BLEAT (YNOMIA)
AN ON PROGRAM CASE STUDY

BOX 1.1 BLEAT CASE STUDY – EXECUTIVE SUMMARY

Key findings

The BLEAT project has produced the following outputs[1]:

- Developed the algorithm that underpins the BLEAT technology and built a prototype BLEAT system
- Demonstrated that the BLEAT technology could be used for indoor localisation, hazard warnings and tracking of people and objects
- Obtained some $1 million to support the development and demonstration of the technology
- Secured funding from Venture Capital and other investors and obtained agreement from industry to trial the technology on building sites

The cost of managing building resources (people, equipment, assets and materials) is substantial. The projects on which BLEAT has been deployed have contract values of $300-$500m over 3 years. The BLEAT technology enables the builder and contractors to have better information on where resources are, who is using them and how much resource a particular activity consumes, in real time and over time. BLEAT also has the potential to help manage waste on building sites.

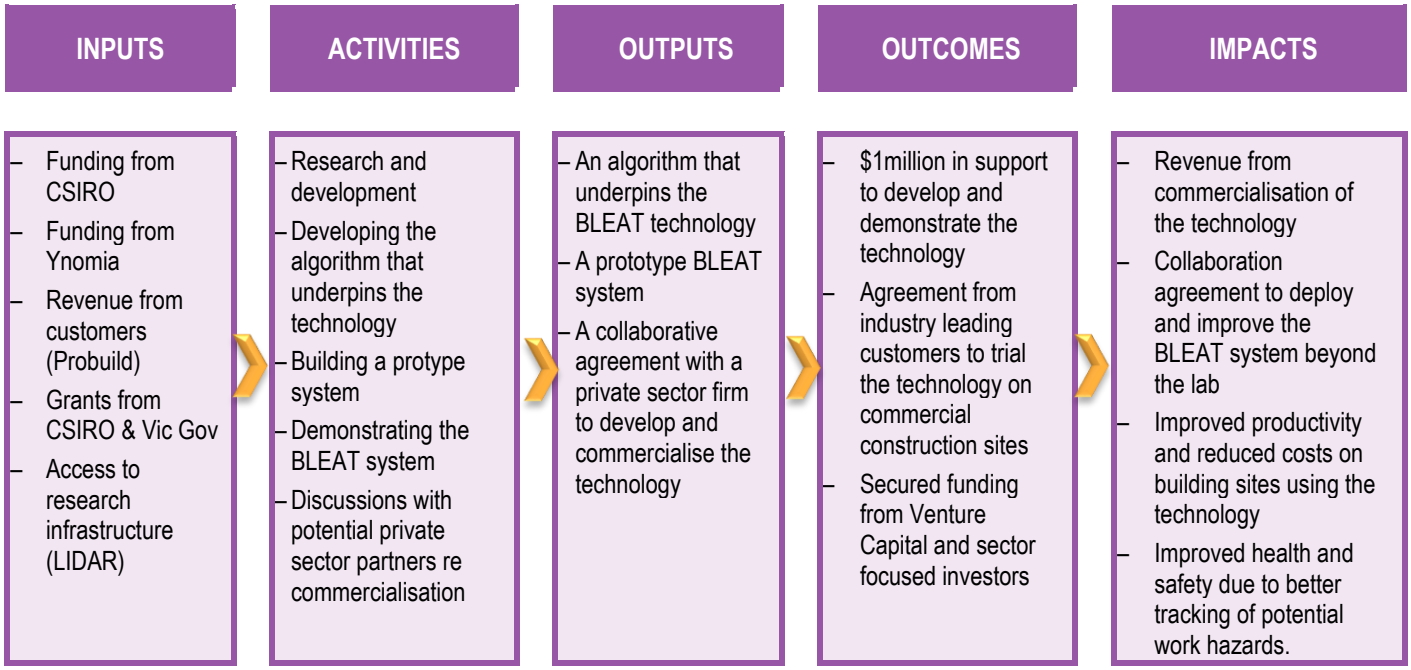
Role played by CSIRO ON

The team's participation in the ON program led them to change their approach to commercialisation. Rather than selling a licence to use the technology, they decided to provide a service that combines the hardware, software and maintenance of the system as a complete package to users. If they had not participated in the ON program the researchers may have shelved the technology rather than develop it.

SOURCE: ACIL ALLEN

This case study uses the evaluation framework outlined in the CSIRO Impact Evaluation Guide. The results of applying that framework to the BLEAT case study are summarised in **Figure 1.1**.

FIGURE 1.1 BLEAT CASE STUDY – IMPACT FRAMEWORK DIAGRAM



[1] Since this case study was originally prepared the BLEAT technology is now being commercialised by Ynomia.

SOURCE: ACIL ALLEN

1.1 Purpose and audience for case study

This case study describes the economic, environmental and social benefits arising from the BLEAT project.

This evaluation is being undertaken to assess the positive impacts arising from the BLEAT project's participation in the CSIRO's ON program. This case study can be read as a standalone document or aggregated with other case studies to substantiate the impact and value of the CSIRO ON activities as a whole, relative to the funds invested in these activities.

The information in this case study is provided for accountability, communication and continual improvement purposes. Audiences for this report may include Members of Parliament, Government Departments, ON, CSIRO and the general public.

1.1.1 CSIRO ON

CSIRO ON was established in 2015 by CSIRO to help accelerate the impact of science research into market. The initiative was expanded through funding from NISA to service more broadly Australia's publicly funded researchers and their industry partners. The aim of the initiative is to more quickly translate great science and technology research into positive impact to help address some of the economic, environmental and social challenges facing the Australian and global community.

There are several elements to the program, including two facilitated programs, ON Prime and ON Accelerate. These two elements are designed to complement each other.

ON Prime is an open and collaborative program for existing science projects as well as new technologies and projects that are still in development. ON Prime helps research teams to ensure that they are working on the right problem, it provides frameworks to create and test assumptions about their idea and provide recommendations towards next steps. ON Prime can be considered as an entry level program, in effect it can be seen as a precursor to participation in the ON Accelerate program.

ON Accelerate is designed for teams that have made significant progress with their idea and their target market(s). This may be in the form of contracts for paid or unpaid trials, or at the most advanced stage, recurring sales with both new and existing customers. This implies that teams will have a working prototype of their product or service and have secured any appropriate intellectual property rights. It is expected that teams applying for ON Accelerate would have conducted significant engagement with their potential customers and be able to demonstrate what they learned throughout, including what the total addressable market is and what competition exists.

For ON Accelerate, shortlisted applicants are invited to participate in a two-day Selection Bootcamp event where teams will be provided with training and coaching simulating the accelerator experience. At the conclusion of the selection bootcamp, the teams will pitch to a panel of external judges for a spot in the Accelerator. Projects that are at Investment Readiness Level (IRL) Stage 3 can apply directly for ON Accelerate without going through Prime or Bootcamp.

Following a team's passage through the ON Prime or ON Accelerate program they are eligible to apply for ON Runway support. That funding is designed to help teams to further progress their project. The support provided can be spent on a range of services, for example, regulatory certification, marketing, bookkeeping or investor agreements.

1.2 Background

The research that ultimately led to the BLEAT (Bluetooth Low Energy Aware Tracking) technology began around 2014. BLEAT combines proprietary Bluetooth beacon localisation with a cloud-based solution to provide a scalable, long term, low maintenance localisation solution using off-the-shelf hardware. The product can be used for indoor localisation and tracking of people and objects. It can also be used to identify locations where there are hazards or alert persons about the movement of hazardous materials (such as gas bottles).

Use of the technology offers the opportunity to improve productivity by reducing the time required to locate objects and people. It can also deliver health and safety benefits (such as knowledge of the location of people during an evacuation or real-time alerts to warn people of the location of specific hazards). BLEAT can also provide knowledge regarding the utilisation of infrastructure, which in turn can be used to optimise planning, maintenance, cleaning, building, etc.

1.2.1 The science behind the BLEAT project

The initial focus of the researchers was to explore how to use GPS technology to track animal movements. This evolved to thinking about how to use the technology to track the location of people and assets. However, the technology was not suitable as many locations are GPS denied.

An industrial placement student was tasked with examining the potential for using the iBeacon technology (that is currently used in retail outlets) for indoor location. The research team found that BLEAT provided room-level accuracy tracking. The research team is using the sub-centimetre accuracy that LiDAR provides to both benchmark and improve BLEAT's location engine accuracy.[2] The researchers were able to develop an algorithm that enabled them to triangulate the location of objects indoors using iBeacon technology. This led to a solution that allowed the technology to provide scalable, low cost, low maintenance, and low power tracking of people and objects indoors.

The technology is currently at Technology Readiness Level (TRL) 7.[3] The research team expects the technology to be up to TRL 7 by mid-2019 and TRL 8 by September 2019.

1.3 Impact Pathway

1.3.1 Project Inputs

The initial cost to develop the science and technology that underpins the BLEAT technology was relatively small. CSIRO provided funding of around $95,000 to pay for some junior researchers to spend approximately 30 per cent of their time on the project over roughly three years. The further development and engineering of the BLEAT technology is being supported by a consortium comprising a new start-up (Ynomia), working in collaboration with an industry partner (Probuild) and CSIRO's Data61. CSIRO and Ynomia have committed a combined total of $3.2 million, which is being spent commencing from September 2018 (see Table 1.1). The support provided by Probuild is confidential and it is therefore not included in the table. However, that information was provided to ACIL Allen and it has been used in our analysis.

According to CSIRO, the overhead costs of the ON program that have been apportioned to the BLEAT project total $13,955.

TABLE 1.1 SUPPORT FOR THE BLEAT PROJECT (BY CALENDAR YEAR)

Contributor/type of support	2014 ($)	2015 ($)	2016 ($)	2018 ($)	2019 ($)	2020 ($)[a]
Cash						
CSIRO Data61	$30,000	$30,000	$35,000	$0	$0	$0
Ynomia – Collaboration Project				$200,000	$450,000	$200,000
Ynomia – Outside Project				$100,000	$550,000	$1,000,000
Probuild				n.a.	n.a.	n.a.
CSIRO Kick Start Grant				$50,000	$0	$0
In-kind						
CSIRO – Hardware				$100,000	$0	$0
CSIRO Data61 – Collaboration Project				$100,000	$200,000	$100,000
Ynomia – Labour				$150,000	$0	$0
Probuild				n.a.	n.a.	n.a.
Total	**$30,000**	**$30,000**	**$35,000**	**$700,000**	**$1,200,000**	**$1,300,000**

[a] Projected figures for CY 2020

Note: The support provided by Probuild for this project is confidential and it is therefore not included in this table or the totals shown.

SOURCE: CSIRO

[2] LIDAR (Light Detection and Ranging), is a remote sensing method that measures distance to a target by illuminating the target with pulsed laser light and measuring the reflected pulses with a sensor.

[3] The technology readiness level (TRL) index is a globally accepted benchmarking tool for tracking progress and supporting development of a specific technology through the early stages of the technology development chain, from blue sky research to actual system demonstration over the full range of expected conditions. A Technology Readiness Level of 8 implies that the technology is at the system test, launch and operations stage.

1.3.2 Project activities

Initially the main project activities were R&D to develop the algorithm that underpin the BLEAT technology and testing of the accuracy of the location services that BLEAT could provide. The research team constructed a prototype system and demonstrated its operation in an environment like that expected to exist in the marketplace.

Initially, the intention was to try to licence the technology to users for a licence fee of $50,000 to $100,000. In March 2017 CSIRO issued an EOI that invited interested parties to submit a proposal to acquire the right to extend the commercial exploitation of BLEAT including access to the underpinning technology to support product and market development. The aim was to identify a company that would be able to fully exploit the commercial potential of the BLEAT platform based on their experience in commercialising similar technology and path to market strategies.

There was considerable interest in the technology, but no firm willing to commercialise BLEAT was identified. However, in June 2017 the BLEAT project team, leveraging lessons learned through the ON program, went to Data61 live in Melbourne to demonstrate the BLEAT technology. At Data61 live, the researchers were approached by an entrepreneur, Matthew Barbuto, who expressed a desire to formulate a start-up [now known as Ynomia] to collaboratively commercialize BLEAT with Data61. This initial discussion followed sourcing of a target Industry [Construction], Industry partner [Probuild], initial field demonstration of BLEAT, negotiation of a License Agreement, which then culminated in the current 12-month collaborative project to commercialise BLEAT (beginning in September 2018).

Ynomia was incorporated in February 2018, initially operating on funds contributed by the founding team, then secured an initial 14 month contract with Probuild in May 2018, to deploy BLEAT on 3 of their large scale commercial construction projects. The rest of the collaboration project funding was provided by external capital raised by Ynomia, in-kind resources from CSIRO's Data61 for $350,000, plus a $50,000 kick-start grant from CSIRO.

Role of the ON program

The research team decided to apply to the ON Prime program to see if they could advance the commercialisation of the BLEAT technology. The research team felt that they gained several benefits from their participation. This included learning what questions to ask and understanding the importance of identifying a target market. They also found significant benefit in talking to potential users of a technology. Further the program gave them the confidence to demonstrate at Data61 live, which ultimately was significant in connecting them to the right commercialisation partner and pathway.

1.3.3 Project outputs

The research team has developed the algorithm that underpins the BLEAT system. They also developed and tested a working prototype of the BLEAT system.

The researchers have also entered into a partnership with Ynomia to commercialise the technology. Technology trials are currently underway on several building sites in Australia and trials will soon be starting in the UK and USA. The BLEAT technology is being used to help manage building productivity and safety work streams. BLEAT is also being tested as a means of tracking High Value materials along the supply chain, from design, fabrication, logistics and final installation within high rise buildings. For example, tracking devises are installed on panels at the manufacturing facility in China and used to track the location of the panels as they are transported to the building site where they are being installed.

Publications

There are no publications on BLEAT at this point. The research team intends to publish following the completion of the commercial evaluation of the technology. Some press related to the BLEAT commercialisation is referenced below:

- https://www.smartcompany.com.au/startupsmart/news/iot-construction-startup-ynomia-150000-government-grant-funding-transform-worksites-csiro/
- https://www.globenewswire.com/news-release/2018/09/25/1575945/0/en/Brickschain-Partners-with-Probuild-Constructions-Australia-to-bring-Construction-Blockchain-across-its-supply-chain-from-China.html
- https://conecta.com.au/blog/probuild-moves-to-brickschain/

Patents

The following provisional patent has been filed:

- P Valencia, N Heaney, "Object Monitoring System", Australian Provisional Patent Application No. 2018900664, TW9451/AU/PROV. (2018)

Innovation / commercialisation

There is an agreement in place with Ynomia to collaborate on a one-year project to commercialise the technology. That project is being supported by a cash injection from Ynomia and $350,000 from CSIRO, including $50,000 through a CSIRO kick-starter grant, plus additional cash and in kind resources raised to help expand the commercial deployment of BLEAT globally.

The research team did not initially see the use of BLEAT technology on building sites as a high priority/value application. However, they learnt that the technology had the potential to be very useful in helping to manage waste on building sites. The cost of managing building resources [people, equipment, assets and materials] is substantial. Building projects spend $2-3 million per week at each building site. The Probuild projects which BLEAT has currently deployed have contract values of $300-$500m with average lifespans of 3 years. The BLEAT technology enables the builder and contractors to have better information on where resources are, who is using them and how much resource a particular activity consumes, in real time and over time.

The partnership is currently also testing the use of an adapted version of BLEAT technology to track high value, glass panels used on the building facades. Ynomia, in partnership with CSIRO's Data61 was contracted to track some 5,000 glass panels over an 18 month lifecycle. Trackers are installed in China (the cost of the tracker is approximately A$15 a panel). The builder can see when panels left the factory, when they arrived in Australia, how many panels are in the warehouse, how many are being moved. This information can help to ensure that production delays are identified proactively and the required tradesmen/installers are on site when needed, thus avoiding expensive downtime on the building site.

The technology is ideal for vertical building sites over 10 stories or large horizontal projects like shopping centres. Depending upon project size, the cost of BLEAT deployment might be of the order of $5,000-$10,000 per month (to track 1,000-2,000 objects/resources at $1-$2 per object/resource per week). It is estimated that once scale is achieved, about 50% of this would be consumed on hardware, software and support costs. This implies monthly earnings of around $2,500-$5,000 per building site per month. If the average time for a build is around 3 years, then this would imply earnings of around $30,000-$60,000 per year, per building project. Ynomia is targeting to exceed 30 deployed projects by 30th June 2020, of which 33% will be overseas.

The Property Council of Australia (PCA) has reported that there were some 19 commercial building starts in the six months to end 2018.[4] The PCA advised that this was a lower number of starts than in recent times. If we assume the rate of construction starts is relatively constant over time, then one might expect to see some 38 commercial building starts a year. ABS data on the number of residential apartments or units built in buildings with more than four stories in 2018 was around 53,600.[5] If one assumes that on average each building has 100 apartments, then this suggests that around 536 residential buildings were commenced in 2018.[6]

Role of ON program

The team's participation in the ON program led them to think about their technology in a different way and a change in their approach to commercialisation. Rather than selling a licence to use the technology, they decided to provide a service that combines the hardware, software and maintenance of the system as a complete package to users. Participation in the ON program made the researchers more determined to hang on to the technology rather than shelve it.

As a result of their participation in ON they held discussions with Westfield. Westfield had already invested in tracking, but without much success. Westfield operate three tiers of tracking, namely tracking:

— around the shopping centre and car park
— within a store (for security purposes)
— how people move within the centre (to improve site management)

Ultimately, the discussions with Westfield failed to lead to any project.

The researchers therefore decided to try issuing a call for expressions of interest.

1.3.4 Project Outcomes

An important outcome is a collaborative agreement with Ynomia for a year-long project to engineer and commercialise the tracking technology. Trials of the BLEAT system are now underway at real life building sites. There are currently about 10 Data61 people involved in the collaboration project [some part time / some full time], plus around another 10 people from Ynomia and Probuild, meaning the BLEAT technology has created incremental new employment, plus high commercial impact, applied research for Data61.

[4] Personal communication with PCA, February 2019. Figure taken from PCA's Office Market Report, January 2019.
[5] Data extracted from ABS on 24 February 2019.
[6] Personal communications with NABERS officials suggest that this assumption is reasonable.

1.3.5 Adoption

We have assumed that the total potential market for the use of BLEAT on building sites in Australia is around 500. For the purposes of estimating the potential benefits of the BLEAT technology we have assumed that the technology is adopted by four per cent of building sites by 30 June 2020, and that the number of building sites using BLEAT increases by one per cent a year to 2030, after which the percentage of project adoption / penetration remains stable.

We also assume that each building site uses BLEAT for 3 years and that the cost of the Ynomia service is A$10,000 a month.

We have assumed that overseas projects using BLEAT will be about half the number in Australia. This is a conservative estimate as Australia only represents around two per cent of the global construction market.

Role of the ON program

In the absence of the team's participation in the ON program it is highly likely the technology would have been shelved. Whereas the agreement to collaborate on the engineering and commercialisation of BLEAT now means that ongoing work on the technology is making up around 40 per cent of the time of the research team.

1.3.6 Impacts

The impacts of the BLEAT system include:

- Revenue for the joint venture set up by CSIRO and Ynomia to commercialise the technology
- Employment for manufacturing, deploying and maintaining the BLEAT system
- Improved productivity and reduced costs on building sites using the system
- Improved health and safety due to better tracking of potential work hazards

1.4 Clarifying the Impacts

1.4.1 Counterfactual

In the absence of the team's participation in the ON program it is likely the technology would have been shelved due to not fully appreciating the commercial opportunities presented by the technology. Participation in the ON program galvanised the team and lead to them presenting at D61 + Live to try to identify a commercialisation path. This ultimately led to the contact with Ynomia.

1.4.2 Attribution

Given that the tracking technology is unlikely to have been commercialised in the absence of the impetus provided by the researchers' participation in the ON program, we would argue that none of the estimated benefits of this technology would have been realised in the absence of the ON program.

1.5 Evaluating the Impacts

1.5.1 Cost-Benefit Analysis

Costs

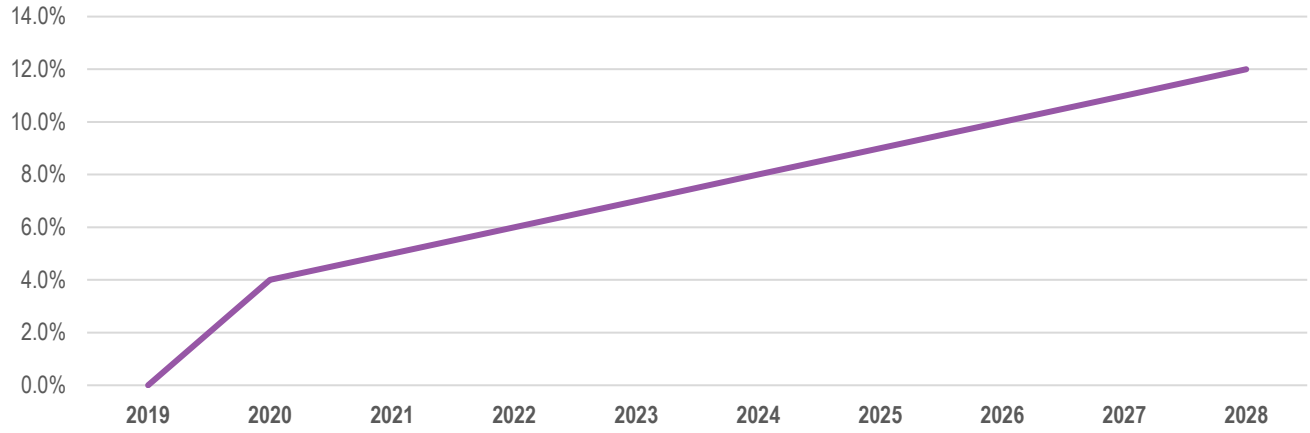
The research and development costs of the BLEAT project were shown previously in Table 1.1. note that the Table does not include the support provided by Probuild.

The costs to the BLEAT team of participating in ON program activities are estimated to be $25,000. According to CSIRO, the overhead costs of the ON program that have been apportioned to the BLEAT project total $13,955. Both sets of costs are assumed to be incurred in 2018.

Benefits

As described previously in Section 1.3.5, it is assumed that the technology is adopted by four per cent of building sites in Australia in 2020, and that the number of building sites using BLEAT then increases by one per cent a year (see **Figure 1.2**). It is assumed that there are 500 building sites across Australia in any given year.

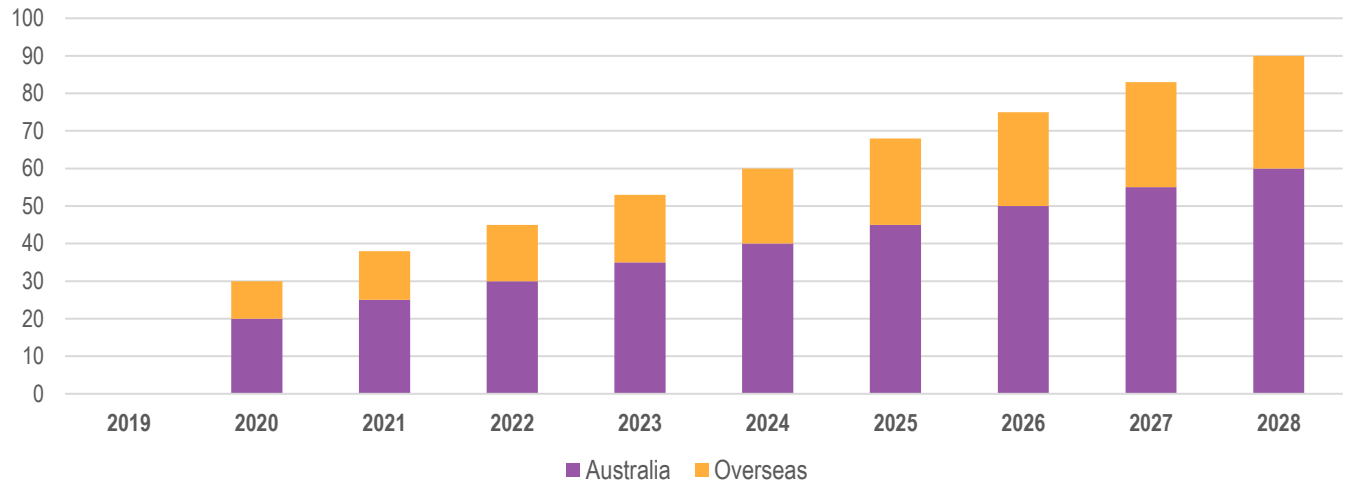
FIGURE 1.2 BLEAT TECHNOLOGY ADOPTION RATE IN AUSTRALIAN BUILDING SITES, 2019 TO 2028



SOURCE: ACIL ALLEN

It is also conservatively assumed that overseas projects using BLEAT in any given year will be half the number in Australia. In addition, it is assumed that the benefits stream ends in 2028 because a similar product/service will have developed in Australia in the counterfactual (that is, in the absence of the BLEAT project and the ON program). The estimated total number of building sites adopting the BLEAT technology in Australia and overseas is shown in **Figure 1.3**.

FIGURE 1.3 NUMBER OF BUILDING SITES ADOPTING BLEAT IN AUSTRALIA AND OVERSEAS, 2019 TO 2028

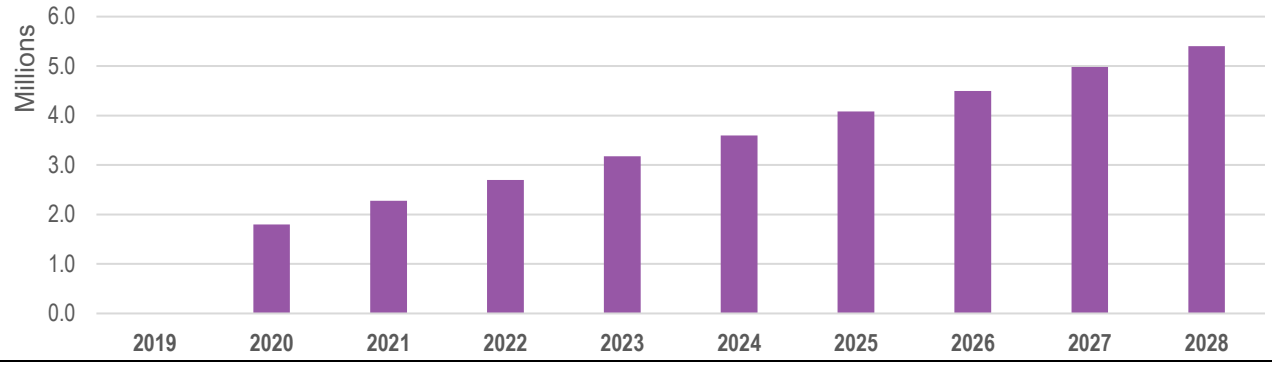


SOURCE: ACIL ALLEN

The cost-benefit analysis assumes that the price of the Ynomia service is A$10,000 a month per site for both Australian and overseas building sites, of which half is used to cover hardware, software and support costs, resulting in a profit of $60,000 per year to Ynomia for each building site.

The benefits of the BLEAT project and the ON program in terms of the profits earned by Ynomia from Australian and overseas building sites between 2019 and 2028 are shown in **Figure 1.4**.

FIGURE 1.4 BENEFITS OF BLEAT PROJECT AND ON PROGRAM, 2019 TO 2028 ($M)



SOURCE: ACIL ALLEN

Assessment of benefits against costs

The present value of project-related and ON-related costs and benefits from the BLEAT project and its participation in the ON program in 2019 dollars under a 7 per cent real discount rate has been estimated by ACIL Allen.

The benefit-cost ratio (BCR) is estimated to be 4.42.

Sensitivity analysis

Sensitivity analysis has been undertaken to test the robustness of the cost-benefit analysis to changes in key assumptions and parameter values.

In the central case of the cost-benefit analysis, it is assumed that the BLEAT adoption rate in building sites across Australia rises by 1 per cent each year from 4 per cent in 2020 to 12 per cent in 2028. If the adoption rate increases by 1.5 per cent each year from 4 per cent in 2020 to 16 per cent in 2028, the BCR rises from 4.42 to 5.46. Conversely, if the adoption rate increases by only 0.5 per cent each year from 4 per cent in 2020 to 8 per cent in 2028, the BCR falls to 3.39.

In the central case of the cost-benefit analysis, it is assumed that the number of overseas building sites adopting BLEAT as a proportion of Australian sites is 50 per cent. If that proportion is 75 per cent, the BCR rises from 4.42 to 5.16. Conversely, if that proportion is only 25 per cent, the BCR falls to 3.69.

A real discount rate of 7 per cent was used in the central case of the cost-benefit analysis. Under a 4 per cent discount rate, the BCR rises from 4.42 to 5.15. Conversely, the BCR falls to 3.82 under a 10 per cent discount rate.

1.5.2 Potential future impacts

There is a multimillion project with Meat and Livestock Australia (MLA) to further develop the technology for use as ear tags on stock. This would enable farmers to track the location and movement of their stock. There is also the potential for others to add apps that add further information from the ear tag. For example, how to use the ear tags to sense the temperature of the cattle. This is a topic that will become increasingly important as climate leads to increasingly frequent heat waves and higher temperatures.

The following have been identified as some of the potential users of the tracking technology:

- Supermarkets (analytical data, asset tracking)
- Hospitals
- Wildlife tracking and research
- Building companies
- Site Managers (private and government organisations)
- Health and Safety firms
- Mining (underground, open cut)
- Schools
- Households (pets, kids, car keys)
- Army Bases (enhanced safety)

1.5.3 Role of ON program

Through their participation in the ON program the team learnt the importance of talking to potential users and identifying a target market. They also gained the confidence to demonstrate at Data61 live, which ultimately helped to connect them to a commercialisation partner and identify the most appropriate pathway for commercialisation. If the team had not participated in the ON program it is highly likely the technology would have been shelved.