2. Project Scoping

Key takeaways from this module

☐ It is important to consider IoT early in your project. It can be more challenging and costly to incorporate IoT as your project progresses (rather than planning for it upfront).

☐ Things to contemplate when considering the use of IoT include your project intent, time, location, resources, systems and processes, and risks.

☐ When thinking about resources and skills, you need to consider the whole of life resourcing needs for your IoT-enabled project.

☐ The specific skillset required for your IoT-enabled project will depend on your knowledge and experience, the type of IoT solution you are implementing, what you intend to do with the data collected and whether devices exist that meet your needs.

2.1 Is IoT an appropriate tool to use?

This chapter will help you determine whether IoT is an appropriate tool to achieve your intended outcome.

It is best to consider the suitability of IoT early on in your project. It can be more challenging and costly to incorporate IoT as your project progresses rather than planning for it upfront.

The following table contains key things to consider before committing to the use of IoT.

Considerations when determining if IoT is an appropriate tool for your project

Consideration	Questions to ask	Follow on questions and explanation
Project intent	Does IoT allow you to meet your intended goal, solve your problem and/or produce a benefit?	An IoT solution collects and communicates data and information and can be used to inform decisions and actions. Consider the outcome you want to achieve, the nature of the problem you seek to solve or the system or service you seek to improve. Can IoT help solve the problem you are trying to address? It is easy to get lost in the multitude of applications that IoT presents and be overwhelmed by the IoT hype. In some instances, project managers are asked to design and implement an IoT-enabled project without proper consideration of what role IoT can play in solving the problem. IoT is not suitable for all projects; it is important to clarify your problem statement and determine if an IoT solution will help you solve it.

Consideration	Questions to ask	Follow on questions and explanation
		Start to think about data – is data or information necessary to help achieve the desired change? If yes, what data will be needed? How will the data be used/analysed? What is the most effective way of collecting the data?
	Are there other solutions that will achieve the same outcome?	What alternative solutions exist that could achieve the outcome you are looking for? If there is an alternative, is IoT the better option? Does it deliver better value for money and/or superior benefits?
	Can IoT enable you to use other forms of technological solutions to improve services?	IoT itself can be a solution but it is also an enabler for other technologies (i.e. digital twins, artificial intelligence (AI), machine learning or augmented reality). Data collected by your IoT solution may also facilitate your agency's use of other data-intensive technologies.

Data collected from other projects or external sources may also provide valuable sources of information. You may not need to collect new data for everything needed on the project. |
| Time | Do you need to collect data as a 'one-off' or periodically, frequently or even continuously for a length of time? | One of the biggest benefits of IoT solutions is the ability to collect information on a frequent basis so that the cost per collection is lower. If you only require data to be collected |

Consideration	Questions to ask	Follow on questions and explanation
		infrequently, consider if there is a positive cost-benefit to deploying an IoT solution compared to collecting data manually or using another method. In some cases, real-time or near real-time data can add new operational insights previously impossible prior to the emergence of IoT technologies.
	Will you save time by implementing an IoT solution?	Does your current process involve many employee hours travelling to locations to collect information in person? A significant benefit of installing an IoT solution is that it can remove the need for employees to collect and communicate information manually.
	Can your organisation commit to IoT in the long term?	IoT is a long-term commitment and should not be expected to succeed with a set and forget approach. Setting up and maintaining an IoT solution is a significant investment of time and money, and once installed can be in place for many years during which there will be technology changes.
	Is now the right time to commit to IoT?	Do you have the time to commit to implementing a new process with new technologies? Do you have the resources?

Consideration	Questions to ask	Follow on questions and explanation
		Do you have the buy-in from senior stakeholders? The IoT market and associated technologies are rapidly maturing, costs continue to decline, standards are being considered and adopted, and the process of implementing IoT solutions is becoming easier. If now is not the right time, the situation may soon change.
Location	Are there any environmental factors that might interfere with the IoT?	Thinking about the environment in which your IoT devices will be placed, is there anything that could impact your ability to install the sensors or their ability to function? Is it rural or far from any network connection? Is it in a coastal area that may be affected by the tide? Is it in the middle of the city on pylons that you cannot access? Is it in a fire-prone area? Is it underground (in which case there may be signal loss)?
	Will you be able to connect to a network?	IoT devices work by transmitting information that is collected by the device to a hub that then responds to the information. Devices need to be connected to a network to be able to do so. This can be a challenge in areas where no network access currently exists or signal strength is weak, and you may need to install additional technical devices to access a network. This may be the case, for

Consideration	Questions to ask	Follow on questions and explanation
		example, in some rural and remote areas or underground.
	Do you own or have access to the infrastructure/land where the IoT solution will be installed?	Do you have the authority/access to the right infrastructure (e.g. buildings, telegraph poles, networks) and land that is necessary to implement the IoT solution?
Resources	Do you have access to the technical expertise that may be required to set up and run an IoT solution?	Depending on your project needs, the perfect IoT solution may or may not exist. If it does not, do you have access to the technical expertise required to build your own IoT solution or work with a service provider to build a solution for you?
	Who will maintain the IoT devices and system?	Do you have adequate human resources to maintain the IoT solution and associated data? If a device needs maintenance, will you be able to respond? Who will maintain the datasets the IoT solution produces?
	Do you have the budget for the whole-of-life requirements for IoT?	IoT-enabled projects do not end once the sensors have been purchased and installed. Devices require ongoing maintenance, as does data and information that is collected.
Systems and processes	How will your IoT solution interact with or impact on current and future systems and processes?	An IoT solution is not a standalone process nor a product. It will either become a part of your current systems or it will interact with them. This includes ICT, organisational,

Consideration	Questions to ask	Follow on questions and explanation
		operational and financial systems and processes. It is also important to plan for the rapid evolution of technology. This means IoT solutions should be as technology agnostic as possible to minimise the need for costly re-integrations and re-writes when new technologies require re-fit of old technology
	Can you integrate the new IoT system into your existing system?	Will there be any issues with an IoT solution being implemented and integrated into your current systems?
	Is human intervention still required in the process?	If you install IoT devices, will you still require staff to attend the location for information collecting or other purposes? Think about whether installing an IoT solution makes a positive impact on the process and reduces the time required for employees to deliver the outcome.
Risk	How critical is the system that you are planning on using IoT for?	If there is a network interruption or repairs are needed for the IoT device, will the disruption cause serious negative consequences? Will it cause other systems to fail? If the system and information are hacked, will critical information be at risk?
	How sensitive is the data you need to collect?	Will device encryption be enough to protect the data you are collecting, or are you

Consideration	Questions to ask	Follow on questions and explanation
		working in a sensitive area where certain information should not be collected and transmitted by IoT devices?
	Do you know how to make decisions about how to appropriately share your data and protect any personal or sensitive information?	Data gathered for a project may contain sensitive information. You need to know how to preserve privacy and trust while sharing data with others.

Case Study – Sydney Water's digital metering trial

Sydney Water is trialling digital metering to test the technical reliability, connectivity, and handling of different digital metering solutions for non-mission critical monitoring activities.

Sydney Water explored various technologies in the first phase of the trial:

- retrofits for mechanical meters

- digital/smart meters

- Smart Meters with integrated pressure and temperature sensors

- 80 digital meters fitted to residential and commercial sites.

Sydney Water deployed around 1500 sensors into the field, including sewer level sensors in high-risk areas and digital flow meters on customer properties. The trials showed some early benefits; for example, the system detected a number of blockages in sewers which Sydney Water crews could clear before customers or the environment were impacted.

As at June 2020, the next phase of the trial will deploy 'thousands' more of the sensors to l gather more robust insights on how digital metering can support Sydney Water's objectives of general water consumption reduction, asset investment deferral and reduction of system losses and network leakage.

2.2 Skills and expertise

This chapter will help you consider what skills and expertise your project team may need at different points in the lifecycle of your IoT-enabled project. It provides advice on ways to address any gaps.

2.2.1 Skills and expertise required to roll out an IoT-enabled project

When thinking about resources and skills you need to consider whole of life resourcing needs. Whole of life resources include the time and labour required to plan for, deliver, maintain and assess your project.

The specific skillset required for your project will depend on your knowledge and experience, the type of IoT solution you are implementing, what you intend to do with the data collected, and whether devices exist that meet your needs.

Implementing your project may require a broad spectrum of skills in areas including, but not limited to:

- *Data*: To assist with determining your data requirements and ensure they are met. The collection, processing, analysis, presentation and interpretation of IoT data and insights requires a range of specialist skills. Key roles include:

    o Business domain experts

    o Data architects, engineers, analysts, scientists, visualisers, and storytellers

- *Cyber security:* To verify that your IoT solution is safe and secure

- *Privacy:* To help ensure that your IoT solution is compliant with privacy legislation

- *Legal*: To check that all legislative obligations are met

- *Procurement:* To assist with procuring the elements of the IoT ecosystem

- *Finance:* To assist with cost-benefit analysis, budgeting, economic evaluation and audit

- *Evaluation and audit:* To conduct an independent evaluation and/or audit, or to assist with doing so

- *Field installation and maintenance staff*: To install and maintain sensors and/or network equipment

- *Technology skills:* Obtaining specialist technology input will ensure that necessary infrastructure and tools are in place to support your project requirements, such as data modelling and processing, secure information transmission and storage, and integration and analytics. Specialist skills are useful for:

  o Hardware interfacing: to interface sensors and transmitters

  o IP networking: to set up the network used to communicate information

  o UI/UX design: to design the interfaces between the IoT device and the user

  o Reference architecture: to set up the architecture for the IoT solution and ensure that your IoT solution fits within the broader organisational architecture

  o Machine learning and artificial intelligence: to work with the data received

  o System configuration: to program and configure IoT devices at all levels of the ecosystem.

Tip: IoT experts exist and may have a combination of the above skills. If you have the resources, you may choose to engage a specialist consultant who has the skills and experience you require. Check that they have the experience (preferably in your subject area), good references and a sound reputation.

2.2.2 Engaging with experts

It is unlikely you will require all the skills listed in this chapter throughout your entire project. If you do not have the relevant skills within your team, you may wish to engage experts.

Look within your organisation for internal expertise or look more broadly across the NSW Government for expertise. Engaging with experts should form part of your stakeholder engagement strategy (see Chapter 3.2 Stakeholder engagement).

The NSW Department of Customer Service has a Cyber Security team that can provide advice and guidance on managing the cyber security elements of your IoT system or solution. Similarly, the Data and Analytics Centre Program and Practice team can provide general guidance and advice on managing your IoT-generated data. If your organisation has a data governance committee or group, notify them of your project. If not, consider establishing one to ensure effective decision-making about data issues.

Another way to engage with experts is to join a NSW Government Community of Practice (ComPrac). Membership is free and open to all NSW Government employees, and it provides access to free resources, events and networking. ComPracs exist for areas including procurement, finance, change, customer experience (CX), policy, ICT, records management, and commissioning and contestability.

You can also reach out to other organisations that have experience with IoT to learn from their successes and challenges, within NSW and in other states and countries. There may be opportunities to leverage the research and accumulated knowledge of academia through formal partnerships or informal advice to supplement your team's skills and expertise.

Industry associations and other organisations are also a valuable source of knowledge. Organisations in the IoT space include:

- Internet of Things Alliance Australia (IoTAA)
- OpenCities
- Communications Alliance
- Design Futures Council
- Australian Smart Communities Association
- Standards Australia.