ICT Practice:

Emerging Technologies

Researching Emerging Technologies and Practices

ICTICT426 - Identify and Evaluate Emerging Technologies and Practices

This unit describes the skills and knowledge required to identify emerging technologies and practices in the ICT sector and evaluate their potential impact on organisational practices.

In English: Be able to look at trends in the industry and predict what effects they might have on your workplace.

ASSESSMENT
1. KNOWLEDGE QUESTIONS (CAN LOOK AT NOW) - DUE DATE 3RD MARCH
2. PERFORMANCE ASSESSMENT

"Mother of all demos" Douglas Engelbart - first mouse

Research - is defined as:

"...careful consideration of study regarding a particular concern or problem using scientific methods. " (https://www.questionpro.com/blog/what-is-research/)

Research Approaches:

A research approach is a plan and procedure that outlines how you will collect, analyse and interpret data. Three approaches to research include qualitative, quantitive and mixed methods.

Qualitive and Quantitive Research:
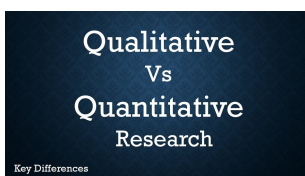
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Qualitative research: obtains descriptive data, usually concerning **quality** rather than **quantity** (hence the name). Qualitative research tends to find out about how and why a behaviour or occurrence works as it does, helps gain an insight into the problem and uncover trends in thinking.

Quantitive Research: data in a numerical form, which can be represented in graphs or tables. This approach is seen as rational and objective because it relies on statistics.

Mixed Research: a combination of both.

EXERCISE - QUALITATIVE, QUANTITATIVE OR MIXED?

1) Rate each of the following research methods as *qualitative*, *quantitative* or *mixed*

- A one-on-one interview with a client
- An individual training plan (ITP) - this is a document that asks you to check if all your enrolment details are correct
- A focus group with a selection of gamers, trying out a new game
- A report based on beta test playing of a new game
- The National Census (run every 5 years to gain data on every household in the country)
- A phone poll to see who is the most popular candidate for an election
- A workplace audit
- A product review website

2) Imagine you want to buy a particular game console. Give an example of:

1. Quantitative data that will inform your decision
2. Qualitative data that will inform your decision

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1. Mixed, more qualitative

2. Quantitive

3. Quantitive, mixed

4. Quantitive, mixed

5. Quantitive

6. Quantitive

7. Quantitive

8. Mixed

2A. Speed, specs, costs, game lists, storage

2B. opinions, brands friends,

CASE STUDY - LECTURE vs CDROM

In the 1980's, computers were starting to come into their own as a tool for education. One of Sydney's main universities ran a research project to test a new learning technology, the CDROM.

They created a self-paced interactive course on CDROM for first-year Chemistry, and ran it for a select group of students, whilst the remaining students attended traditional face-to-face lectures. The hypothesis was that the self-paced CDROM would help students more than traditional face-to-face lectures.

In order to make the research effective, they chose a **quantitative approach**:

1. They pre-tested all student Chemistry knowledge on entering first year, to get a baseline for each student

2. They ran the face-to-face lectures for some students, and the CDROM for others, for a fixed period of time, and

3. They administered another test at the end of the project, to see how the students' results compared.

When they reviewed the results of the research, the project team were astonished. The students who had used the CDROM had achieved learning over 10% higher than the traditional face-to-face students. It seemed a victory for technology.

But that is not the end of the story...

Shortly after the research was completed, one of the research team met some of the students who had used the CDROM in the cafeteria, and asked them about the project.

They were very surprised to hear that the students actually hated the CDROM.

They found it confusing, hard to navigate, and difficult, and found themselves in the position of potentially failing Chemistry in their first year. So they formed study groups, met regularly to discuss Chemistry problems, and supported each other through the entire painful process.

The CDROM, although seeming to be a success, was actually a failure. Yet this would not have been realised without the informal chat with the students - without the addition of the **qualitative** information...

Would run the play test as both, allowing players to comment at the end of quantitive data gathering.

The information id wish to gather would be if the game ran smoothly, did the storyline flow, how did the characters control, etc but also did the players enjoy themselves, was it fun did they think there was anything needing improvement etc.

Define the Problem

What is the problem you are trying to solve with your research?

| Activitiy | Discover | Define | Develop | Deliver | |
| Phase | Research | Synthesis | Ideation | Implementation | |

Designing the right thing | **Designing things right**

Diverging — Converging — Diverging — Converging

A

Primary Research
Rip the brief — Cluster topics
Secondary Research
Insights — Themes — Opportunity areas — HMW
Ideation — Evaluation — Ideas — Ideas
Build, test, iterate — Build, test, iterate — Build, test, iterate — out

B

Don't know — Could be

Do know — Should be

Question, Challenge, Client brief — Unstructured research findings — Final brief, HMW-Question — Ideas — Answer, product, solution

The Double Dimond

Those of you who are programmers will already possibly know that this is the first step towards creating an algorithm, or solution to a problem - knowing what the actual problem is.

But it is also the first step in design - and research.

What is the actual problem we are trying to solve?

Saved in ICT Practice in Bookmarks

Airforce one Graffiti

See Video link

Sources of information

In conducting research, where are you going to look for information?

It depends on what you are looking for...

David Droga, when researching the above campaign, did a background search on the client and found he was an ex graffiti artist.

Types of sources of information include:

- **Scholarly sources** -written by experts, peer reviewed, including references

- **Popular sources** - written for a general audience in magazines, blogs, websites

- **Primary sources** - where information has been collected firsthand - for example, if you directly interview a game tester

- **Secondary sources** - if someone asks you about the interview you did with the game tester, you are a secondary source, and possibly not as reliable

World without oil game

DEEPFAKES - WAR OF THE WORLDS

thispersondoesnotexist.com

Video of - you won't believe what Obama says on this video… saved in ICT

Bookmarks.

Nothing is real: how German scientists manipulated Putins face… on YouTube

Two minute papers YouTube

Sources of technology information

This Unit looks at Emerging Technologies and Practices.

These are broad terms that describe technology or practices that:

- are currently being developed

- are expected to be available in the next five to 10 years

- are relatively new but not yet widely adopted

- already exist but are in continuing development

So where do you look to find information on these technologies and practices?

One place might be relevant industry journals or associations.

For example, to find out new and emerging practices in the video game industry, you might look at igea.net.

When looking for information on technological trends, you can try the following:

- Companies who do surveys and research on technology trends, for example:

  o PwC global

  o Educause Horizon Report (previously New Media Consortium, or NMC)

- Academic research papers, which will list their references

- Organisations that post blog articles, hold events or workshops, webinars, etc, such as:

  o IDEO

  o Singularity University

  o Foresight Mindset

- Government Departments related to technology, such as:

  o Department of Industry, Innovation and Science

  o Digital Transformation Agency

- - Australian Bureau of Statistics
- Business magazines, such as:
  - Business Insider Australia
  - Harvard Business Review
  - The Enterprisers Project
- Technology expos and conferences, for example
  - CEBIT Australia
  - EduTECH
  - SXSW
  - TED Talks
- Technology websites, such as
  - Gizmodo
  - Endgadget
  - Technorati
  - The Verge
  - TechRepublic
  - Slash Gear
  - Digital Trends
  - The Next Web
  - TechCrunch
  - Wired
  - TechRadar

As can be seen from the above list, there's no shortage of credible sources for information about emerging technologies and practices...

<u>Room 9</u>

1. Australian Bureau of Statistics - is a data statistical agency and an offical source of independent, reliable information. They provide a range of services which give people Quantitive information.

2. Ted talks - TED Talks are a non for profit place where it is devoted to spreading ideas, usually in the form of short videos and powerful talks. Today talks cover almost all topics in more than 100 languages, meanwhile TEDx events help share ideas in communities around the world.

3. Singularity University - founded on the idea that exponential technology can give anyone, anywhere the ability to create positive impacts. To help people in the leaders adapt to a world of accelerating change and empower them to leverage technology to improve the lives of one billion people over the next five years is there mission statement.

Evaluating Emerging technologies and practices

Evaluating emerging technologies or practices is going to be suitable to for your studio or company. What if there are competing technologies and you choose the wrong one? There have been many examples in history where companies "got it wrong" and backed a technology that ultimately wasn't successful.

E.g

- VHS and Betamax

- Kodaka's digital camera and the continuation of film focused cameras

- Dvd and streaming technologies

Function and Features

When looking at a potentially new technology or practice, you need to work out what criteria you will use for its evaluation.

https://drive.google.com/file/d/1X-j2GphcK2YULbLWW4VjVmAAwBaEUweB/view?usp=sharing

For example, in VHS and Betamax's competition described above in the video, Betamax was actually a better system technically, and yes it lost to VHS - other factors such as size and cost came into account.

So you need to be able to evaluate a technology based on criteria that you must first define.

Determining the features and functions of the technology or practice will give you the criteria needed for evaluate.

Knowing your studio and their requirements will let you determine the advantages and disadvantages of the technologies or practices.

Functions - a goal that a technology or practices can achieve - for example an aeroplane can take off and land.

Feature - a tool that can help a technology or practice achieve its function - for example an aeroplane has wheels that help it take off and land.

EXERCISE - FUNCTION OR FEATURE?

1) For each of the statements below, decide which is a **function** and which is a **feature** of the particular technology or practice:

- A plane has wings
- A car can take us from place to place
- Electric cars need no fuel
- The Oculus Quest headset is portable
- VR Headsets immerse us in a 3D world

2) List as many functions and features as you can for the following technologies and practices:

- HTC Vive trackers
- Augmented Reality
- Drones
- 3D Printing

Place your responses onto **this jamboard**.

This Jamboard

A planes wings - feature

A car can take us place to place - feature

Electric cars need no fuel - Feature

The oculus quest headset is portable - Function/Feature

VR headsets immerse us in the 3D world - Function

https://jamboard.google.com/d/
110LSThOuIumwOSZ2Vk0Lhx1IpXHLUoSMOky3etvAhts/viewer?f=2

Or see this table:

	Function	Feature
HTC Vive trackers	• Cup holders • Move and interacts with objects in virtual reality • Tracks objects in 3D space	• Head-mounted display • Features a multitude of tracking sensors • Hand held form factor
Agumented reality	• Using existing reality and physical objects to trigger computer generated enhancements over the top of reality, in realtime. • Google maps on glasses. • See reviews of a restaurant when you see it in real time.	• More interactive programs. • Less expensive VR • Pokemon irl • Virtual objects partially exists in real life space.
Drones	• Flight mode • Navigation • Unmanned flight • Aerial Photography	• Different camera views available to photographers. • Wings or rotors • Smaller body for faster control
3D Printing	• Can make any shape easily • Fast prototyping • Pouring requires more time a larger work force and more materials and the shape of structures is limited.	• Can use 3D modelling software models. • Plastic dust can easily melt. • Portable and accessible. • Recyclable plastics. • Capable of printing buildings/building materials.

Impact, Opportunities and Threats:

In evaluating a technology or practice, you need to identify its potential **opportunities** and **threats**.

If another company has already adopted the technology or practice, then you can use them as an example, for example, if you were to start a streaming service, say *Jetflix*, then you have a lot of examples to follow, but if not, you will need to brainstorm the possible positives and negatives that may occur.

An example of a structured brainstorming exercise for this kind of evaluation is the **Futures Wheel**, created by an American scientist, Jerome C Glenn.

The Future Wheel:

The Futures Wheel is a structured brainstorming method for thinking about future events.

It consists of five steps:

1. *Identifying change*

2. *Direct Consequences*

3. *Indirect consequences*

4. *Analysis of implications*

5. *Actions*

Step 1 - Identifying Change

A central term is placed at the centre of the screen. this could be the change, an event, trend, problem or a possible solution to a problem. this is the starting point. for example, if you are contemplating moving your company from a 5-day to a **4-day week**, you would write this in the centre. We will use sticky-notes in our example (click each image to expand)

FUTURES WHEEL: identifying change

4 day
week

Step 2 - Direct Consequences

Now participants write down the 'first order' consequences which result directly from the change. These are placed around the change, ideally in a different colour. These all connect to the change with a line or arrow.

In our example, direct consequences may be:

- **Employees less available**

- **Less productivity**

- **Less Electricity used**

- **Employees Happier**

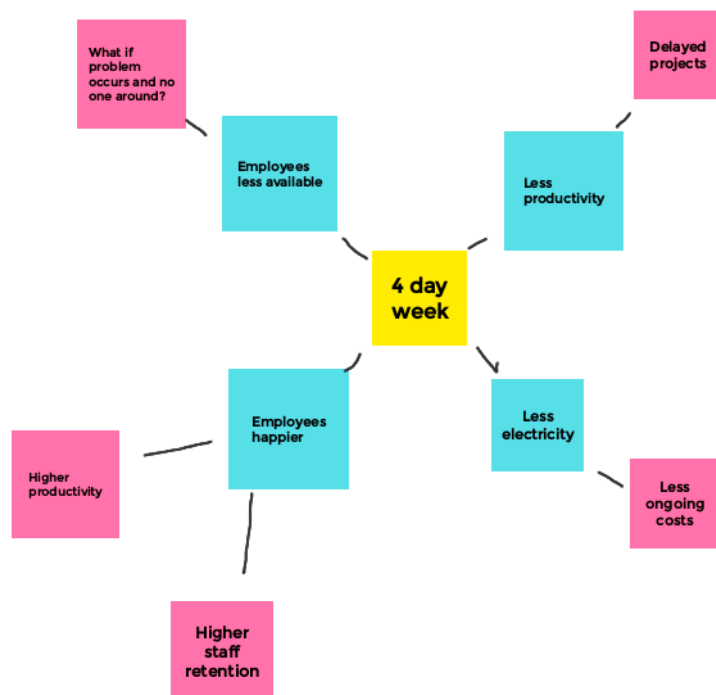## FUTURES WHEEL: first-order consequences
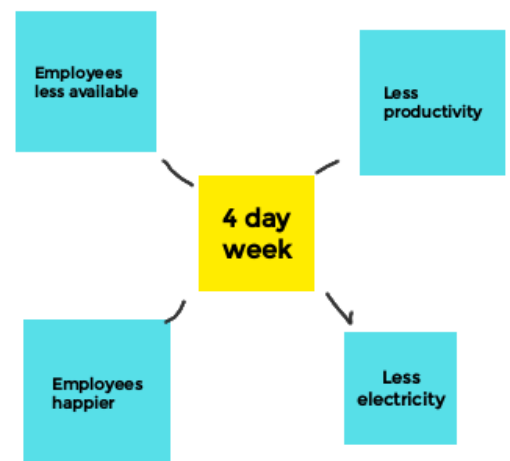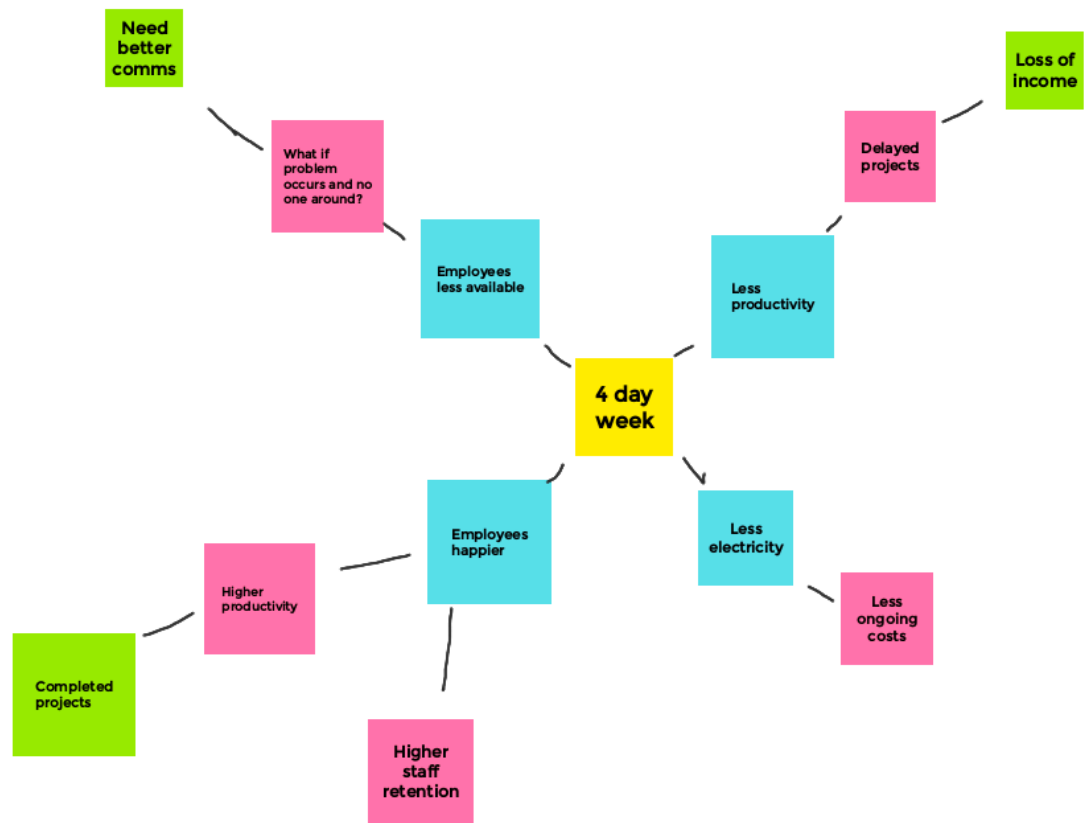
Step 3 Indirect Consequences

The 'second-order' consequences are then identified, and are placed around the first-order or first level, in a different colour. They are connected to the first-order consequences as nodes, creating a web of consequence. Now we can start brainstorming.

Our 2nd-order indirect consequences may be as shown below:

FUTURES WHEEL: second-order consequences

FUTURES WHEEL: third-order consequences

Need better comms

What if problem occurs and no one around?

Employees less available

Loss of income

Delayed projects

Less productivity

4 day week

Employees happier

Less electricity

Higher productivity

Less ongoing costs

Completed projects

Higher staff retention
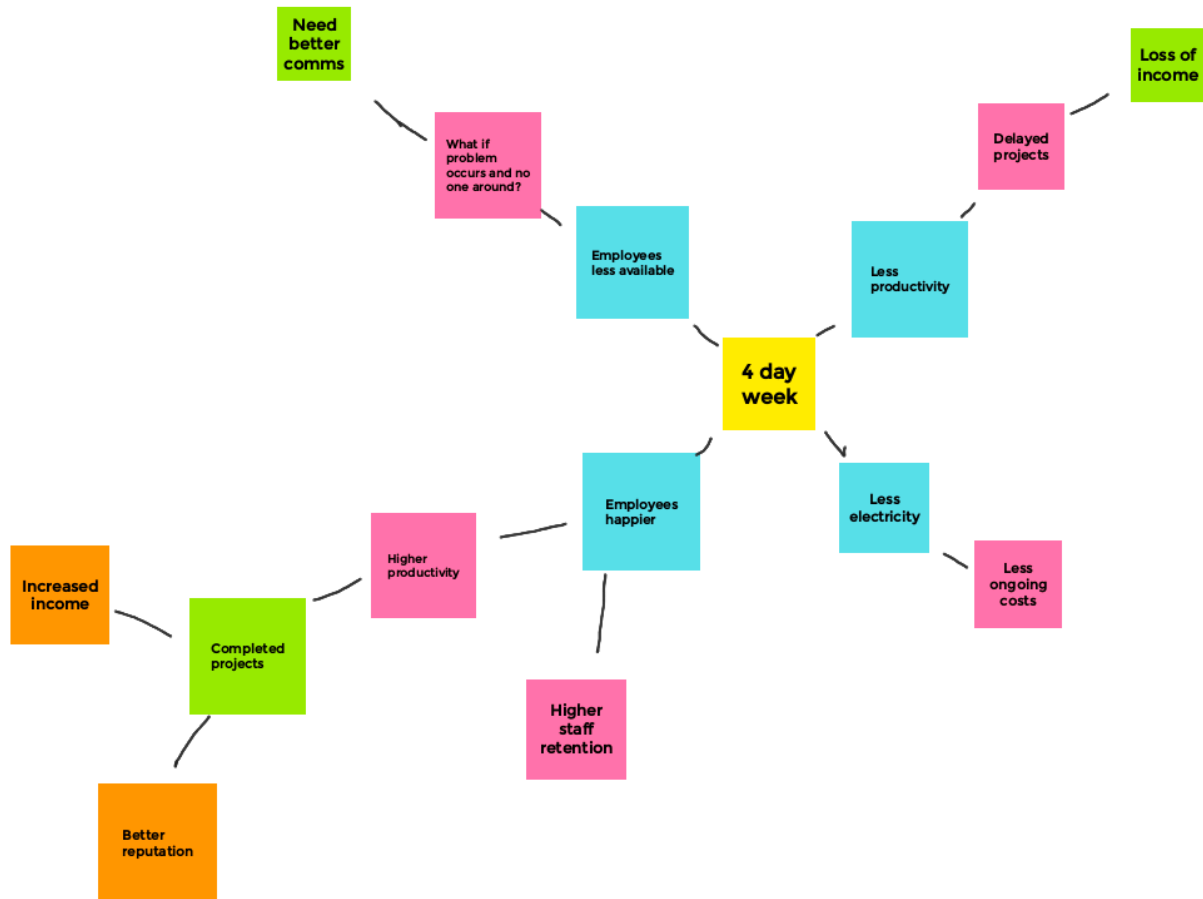
We may also introduce 3rd, and 4th-order consequences, etc: on the next pages

FUTURES WHEEL: fourth-order consequences

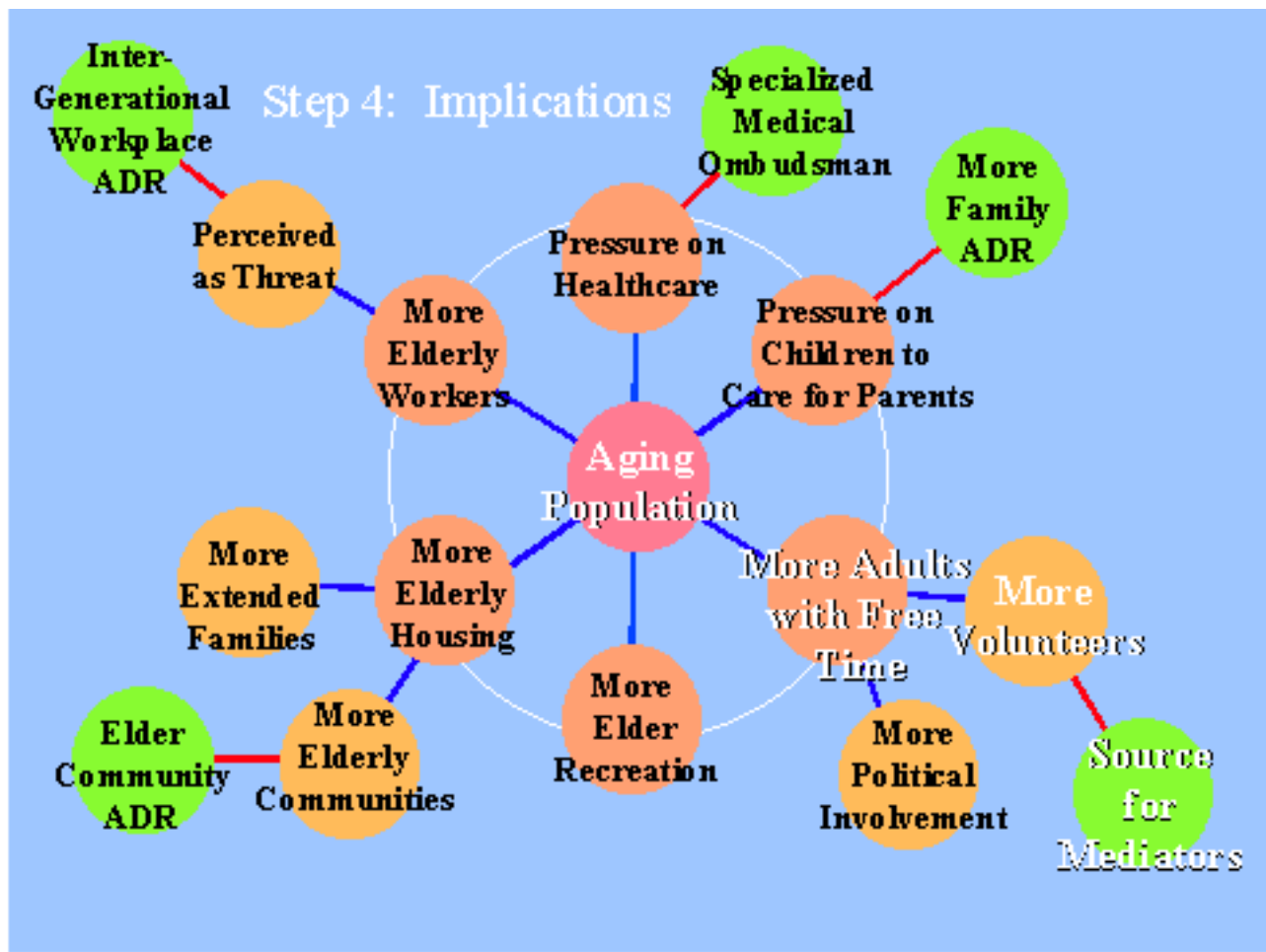## Step 4 - Analysis of implications

Once we feel we have completed all levels required, a clear picture arises of the direct and indirect consequences of our change. We can list these, in priority, or just by looking at the wheel we can start to get a feel for what kind of impact our change will have.

Step 5 - Actions

Finally, identify the most negative consequences, and discuss the positive consequences with those in mind.

What do you thin k our studio should do? Should it reduce the working week?

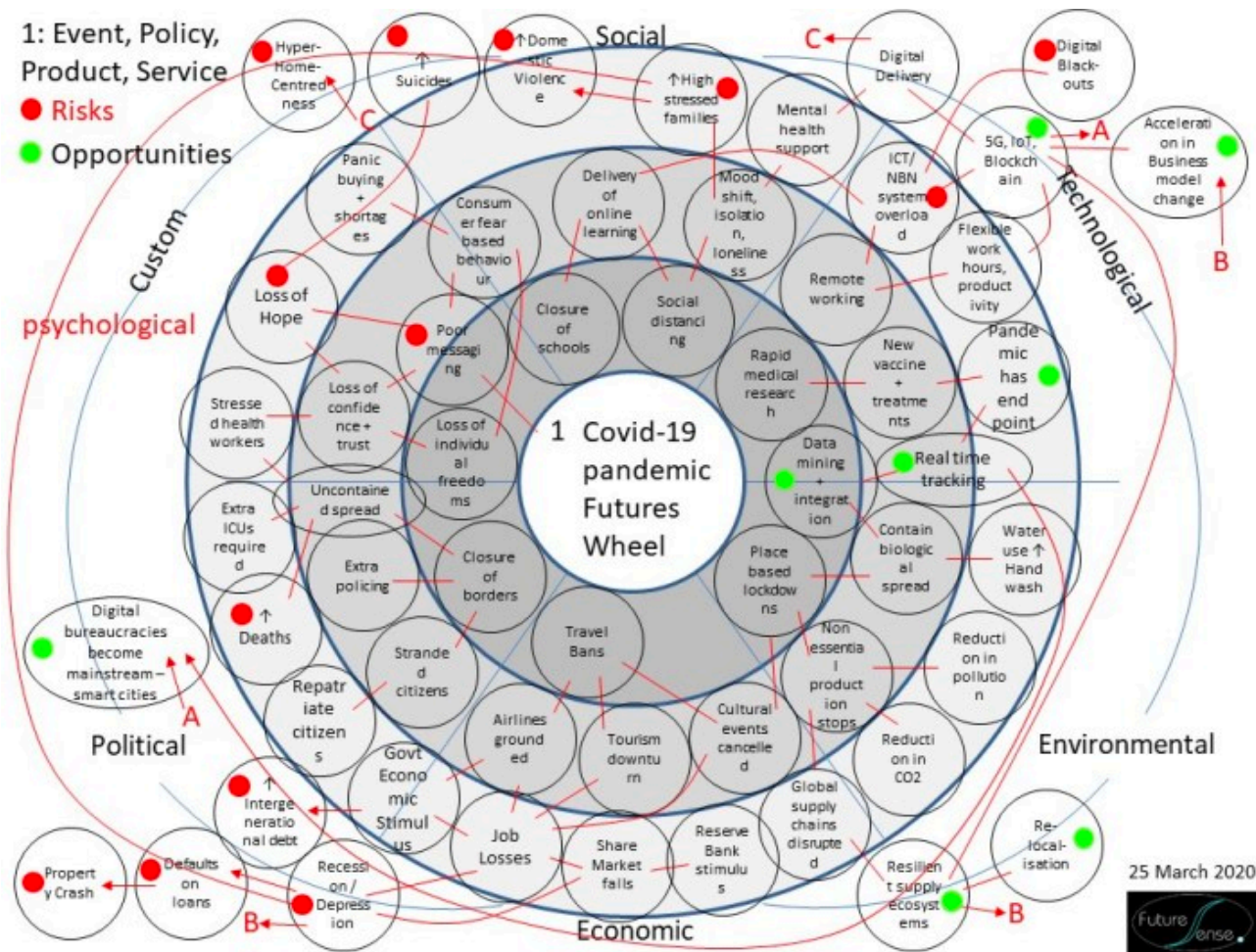# Here is a futures wheel produced around an ageing population:

A image of a Future Wheel for Covid:

1: Event, Policy, Product, Service

🔴 Risks

🟢 Opportunities

Social

Technological

Environmental

Economic

Political

Custom

psychological

1 Covid-19 pandemic Futures Wheel

- Hyper-Home-Centredness
- ↑ Suicides
- ↑ Domestic Violence
- ↑ High stressed families
- Mental health support
- Digital Delivery
- Digital Black-outs
- 5G, IoT, Blockchain
- Acceleration in Business model change
- Panic buying + shortages
- Consumer fear based behaviour
- Delivery of online learning
- Mood shift, isolation, loneliness
- ICT/NBN system overload
- Flexible work hours, productivity
- Loss of Hope
- Poor messaging
- Closure of schools
- Social distancing
- Rapid medical research
- New vaccine + treatments
- Remote working
- Pandemic has end point
- Stressed health workers
- Loss of confidence + trust
- Loss of individual freedoms
- Data mining + integration
- Real time tracking
- Extra ICUs required
- Uncontained spread
- Extra policing
- Closure of borders
- Place based lockdowns
- Contain biological spread
- Water use ↑ Hand wash
- Digital bureaucracies become mainstream – smart cities
- ↑ Deaths
- Stranded citizens
- Travel Bans
- Non essential production stops
- Reduction in pollution
- Repatriate citizens
- Govt Economic Stimulus
- Airlines grounded
- Tourism downturn
- Cultural events cancelled
- Reduction in CO2
- ↑ Intergenerational debt
- Job Losses
- Share Market falls
- Reserve Bank stimulus
- Global supply chains disrupted
- Resilient supply Ecosystems
- Re-local-isation
- Property Crash
- Defaults on loans
- Recession / Depression

A   B   C

25 March 2020

FutureSense.

EXERCISE - ASSESS IMPACT OF TECHNOLOGY (Approximately 40 minutes)

In **8 breakout groups**, you will examine one of eight emerging technologies, and:

1. List the **functions** and **features** of the chosen technology
2. Brainstorm the impact the technology might have on an organisation. Use your futures wheel (see below) to discuss the problem.
3. Analyse the implications, and discuss some actions you could take if you are a gaming studio.

Remember, the Futures Wheel is a tool to help with your discussion - it is not the endpoint.

Here is an article to review before examining your technology (you can scroll up to for more context):

https://www.pwc.com/us/en/tech-effect/emerging-tech/essential-eight-technologies.html#the-essential-eight-building-blocks

Here are the technologies and Jamboards for each breakout room (remember your room number. if you prefer, your team may decide to choose an alternative technology or practice not listed below):

Breakout room 1 jamboard - Artificial Intelligence

Breakout room 2 jamboard - Augmented Reality

Breakout room 3 jamboard - Blockchain (you can change this to NFTs if you wish)

Breakout room 4 jamboard - Drones

Breakout room 5 jamboard - Internet of things
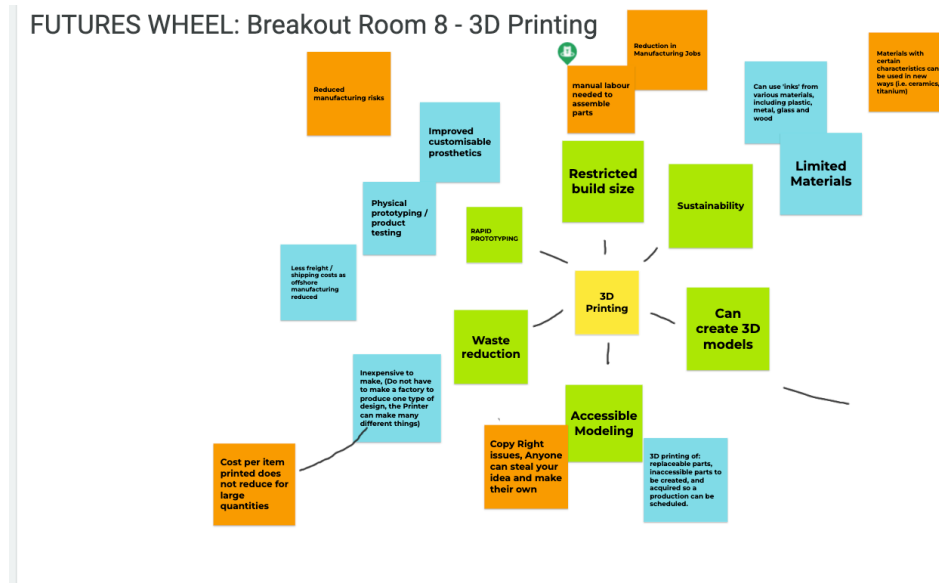
Breakout room 6 jamboard - Robotics

Breakout room 7 jamboard - Virtual Reality

Breakout room 8 jamboard - 3D Printing

When you have finished analysing the implications and have a completed future wheel, you can share possible actions with the class

https://www.pwc.com/us/en/tech-effect/emerging-tech/essential-eight-technologies.html#the-essential-eight-building-blocks

Group 8's Jamboard

FUTURES WHEEL: Breakout Room 8 - 3D Printing

Legal Issues around Emerging Technologies and Practices

Legal and Ethical issues often arise with the introduction of new technologies and practices.

For example, digital communication technologies have made it very easy to create exact copies of digital assets (something that the introduction of NFTs is hoping to partially solve).

Other examples include the ethical issues arising from cloning and stem cell research, or controversy around the ability to download and 3D print guns from the Internet.

EXERCISE - LEGAL ISSUES

Consider the following:

1. If a self-driving car injures or kills a pedestrian, who is liable?
2. If someone 3D-prints a gun and shoots someone, who is liable?
3. If you download a char file from IKEA and 3D print it, what happens if it breaks when you sit on it? If you hurt yourself?
4. If someone creates Deepfake of you acting like a dick and places it on youTube, what are your options?
5. Consider another new or emerging technology or practice - what legal issues could arise from its use?

The Australian Copyright Council (https://www.copyright.org.au/search?page=1&imprint=info) has a number of fact sheets on copyright (covered by the Copyright Act, 1968)

The Privacy Act 1988 specifies a number of Australian Privacy Provisions (APP) (see image under paragraph) that all businesses that come under the Act must conform to

The Notifiable Data Breaches (NDB) (https://www.oaic.gov.au/privacy/notifiable-data-breaches) scheme specifies how companies must respond to privacy breaches:

Australian Privacy Principles — a summary for APP entities
from 12 March 2014

APP 1 — Open and transparent management of personal information
Ensures that APP entities manage personal information in an open and transparent way. This includes having a clearly expressed and up to date APP privacy policy.

APP 2 — Anonymity and pseudonymity
Requires APP entities to give individuals the option of not identifying themselves, or of using a pseudonym. Limited exceptions apply.

APP 3 — Collection of solicited personal information
Outlines when an APP entity can collect personal information that is solicited. It applies higher standards to the collection of 'sensitive' information.

APP 4 — Dealing with unsolicited personal information
Outlines how APP entities must deal with unsolicited personal information.

APP 5 — Notification of the collection of personal information
Outlines when and in what circumstances an APP entity that collects personal information must notify an individual of certain matters.

APP 6 — Use or disclosure of personal information
Outlines the circumstances in which an APP entity may use or disclose personal information that it holds.

APP 7 — Direct marketing
An organisation may only use or disclose personal information for direct marketing purposes if certain conditions are met.

APP 8 — Cross-border disclosure of personal information
Outlines the steps an APP entity must take to protect personal information before it is disclosed overseas.

APP 9 — Adoption, use or disclosure of government related identifiers
Outlines the limited circumstances when an organisation may adopt a government related identifier of an individual as its own identifier, or use or disclose a government related identifier of an individual.

APP 10 — Quality of personal information
An APP entity must take reasonable steps to ensure the personal information it collects is accurate, up to date and complete. An entity must also take reasonable steps to ensure the personal information it uses or discloses is accurate, up to date, complete and relevant, having regard to the purpose of the use or disclosure.

APP 11 — Security of personal information
An APP entity must take reasonable steps to protect personal information it holds from misuse, interference and loss, and from unauthorised access, modification or disclosure. An entity has obligations to destroy or de-identify personal information in certain circumstances.

APP 12 — Access to personal information
Outlines an APP entity's obligations when an individual requests to be given access to personal information held about them by the entity. This includes a requirement to provide access unless a specific exception applies.

APP 13 — Correction of personal information
Outlines an APP entity's obligations in relation to correcting the personal information it holds about individuals.

For private sector organisations, Australian Government and Norfolk Island agencies covered by the *Privacy Act 1988*

www.oaic.gov.au

Video: New Notifiable Data Breach Scheme in bookmarks or on Tafe Moodle.

Other laws revolve around fraud/misrepresentation, workplace Health and Safety, and others.

It is important when considering a new technology or practice that you are aware of possible legal implications - even if relevant laws don't yet exist.

Communicating your Research findings

When you have analysed the implications of an emerging technology or practice for your organisation, you will need to be able to communicate them effectively, either verbally, or in writing.

It will be important that you can use good verbal and written communication skills, including using clear, easy to understand language, and translating any industry-specific terms into plain English.

Look at the following two excerpts from technical manuals. Can you see why one works and one doesn't? What are the main reasons?

Click to expand the first one and try to interpret it before looking at the second one

Images inside exercise enlarged

1.

Energising and creating momentum for the transport transducer

The conversion of the storage medium from potential energy A to kinetic energy B will be successful on the acquisition of sufficient storage medium (refer index 5.5.67) into the potential repository.

Depression of the actuator will provide a contiguous pathway for storage medium from potential repository towards kinetic converter. Before reaching the kinetic converter, the storage medium will be vaporised into .05ppm droplets and emitted into the venturi converter before being ignited and rapidly converting into step 1 of Kinetic energy B, causing a pressure differential in the entrapment chamber. This will exert a positive force F_p against the reciprocating device, which in turn will convert a linear momentum into an angular momentum, passing along the rotational tube to the rotational discs, utilising the high frictional coefficient resulting in step 2 of kinetic energy B, resulting in a positive linear momentum of the transport transducer.

2.

◢ Starting and moving the car

If there is sufficient petrol in the petrol tank, the energy stored in the petrol will help make the car move:

1. Pushing the **accelerator** pedal lets petrol flow from the tank into the engine.
2. Before reaching the engine, the petrol is turned into a spray in the **carburettor**, and then it gets ignited in the **cylinder** and rapidly expands, forcing the **piston** down.
3. This then turns the **crankshaft**, and rotates the **tail shaft**, which makes the wheels rotate.
4. This pushes the car forward due to the tyres grabbing the road.

Glossary

Term	Explanation
accelerator	Pedal which varies the amount of petrol that flows through the carburettor towards the engine (Fig 1)
carburettor	Venturi tube which vaporises the petrol into the cylinder (see below and Fig 2)
cylinder	Hollow tube containing a piston (see below) which can move up and down
piston	Metal that can move within the cylinder in response to expanding vapour. Connected to crankshaft (see below) which will then rotate
crankshaft	See Fig 3. Rotates in response to piston movement
tail shaft	Long metal tube cary8ing the rotation to the rear wheels (for rear wheel drive cars) see Fig 4.

Obtaining Feedback

The whole purpose of conducting and evaluating research into emerging technologies and practices is to improve decisions and directions for your company or studio. You will need to ensure that the communication of your research has been clearly understood, so that these decisions can be clearly made. This may involve **formal** methods such as a survey, or **informal** methods such as quick decisions. If you are seeking information from a survey, it is important to recognise that, just like any form of research, you can seek **quantitive** or **qualitative** responses.

Designing Quantitive Questions

Quantitative questions may involve rating something on a scale from 1-10 (**Likest scale**), or as Excellent, Satisfactory, Good or Poor, or even checkboxes - qualitative questions tend to be restrictive in their pre-assigned response categories. A quantitative question will have several predefined answers, which should evenly represent the range of possible responses from the very positive to the very negative, so as not to influence the user. Qualitative responses are the easiest to 'mark', and can be tallied by computer.

Dessigning qualitative questions

Qualitative questions don't seek predefined responses. Questions tend to be more open-ended. Be aware that the quality of the feedback will usually depend on the quality of the question.

EXERCISE DESIGN A SURVEY (in groups)

Imagine your team has just presented a report on the use of NFTs and rare in-game assets.Write a series of quantitative and qualitative questions to the rest of the studio to find out whether they have understood your research. Feed your questions back to the class. You can use the chat in your breakout room, or **this jamboard** as a collaborative space if you wish.