

## ***Group 4 - Workshop ATC320 - from 10.30 to 12.30***

### **ACTIVITY 2**

1. What is meant by emerging technologies ?

- Emerging technologies are technologies whose development, useful applications, or both are still mainly unrealized. These technologies are mostly new, but they also include older technologies that have found new uses.

2. 10 different emerging technologies:

- Autonomous vehicles
- Internet of Things (IoT)
- Robotics
- Artificial intelligence (AI)
- Biotechnology
- Renewable energy
- E-learning
- Digital Identity
- Smart water management
- Microgrids

Q3:

- Autonomous vehicles :
  - + Is for : operate without human input or intervention.

- + Multipurpose: Ride-hailing services, Public transportation, Delivery services, Freight transportation, personal transportation, etc
  - + Costing: about \$250,000 per vehicle to own a fully autonomous vehicle.
  - + Maintenance challenges: Sensor maintenance - AVs rely heavily on sensors, such as cameras, lidar, and radar, to navigate roads and detect obstacles. These sensors need to be calibrated and cleaned regularly to ensure they are accurate and functioning properly.
  - + Requires professionals who fully understand in order to introduce how to operate.
- IoT:
- + Is for: IoT can be applied to the indigenous community in various ways such as environmental monitoring, agriculture, healthcare, cultural preservation, and community safety. It can help them understand and protect their lands, improve their agricultural practices, ensure food security, provide remote healthcare services, preserve cultural knowledge, and enhance community safety and security.
  - + Costing: The cost could range from a few dollars for a simple sensor to thousands of dollars for a more complex system, depending on the requirements of the IoT's application.
  - + Maintenance challenges: Maintaining IoT systems can present several challenges including device management, security, data management, power management, and scalability. Device management can be challenging due to a large number of devices and sensors spread over a wide area. Security and regular updates are essential to protect the system from cyber-attacks. Handling vast amounts of data generated by the IoT system requires a robust data management plan. Regular monitoring and replacement of batteries or power sources is

necessary. Scalability is essential to accommodate the addition of new devices and sensors over time.

- + While some IoT systems are designed to be user-friendly and require little technical knowledge, others may require significant expertise to set up, configure, and maintain. Therefore, it is essential to have a team or individuals with the required knowledge and expertise to operate and maintain IoT systems effectively.
- Robotics:
  - + Is for: improving Indigenous communities' livelihoods, protect their lands, automate tasks in agriculture.
  - + Costing: the cost of implementing agricultural robotics can range from a few thousand dollars to hundreds of thousands of dollars per user, depending on the level of automation required and the size of the farm or operation.
  - + Maintenance challenges: the maintenance of agricultural robotics systems requires ongoing attention and management to ensure that the system operates efficiently, reliably, and cost-effectively over time. It is important to have a maintenance plan in place that addresses these challenges and ensures that the system is properly maintained and operated.
  - + Operating robotics systems requires some level of technical knowledge and expertise.
- AI:
  - + Is for: AI can be used to automate processes, make predictions, and analyze data, and has applications in fields such as education, healthcare, and employment and economic development.
  - + Costing: Overall, the cost of implementing AI in the education field for Indigenous communities in Australia can range from a few thousand to tens of thousands of dollars per user, depending on different fields that AI is applied, including infrastructure, data, training and support...

- + Maintenance challenges: implementing AI in the education field for Indigenous communities in Australia can present maintenance challenges related to data quality, technical expertise, compatibility, security, privacy, and ethical considerations. It is important to consider these challenges carefully and develop a maintenance plan that addresses these issues proactively.
- + Requires professionals who fully understand in AI in order to introduce how to operate.
- Biotechnology:
  - + is for: This technology involves the use of living organisms to create new products and solve problems in fields such as medicine, agriculture, and energy.
  - + Applications: biotechnology has significant potential to support Indigenous communities in Australia across a range of sectors, from health and nutrition to environmental management and cultural preservation. However, it is important to ensure that biotechnology applications are developed and implemented in a culturally sensitive and appropriate manner, in consultation with Indigenous communities and stakeholders.
  - + Costing: the cost of using biotechnology in Indigenous communities can range from a few dollars to thousands of dollars per user, depending on many factors, including R&D, Infrastructure, Access to Resources, Intellectual Property Rights.
  - + Maintenance challenges: Biotechnology infrastructure in Indigenous communities can pose several maintenance challenges due to limited resources, specialized knowledge and skills, access to resources, environmental factors, cultural sensitivity, and data management. To address these challenges, it is important to ensure that biotechnology infrastructure is developed and maintained sustainably, with a focus on cost-effectiveness and cultural sensitivity, in

consultation with Indigenous communities and stakeholders. Investing in training and education programs can also help build local capacity and promote self-sufficiency.

- + Operating biotechnology infrastructure, such as laboratories or research facilities, typically requires specialized knowledge and training, as well as experience with relevant equipment and technologies. However, with appropriate training and education programs, anyone with an interest in biotechnology can learn to operate and maintain this infrastructure. It is important to ensure that Indigenous community members have access to training and education programs that provide technical skills and knowledge, as this can help build local capacity and promote self-sufficiency in biotechnology research and development.
- Renewable energy:
  - + Is for: Technologies such as solar and wind power have the potential to provide clean, sustainable energy and reduce our dependence on fossil fuels.
  - + Application: Overall, renewable energy can provide significant benefits to Indigenous communities by improving energy access, promoting economic development, protecting the environment, and fostering community engagement.
  - + Costing: According to the Clean Energy Council, the cost of installing a solar system can range from around AUD 3,000 for a small residential system to AUD 10,000 or more for larger commercial systems.
  - + Maintenance challenges: Renewable energy approach may face limited resources, funding, and equipment to carry out maintenance and repair work on solar and wind energy infrastructure. This can lead to delays in repairs or reduced functionality of the system. Also, some infrastructure like solar panels and wind turbines are exposed to the elements and can be

damaged by extreme weather events such as cyclones, storms, and bushfires. These events can cause damage to the infrastructure, requiring repairs or replacement.

- + The operation and maintenance of renewable energy infrastructure requires specialized technical knowledge and skills. For instance, while some basic tasks such as cleaning solar panels can be carried out by non-experts, more complex tasks such as repairing and troubleshooting the system require specialized expertise and training.
- E-learning:
  - + Is for: E-learning technologies can provide Indigenous Communities with access to educational resources and opportunities, regardless of their location, helping to bridge the education gap between Indigenous and non-Indigenous communities.
  - + Costing: Some e-learning programs may be offered for free or at a very low cost, while others may require significant investment in technology, resources, and support services.
  - + The maintenance challenges that e-learning programs may face in Indigenous communities include technical issues, infrastructure requirements, training and support needs, and content development challenges. These challenges can impact the accessibility and reliability of e-learning resources, particularly in remote or resource-constrained areas. To ensure the long-term success and sustainability of e-learning initiatives in Indigenous communities, it is important to carefully consider these challenges and develop strategies to address them.
  - + Operating an e-learning program typically only requires a basic level of technological literacy, such as familiarity with using a computer, accessing the internet, and using common software programs like

web browsers, document editors, and video conferencing tools.

- Digital identity:
  - + Is for: Digital identity technologies can help Indigenous people to access government services and benefits, including healthcare, education and other important resources, as well as improve their access to financial services and employment opportunities.
  - + Costing: It should be totally invested by the government, which may cost about millions dollars to development the essential infrastructure and programs.
  - + Maintaining digital identity infrastructure and facilities requires ongoing investment in technology, security, regulatory compliance, and user engagement. It is important to ensure that these challenges are carefully considered and addressed in the design and implementation of digital identity systems for Indigenous communities.
  - + It should be operated and managed by the government, which requires some degree of technical knowledge and expertise. Also, users may need to understand how to use digital devices, navigate online platforms, and manage their personal information securely.
- Smart water management:
  - + Is for: Smart water management technologies, such as sensors and real-time monitoring systems, can help Indigenous communities to manage and conserve water resources, particularly in areas affected by drought or climate change.
  - + Applications: Smart water management technologies can help Indigenous communities in Australia manage their water resources more effectively, reduce water waste, and ensure the sustainability of these resources for future generations.

- + Costing: This should also be totally invested by the government, that means the users, here is the indigenous communities, can access it for free.
- + The maintenance challenges associated with smart water management systems include data management, sensor maintenance, software updates, and power supply. To ensure optimal performance, these systems require regular maintenance, technical expertise, resources, and ongoing support.
- + Operating smart water management systems may require some technical expertise and knowledge, particularly in areas such as data analysis, software systems, and sensor calibration. However, with adequate training and support, it is possible for community members with limited technical skills to operate these systems effectively.
- Microgrids:
  - + Is for: Microgrids are small-scale electrical systems that can operate independently or in connection with a larger grid. They can provide people with greater control over their energy supply and help to reduce reliance on fossil fuels.
  - + Applications: Microgrids can have several applications for Indigenous communities, particularly those in remote or off-grid areas. These systems can provide a reliable and sustainable source of electricity and can be integrated with renewable energy sources such as solar and wind power. They can also be designed to meet the specific energy needs of the community, which can be beneficial in reducing energy costs and increasing energy independence. In addition, microgrids can improve energy security and resilience by providing backup power during outages and emergencies. This can be particularly important for Indigenous communities in regions prone to extreme weather events or natural disasters.



- + Costing: As other emerging technologies, it may be costly for the users, especially the Indigenous communities, but there are several funding opportunities available to them to help cover the costs of implementing microgrid systems, such as government grants and subsidies, as well as private sector investments.
- + It also poses some maintenance challenges, such as the need for regular equipment inspections, software updates, and system monitoring. However, with proper maintenance and support, microgrid systems can provide long-term benefits to Indigenous communities.
- + Microgrid systems typically require specialized knowledge and expertise to operate and maintain, particularly as they involve integrating multiple renewable energy sources and energy storage technologies. However, Indigenous communities can receive training and support to develop the necessary knowledge and skills to operate and maintain microgrid systems. In addition, there are companies and organizations that offer ongoing support and maintenance services for microgrid systems to help ensure their efficient and reliable operation.