated with New Quality Productive Forces and make a

transformation to the traditional industries? Let's look at two traditional industries, Construction and Transportation as examples.

Construction Industry

5. 'Dangerous', 'demanding' and 'traditional' are some of the common impressions of the construction industry. In Hong Kong, the accident rate was about 39 cases per 1000 workers in 2015. With joint efforts by the government, various stakeholders and the trade in recent years, the accident rate is now dropped to below 30 cases per 1000 works (or approximate down by 23%. The fatality rate dropped from 0.2 per 1000 workers in 2015 to 0.16 per 1000 workers in 2022). Actually, ALL the fatal accidents in the construction sector in 2022 were caused by "Falling from height" and "Trapped by objects" which claimed 17 lives (and 19 cases in 1st 2023), prompting strong public concerns to effective site safety management. Safety is the paramount importance of the construction industry, even a single fatal accident is an unacceptable tragedy.

6. Digital Twin is a real-life version of a science fiction 3D map. It can collect construction site conditions in real-time by using wireless connected sensors and cameras. This enables the Digital Twin to mimic the construction site on a virtual platform. Supervisor can take the advantage of Digital Twin to acquire real-time site conditions, works progress, worker's health status so that he can make swift decisions, anytime, anywhere.

7. To further enhance site safety, various wireless IoT devices are being deployed to construction sites which can also be integrated with the Digital Twin. For example, the smart helmet can continuously track the workers' positions and monitor their health conditions. Restricted Zone Alert and Smart locks can effectively control the access of hazardous areas and equipment for higher risk or hot works. In order to enter the hazardous areas or use of equipment for hot works etc., the workers need to pre-register the estimated start and completion time for supervisors' approval via the electronic platform. The workers need to report again upon completion of works. If the pre-registered completion time limit was exceeded, supervisor will receive alert for follow up action. This enhanced monitoring and control will largely enhance safety and reduce risks.

8. Robot is an alternative to reduce the risks while increase the work's quality and efficiency. Construction robots can perform hazardous and repetitive construction tasks, especially those required to be conducted at height, such as, hole drilling, painting, skim coating, floor cleaning, and brick laying. With the support of BIM and wireless network,

worker can pre-loaded the way point for performing those construction tasks to ensure precision workmanship be completed overnight, as well as removing the risks of working at height.

9. This video shows a real-life case of how a Smart Site Management platform works for the project of construction of Central Kowloon Route by Highways Department.

We have just looked at a few use cases of how wireless technologies being a crucial infrastructure to link up those devices. Supervisors can manage the construction site easily via Smart Site Management Platform (or Digital Twins) which have been applied to the traditional construction industry to enhance its quality, efficiency and safety. Now, we will look at another traditional industry – Transportation.

Transportation Industry

10. Other than construction, transportation is also an essential industry to support a better Hong Kong. In order to shorten our daily traveling time, we keep building highways and investing more and more on public transport (transits system). However, it seems the traffic congestion problem still persists. Is there any other ways to uplift the pressure on our road system?

11. Major causes of traffic congestions include capacity saturation, traffic accidents, road works and weather condition. Among them, traffic accident is one of the causes that could be largely avoided by deploying new technologies.

12. According to the statistics *from the Hong Kong Police Force*, in year 2023 there were over 16,000 traffic accidents in Hong Kong. We all well understood that most of the traffic accidents were caused by human errors (*such as (1) improper lookout, (2) poor driving habit and (3) inattention*). One of the suggested solutions known as cellular vehicle-to-everything or C-V2X technology in short, is a communication system which enables a vehicle's smart sensors to interact and exchange data with other smart vehicles, infrastructure, mobile networks and relevant devices. Supported by 4G/5G cellular network technology, C-V2X can achieve (1) low latency (*down to 50ms*), (2) high bandwidth (*~500 Mbps*), (3) long distance (*1 km*) and (4) wide coverage of cellular network, all these advantages are attributed to the advancement of wireless technologies, which enabled rapid communication between infrastructure, pedestrian and vehicles on the road. It also allows timely alerts, giving drivers advance notice to clear the way early, thereby assisting emergency rescue teams in reaching their destinations faster and safer.

13. Through the continued development of V2X technology, more specifically the advancements within Cellular Vehicle-to-Everything (C-V2X), autonomous driving becomes one of the advanced uses of wireless technologies to achieve “Full Driving Automation”.

Today most of the driving automation can only achieve partial driving automation with the use of cameras and sensors such as Radar and LiDAR which allow a vehicle to understand what is happening around to ensure safety for the driver. A driver is still required to take control of the vehicle when dealing with emergency situations due to the limitations of these electronics sensors which can only detect objects in the line of sight of the vehicle. This means they cannot detect hazards that may be a few vehicles ahead, blocked, or around the corners. Moreover, these sensors can be ineffective in adverse weather conditions.

The Cellular Vehicle-to-Everything (C-V2X) technology can overcome these limitations by allowing sensors on roads and vehicles to communicate with each other, extending the coverage and blind-spot detection of autonomous vehicles to enable fully (higher levels of) automated driving for vehicle users. C-V2X technology enables a key critical feature more than existing sensors can do – that is: Communication. Wireless data communication provided by C-V2X allows vehicles to “see through” obstacles on the road and understand the road condition at a wider coverage, for a more accurate picture of the surroundings, in real-time.

Wrap up with the New Quality Productive Force (NQPF)

14. We have just looked at a few examples of how wireless technologies have been applied to the traditional industries to enhance its quality, efficiency and safety. Wireless technology revolutionizes the traditional industry by enabling seamless communication, real-time data access, and remote operations that were a big jump from the past. It enhances productivity, fosters innovation, and supports the development of smart infrastructure, ultimately transportation efficiency and economic growth across various industries, and paving a way to achieve “New Quality Productive Forces”.

Encourage of Innovation

15. In the long run, wireless technology not only enables advancement of innovative applications, it will also inherit fundamental changes of technological development and become a game-changer for new applications. Currently, wireless technology is mainly

focused on the applications for data transmission, but the idea of using wireless technology to transmit power has long been explored, even as far as in the late 19th century, by the Serbian-American Engineer, Nikola Tesla.

16. Although these early trials of wireless power were not successful, this did not discourage people from further study in this field. Currently, near-field wireless charging technology such as “Qi” is being adopted in wide range of smart devices, such as Smart phones and Smart watches. There are pilot studies aiming to achieve wireless high power and long-distance power transmission utilizing power beams of laser and microwave, as well as the principle of magnetic resonance. If the result of these researches on far field electricity delivery is promising, it will open a new window for applications that are beyond our imagination:

- Have any one think of power delivery for remote sites without power lines?
- Dynamic charging of electric vehicle on the road? and
- No more power cord connected to the appliances in your home?

The development of wireless power delivery is a typical example of how fundamental technological changes leading us to a world of “completely wireless”.

Closing

17. In conclusion, advancements in wireless technology are driving the emergence of New Quality Productive Forces, characterized by high technology, efficiency, and quality. These innovations are transforming industries, from automated vehicles to smart construction, enhancing connectivity and productivity. With the innovative advancement of wireless technology, it paves the way for sustainable growth and a more connected future that are beyond our imagination. Let us continue to explore and push the boundaries of what is possible.

“May the Innovation and Technology be with you always.”

Thank you.

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