



Please hold: costing telco customer wait times

Report for the Australian Communications Consumer Action Network

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Executive Summary

Introduction

The Australian Communications Consumer Action Network (ACCAN) is Australia's peak body for consumer representation in communications. It has identified long wait times to resolve problems and poor reliability as significant issues facing telecommunications consumers. The value of these aspects of telecommunications services are not reflected in prices. This is because consumers are generally not offered different tiers of reliability or customer service.

Yet poor customer service and reliability will impose costs on consumers and the broader economy. The size of these costs is relevant to regulatory questions concerning customer service standards, service guarantees and obligations to pay customers compensation for inconvenience or damage when standards are not met.

ACCAN asked Synergies for advice on estimating the value of consumers' time wasted ("time forgone") trying to resolve customer service issues and intermittent or delayed supply ("reliability"). This advice is an evidence base and a source of practical guidance on matters including:

- how to apply non-market valuation techniques in the telecommunications context;
- the strengths and limitations of the techniques; and
- how they compare relative to using simpler proxies such as a wage rate for measuring the time forgone.

Non-market valuation

Non-market valuation finds dollar values for things that are not traded in markets. Multiple techniques are available to assess non-market values and these techniques can be broadly classified into two categories:

- *revealed preference* methods rely on relationships between how much of some market-priced and non-market priced things consumers buy to work out how consumers value related things; and
- *stated preference* valuation techniques survey a sample group to get information about how consumers value different options.

The values generated by these techniques can be used for different purposes. When a value is taken from a previous study and used to estimate another value it is called a benefit transfer. There are well-established protocols to do a benefit transfer, provided

the services and policy contexts of each study are similar. Non-market valuations from both revealed preference and stated preference techniques can be used for benefit transfer, subject to the contexts and attributes being sufficiently similar.

Literature Review – Value of Time

Synergies carried out a literature review to identify how customer time has been valued in other potentially relevant sectors (transport, water, waste management and others).

Synergies found that value of time studies are most prevalent in the transport sector. These are particularly important in the evaluation of public investment in transport infrastructure as travel time reductions are a core target benefit. Unsurprisingly, we found that the transport sector has developed the most sophisticated and well-supported framework for the valuation of customer time.

The value of travel time weighted across transport modes provided by a leading transport valuation framework, gives a well-accepted and relatively up-to-date estimate for the Australian transport context of \$13.70/hour (2018 dollars).

Synergies did not find estimates for the value of customer time in other economic sectors that we consider would be suitable for benefit transfer into a telecommunications context.

Literature Review – Value of reliability

Synergies carried out a second literature review examining studies of the value of reliability to customers across multiple sectors in Australia and internationally.

Synergies found that value of reliability studies are prevalent in the electricity and water sectors. In both cases, attributes and methods have become relatively well established and consistent across different countries over more than a decade. In the telecommunications sector, we find that the quantification and valuation of reliability is much less prevalent, and the analytical frameworks used are more diverse.

Benefit Transfer

There is a promising benefit transfer opportunity for valuing customer time, but not in the value of long delays in receiving a broadband service connection.

In Australian transport planning, best practice for the estimation of non-market value is in the Australian Transport Assessment and Planning (ATAP) Guidelines. These align closely with Infrastructure Australia's Reform and Investment Framework.

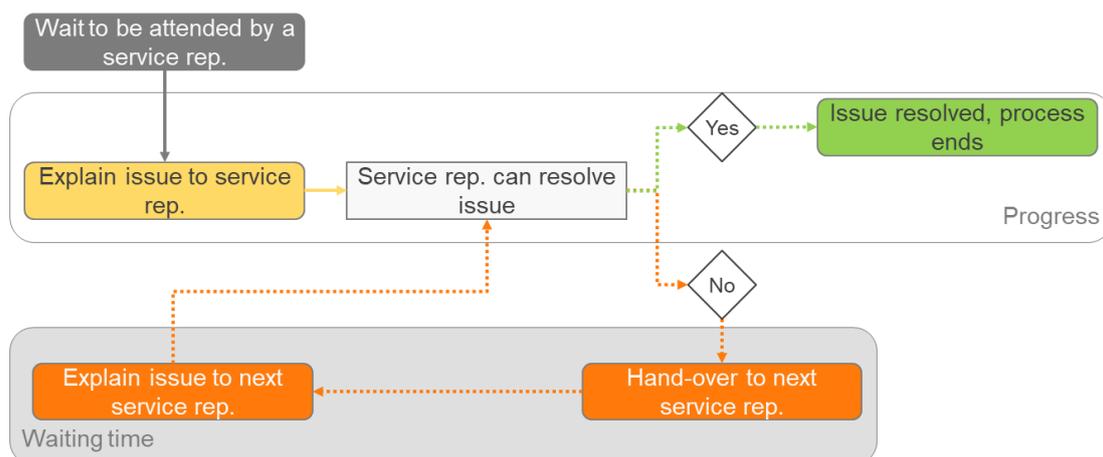
The ATAP Guidelines specify a value for the cost of each hour an average person spends travelling in a vehicle. Then a set of multipliers that can be applied to adjust the value to account for the additional inconvenience or distaste people experience during other stages of a journey (relative to what they experience while travelling ‘in vehicle’). The resulting generalised value of time measure is the weighted sum of the value of time across all steps making up a journey.

This value can be applied to time forgone trying to resolve a telecommunications service issue. Trying to resolve a service issue involves the following steps:

1. The customer calls, visits or lodges a written communication and waits to be attended to by a customer service representative
2. The customer explains the issue to the service representative (for engagement by email, this step may occur as the first step)
3. If the service representative is able to resolve the issue the process then ends
4. If the service representative is not able to resolve the issue, the customer is then handed off to another operator and the process resumes at step 2.

Figure ES 1 illustrates the steps in the process and shows the classification of each step as either progress or waiting time.

Figure ES 1 Steps in resolving a telco service issue



Data source: Synergies illustration

Each step of the above flow chart is similar to a public transport journey. For instance, making progress on a service interaction is similar to time spent moving on a public transport journey. Time spent waiting for a service agent is similar to waiting for a bus or train to arrive.

Table ES 1 shows the values combined with the multipliers specified by ATAP for those stages of a journey judged to be similar to a stage in a customer’s telecommunications service “journey”.

Table ES 1 Applying ATAP parameters to resolving an issue on the phone (\$/hour)

Step in the process	Recommended value	Maximum value
Wait for answer	\$13.67	$\$13.67 * 1.4 = \19.14
Explain issue to operator	\$13.67	\$13.67
Transfer to other operator	$\$13.67 * 1.4 = \19.14	$\$13.67 * 1.5 = \20.51
Explain issue to next operator	$\$13.67 * 1.4 = \19.14	$\$13.67 * 1.65 = \22.56

The table gives the recommended and maximum values for the four steps in the service resolution process measured in \$13.67 per hour in 2018 dollars. It shows that the recommended value of waiting time is \$19.14 per hour, that is the waiting time penalty amounts to \$5.47 per hour. Under extreme conditions, e.g. if a customer has to explain their problem to the fourth service representative, it could be argued that this penalty value increases to up to \$8.89 per hour making the total value of time \$22.56 per hour.

We stress that the values shown in Table ES 1 represent recommended and maximum value estimates, if ACCAN seeks to estimate values from the ATAP guidelines. We would expect there to be valid alternative estimates (both higher and lower than the estimates shown) based on other studies and methods described in this report.

Synergies considers that applying the ATAP Guidelines in a telecommunications context as described here is both reasonable and defensible, while acknowledging that this benefit transfer approach would introduce some degree of imprecision. Synergies also provides advice in the report on how to conduct bespoke research.

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1 Introduction

The Australian Communications Consumer Action Network (ACCAN) is Australia's peak body for consumer representation in communications. ACCAN has identified that long wait times to resolve customer service issues and poor reliability for some fixed line and broadband services are issues of importance to consumers. Accordingly, ACCAN anticipates the need for continued strong advocacy on behalf of consumers for measures to improve service in these areas.

Neither consumer wait times nor service reliability are directly priced in the Australian telecommunication market. That is, customers are not offered specific products allowing them to pay more to reduce the time they must spend resolving service issues or to reduce the likelihood or duration of periods without a service.¹ Therefore, it is not possible to directly observe the value customers attach to these benefits through market prices. Nonetheless, spending additional time on service calls or going without a broadband service for days will impose economic costs. The magnitude of these costs is highly relevant to regulatory questions concerning customer service standards, service guarantees and obligations to pay customers compensation for inconvenience or damage when standards are not met.

ACCAN has sought assistance from Synergies to improve the way that it estimates the value of consumer time forgone and service reliability. Synergies has prepared this advice to ACCAN as an evidence base and a source of practical guidance on how to apply non-market valuation techniques in the telecommunications context, the strengths and limitations of the techniques, and how they compare relative to using simpler proxies such as wage rate for measuring the opportunity cost of time. Our advice is presented in the following parts:

- Section 2 provides an introduction to the main techniques and concepts in non-market valuation.
- Section 3 summarises findings from our scan of the domestic and international literature on valuing the opportunity cost of time.
- Section 4 summarises our findings from a second literature review that focuses on studies that have sought to value service reliability.

¹ We can speculate as why this is the case. It may reflect a lack of competitive pressure in the Australian telecommunications market or that service providers have not found customers to be responsive to products that aim to differentiate themselves on these dimensions.

- Section 5 shows how ACCAN could apply the technique of benefit transfer to apply non-market valuation estimates from the literature to derive values for forgone customer time in a telecommunications context.
- Section 6 provides advice on how ACCAN should approach the development of primary research to generate non-market valuations specific to the Australian telecommunications context.

2 Non-market valuation

2.1 The role of non-market valuation

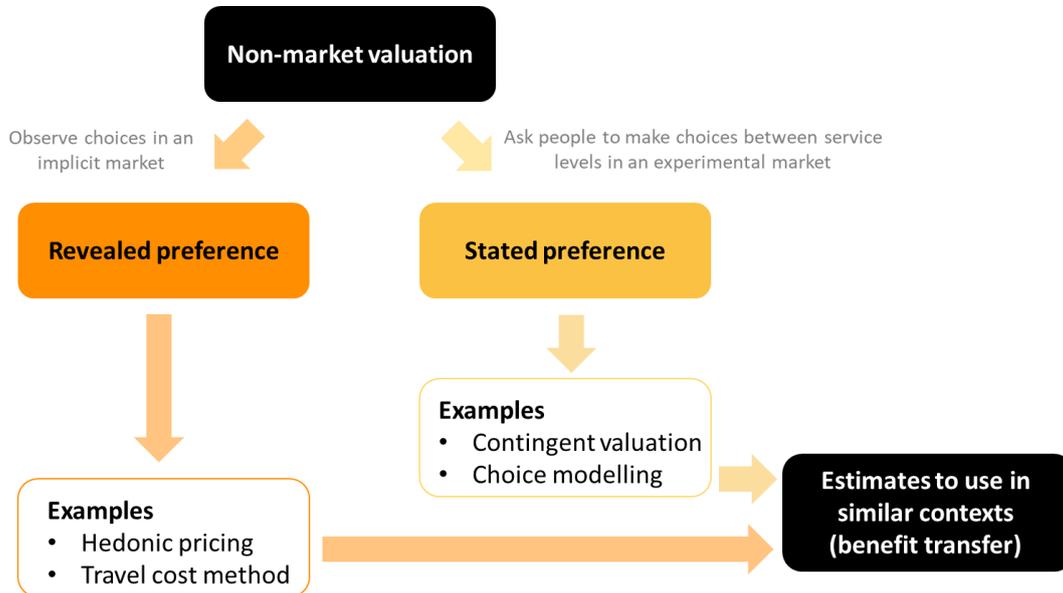
Many of the things people value are not explicitly bought and sold in markets and therefore it is not possible to use market prices to estimate the value of those goods and services. Improving the condition of the natural environment, increasing access to public amenities, reducing time spent waiting for a bus, reducing the incidence of power blackouts. These are all examples of things that many people would attach some value to, even though they cannot simply purchase more of them as they would for a market traded service or product.

At the same time, companies and policy makers face choices such as where to make investments, what practices to change and what strategies to pursue that would ideally be informed by knowledge of the magnitude of non-market (i.e. unpriced) values affected by those choices. Non-market valuation is a field of applied economics that enables us to ascribe monetary values to things that are not explicitly traded in markets, in order to ensure that decisions can take better account of them and lift the overall efficient use of resources to meet the interests of consumers or citizens.

2.2 Techniques

Multiple techniques are available to assess non-market values. These techniques can be broadly classified into revealed preference and stated preference techniques as illustrated in Figure 1. In both cases, the techniques can be used in specific contexts to estimate non-market values to inform decision-making. Further, subject to well-established protocols, the values generated by these techniques can be taken from a previous study and transferred to the investigation of interest, provided the services and policy contexts of each study are similar. This technique is referred to as 'benefit transfer'. These techniques are explained in greater detail below.

Figure 1 Classification of non-market valuation techniques



Data source: Synergies

2.2.1 Revealed preference

Revealed preference methods rely on observable relationships between demand for some market-priced goods and preferences for related non-market goods and services. By observing particular household and business customer behaviours it is possible to infer their preferences for levels of provision of related services or characteristics. Examples of revealed preference techniques include the travel cost method and hedonic pricing.

The travel cost method assumes that the time and travel cost expenses that people incur to visit a site constitute the access price. Using this assumption, one can estimate a sample group’s willingness to pay to visit the site by measuring the number of trips that they make at different travel costs.

In another technique (referred to as random utility modelling), commuter choices between different modes of transport can be used to estimate values for particular attributes associated with each mode – for example, travel time, comfort, safety, convenience, and cost. This technique is used extensively in the transport sector.

Hedonic pricing uses observed market prices for properties and develops a statistical relationship between prices and the non-market attributes associated with properties – such as ocean views or proximity to a park. The technique isolates the effect of these attributes on property values to arrive at an estimate of how much the market is

prepared to pay for the non-market good of interest – in this case visual amenity and recreational opportunities.

In summary, revealed preference techniques require data on observed, actual choices such as choices between different modes of transport, choices between recreation sites that have different quality characteristics, or property purchase or lease decisions. Where these data exist, they can provide reliable estimates of people's preferences and monetary values for non-market goods. However, the requirement for data on actual behaviours limits the use of revealed preference techniques to evaluating the value people place on choices that currently exist (or previously existed).²

2.2.2 Stated Preference

Stated preference valuation techniques survey a sample group to elicit information about how respondents value different options. Stated preference techniques have become increasingly sophisticated over time both in response to concerns regarding the validity of responses and the desirability of extracting richer insights into customer preferences where products have more than one attribute.

Contingent valuation

There are two main forms of contingent valuation – open ended and discrete choice (or referendum format).

Open ended contingent valuation was once the most common stated preference method. In its most basic form, respondents are asked an open-ended question about how much they would be willing to pay for a given improvement in a service or product³. Then the responses are regressed against variables of interest to see how individual willingness to pay is affected by those variables. This form of contingent valuation is now rarely used because responses have been found to be vulnerable to a range of biases.^{4,5}

The second main form of contingent valuation – sometimes called the referendum form – presents respondents with a specific payment amount and respondents are asked

² Francisco Alpizar, Fredrik Carlsson, and Peter Martinsson, "Using Choice Experiments for Non-Market Valuation," June 2001, 37.

³ Respondents could equally be asked how much compensation they would be willing to accept for a decrease in service or product quality. Noting that this is functionally the same question in economic terms, we will focus in the explanations that follow on the willingness-to-pay form of the question.

⁴ Mark Morrison et al., "A Comparison of Stated Preference Techniques for Estimating Environmental Values," 1997.

⁵ Centre for International Economics, "Review of Willingness to Pay Methodologies (A Report Prepared for IPART)," August 2001.

whether they would be willing to pay that amount. This closed questioning structure, combined with well-established protocols for designing surveys, addresses most of the concerns regarding bias in survey responses. Contingent valuation of this kind offers respondents a binary choice, typically between paying no extra and maintaining the status quo or paying the specified amount to improve quality as measured by a given attribute of interest, like travel time. Thus, in a contingent valuation survey (referendum form), respondents could be asked:

“Would you be willing to pay an additional \$10 per year for a guarantee that customer service call wait times would not exceed 10 minutes? (yes or no)”

Respondents are assumed to be trying to maximise their welfare by weighing the benefit they get from the improvement in quality against the increased cost. In the question above, the two factors influencing the respondent’s utility are the bid amount “\$10” and the quality level defined as “service call wait times that don’t exceed 10 minutes”. In practice, the levels of these factors are varied systematically across respondents. The responses are then used to estimate a statistical model that predicts choices of the respondents as well as permitting values to be estimated for changes ‘at the margin’ (e.g. dollars per minute of wait time reduction). The statistical techniques used to process responses to a referendum-style contingent valuation survey are more complex than warrants discussion in this report but are set out in a relative accessible way by Louviere et al (2000).⁶

The referendum-style contingent valuation technique is most useful in valuing single outcome changes. A relevant example of this might be to value a specific and binary policy proposal such as to eliminate service call wait times. In practice, customers may be interested in multiple characteristics or attributes of a given service or product, in which case contingent valuation may be less useful. However, referendum-style contingent surveys tend to be cheaper to develop and administer than the more sophisticated choice modelling technique discussed in the following section.

Choice modelling

Choice modelling is another stated preference technique that extends the referendum-style contingent valuation approach by presenting predefined options but expanding the number of factors (or attributes) presented to respondents for valuing.

⁶ Jordan J. Louviere et al., *Stated Choice Methods: Analysis and Applications* (Cambridge: Cambridge University Press, 2000).

A choice modelling survey presents respondents with a so-called “choice set” – a set of alternatives (usually three) related to the service or product of interest. Each alternative is usually described as a mix of relevant attributes. In each choice set, one of the alternatives will describe the existing attributes of the service or product and the other two alternatives will offer modifications to the status quo product or service. Each attribute included in the definition of an alternative will be allowed to take one of a discrete set of values or levels. A limited number of choice sets will be presented to each individual respondent (typically around eight), who will be asked indicate their preferred alternative within each set.⁷

Data from a choice model survey are used to estimate a statistical model of product choice. The model can then be used to estimate customers’ preparedness to trade attributes off against one another. Further, since one of the measured attributes will generally be measured in dollars (e.g. the price of a fare or the value of a compensation payment) any given attribute can be analysed in terms of the monetary value people would be willing to give up for an additional increment of the attribute of interest.

An example of a choice set from an actual choice modelling study may be instructive. In 1999, researchers administered a survey to 143 commuters in urban New Zealand to evaluate their preferences concerning travel times, congestion, certainty and transport costs.⁸ Each option is described in terms of multiple attributes – any of which may be particularly decisive in a given respondent’s willingness to pay for that option. The researchers included two options in each choice set - varying the specification of those options in each choice set presented. They presented multiple choice sets to each respondent to increase the statistical power of the study.⁹ Using the data collected from this choice modelling experiment, the researchers were able to evaluate the willingness of commuters to pay, in the form of a hypothetical road toll, per minute reduction in commute time or per percentage point reduction in arrival time uncertainty. A slightly more complicated telecommunications example of a choice modelling study is provided in Appendix A.

Choice modelling offers several advantages over the referendum-style contingent valuation approach. Firstly, it allows the researcher to test preferences over a mix of attributes – which can be important in the context of alternative service packages that contain multiple attributes, the levels of which differ across packages (or options). In the telecommunications context, this could include hypothetical new service packages

⁷ Centre for International Economics, “Review of Willingness to Pay Methodologies (A Report Prepared for IPART).”

⁸ D Hensher and W Greene, “The Mixed Logit Model: The State of Practice,” *Transportation* 30, no. 2 (2003): 133–176.

⁹ Total of 2,288 data points i.e. 143 responses × 16 choice sets per response.

that differ according to the plan price, whether call-centres are based in Australia, the hours within which service calls can be received, the availability of a call-back service, the quality of online service resolution procedures in addition to the time required on the phone resolving a problem.

Secondly, it allows a more realistic contextual setting, in which customers are often confronted with multiple trade-offs in selecting their preferred service. Because choice modelling presents multiple attributes in a choice set, the valuation for any one attribute is appropriately framed (or contextualised). This avoids the potential for values for any one attribute to be over-estimated, which can be the case in a referendum contingent valuation where respondents may not be conscious of the other goods and services that may be competing for their budget.

Finally, because it is based on a richer description of service attributes and disaggregates the factors in a valuation, it supports more reliable benefit transfer, by allowing values to be adjusted to reflect differences in the characteristics of different contexts.

2.2.3 Comparing valuation methods

Table 2 summarises the valuation techniques likely to be relevant to ACCAN assessed against a set of evaluation criteria. Of the techniques described, only the basic form of contingent valuation warrants exclusion – on account of its widely studied and accepted flaws and biases. Regarding the remaining three techniques, we stress the following points:

- Revealed preference approaches are well-accepted and limited largely by the availability of suitable data;
- Contingent valuation surveys using referendum-style questions are generally well-accepted in situations where options are simple to capture and present few variants;
- Choice modelling is also generally well-accepted and capable of exploring preferences between diverse options, though this technique tends to be more expensive to administer compared to contingent valuation.

Table 2 Comparison of valuation methods

Method Evaluation Criteria	Revealed preference	Contingent valuation – basic	Contingent valuation – binary choice / referendum-style	Choice modelling
Level of expert acceptance	Well accepted	Largely discredited as prone to bias	Well accepted	Well accepted
Data requirements	Requires specific service data – e.g. pricing of different customer plans; customer switching behaviour; call wait time data; call resolution time data	Short survey	Short survey	Longer survey
Robustness	Generally recognised as being robust	Not robust	Robust if well designed and executed, but sometimes criticised as hypothetical.	Robust if well designed and executed, but sometimes criticised as hypothetical.
Cost	Low cost if telco customer data can be obtained. Otherwise prohibitive	Very low cost	Low to medium cost	Medium to high cost
Richness	Dependent on data and study	Very low richness	Low richness – does not allow the role of multiple attributes to be comprehensively explored	High richness – allows the role of multiple attributes to be comprehensively explored

Source: Synergies analysis

2.2.4 Benefit Transfer

Benefit transfer is the practice of using non-market value estimates from a previous study or studies (the ‘source’) and transferring these estimates to the investigation of current interest. For instance, if the value of commuter time is valued for travelling in a private vehicle in Sydney, and an estimate is required for the value of commuter time in Adelaide, it may be valid to perform a benefit transfer by applying the Sydney estimate.

An extensive body of academic research exists that can support adjustments in valuations to account for differences in the context. Some adjustments that studies have suggested may be appropriate in the example given include:¹⁰

- adjusting for differences in average income between the source and destination populations – higher incomes are clearly correlated with higher values of customer time.

¹⁰ J. D. Shires and G. C. de Jong, “An International Meta-Analysis of Values of Travel Time Savings,” *Evaluation and Program Planning*, Evaluating the Impact of Transport Projects: Lessons for Other Disciplines, 32, no. 4 (November 1, 2009): 315–25, <https://doi.org/10.1016/j.evalprogplan.2009.06.010>.

- adjusting for distances – the longer the distance the higher the value of time for commuting – potentially because the experience of travel becomes more taxing the longer it continues.
- adjusting for mode – commuters show some differences in the value of time depending the mode.

Non-market valuations from both revealed preference and stated preference techniques can be used for benefit transfer, subject to the contexts and attributes being sufficiently similar. Stated preference techniques that produce valuation estimates able to be adjusted for differences in key attributes – choice modelling being the example presented above – are more suited to benefit transfer.¹¹

In the case of non-market values relevant to transport, a formalised benefit transfer framework exists to guide both the selection of non-market values and how those values are applied. This framework forms part of the ATAP Guidelines and is discussed in more detail below.

2.2.5 Willingness to pay and willingness to accept

There are two alternative approaches to framing how respondents should express the value they attach to a service or attribute. One approach poses questions framed in terms of the amount respondents are willing to pay for an improvement in service from a low level to a high level (relatively speaking). The alternative approach is to pose questions framed in terms of how much compensation respondents are willing to accept for a reduction in their service level from the high level to the low level. In theory, the two approaches should arrive at the same value estimate since they are, in formal terms, exactly the same question. Empirically, however, many studies have found that willingness to accept compensation frequently exceeds willingness to pay for an equivalent change in quality.^{12,13} Willingness to accept methodologies are, accordingly, more susceptible to criticisms that they may have over-estimated the true value, while willingness to pay measures may be more readily defended as providing a conservative lower-bound estimate.

¹¹ Morrison et al., “A Comparison of Stated Preference Techniques for Estimating Environmental Values.”

¹² Centre for International Economics, “Review of Willingness to Pay Methodologies (A Report Prepared for IPART).”

¹³ Jonathan Chapman et al., “Willingness to Pay and Willingness to Accept Are Probably Less Correlated Than You Think” (Cambridge, MA: National Bureau of Economic Research, October 2017), <https://doi.org/10.3386/w23954>.

2.2.6 Payment vehicles

People are inclined to want something for nothing. A core weakness in stated preference studies is the possibility that a person answers strategically in order to maximise their benefits in the form of improved services or compensation payments, without accurately representing their true willingness to pay or willingness to accept. A robust study needs to convince respondents that a real-life intervention will take place and that they will actually be required to pay an amount for a change in service or will be receiving some reduction in service for which they will be compensated. In a willingness to pay study, a suitable payment vehicle might be an increase in the average cost of service (e.g. higher tariffs for all customers of a utility), the introduction of a levy by the Government or different prices for different service packages.

3 Literature Review – Value of Time

This section summarises the key concepts and insights from our review of the academic and industry literature relating to practices used for valuing customer time, particularly as it might apply in a telecommunications context. Specifically, the objectives of the literature review were:

- To identify how customer time has been valued in other potentially relevant sectors (transport, water, waste management and other sectors); and
- To identify specific examples of valuations that may be promising to apply in (transfer to) the Australian telecommunications context.

3.1 Findings

3.1.1 Transport sector

Overall, we found that value of time studies are most prevalent in the transport sector, where travel time is an extremely important attribute of travel services. Value of time estimates are found to be particularly important in the evaluation of public investment in transport infrastructure given that this investment frequently targets travel time reductions as a core benefit. Unsurprisingly, we found that the transport sector has developed the most sophisticated and well supported framework for the valuation of customer time.

The value of travel time weighted across modes provided by ATAP gives a well-accepted and relatively up to date estimate for the Australian transport context of \$12.80/hour (2014) or \$13.70/hour in \$2018¹⁴. Whether this estimate could be suitable to use for benefit transfer, and if so how much it might need to be adjusted by, is considered in Section 5.3.

Use of valuation based on wage rates

We found that valuation of time based on the opportunity cost of a person's labour remains widely used in the transport sector though only in the context of business travel, where the "cost savings approach" remains in widespread use.¹⁵ This approach

¹⁴ Note that this estimate has not been updated to account for income growth – only for the rate of inflation. Adjusting for inflation should capture most of the change, given that the literature values are relatively recent.

¹⁵ Mark Wardman et al., "Valuation of Travel Time Savings for Business Travellers (A Report Prepared for the UK Department for Transport)" (Institute for Transport Studies, University of Leeds, 2013).

assumes that the value of in-work time savings is the wage rate plus overhead costs.¹⁶ However, this approach would only be relevant to consumers who are spending time to address service issues while at work, such as for small business customers. Further, the approach has been subject to a variety of theoretical criticisms that have encouraged researchers to pursue alternative approaches. These criticisms include the suggestion that travel time is increasingly becoming useable for many business travellers and that changing expectations about work may mean that shorter journey times switch time at least partially between travel and leisure rather than between travel and work.¹⁷

Labour costs have also been the basis for estimating the impact of regulatory burden on businesses, community organisations or individuals. The Office of Best Practice Regulation (OBPR) recommends that the assessment of impacts from new regulatory proposals explicitly include the cost of forgone leisure time.¹⁸ The OBPR applies a non-labour cost of time for individuals, reflecting the opportunity cost of peoples' personal time (or 'leisure time'). This cost is based on the standard economic approach to consider the trade-off between work and leisure such that the marginal value of time spent working (average hourly wage, plus overtime and after tax) equals the marginal value of time spent at leisure. Therefore, the OBPR adopts the default value for an individual's leisure time as average weekly earnings, estimated at \$32 per hour. OBPR's approach is also applied by the Australian Communications and Media Authority.¹⁹

3.1.2 Other sectors

We did not find estimates for the value of customer time in other contexts that we consider would be suitable for benefit transfer into a telecommunications context.

We found no examples of studies valuing customer time in electricity and gas services, since this does not appear to be a relevant attribute in the customer experience of these services. It appears that consideration of the value of customer time in the electricity

¹⁶ P. Mackie et al., "Toolkit for the Economic Evaluation of World Bank Transport Projects," *Institute for Transport Studies, University of Leeds*, 2003.

¹⁷ Wardman et al., "Valuation of Travel Time Savings for Business Travellers (A Report Prepared for the UK Department for Transport)."

¹⁸ Office of Best Practice Regulation, "Regulatory Burden Measurement Framework," February 2016, <https://www.pmc.gov.au/sites/default/files/publications/regulatory-burden-measurement-framework.pdf>.

¹⁹ Australian Communications and Media Authority, "Reconnecting the Customer - Estimation of Benefits," November 2015, https://acma.gov.au/-/media/Economics-Advisory/Research/PDF/Reconnecting-the-Customer_estimation-of-benefits-pdf.pdf?la=en.

sector has been overshadowed by the value of reliability – something we explore in Section 4. We can also speculate that lack of attention paid to the value of customer time in the context of electricity service provider call centres might reflect the fact that most service calls originate with electricity retailers (who are not typically subject to economic regulation). We note that regulatory performance obligations on call centres operated by electricity distributors tend not to measure the total time required on the service call.²⁰

We found one example of a study that used estimates of the value of customer time to evaluate willingness to pay to avoid sprinkler restrictions (i.e. avoidance of spending time hand watering over using automated sprinklers), but again, in general, customer time did not appear to be an especially salient attribute for this type of service. Several studies of household recycling preferences were found but these appear to have employed problematic survey techniques or found counter-intuitive preferences with respect to the activity that takes up the person’s time that suggest little opportunity to transfer values from those studies into the telecommunications context.

We found one study in a retail sector context and, despite searching, found no studies concerning the value of time in the context of call centres and IT helpdesk services. Another context we did not investigate but which might merit attention in future research is the subject of waiting times in the health sector.

3.2 Studies considered

Table 3, Table 4 and Table 5 summarise the studies identified by Synergies in the contexts of transport, waste and assorted other settings respectively. Studies were selected where they were felt to have some relevance to the valuation of time in the context of telecommunications, both for insights into methodological questions and as potential sources of values to use for benefit transfer.

²⁰ Western Power, “Service Standard Report - 2017-18,” 2018, <https://www.erawa.com.au/cproot/19955/2/Western%20Power%20-%20Service%20standard%20report%20-%202017-18.PDF>.

Table 3 Non-market valuation studies concerning the valuation of customer times in transport context

Study (Year)	Sector / Jurisdiction	Study goal and studied attributes	Valuation method(s)	Valuations and other implications
Australian Transport Assessment and Planning (ATAP) Guidelines ²¹ (2018)	Public Transport / Australia and New Zealand	The ATAP Guidelines specify methods and values for the quantification of various costs and benefits for evaluating transport infrastructure proposals. Methods and assumptions for valuations of commuter time draw on meta-analyses of academic literature, which identified 30 studies (26 in Australia and 4 in NZ) providing 110 value of time estimates.	Predominantly stated preference. Adjusted for changes in purchasing power and weighted according to modal shares.	\$12.80/hr (2014) with a range of \$11.10 to \$18.70 depending on the mode of transport considered. Note – this is addressed in greater detail later in this report. See Section 5.3.
NSW stated preference value of travel time study ²² (2015)	Public transport / New South Wales	To inform public transport development and planning. Studied attributes: fare, in-vehicle time, service frequency, train quality and station quality	Stated preference survey	\$14.39/hour (2014)
Predicting the Value of Public Transport In-Vehicle Time ²³ (2013)	Public transport / Australia and New Zealand	To update the value of in-vehicle time to support better economic evaluations of transport projects. Studied attributes: the estimated values of time and correlates the trends with the consumer price index, GDP, GDP per capita and wage indices.	Meta-analysis of 28 studies – predominantly stated preference.	\$11.80/hour (2012) Over the twenty year period, the value of time increased by 1.8% a year more than inflation in NSW and by 1.3% in NZ.
Valuation of travel time in economic analysis ²⁴ (2011)	Public transport / United States	To inform the evaluation of the benefits of transportation infrastructure investment and rulemaking initiative Studied attributes: demographics, income, mode, distance, comfort, time, location and purpose of travel	Stated preference studies (discrete choice technique)	Hourly values of travel time savings (2010) USD \$12.00 (local personal travel) USD \$22.90 (local business travel) USD \$16.70 (intercity personal travel) USD \$22.90 (intercity business travel)
Estimation of value of travel time for work trips ²⁵ (2014)	Public transport / India	To estimate value of in-vehicle time to inform the management and appraisal of transport investment decisions Studied attributes: travel time (minutes), travel costs, mode, trip length (km), income and demographics	Combination of revealed preference and stated preference survey techniques Stated preference survey in form of choice modelling	35.73 rupees/hr (income group 10,000 Rs/month) 142.19 Rs/hr (30,000-50,000 Rs/month)
Valuation of travel time savings for business travellers ²⁶ (2013)	Business travel / United Kingdom	Review and assess advantages and disadvantages of practically feasible methods for valuing business travel time savings.	Cost savings approach (based on labour costs: wage and overheads), stated preference survey techniques, revealed preference techniques.	Summarised critiques of the cost saving approach -
Valuation of travel time ²⁷	Transport / United	To inform decisions in transportation policy, travel demand modelling and	Mixed discrete choice model	Wage rate

²¹ Department of Infrastructure, Regional Development and Cities, "Australian Transport Assessment and Planning Guidelines - M1 Public Transport Supporting Technical Report (Public Transport Parameter Values)," January 9, 2018, <https://atap.gov.au/parameter-values/road-transport/3-travel-time.aspx#ftr2>.

²² J Legaspi and N Douglas, "Value of Travel Time Revisited - NSW Experiment," 2015, 15.

²³ N Douglas and I Wallis, "Predicting the Value of Public Transport In-Vehicle Time," in *Australasian Transport Research Forum 2013 Proceedings*, 2013.

²⁴ Peter Belenky, "Valuation of Travel Time in Economic Analysis," September 28, 2011, https://www.transportation.gov/sites/dot.dev/files/docs/vot_guidance_092811c.pdf.

²⁵ I.C. Athira et al., "Estimation of Value of Travel Time for Work Trips," accessed March 18, 2019, <https://doi.org/10.1016/j.trpro.2016.11.067>.

²⁶ Wardman et al., "Valuation of Travel Time Savings for Business Travellers (A Report Prepared for the UK Department for Transport)."

Study (Year)	Sector / Jurisdiction	Study goal and studied attributes	Valuation method(s)	Valuations and other implications
(2012)	States	human behaviour in economics Studied attributes: cost, income, distance, reliability and mode		Willingness to pay
An international meta-analysis of values of travel time savings ²⁸ (2009)	Transport / International	To study the effect of different research methods (e.g. stated versus revealed preference) on the valuation of travel time savings.	Revealed preference, stated preference, wage rate approach.	8.84 Euro/hour (EU commuter) (2003) 10.69 Euro/hour (EU commuter)
Productive use of rail travel time and the valuation of travel time savings for rail business travellers ²⁹ (2009)	Rail transport / United Kingdom	To inform rail transport policy, value of speedier rail services and demand forecasting Studied attributes: cost, time, crowding, mobile phone contact and time and cost gains vs losses	Surveys comprising revealed preference, stated intentions, stated preference and socio-economic (person type, income, age and gender).	Employee Value of Time – Average €17.80/hour (2008) Employer Value of Time – Average €4.40/hour
Estimating the passenger cost of station crowding ³⁰ (2005)	Rail Transport / New South Wales	To estimate the value of customer time in transferring to/from rail trips. Studied attributes: crowding, wait times, seating density, preference differences between genders	Choice model	\$14.19/hour for peak travellers (2005)
The Mixed Logit Model: The State of Practice ³¹ (2003)	Australia	To inform practitioners on the application of choice modelling approach to non-market valuation (focussed on travel time valuation as an illustration)	Stated preference (choice modelling) and mixed stated preference – revealed preference	N/A
Rationing by waiting and the value of time ³² (1985)	Transport / United States	To evaluate consumer choice behaviour Studied attributes: station chosen, capacity of gas tank, gallons purchased, employment status and income level	Contingent valuation questionnaire	Value of time \$/hour (1984) Fully employed: \$9.94 - \$17.26/hour (increasing with income level) Part-time workers: \$3.52 - \$5.39/hour; Students: \$7.15 - \$10.96/hour; Housewives: \$6.32 - \$9.70/hour; Unemployed: \$6.30 - \$9.67/hour

Table 4 Non-market valuation studies concerning the valuation of customer times in waste management context

Study (Year)	Sector / Jurisdiction	Study goal and studied attributes	Valuation method(s)	Valuations and other implications
Effects of Norms and Opportunity Cost of Time on Household Recycling ³³ (2010)	Waste management / Norway	To inform waste recycling policy Studied attributes: household income and labour supply, population density of area, household member	Survey of dichotomous choice contingent valuation questions	Monthly willingness to pay to avoid spending time on recycling €4. (Average of several comparable countries)

²⁷ Kenneth A. Small, "Valuation of Travel Time," *Economics of Transportation* 1, no. 1-2 (December 2012): 2-14, <https://doi.org/10.1016/j.ecotra.2012.09.002>.

²⁸ Shires and de Jong, "An International Meta-Analysis of Values of Travel Time Savings."

²⁹ Robert Fickling et al., "Productive Use of Rail Travel Time and the Valuation of Travel Time Savings for Rail Business Travellers," June 2009, 170.

³⁰ Neil Douglas and George Karpouzis, "Estimating the Passenger Cost of Station Crowding," in *28th Australasian Transport Research Forum, Sydney, Australia*, 2005, 1-11.

³¹ Hensher and Greene, "The Mixed Logit Model: The State of Practice."

³² Robert T. Deacon and Jon Sonstelie, "Rationing by Waiting and the Value of Time: Results from a Natural Experiment," *Journal of Political Economy* 93, no. 4 (1985): 627-47.

³³ Bente Halvorsen, "Effects of Norms and Opportunity Cost of Time on Household Recycling," *Land Economics* 84, no. 3 (2008): 501-16.

Study (Year)	Sector / Jurisdiction	Study goal and studied attributes	Valuation method(s)	Valuations and other implications
		number and age, political preferences, attitude toward environmental issues, reasons for recycling and price tariffs.	Open ended contingent valuation questions	
Households' recycling efforts ³⁴ (2002)	Waste management / Norway	To inform waste recycling policy Studied attributes: time spent sorting recycling and willingness to pay for a company to take over the sorting.	Simple survey regarding time spent sorting and willingness to pay to avoid it (authors used no response quality management techniques)	USD \$1.00 per hour (2014)
We Want to Sort! Assessing Households' Preferences for Sorting Waste ³⁵ (2014)	Waste management / Poland	To inform waste recycling policy Studied attributes: household willingness to pay for recycling services		Found that most people prefer to sort waste themselves if given the choice, and thus demonstrate their pro-environment preferences.

³⁴ Annegrete Bruvoll, Bente Halvorsen, and Karine Nyborg, "Households' Recycling Efforts," *Resources, Conservation and Recycling* 36, no. 4 (November 1, 2002): 337-54, [https://doi.org/10.1016/S0921-3449\(02\)00055-1](https://doi.org/10.1016/S0921-3449(02)00055-1).

³⁵ Mikołaj Czajkowski, Tadeusz Kądziała, and Nick Hanley, "We Want to Sort! Assessing Households' Preferences for Sorting Waste," *Resource and Energy Economics* 36, no. 1 (January 1, 2014): 290-306, <https://doi.org/10.1016/j.reseneeco.2013.05.006>.

Table 5 Non-market valuation studies concerning the valuation of customer times in other contexts

Study (Year)	Sector / Jurisdiction	Study goal and studied attributes	Valuation method(s)	Valuations and other implications
Regulatory Burden Measurement Framework ³⁶ (2016)	Regulation (multiple sectors) / Australia	The Framework states that the cost burden of new regulation must be calculated in order to fully offset that cost by reductions in existing regulatory burden. To estimate changes in regulatory burden, the Framework considers nature of costs, costing activities including labour cost and cost offsets.	Work related costs Default labour rate for cost of leisure time, based on average weekly earnings but adjusted to include income tax Plus, scaled up 75% to account for non-wage labour on-costs (payroll tax and superannuation) and overhead costs (rent, telephone, electricity, etc.) Non-work-related costs The marginal value of time spent working equals the marginal value of time spent at leisure	Work-related costs \$41.74 per hour (not scaled) \$73.05 (+75%) per hour Non-work-related costs \$32 per hour (based on average weekly earnings, including overtime and after tax)
Rationing by waiting and the value of time: results from a natural experiment ³⁷	Retail / California, USA	An American study investigated consumers' willingness to pay for a shorter waiting time when purchasing petrol by using a contingent valuation questionnaire. Studied attributes: station chosen, capacity of gas tank, gallons purchased, employment status and income level	Contingent valuation questionnaire	Estimates of the value of time USD per hour (1980) \$3.52 - \$5.39 (Part-time workers) \$7.15 - \$10.96 (Students) \$6.32 - \$9.70 (Housewives) \$5.12 - \$9.67 (Unemployed) \$6.51 - \$17.26 (Fully employed, depending on income level)
Reconnecting the Customer – Estimation of benefits ³⁸ (2015)	Telecommunications / Australia	Examined core issues of the <i>Reconnecting the Customer (RTC)</i> inquiry that led to the revision of the Telecommunications Consumer Protection Code. The report looked at the systematic problems in the telecom sector in dealing with customers and the potential causes, solutions and strategy for addressing customer care issues.	Adopted the Office of Best Practice Regulation's (OBPR) value of leisure time, assuming that customers complain in their spare time	\$29 per hour (Note: this value has since been updated to \$2019 by the OBPR in its latest Framework discussed above)
The welfare costs of urban outdoor water restrictions ³⁹ (2007)	Water / Australia	To analyse the efficacy of watering technology restrictions as a drought management strategy Studied attributes: utility (whether household saw hand-held watering as leisure or task); level of preference for a green lawn; and cost of convenience	Household production model	~\$15/hour (2018) Assumed a time cost of time cost is 50% of wage rate (tested at 33% and 100%)

³⁶ Office of Best Practice Regulation, "Regulatory Burden Measurement Framework."

³⁷ Deacon and Sonstelie, "Rationing by Waiting and the Value of Time."

³⁸ Australian Communications and Media Authority, "Reconnecting the Customer - Estimation of Benefits."

³⁹ Donna Brennan, Sorada Tapsuwan, and Gordon Ingram, "The Welfare Costs of Urban Outdoor Water Restrictions," *Australian Journal of Agricultural and Resource Economics* 51, no. 3 (August 7, 2007): 243–61, <https://doi.org/10.1111/j.1467-8489.2007.00395.x>.

4 Literature Review: Value of reliability

We carried out a second literature review examining studies across multiple sectors in Australia and internationally of the value of reliability to customers in different sectors. Special attention was paid to the Value of Customer Reliability (VCR) framework found within the electricity sector.

Specifically, the objectives of the literature review were:

- To identify how reliability has been valued in other relevant sectors and services; and
- To identify reliability valuations or valuation techniques that may be promising to apply in the Australian telecommunications context.

4.1 Findings

Overall, we found that value of reliability studies are prevalent in the electricity and water sectors and in both cases attributes and methods have become relatively well established and consistent across different countries and over more than a decade. In the telecommunications sector, we find that the quantification and valuation of reliability is much less prevalent, and the analytical frameworks used are more diverse.

4.1.1 Electricity Sector

Value of customer reliability

In the case of electricity, reliability has been valued at both a system and a network level and the value of customer reliability (VCR) has become a widely accepted metric in both contexts. VCR expresses the average value of a unit of energy not supplied to a given group of customers⁴⁰ (measured in dollars per kilowatt hour, \$/kWh). While the term benefit transfer is not usually used by the regulators, electricity networks and system operators who apply VCR, these applications are nonetheless example of benefit transfer. Current applications of VCR in Australia include:⁴¹

- valuing incremental improvements in service reliability that can then be used to set incentives for networks under their revenue determinations;
- Determining demand management incentives and innovation funding;

⁴⁰ The main groups of customers considered by VCR studies in Australia have been Agriculture, Small Industrial, Large Industrial, Commercial and Residential.

⁴¹ Australian Energy Regulator, "Values of Customer Reliability Consultation Paper," October 2018, 12.

- Assigning value to the reliability performance of network businesses in economic benchmarking models; and
- Informing wholesale market settings such as market price caps.

The Australian Energy Regulator recently suggested that VCR could be used for a variety of other purposes, including informing load shedding priorities, setting price caps for certain services and assessing proposed expenditures to address high impact low probability events.⁴² In short, the VCR has proved to be an extremely versatile monetary metric of the value of reliability.

The most recent national valuation of VCR used choice modelling to quantify VCRs for most customer groups and validated these findings using several contingent valuation questions.⁴³ The preference for choice modelling in this instance was based on a literature review that showed that choice modelling was the predominant approach to estimating VCR internationally.⁴⁴

Reliability standards and service level payments

VCR is not the only lens through which reliability is viewed in the electricity sector. For network businesses, reliability is often expressed in terms of both the frequency and duration of outages. These are standard measures of the amount of time and the number of times per year the average customer experiences unplanned outages. In all Australian jurisdictions, both metrics are codified in service standards that network operators are required to meet.

Once the standards are set, it becomes a condition of license that a network operator shall meet those standards. Non-market valuation studies are relevant to determining at what level the standards should be set or for determining reasonable compensation levels. In a recent revision to the South Australian reliability standards, the contingent valuation approach was used for this purpose. This offers an interesting case study to illustrate considerations that might be particularly relevant for ACCAN – to inform the choice between contingent valuation and choice modelling approaches (see Section 4.3).

⁴² Australian Energy Regulator, 15.

⁴³ Australian Energy Market Operator, “Value of Customer Reliability Statement of Approach,” November 11, 2013, https://www.aemo.com.au/media/Files/Other/consultations/nem/Value_of_Customer_Reliability_Statement_of_Approach_121113.pdf.

⁴⁴ Australian Energy Market Operator, “Value of Customer Reliability Review,” September 2014, <http://www.aemo.com.au/-/media/Files/PDF/VCR-final-report--PDF-update-27-Nov-14.pdf>; Ric Scarpa, “Methodology for the Estimation of the Value of Customer Reliability for AEMO,” November 11, 2013, https://www.aemo.com.au/media/Files/Other/consultations/nem/Methodology_Paper_Ric_Scarpa_121113.pdf.

Other methods

Synergies notes that several studies proposed using direct cost estimation techniques – essentially building a table of costs caused by outages for different customer types. In one instance, this was suggested to be an appropriate technique for households although we are only aware of it being used in Australia for large industrial customers. While we are not inclined to support the use of the direct cost method for small business and residential customers, there may be value in being able to identify the types of costs associated with supply interruptions. For instance, the same study indicated that in contingent valuation, it may be useful to prime survey respondents with questions regarding the particular categories of cost that outages might cause (food spoilage, lost work hours, loss of light, temperature discomfort).

4.1.2 Water sector

The value of reliability in the studies we reviewed have focussed on the cost of restrictions on customer’s ability to use water – particularly for the purposes of watering their gardens. These studies have generally assessed customer willingness-to-pay to avoid restrictions. Different studies have investigated customer values for different types of watering restrictions – such as different levels of severity or different degrees of probability of watering restriction being imposed. The resulting diversity in the specific choices presented to respondents makes benefit transfer more difficult but reflects the diverse policy and environmental circumstances in which each study is carried out. We found that several valuation methods were applied in the water sector and that contingent valuation and choice modelling methods predominated.⁴⁵

Synergies recognises that the water sector has developed different operational practices and different customer expectations to those found in other utility sectors and that valuations of service reliability may be lower in the case of water than for other sectors. In water, service restrictions are routinely imposed as a form of demand management and as an alternative to always investing in infrastructure sufficient to meet expected demand. In the electricity sector, for instance, capacity expansions tend to be triggered when even relatively low probabilities of future capacity shortfalls are exceeded. By contrast, in the water sector it is commonplace to impose supply restrictions. Communities have tended to be more accepting of low-level water restrictions than of short-term blackouts.

⁴⁵ We have supplied only a sample of the water restrictions literature we have reviewed for previous studies. Most of the studies not presented here used either choice modelling or contingent valuation.

4.1.3 Telecommunications sector

In the telecommunications sector, our literature review identified very little in the way of studies explicitly valuing service reliability. This is an interesting finding in itself, particularly in view of the fact that reliability has been a major focus of telecommunications engineers for decades.⁴⁶

One study of broadband providers found that no Internet service providers sell quality of service⁴⁷ explicitly, be it for residential or business customers.⁴⁸ This could reflect, at least in part, the monopoly characteristics of the physical networks that are principally responsible for determining the quality of broadband service. If retailers are selling broadband services delivered over the same network(s) this reduces the scope for retailers to differentiate on the basis of reliability. An alternative explanation could be that service providers find that reliability is of relatively low importance to broadband customers. Perhaps the more plausible variant of this explanation is that the reliability levels provided at the time and place of the study (US, 2010) were sufficient for consumers to be more focused on other service attributes, like price, speed or download limits.

In general, the studies we identified point to telecommunications services being characterised by a much richer set of attributes than is true of electricity services. We found studies considering attributes that might affect customer willingness-to-pay or choice of service provider including:

- speed, download limits, quality of communications service, restrictions on mobile use abroad;⁴⁹
- The availability of mobile number portability;⁵⁰ and
- The probability of data being lost in the network during transfer and the time taken for data to buffer.⁵¹

⁴⁶ D Richard Kuhn, "Sources of Failure in the Public Switched Telephone Network," *Computer* 30, no. 4 (1997): 31-36.

⁴⁷ As measured by characteristics such as up-time

⁴⁸ A. Meddeb, "Internet QoS: Pieces of the Puzzle," *IEEE Communications Magazine* 48, no. 1 (January 2010): 86-94, <https://doi.org/10.1109/MCOM.2010.5394035>.

⁴⁹ Orhan Dagli and Glenn Jenkins, "Consumer Preferences for Improvements in Mobile Telecommunication Services," 2015, <https://doi.org/10.1016/j.tele.2015.07.002>.

⁵⁰ Ho Kyun Shin, Andrey Kim, and Chang Won Lee, "Relationship between Consumer's Preference and Service Attributes in Mobile Telecommunication Service," *Expert Systems with Applications* 38, no. 4 (April 2011): 3522-27, <https://doi.org/10.1016/j.eswa.2010.08.140>.

⁵¹ Neil J. Keon and G. Anandalingam, "Optimal Pricing for Multiple Services in Telecommunications Networks Offering Quality-of-Service Guarantees," *IEEE/ACM Trans. Netw.* 11, no. 1 (February 2003): 66-80, <https://doi.org/10.1109/TNET.2002.808409>.

This diversity in the service attributes considered relevant in telecommunications may have worked against the development of a concentrated body of research on the value of reliability specifically. However, it also points to an important consideration for ACCAN as it plans its investment in research to support advocacy. ACCAN might be better served by a choice modelling investigation of multiple service attributes than by a contingent valuation study of the value of a narrowly defined reliability outcome.

Our literature review did not suggest to us obvious scope for the development of a multipurpose metric in the telecommunications sector that could serve a similar function to the VCR in electricity. We concede the possibility that a telecommunications analogue of the VCR might have emerged if telecommunications had been subject to the same kind of regulatory framework that applies in electricity networks. Nonetheless, if such a metric could be developed, it appears to be some way off into the future.

4.2 Overview of studies

We examined studies on the non-market valuation of reliability and the relevant methods used across multiple sectors in Australia and internationally. Table 6, Table 7 and Table 8 provide summaries of studies in the electricity, water and broadband contexts, including the approaches and valuation measures used.

Table 6 Non-market valuation studies on the value of reliability in electricity

Study (Year)	Jurisdiction	Study goal and studied attributes	Valuation method(s)	Relevant insights
Willingness to pay for residential electricity supply quality and reliability ⁵² (2014)	Canberra	To inform the amount of expenditure that should be reflected in the revenue requirement for a service provider Studied attributes: households' WTP to avoid specific restrictions on service supply quality (especially reliability) in residential electricity, frequency of outages, duration of outages.	Choice modelling	Residential customers value reliability of the electricity service. In particular, frequency and the duration of outages are important to customers, and customers value incurring fewer and shorter outages. Average WTP to avoid a common set of events such as outages, power surges and flickers in electric current vary from \$60 (2012) per customer per event for an 8 hour electricity outage when it occurs once a year through to \$9 per event for a flicker in electric current.
Estimating the willingness to pay for reliable electricity supply ⁵³ (2016)	Turkey	To examine household WTP for improved electricity service Studied attributes: frequency of outages, duration of outages, notification of outages and timing of outages (season, day of the week, time of day)	Choice modelling	To avoid the cost of outages, households are willing to incur a 3.6% and a 13.9% increase in their monthly electricity bill for summer and winter, respectively. The willingness to pay per hour unserved is \$0.24 USD (2008) for summer, and \$0.92 USD (2008) for winter.
Value of Customer Reliability Final Report ⁵⁴ (2014)	Australia	To review of the value of customer reliability to provide national level value of customer reliability (VCRs) for the first time Studied attributes: Length of outage, frequency, timing	Choice modelling and contingent valuation	Choice modelling was used to establish the relative importance to customers of the different characteristics of unplanned outages (duration, frequency, time of year, time of day) Contingent valuation was used to establish customers' willingness to pay for improvements in average reliability. Residential \$25.95 VCR \$/kWh (2013) Agriculture \$47.67 VCR \$/kWh Commercial \$44.72 VCR \$/kWh Industrial \$44.06 VCR \$/kWh Direct connect customers \$6.05 VCR \$/kWh
CBD and Inner Metro VCR estimates ⁵⁵ (2016)	Australia	To determine defensible values of the Value of Customer Reliability (VCR) that can be applied to unserved energy estimates in both Sydney's CBD and Sydney's Inner Metropolitan (Inner Metro) areas, drawing on existing, publicly available VCR estimates. Studied attributes: type of customer, location, length of outage, frequency of outage	Used AEMO 2014 VCR as a base, the applied a range of income uplift factors to value CBD/Inner Metro Residential VCR. Used OGW's VCR as a base for CBD/Inner Metro Commercial VCR, adjusting for size of commercial customer	Total CBD VCR: \$150-\$192/kWh (in 2015/16\$) Total Inner Metro VCR: \$90/kWh (in 2015/16\$)

⁵² David A. Hensher, Nina Shore, and Kenneth Train, "Willingness to Pay for Residential Electricity Supply Quality and Reliability," *Applied Energy* 115 (February 15, 2014): 280-92, <https://doi.org/10.1016/j.apenergy.2013.11.007>.

⁵³ Aygul Ozbaflı and Glenn P. Jenkins, "Estimating the Willingness to Pay for Reliable Electricity Supply: A Choice Experiment Study," *Energy Economics* 56 (May 1, 2016): 443-52, <https://doi.org/10.1016/j.eneco.2016.03.025>.

⁵⁴ Australian Energy Market Operator, "Value of Customer Reliability Review."

⁵⁵ Houston Kemp, "CBD and Inner Metro VCR Estimates (A Report for TransGrid)" (Sydney, Australia, July 28, 2016), <https://www.ipart.nsw.gov.au/files/sharedassets/website/shared-files/investigation-section-12-publications-electricity-transmission-reliability-standards/consultant-report-transgrid-vcr-estimates-july-2016.pdf>.

Study (Year)	Jurisdiction	Study goal and studied attributes	Valuation method(s)	Relevant insights
Economics of Widespread, Long-Duration Power Interruptions ⁵⁶ (2019)	US	Assessing the state of knowledge on valuation techniques applicable to long duration and widespread power outages.	Contingent valuation; customer damage functions; macroeconomic modelling (I/O and CGE)	Different methods are required for analysing interruptions that are of longer duration (days, weeks, or longer) and of a larger geographic scope (entire metropolitan areas or regions which may extend across multiple service territories). That is VCR methods and the resulting valuations are not applicable to these types of outages.
Economic assessment of electricity distribution reliability standard packages ⁵⁷ (2018)	South Australia	To examine the economic efficiency of selected reliability improvements that could be implemented in different parts of South Australia's electricity distribution network Studied attributes: reliability, frequency of outages, length of outages	Contingent valuation	Customers are willing to pay about (2018) \$7 per year (on average) to allow SA Power Networks to provide guaranteed service level (GSL) payments to customers that experience long one-off outages. This is about 60% of what every customer currently contributes annually on their electricity bill for these payments. However, 42% of customers said they would prefer to not pay anything at all for the GSLs.
Study on Estimation of Costs due to Electricity interruptions and Voltage Disturbances ⁵⁸ (2010)	Europe	To advise the Council of European Energy Regulators how to design and develop nationwide cost-estimation studies	Contingent valuation; Direct cost studies; Preventative cost method	Recommends the use of contingent valuation techniques for households but also encourages consideration of direct cost method for households and other customer types. This involves surveying customers with an extensive list of potential cost categories for them to assign estimated values to.
Value of Lost Load: An Efficient Economic Indicator for Power Supply Security? A Literature Review ⁵⁹ (2015)	International	A literature review of methods of valuing lost load – a concept very similar to VCR.	Blackout studies; Willingness to pay/avoid; Direct cost studies; Production function techniques	In some cases, VCR and its equivalents can be estimated using bottom-up analysis of the damage costs and mitigation costs imposed on customers. This procedure is mainly applied for industrial and commercial users, for which electricity inputs to operations may be well documented or understood.

⁵⁶ P. Larsen et al., "Frontiers in the Economics of Widespread, Long-Duration Power Interruptions: Proceedings from an Expert Workshop," 2019.

⁵⁷ Oakley Greenwood, "Economic Assessment of Electricity Distribution Reliability Standard Packages," June 26, 2018, <https://www.escosa.sa.gov.au/ArticleDocuments/1186/20180801-Electricity-EconomicAnalysisReliabilityImprovementPackages-SSF20Report-OakleyGreenwood.pdf.aspx>.

⁵⁸ Matthias Hofmann et al., "Study on Estimation of Costs Due to Electricity Interruptions and Voltage Disturbances," *SINTEF Energy Research*, 2010.

⁵⁹ Thomas Schröder and Wilhelm Kuckshinrichs, "Value of Lost Load: An Efficient Economic Indicator for Power Supply Security? A Literature Review," *Frontiers in Energy Research* 3 (2015), <https://doi.org/10.3389/fenrg.2015.00055>.

Table 7 Non-market valuation studies on the value of reliability in water

Study (Year)	Jurisd.	Study goal and studied attributes	Valuation method(s)	Relevant insights
Willingness to Pay Research Project ⁶⁰ (2012)	ACT	To estimate the amounts of money that household in the ACT are willing to trade for changes in water supply security, and electricity and gas supply reliability. Studied attributes: Value to customers of reducing the likelihood of – Stage 4 restrictions by 5 percentage points; Stage 3 restrictions by 5 percentage points; and Stage 2 restrictions by 5 percentage points	Choice modelling	\$222.74 annual WTP \$ per household (2012) \$78.32 annual WTP \$ per household \$22.38 annual WTP \$ per household
Willingness to pay to avoid water restrictions in Australia under a changing climate ⁶¹ (2014)	Greater Sydney, NSW	To assess the value to customers of 1% reduction in the probability of a Level 2 water restriction (No sprinklers, but hand-held hoses with trigger permitted 2 days/week) and of a 1% reduction in the probability of a Level 1 water restriction (Sprinklers only permitted 2 days per week)	Choice modelling	\$4.87 annual WTP \$ per household \$1.30 annual WTP \$ per household
Willingness to Pay to Avoid Water Restrictions in Australia Under a Changing Climate ⁶² (2018)	Wodonga, Melbourne, Bendigo, Goulburn, Albury, Sydney	To assess WTP to avoid water restrictions. Studied attributes: WTP in periods of drought vs post-drought (with and without house price)	Contingent valuation	The study found that WTP estimates change over time in almost all regional centres, but not in Sydney and Melbourne when housing prices are considered \$145 (Melbourne) annual WTP \$ per household; \$149 (Sydney) annual WTP \$ per household
Measuring Welfare Losses from Urban Water Supply Disruptions ⁶³ (2015)	San Francisco Bay Area (SF) and Southern California (SC)	The study evaluates welfare losses from urban water supply disruptions, looking at annual WTP in order to avoid 10% percent disruption	Utility Fixed Effects Model	\$65.09 (SF) annual WTP AUD\$ per household (2015) \$82.38 (SC) annual WTP AUD\$ per household

^a WTP estimates from Water studies have been inflated to 1 July 2018 dollars using the Australian consumer price index.

⁶⁰ Ben McNair and Michael Ward, "Willingness to Pay Research Project," Final Report (Prepared for ACTEW Corporation, 2012).

⁶¹ Bethany Cooper, Michael Burton, and Lin Crase, "Avoiding Water Restrictions in Australia: Using a Finite Mixture Scaled Ordered Probit Model to Investigate the Impact of Changes in the Climatic Setting" (World Congress of Environmental and Resource Economists, 2014).

⁶² Bethany Cooper, Lin Crase, and Michael Burton, "Willingness to Pay to Avoid Water Restrictions in Australia Under a Changing Climate," *Environmental and Resource Economics*, March 2, 2018, 1–25, <https://doi.org/10.1007/s10640-018-0228-x>.

⁶³ Steven Buck et al., "Measuring Welfare Losses from Urban Water Supply Disruptions," *Journal of the Association of Environmental and Resource Economists* 3, no. 3 (July 27, 2016): 743–78, <https://doi.org/10.1086/687761>.

Table 8 Non-market valuation studies on the value of reliability in broadband

Study (Year)	Jurisd.	Study goal and studied attributes	Valuation method(s)	Relevant insights
Household Demand for Broadband Internet ⁶⁴ (2010)	USA	To determine consumer valuations of different aspects of broadband internet service Studied attributes: household data, eight internet service characteristics (including cost, connection speed, connection reliability, wireless connectivity)	Choice modelling	It found that reliability and speed are important service characteristics, reflected in WTP: USD \$20 per month for more reliable service (2010) USD \$79 per month for a fast, reliable Internet service
Broadband Internet access, awareness, and use: Analysis of United States household data ⁶⁵ (2005)	USA	To understand into how important various attributes including reliability attributes are in determining customer choice of service. Studied attributes: 'always-on', price, speed, installation, and reliability	Choice modelling	WTP up to USD \$16.54 for more reliable service (2002); \$11.37 for more speed and \$5.07 for 'always on' (Note: study does not explicitly state the period – whether monthly or annually – Synergies believes values most likely to be “per month”)
Characterizing and improving the reliability of broadband internet access ⁶⁶ (2011)	USA	To demonstrate the growing importance of reliability by measuring its effect on user behaviour. Studied attributes: three different ways in which the “reliability” of broadband services can be measured: (1) the reliability of the service itself; (2) the reliability of network services offered by the ISP (e.g., DNS); and (3) the consistency of the service’s performance.	Analysis of data packet and outage data	The study demonstrated that where consumers experience a consistently lossy connection – one with high average packet loss – they make less use of the service (implying that some give up and forgo the benefit of internet use).
Assessing broadband reliability: measurement and policy challenges ⁶⁷ (2011)	USA	To assess broadband reliability and what reporting requirements should be for various types of outages at the current time Studied attributes: reliability, speed, access	N/A	Consumers identified concerns about reliability as second only to speed in importance
Measuring performance when broadband is the new Public Switched Telephone Network ⁶⁸ (2013)	USA	To investigate the metrics which will need to be considered by communications policymakers as the world transitions to broadband as the new PSTN and as essential infrastructure. Studied attributes: reliability of performance, connectivity and core services.	N/A	Defining metrics will be difficult due to the nature of broadband internet – heterogenous, complex and dynamic. Performance metrics are needed to formulate, target, and enforce effective communication policies. The challenge of meeting these needs is complicated by the growing complexity of broadband and the more dynamic market and regulatory environment in which the new PSTN exists
Internet QoS: Pieces of the puzzle ⁶⁹	International	Qualitative investigations into how to make quality of service (QoS) an explicit service attribute given relevant features of the internet and related networks.	N/A	The study found that no Internet service provider sell QoS explicitly, be it for residential or business customers. Reflects in part the monopoly characteristics of the physical networks that reduce the scope for retailers to differentiate on the basis of reliability.

⁶⁴ Gregory L. Rosston, Scott J Savage, and Donald M Waldman, “Household Demand for Broadband Internet in 2010,” *The B.E. Journal of Economic Analysis & Policy* 10, no. 1 (2010), <https://doi.org/10.2202/1935-1682.2541>.

⁶⁵ Scott J. Savage and Donald Waldman, “Broadband Internet Access, Awareness, and Use: Analysis of United States Household Data,” *Telecommunications Policy* 29, no. 8 (September 2005): 615–33, <https://doi.org/10.1016/j.telpol.2005.06.001>.

⁶⁶ Zachary Bischof, Fabian Bustamante, and Nick Feamster, “Characterizing and Improving the Reliability of Broadband Internet Access,” SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, February 11, 2018), <https://papers.ssrn.com/abstract=3121942>.

⁶⁷ William Lehr et al., “Assessing Broadband Reliability: Measurement and Policy Challenges,” SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, September 24, 2011), <https://papers.ssrn.com/abstract=1979746>.

⁶⁸ William Lehr, Steven Bauer, and David D. Clark, “Measuring Performance When Broadband Is the New PSTN,” *Journal of Information Policy* 3 (2013): 411–41, <https://doi.org/10.5325/jinfopoli.3.2013.0411>.

⁶⁹ Meddeb, “Internet QoS.”

4.3 Case study: SA reliability standards review

In January 2019, the Essential Service Commission of South Australia (ESCOSA) published its final decision from its SA Power Networks 2020 reliability standards review, which set reliability levels for the next 5 years and reformed the basis for compensation payments (Guaranteed Service Level scheme). Based on willingness to pay studies, ESCOSA determined that:

- Reliability levels should remain unchanged; and
- Compensation payments would be reduced in scope and be targeted to compensating customers with ongoing, persistent reliability issues.

The willingness to pay study relied upon by ESCOSA was prepared by Oakley Greenwood in June 2018,⁷⁰ which surveyed SAPN customers using a contingent valuation approach.

4.3.1 Reasons for using contingent valuation

In its report, Oakley Greenwood provided a detailed explanation of their reasons for adopting contingent valuation over choice modelling for this purpose.

Firstly, Oakley Greenwood noted that:⁷¹

“[Contingent valuation] provides a means for getting a specific estimate in absolute dollar terms of the value each respondent places on each reliability improvement option. ... By contrast, [choice modelling] only provides information on customers’ preferences regarding different costs in combination with other attributes of a service improvement option. It cannot (on its own) provide a definitive statement of willingness to pay for any specific level of cost of a service improvement option.”

Oakley Greenwood noted the advantage that choice modelling typically offers by showing how customers are willing to trade-off different attributes against one another, but then explained why this advantage wasn’t relevant to the question at hand. Essentially, the things required to improve the frequency and duration attributes vary considerably by location and it would be impractical for the distributor to specify variable “packages” of outlays that would deliver different levels of improvement in each attribute. As a result, Oakley Greenwood concluded that “there is not a smooth

⁷⁰ Oakley Greenwood, “Economic Assessment of Electricity Distribution Reliability Standard Packages.”

⁷¹ Oakley Greenwood, 13.

trade-off relationship between improvements in the frequency and duration of outages”.⁷²

Given the constraints on how the electricity distributor would deliver reliability improvements in practice, Oakley Greenwood concluded that the insights into customer preferences for trade-offs between multiple attributes would be of largely academic interest only.

4.3.2 Determining compensation payments

Given ACCAN’s interest in calculating compensation payments, we point out that the Oakley Greenwood analysis was not used directly for this purpose. Oakley Greenwood directed the contingent valuation study towards determining the average willingness to pay for 5% and 10% improvements in reliability and then they used these valuations as inputs to a cost-benefit analysis of different reliability levels. ESCOSA then selected the most economically efficient reliability setting⁷³ and derived compensation by multiplying the VCR (\$/MWh) determined by AEMO by the implied amount of energy not served (MWh) to a customer experiencing different total outage durations.

4.3.3 Implications for ACCAN

ESCOSA’s review of reliability standards and compensation levels offers illustrates two points relevant to ACCAN’s non-market valuation strategy. Firstly, the potential richness of choice modelling insights should be considered in light of what could be done with those insights that would be of practical value to the consumers ACCAN represents. Secondly, the review underscores the continuing acceptability of contingent valuation as an appropriate technique in circumstances where the options to be evaluated can be narrowly specified.

The fact that ESCOSA opted to use VCR as the basis for setting the level of compensation payments for eligible customers may not be particularly relevant to ACCAN. It illustrates the very wide application that the VCR has as a metric of incremental cost/value in the electricity sector. However, in the absence of VCR, we consider that it would also have been feasible for ESCOSA to use a stated preference valuation approach to determine the appropriate level of compensation.

⁷² Oakley Greenwood, 14.

⁷³ As demonstrated by Oakley Greenwood’s cost benefit analysis

5 Benefit Transfer

5.1 Opportunities for benefit transfer

Based on the literature reviews of non-market valuation studies for the value of customer time and the value of reliability, Synergies considers that there is a promising benefit transfer opportunity in the case of valuing customer time, but not in the case of estimating the value of long delays in receiving a broadband service connection or experiencing an outage.

In the case of customer time, we consider that there is a sound basis for considering that the costs incurred by a person spending time trying to resolve a service issue with a telco provider will have much in common with those incurred by a commuter using the transport system to travel from one point to another. In both cases, the costs relate primarily to the opportunity cost of a person's time – the value of the best alternative use of that person's time. In both cases, there may be differences in cost depending on the relative unpleasantness or perceived inconvenience of the experience. In both cases the commuter or customer is engaged in a largely non-discretionary activity. In both cases, there may be scope for the commuter or customer to mitigate costs by multitasking during some steps in the process.

In the case of reliability, we do not see an opportunity for benefit transfer to be used to value the parameter of interest – namely the cost of excessively long waits to receive a service connection or experiencing an outage. The valuation studies we identified in the water and electricity sectors apply to services that provide utility to customers in ways that are very different to telecommunication services. The impact on a customer of being denied access to a fixed broadband service for a day is clearly not equivalent to the impact of being without electricity for the same period, nor to the impairment of a household's ability to water its garden over summer. Thus to estimate the value to customers of lengthy delays in service connection, we consider that a novel non-market valuation study would be required.

The following sections detail how we consider that the ATAP guidelines could be applied to perform a benefit transfer of value of time estimates from the transport context into a telecommunications setting.

5.2 Overview of the ATAP time valuation framework

In Australian transport planning, best practice for the estimation of non-market value has come to be embodied in the Australian Transport Assessment and Planning (ATAP) Guidelines, which align closely with Infrastructure Australia's (IA) Reform and Investment Framework. IA regards the ATAP Guidelines as representing best

practice for transport planning and assessment in Australia and accordingly hosts these materials on its website.⁷⁴

The ATAP Guidelines are routinely applied to assess the costs and benefits of major transport infrastructure projects. The non-market values provided in the Guidelines support benefit transfer estimations of, for instance, the economic benefits of investments to reduce congestion or reduce average travel times. Examples of multi-billion projects from IA's infrastructure high priority list that use this approach include:

- M4 Motorway upgrade from Parramatta to Lapstone (NSW);
- Sydney Metro: City and Southwest (NSW);
- Western Sydney Airport (NSW);
- M80 Ring Road upgrade (Vic);
- Monash Freeway Upgrade Stage 2 (Vic);
- North East Link (Vic);
- Brisbane Metro (Qld); and
- METRONET: Yanchep Rail Extension (WA).

The ATAP Guidelines specify a headline value for the cost of each hour an average person spends travelling in a vehicle – the value of in-vehicle time (IVT), expressed in units of dollars per hour. The guidelines then specify a set of multipliers that can be applied to adjust the IVT to calculate an accurate estimate of the cost of time forgone during an entire journey from Point A to Point B. The resulting generalised value of time measure is the weighted sum of the value of time across all steps making up a journey.

5.3 Application of ATAP Guidelines to customer wait times

Not all measures specified by ATAP in relation to a public transport journey are relevant in this context. Resolving an issue with a customer service representative, whether by phone, in person or by email, is less complex and hence unlikely to require the whole suite of adjustment multipliers estimated in the Guidelines.

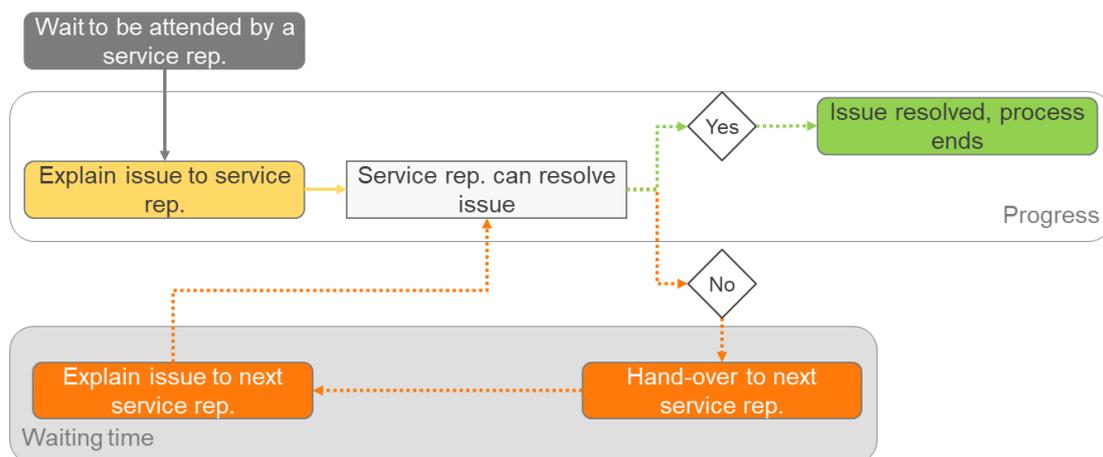
⁷⁴ Regional Development and Cities Department of Infrastructure, "Infrastructure Australia - Associated Websites," Infrastructure, Regional Development and Cities, accessed April 12, 2019, <https://infrastructure.gov.au/utilities/websites.aspx>.

In most cases the resolution of an issue proceeds by the following steps:

1. The customer calls, visits or lodges a written communication and waits to be attended to by a customer service representative
2. The customer explains the issue to the service representative (for engagement by email, this step may occur as the first step)
3. If the service representative is able to resolve the issue the process then ends
4. If the service representative is not able to resolve the issue, the customer is then handed off to another operator and the process resumes at step 2.

Synergies proposes to classify the above steps in obtaining a resolution to a telco service issue according to whether the customer is likely to experience the feeling that they are making progress towards their objective or feel they are merely waiting. If the first service representative is able to resolve the issue, waiting time only occurs during Step 1. If the first service representative is unable to resolve the issue, all subsequent steps can be considered waiting time since in their view the customer does not make progress. The first time the customer explains the issue to the service representative can be considered progress. The reason for treating the first and second rounds of explanation differently is explained later in this section. Figure 2 illustrates the steps in the process and shows the classification of each step as either progress or waiting time.

Figure 2 Steps in resolving a telco service issue



Data source: Synergies illustration

The public transport journey equivalent of progress is the time spent moving, which in the ATAP framework is simply the IVT. This time constitutes the unavoidable component of the process necessary to achieve the goal during which the traveller or customer could perform other tasks but typically does not feel frustration. The time

spent waiting tends to involve varying degrees of frustration for which the IVT value should be adjusted. In the public transport setting, there are two types of waiting time:

- wait time relates to the time spent at a bus stop or train station; and
- a transfer penalty is typically applied for this waiting time when it is at an intermediate point of the journey, e.g. when the traveller changes from a feeder bus to the train that takes them to their ultimate destination;

An equivalent distinction is likely to be applicable to time spent waiting to resolve a service issue. While re-explaining an issue can be unpleasant, waiting for the opportunity to do so may be considered frustrating and thus disliked even more. We therefore suggest that the valuation of time spent resolving a service issue apply between two and four valuation estimates to different steps in the process, as set out below.

At a minimum:

- the time spent on the initial explanation to the first service representative should be valued at the unadjusted IVT; and
- time spent waiting during hand-overs between service representatives should be valued at the IVT multiplied by the transfer penalty adjustment.

In addition, to estimate upper limit values:

- the time the customer waits for the first service representative to answer and any time waiting during handovers and re-explaining the issue to subsequent service representatives could be valued at the IVT multiplied by the wait time adjustment;⁷⁵ and
- the time spent re-explaining an issue after several iterations could be valued at the IVT multiplied by the crowded conditions multiplier.

These proposed matches between ATAP parameters and the components of a customer's "journey" through a service interaction are summarised in Table 9.

⁷⁵ The ATAP guidelines also include a penalty for crowded conditions. This represents an adjustment for personal discomfort. It could be argued that once a customer has re-explained their problem several times such discomfort sets in.

Table 9 Applying ATAP parameters to resolving an issue

Step in the process	Recommended value	Maximum value
Wait for answer	IVT	IVT x wait time adjustment (1.4)
Explain issue to operator	IVT	IVT
Transfer to other operator	IVT x wait time adjustment (1.4)	IVT x transfer penalty (1.5)
Explain issue to next operator	IVT x wait time adjustment (1.4)	IVT x crowded conditions multiplier (1.65) ^(a)

(a) use only in cases where the customer has been through several iterations of re-explaining the problem

Source: Synergies analysis

5.4 Calculating the values

The value of in-vehicle time in uncrowded seated conditions is measured in dollars per hour and based on regression analysis conducted by ATAP of 31 Australian and NZ studies, mainly Stated Preference surveys undertaken between 1990 and 2014. The average value for IVT in Australia based on this estimation is \$12.80 per hour in 2014 dollars.⁷⁶ Applying CPI figures escalates this value to \$13.67 per hour in 2018 dollars.⁷⁷

The adjustment multipliers provided in the ATAP Guidelines were derived from the same review of 31 Australian and New Zealand studies as the IVT is based on. The adjustment multiplier are as follows:⁷⁸

- Wait time: 1.4
- Transfer penalty: 1.5
- Standing in crowded conditions: 1.65

Table 10 shows the IVT values combined with the multipliers, giving the recommended and maximum values for the four steps in the service resolution process measured in \$13.67 per hour in 2018 dollars. It shows that the recommended value of waiting time is \$19.14 per hour, that is the waiting time penalty amounts to \$5.47 per hour. Under extreme conditions, e.g. if a customer has to explain their problem to the fourth service representative, it could be argued that this penalty value increases to up to \$8.89 per hour making the total value of time \$22.56 per hour.

⁷⁶ Transport and Infrastructure Council (2018); Australian Transport Assessment and Planning Guidelines: M1 Public Transport, p. 2

⁷⁷ Based on ABS catalogue 6401.0 Consumer Price Index, Australia the average CPI in 2014 was 106.1 and that in 2018 113.3.

⁷⁸ Transport and Infrastructure Council (2018); Australian Transport Assessment and Planning Guidelines: M1 Public Transport, p. 5

Table 10 Applying ATAP parameters to resolving an issue on the phone (\$/hour)

Step in the process	Recommended value	Maximum value
Wait for answer	\$13.67	$\$13.67 * 1.4 = \19.14
Explain issue to operator	\$13.67	\$13.67
Transfer to other operator	$\$13.67 * 1.4 = \19.14	$\$13.67 * 1.5 = \20.51
Explain issue to next operator	$\$13.67 * 1.4 = \19.14	$\$13.67 * 1.65 = \22.56

Note: Rounded values

Source: Synergies analysis of ATAP data

We stress that the values shown in Table 10 represent recommended and maximum value estimates if ACCAN seeks to estimate values from the ATAP guidelines. We would expect there to be valid alternative estimates (both higher and lower than the estimates shown) based on other studies and methods described earlier in this report.

5.5 Defensibility

In support of our proposed approach to applying the ATAP guidelines as described above, we make several points. The ATAP Guidelines are widely accepted and regularly updated, which suggests that the values and the valuation framework can be considered robust, at least in the travel context. Many critiques of non-market valuations rest on technical objections to the sampling and survey methods or the scarcity of studies and we consider that similar critiques must be considered weak in this instance.

We consider that there is no reason to believe that a person has a smaller range of alternative uses of their time when they are on the phone dealing with a service call than if they are commuting. In other words, the alternative activities that would be available to a person who could avoid spending an hour on either of these two tasks (waiting to resolve a service issue or commuting), seem more likely to be very similar. Since the value of one's time is primarily a function of the opportunity cost of that time, this suggests that substituting values from a travel context into the context of resolving a service issue is reasonable.

We further consider that there are grounds for considering that an estimate of the value of time from a travel context could underestimate the inconvenience cost experienced by telecommunication customers. Firstly, it could be relevant that in the case of travel, consumers generally have choices between different transport modes – allowing them to choose a mode that minimises their subjective experience of inconvenience. In the case of telecommunication customers, the customer has essentially no choice as to how they can resolve their service issue – they must deal with their service provider's call centre (or alternative point of contact). Secondly, many commuters now use bus or train time to check emails, read a book or perform many other work or leisure related

activities that can be mediated by a smart phone. The increased opportunity to do this creates considerable scope to reduce the opportunity cost of the time spent travelling. We predict that there would be less scope to engage in parallel activities of this kind when waiting on a service call and clearly less scope when explaining the problem to a customer service representative.

Some may argue that spending time on public transport is less pleasant than spending time at home, waiting on the phone and that therefore a lower average value of time should apply to the latter. Such arguments are plausible, but a proponent of this view ought to be able to account for why the value of time for private car journeys has been found to be similar to, indeed slightly higher than, the value of time for public transport journeys.⁷⁹

Synergies believes the main source of uncertainty in applying the ATAP Guidelines to the telecommunications context as proposed is in the adjustments required to reflect the additional unpleasantness or frustration with particular variants or steps in the process. This could be addressed by presenting valuations in the form of a range with the unadjusted value (IVT) used to estimate the bottom of the range and the adjusted values used to estimate the top of the range.

Finally, if ACCAN undertakes novel research into the value of time in the context of resolving service issues, we think there would be value in returning to crosscheck these results against the ATAP Guidelines. We could also envisage designing a choice modelling experiment by thinking about the different steps in a service call and specifying these as attributes such that the relative importance of these different aspects of the customer service experience could be assessed.

⁷⁹ Neil Douglas and Julieta Legaspi, "Estimating the Value of Private Car Travel Time and Reliability for NSW," in *ARRB International Conference, 28th, 2018, Brisbane, Queensland, Australia, 2018*.

6 Guidance for conducting bespoke primary research

As the preceding sections have made clear, a considerable body of evidence already exists to support the estimation of the value of customer time in a telecommunications service context. This is less true in the case of estimating the costs of interruptions or delays in receiving a telecommunications service. However, in both instances, ACCAN may form the view that bespoke primary research would be of benefit to future public policy discussions. This section offers guidance to inform how such primary research may be approached.

6.1 Scope of guidance

Based on the materials provided and discussions with ACCAN there are several potential research objectives that ACCAN may pursue through bespoke research. In relation to the value of customer time, we understand that ACCAN intends to use a valuation as part of demonstrating the “broader economic costs of poor customer service, and the need for further regulatory interventions to address these costs”⁸⁰. In relation to service reliability, we understand that the ultimate purpose of a valuation may be to provide an estimate on which to base customer compensation payments by a service provider for failure to meet minimum service levels – for instance for connection times.

The first of these bespoke research objectives – providing an estimate of broader economic cost – implies two different types of research: a non-market valuation study of the value of customer time forgone (choice modelling) and a second investigation to quantify the amount of time spent waiting to resolve issues per customer per year⁸¹ (customer service survey). In the case of service reliability, it appears that only a non-market valuation study would be required.

The guidance offered in this section relates to non-market valuation studies and we haven’t considered the methodological issues that may accompany a study to robustly estimate average wait times. However, we would anticipate that a market research firm would be well placed to address any such issues. Moreover, in the case of the non-market values studies, we think that there will be some benefit in ACCAN gaining a better awareness of some methodological issues before it goes to market to seek a service provider to undertake these studies.

⁸⁰ ACCAN Brief – 5 February 2019

⁸¹ We are not suggesting that these research questions must be addressed through separate studies or surveys. We simply note that they are distinct types of investigation.

6.2 Valuation approach

On the question of what valuation approach(es) may be suitable for ACCAN, our high-level advice can be summarised as follows.

- *Both contingent valuation⁸² and choice modelling are relevant, well accepted techniques that could be used to value both customer wait times and service reliability.*

Contingent valuation may be the best approach if ACCAN is highly budget constrained and interested in valuing a narrowly defined option or outcome for a point-in-time application (that is, there is a single attribute of interest). Choice modelling would be the better approach if ACCAN can afford it and believes that it may need valuation evidence to support advocacy concerning other service attributes besides the timeliness of service call resolution or the extent of connection wait times. Choice modelling results would also allow ACCAN the flexibility to explore customer values across a range of future service offerings, and therefore the estimates generated by choice modelling are likely to have longer 'shelf-life' than contingent valuation (notwithstanding the need to update the values periodically as consumer preferences may change over time).

- *Revealed preference studies unlikely to be relevant to ACCAN*

We have not identified any opportunities for ACCAN to use revealed preference techniques to estimate the value of customer time forgone or the costs of a service provider failing to meet mandated connection and repair timeframes. Studies of this kind would likely require access to high value commercial data held by telcos – access that ACCAN wouldn't normally expect to enjoy.

- *Direct cost method unsuitable for valuation purposes, though approach may be helpful in designing a stated preference study of reliability.*

Notwithstanding the fact that the direct cost method has been used in the electricity context, we don't consider the technique robust for the purposes of estimating non-market values for diverse small customers⁸³ as ACCAN is interested in doing. However, we think that it may be useful to develop a list of the types of costs that connection delays impose, since this could be helpful in framing survey questions.

⁸² Here we refer to a referendum-style survey type, rather than open-ended questionnaires.

⁸³ That is, many different types of households and small businesses, as distinct from a small number of very large enterprises for which it might be feasible to carry out a small number of detailed business process studies that calculate the cost of disruptions to business inputs.

In the following section, we identify methodological considerations for ACCAN to be aware of if it pursues either a contingent valuation or choice modelling study.

6.3 Methodological considerations

If ACCAN intends to commission a stated preference survey of some type – whether contingent valuation or choice modelling – the following methodological issues and preparations should be considered.

6.3.1 Choice of provider

ACCAN should choose a market research firm with extensive experience in designing and delivering both contingent valuation and choice modelling surveys. ACCAN should request examples of the consultant's reports to clients in order to assess how accessible the consultant has made its work to past clients.

6.3.2 Willingness to pay versus willingness to accept

As an advocacy body, ACCAN is interested in raising consumer welfare. ACCAN therefore would be expected to advocate for service providers to lift their performance, without increasing their charges. This perspective may lead it to prefer a survey design that frames questions in terms of customers' willingness to accept compensation for service below a minimum level rather than in terms of their willingness to pay for improved service. We encourage ACCAN to adopt the willingness to pay framing when designing research. We consider this approach to be more robust as respondents are likely to regard the framing as credible and easy to grasp. An emphasis on tangible service attributes as part of a willingness to pay assessment is likely to produce a more valid measure of value.

6.3.3 Specification of options / attributes

If conducting a stated preference valuation study, for instance on the value of reliability, ACCAN should ensure that it has specified the option(s) in a manner that matches, as far as possible, the policy settings that it anticipates.

ACCAN should consult among its members and/or telecommunication customers (for instance by means of a workshop or focus groups) to obtain information on the set of attributes to test and the credible minimum and maximum attribute levels to specify for the model. The attributes identified in Section 4.1 provide a starting point for the attributes that ACCAN and its members may consider relevant. A workshop with

members would also provide an opportunity to ensure that the packages or choice sets presented are ones that respondents might expect to experience.

6.3.4 Sampling strategy

We understand that ACCAN's advocacy covers both "consumers" (which we take to mean residential customers) and small businesses. It is likely that the value of delays in receiving a service connection will differ considerably between these two groups and ideally, both groups would be separately tested. This would require survey samples to be drawn from both these sub-populations, which would increase the cost. A cheaper alternative might be to obtain a random sample of all customers that includes both consumers and small businesses. This would allow an average value to be estimated across both types, but would not allow separate valuations to be estimated.

ACCAN will need to assess the benefit to its advocacy of distinguishing between the value to residential customers and small business customers and compare this against the additional cost this would involve. This assessment can be done as part of the procurement process by requesting quotes for both approaches.

6.3.5 Other design choices

There are several stages in the design of a choice experiment and each involve important design choices. Synergies recommends that ACCAN note the matters listed in Appendix C, being issues and judgements for the specialised market research firm that ACCAN selects.

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8 Appendices

A. Sample Choice Modelling Survey

An example of a choice modelling survey form used in one of the studies reviewed here is shown in Figure A.1. The two alternative service packages Option A and Option B comprise a “choice set”. Cost, speed, reliability, priority are the service attributes.

Figure A.1 Example of a choice modelling survey for broadband fixed line service (US, 2010)

1. Consider the following two Internet service options, A and B. For this first question, we highlight the differences in the levels of the features in red. For some features, there may be no difference

[Click here to review a summary of the levels of all the features.](#)
To see the description of an individual feature, place your cursor over that feature

	Option A	Option B
Cost	\$25 per month	\$45 per month
Speed	Fast	Slow
Reliability	Less reliable	Very reliable
Priority	No	Yes
	<i>Option A is less expensive and faster</i>	<i>Option B is more reliable and has the Telehealth feature</i>
Select the option you prefer	<input type="radio"/> I prefer option A	<input checked="" type="radio"/> I prefer option B

2. Since you currently have Internet service at home, we also ask if you would actually switch to the Internet service, A or B, you have chosen. Please indicate “Yes” when your choice of A or B is preferred to your service at home, or “No” when your choice of A or B is not preferred to your service at home.

[Click here to review a summary of the levels of all the features.](#)
To see the description of an individual feature, place your cursor over that feature.

	Your Home Service	Option B
Cost	\$25.99 per month	\$45 per month
Speed	Fast	Slow
Reliability	Very reliable	Very reliable
Priority	No	Yes
Select the option you prefer	<input checked="" type="radio"/> I would stay with my home service	<input type="radio"/> I prefer option B

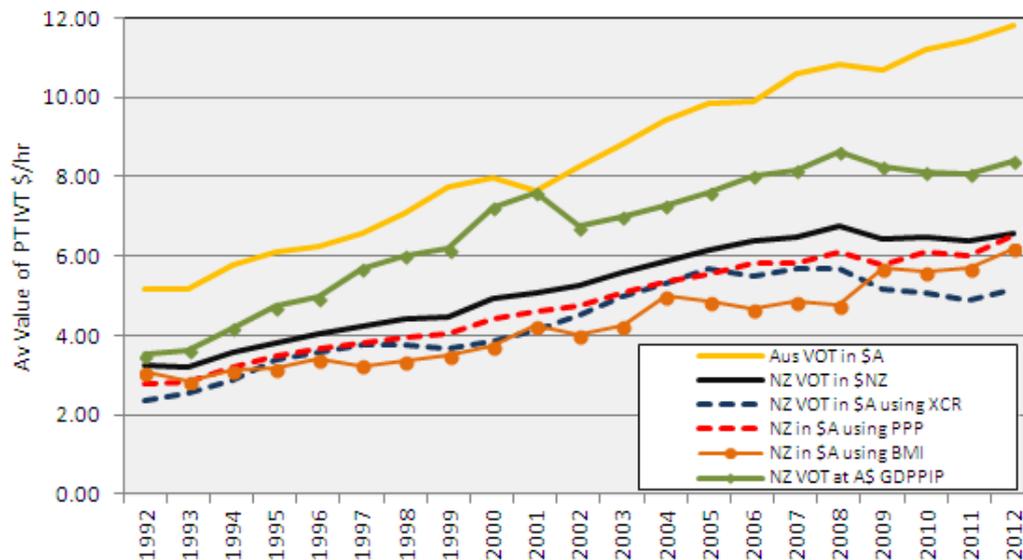
Data source: Rosston et al 2010⁸⁴.

⁸⁴ Rosston, Savage, and Waldman, “Household Demand for Broadband Internet in 2010.”

B. Income effects in benefit transfer

In our benefit transfer discussion, we noted the importance of accounting for differences in context between the study in which a value was estimated and the situation in which that value is to be applied by means of benefit transfer. Income effects on non-market values can be neatly illustrated by observing how valuations tend to increase in step with rising income and wealth in the population, with the implication that older estimates must be adjusted for income. This point is well illustrated in Figure B.1 – extracted from a 2013 NSW study.

Figure B.1 Trends in NSW/Australia & NZ Value of Time



Note: Average value of Public Transport Time \$/hr

Data source: Douglas and Wallis (2013)⁸⁵

⁸⁵ Douglas and Wallis, "Predicting the Value of Public Transport In-Vehicle Time."

C. Survey Design Considerations

There are several stages in the design of a choice experiment and each involve important design choices, as shown in Table C.1, Table C.2, Table C.3 and Table C.4. In most instances, these design considerations will be for a market research service provider to apply.

Table C.1 Dos and Don'ts of specifying attributes, attribute levels and customisation

DO

- Research attributes and attribute levels used in previous studies and their importance in the choice decisions ^(a)
- Consider the target population's perspective and experience in selecting and defining the attributes. Published and grey literature, such as policy documents and government reports, are a useful starting point for identifying attributes. ^(c)
- Use focus group studies to provide information on credible minimum and maximum attribute levels^(a) This will also ensure the range of situations are ones that respondents might expect to experience.
- Ensure that the attributes selected, and their levels, can be combined in a credible manner. ^(a)
- To appropriately inform policy, ensure participants are given the impression that their answers are consequential and that they might be compelled to pay any amount they commit to in the survey, which in turn gives participants an incentive to answer carefully and honestly. ^(a)
- Ensure that the payment mechanism by which people would financially contribute (e.g. taxes or fees) is specific and credible. The choice of payment can be difficult but can be informed by focus groups. ^(b)

Don't

- Limit attribute research to only one field/sector or the field/sector targeted by the survey ^(a)
- Use attributes that respondents are not familiar with^(a)
- Use an excessive number of choice sets and/or excessive number of attributes in each choice (which can affect quality of responses) ^(a)

Table C.2 Dos and Don'ts of experiment design

DO

- Ensure the levels of each attribute occur with equal frequency in the design^(a)
- Ensure the design has minimal overlap (where an attribute level does not repeat itself in a choice set) ^(a)
- Ensure there is utility balance, where the utility of each alternative within a choice set is equal^(a)

Don't

- Ignore the correlation between attributes, the choice set may not be credible to the respondent^(a)
- Do not assume a more advanced experimental design is superior to a simpler experimental design. The advantages of a more powerful design may be outweighed by the complexity and problems, such as obtaining information about the parameter values. ^(a)

Table C.3 Dos and Don'ts of experimental context, test of validity and questionnaire development

DO

- Use attributes that are sufficiently differentiated to ensure trade-offs^(a)
- Allow for a status quo alternative^(a)
- Use debriefing questions to identify and eliminate result bias. Debriefing questions can be used where respondents are asked to give reason why they focused on only one or two of the attributes in the survey. ^(a)
- Test for stability by including choice sets for half of the participants in the start of the survey and the other half in the end of the survey. This helps avoid issues of learning and fatigue effects resulting from task complexity. ^(a)

Don't

- Include more than 4 to 5 attributes in a choice set, which may lead to a severe detriment to the quality of the data collected due to the task complexity^(a) Task complexity arises when the amount of effort demanded when choosing the preferred alternative in a choice set may be so high that it exceeds the ability of the respondents to select their preferred option. ^(a)

Table C.4 Dos and Don'ts of sample selection and sampling strategy

DO

- Consider a more specific sampling method if a small but important sub-group is of particular interest (and budget availability)^(a)
- A simple random sample is generally a reasonable choice.^(a)

Don't

- The selection of sample strategy and sample size is largely dependent on the budget^(a)
-

Note: the points made in Table C.1 to Table C.4 predominantly relate to choice modelling experiments, though some will also apply to contingent valuation. Sources are indicated by superscripts as follows

- (a) Alpizar 2001⁸⁶
- (b) PC 2014⁸⁷
- (c) Mangham⁸⁸

⁸⁶ Alpizar, Carlsson, and Martinsson, "Using Choice Experiments for Non-Market Valuation."

⁸⁷ Productivity Commission, "Public Infrastructure: Inquiry Report," 2014.

⁸⁸ Lindsay J. Mangham, Kara Hanson, and Barbara McPake, "How to Do (or Not to Do) ... Designing a Discrete Choice Experiment for Application in a Low-Income Country," *Health Policy and Planning* 24, no. 2 (March 1, 2009): 151-58, <https://doi.org/10.1093/heapol/czn047>.