National Resilience Technologies

Introduction

1. The covid-19 crisis and it's national responses have brought a sharper understanding of **the role of technology in national resilience**. Technologies can help nations deal with crisis situation in two main ways:
    a. maintain continuity of essential services and the economy at large even under extreme conditions.
    b. Take action necessary to bring the crisis to a speedy and successful end.
2. The covid-19 situation was a public health crisis, but the technological **lessons learned may be applicable to national resilience** in other kinds of crisis, such as wartime or natural disaster.

Perseverance of essential functions during crisis

3. In the covid-19 crisis, the importance of remote access technologies became clear. Whereas in the past, these might have been seen as matters of convenience, we now see that **telework** - secure, continuous and scalable - is a **key component in national perseverance**, as well as in **minimizing economic damage**.

4. In the covid-19 crisis, the mass transfer to telework (as well as remote learning and entertainment) placed considerable stress on the telecommunications networks. Some essential services also went remote as with remote health-care, which the health administration was under pressure to scale up. **The rise in remote access usages also attracted increased cyberattack**, focused on the weaknesses in the relevant remote platforms.

Conclusions regarding perseverance technologies

5. **Communications infrastructure needs to be upgraded** to support mass migration to telefunctioning. These include **fiberoptic and 5G support**. **Redundancies** are also required, such as roaming arrangements between carriers, at least for essential services.
6. **Cloud services** are another necessary infrastructure, located in a close availability region, to support both private and e-gov services with high reliability and scale. Agreements should be considered with trusted platform suppliers to ensure business continuity during crisis.
7. **A strong layer of cybersecurity** is needed to support telefunctioning, including remote ID verification (an advanced version would use biometric ID and public key infrastructure), verification mechanisms for routers and devices, and secure conferencing means on public platforms.

Crisis management and termination

8. A series of technologies were enlisted to deal with the covid-19 crisis – for situational awareness, preventing infections and ultimately neutralizing the threat. This is the first time some of these technologies were ripe for use in a crisis. For example, the ability to collect data sets and make correlations for public alerts (such as infection trace apps), the use of big-data models to support decision making, the need for high performance computing to

support testing and vaccine development, and the use of private 3D printing resources to manufacture essential items such as masks.

9. These technologies, however, were not without problems. **Privacy issues** haunted the ability to collect data for the public good, computing and data infrastructure were inadequate to give full support to the efforts and emergency production was not holistically organized.

Conclusions regarding crisis management and termination technologies:

a. Platforms are required for enabling **anonymized use of private data** sets for the public good, such as geolocations, especially in emergencies. Multiparty computing may be a promising way forward.

b. **Emergency services need to establish and maintain teams with data science expertise** and the data analysis systems to support them.

c. A **national DNA testing and research lab** with high levels of privacy and cybersecurity mechanisms, can prove to be invaluable in crisis situations.

d. **High performance computing infrastructure**, as was made available to covid-19 researchers by a public-private consortium in the US, can be an important capability for finding solutions. If strong quantum computing had been available during the crisis, it might have allowed for complex modeling that could accelerate vaccine discovery.

e. Any future emergency manufacture plans should take into account the proliferation of **3D printing capabilities in the private sector**, beyond the obvious industrial capabilities usually enlisted in emergency economies. A digital bank of emergency items for 3D printing, a catalog of 3D printers in the nation and authorities for enlisting them, may be necessary to best utilize resources.

Best regards,