Embargoed until 09:00 17th May 2016

Channel Islands Fixed Network Broadband

2015 Customer Experience Study

Document No: CICRA 16/08

May 2016

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Table of Contents

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List of figures

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1 INTRODUCTION

This paper reports on the methodology and findings of a detailed study of the Internet experience of Channel Island consumers of fixed line broadband services provided by Sure[1], JT[2] and Newtel[3] (variously delivered through copper, fibre-optic and WiMax technologies). It should be read in conjunction with the technical report produced for CICRA by Actual Experience plc which is attached as Annex D[4]. It is similar to studies undertaken by Ofcom in the UK[5] in that it investigates all elements of the networks that contribute to the consumer's Internet experience and not simply the speed they obtain from their local access networks.

CICRA's intention in undertaking this work was to obtain objective data that can be used as input to discussions about whether Channel Island broadband services need improvements and where any associated investment should be made. Although it makes a number of recommendations it does not pre-empt discussions with stakeholders about levels of investment, who needs to make investment or how investments are to be funded.

CICRA would like to thank everyone that assisted in the collection and preparation of this report : Actual Experience, the three service providers, the near 1,000 members of the public that responded to the recruitment questionnaire and the 350 members of the public that participated.

About CICRA CICRA is the name given to the Jersey Competition Regulatory Authority and the Guernsey Competition and Regulatory Authority. Our aim is to ensure that consumers receive the best value, choice and access to high quality services in addition to promoting competition and consumers' interests. In Jersey, we are responsible for regulating the telecoms, postal and ports sectors along with administering and enforcing competition law. In Guernsey we are responsible for regulating the telecoms, postal and electricity sectors along with administering and enforcing competition law.

[1] In this document the name Sure refers to Sure (Guernsey) Limited and Sure (Jersey) Limited as appropriate.
[2] JT refers to JT (Guernsey) Limited (formerly known as Wave Telecom) and JT (Jersey) Limited as appropriate.
[3] Newtel refers to Newtel Limited and its associate companies (YTel and Homenet).
[4] Analysis of Internet Digital experience for CICRA by Actual Experience plc, April 2015 (annex D of this report).
[5] Investigation of Internet Quality of Experience for Ofcom 23rd July 2015 and Measurement of Internet Quality of 30th November 2015

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2 EXECUTIVE SUMMARY

There has been much discussion about the quality of the Channel Island's Internet service over many years. This often exhibits itself as complaints regarding the speed of the service, its reliability and the price paid.

The goals of the study were to move away from anecdotal discussion, to obtain objective evidence of consumer experience of Internet usage across the Channel Islands and to determine where any impairment to that experience exists. This relates to consumer experience of the Internet accessed via the fixed network broadband networks of the three provides of such services in the Channel Islands : JT, Sure and Newtel. It did not examine the experience of consumers accessing the Internet through the mobile (3G and 4G) networks nor did it consider issues of the price consumers pay or value for money.

Customer experience of the Internet is dictated by the combined performance of all the network elements between the customer and the on-line services being accessed : home computers and networks, local access networks, the equipment and networks of the service providers, the upstream communications paths across the global Internet and the servers of the organisations whose services the customer is accessing. Together these network elements are referred as the Digital Supply Chain (DSC).

The study commenced recruiting participants in the second quarter of 2015 and continued data collection until the end of September 2015. Data was collected from 152 participants in Jersey, 186 participants in Guernsey, 11 in Alderney and one in Sark. Participation in Guernsey and Jersey was sufficient to provide statistically significant, and thus reliable. Alderney's smaller sample size was large enough to provide at least indicative results, especially since elements of its DSC are shared with Guernsey and the samples could, in part, be aggregated. The level of participation in Sark was too small to enable it to be used but since Sark's telecommunications infrastructure, and thus its DSC, has much in common with Alderney's, it was considered that findings for Alderney would be applicable in Sark.

The study used a methodology and tools from Actual Experience which have been created from a body of academic work in the UK and proven in use by Ofcom in studies similar to this one. Actual Experience's detailed findings for the Channel Islands are attached as an annex to this report.

This report is confined to a description of the goals, objectives, methods and overall findings of the study. While it makes recommendations from these findings its does not discuss how these recommendations are to be implemented or funded.

The three key findings of the study are that :

- Channel Island consumer experience of the Internet accessed through fixed broadband connections was often acceptable to good, but there were situations where it could be frustrating and where consumers might occasionally give up.

- Approximately half of all impairment of the consumer experience was in the Upstream segments of the Channel Islands' DSCs. This applies in all locations and for all service providers.
- The remaining half of the impairment was reasonably evenly distributed between the Home, Access and ISP segments.

The key recommendation is that service providers reduce the impairment in the Upstream segments of their DSCs.

2.1 Findings

1. The experience of customers accessing the Internet through fixed network broadband connections throughout the Channel Islands can be good but it is often frustrating, and there are situations where it is too poor to provide usable service.
2. Alderney customers had a lower level of Internet experience than customers in Guernsey and Jersey and part of the additional impairment is seen in the Access segment of the DSC. It is assumed the same is true for Sark.
3. Approximately half of all impairment in Internet experience, regardless of service provider or location, was attributed to the Upstream segment of the DSC. The other half of the impairment was reasonably evenly distributed between the ISP, Access and Home segments.
4. While all network access technologies (FTTH, FTTC/VDSL, copper/ADSL and WiMax) were capable of providing a good level of experience, as was expected, FTTH technologies provided better levels of consumer experience than FTTC/VDSL technologies, which in turn provided noticeably better levels of experience than copper/ADSL technologies.
5. Consumer's that connect their equipment to their routers using Ethernet cables were more likely to have an acceptable level of Internet experience than those consumers using WiFi. WiFi users often experienced frustrating levels of service and WiFi users whose computer were a long distance from their router experienced worse service than those whose computer was close to their router.
6. Commonly used Internet services such as Skype operated adequately over the Channel Islands' DSCs but Netflix (a bandwidth intensive, rich content, streaming service) did not, suffering from the levels of impairment in the Upstream segment of the DSC. It is reasonable to expect that without improvements in the Upstream segment of the DSC and/or increase local caching, levels of experience with such streaming services will, as demand rises, decline below the level of frustrating.
7. The number of people in a household sharing a broadband connection, who can be expected to create concurrent demand, did not appear to have any significant effect on overall experience.

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2.2. Recommendations

1. An on-going programme of work providing advice to consumers regarding how they can reduce impairment in their premises. This can be based on the advice provided by Ofcom, and other authorities, and tailored to the particular circumstances of the Channel Island.

2. In recognition that broadband services are increasingly important to all sections of society, consideration to be given to providing vulnerable consumers with practical assistance in implementing the advice referred to in recommendation 1.

3. Acceleration of the replacement of legacy ADSL access networks by Next Generation Access networks (e.g. FTTH and FTTC) so that all consumers in all islands have access to fast and reliable services that can be expected to provide for their needs into the reasonably foreseeable future.

4. That access networks be designed and configured to provide products (characterised by download speed, upload speed, contention ratio and price point) that satisfy a wide range of needs.

5. Sure to review the capability for Internet traffic of the microwave links between Guernsey and Alderney, and Guernsey and Sark, together with the effect of line length in those islands. Where necessary increase the capacity and performance of these network elements to meet current and reasonably foreseeable future demand for Internet access in those islands.

6. Accepting economic constraints, service providers are to proactively ensure that the components of their ISP segments perform in a way that minimises impairment and maximises customer experience. This may involve optimisation of traffic routing as well as investment in equipment and bandwidth.

7. Service providers to improve the performance of their Upstream networks and/or locate larger amounts of content on the islands.

8. Service providers to be encouraged, and if need be assisted, to negotiate with content providers with the objective of locating content that is in high demand to the Channel Islands.

9. Regular, objective and reported monitoring of consumer experience of Internet services throughout the Channel Islands, with remedial action where it is considered to be required.

10. That Channel Island consumers should be made more aware of the different options they have for broadband services that suit their individual needs and CICRA to continue to ensure that barriers to switching service provider are minimised.

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3 STUDY GOALS

The goals of the study were :

1 To move away from the many anecdotal stories relating to the performance and suitability of broadband provision across the Channel Islands to a position where there can be meaningful discussions with stakeholders based on objective evidence.

2 To present reasoned information on the performance of broadband services and the experience of broadband customers across the Channel Islands in a way that can be understood and used by different stakeholder groups : consumers, elected members of government, government officers , service providers and network operators.

3 To identify where investment in broadband Internet services is required and worthwhile; this to take account of current and likely future customer needs.

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4 THE DIGITAL SUPPLY CHAIN

Key to understanding customer broadband experience is an understanding of the communications paths that their Internet traffic traverses and the identity of the parties responsible for each of the various segments within those paths. Together these segments are referred to as the Digital Supply Chain (DSC) which can be visualised as follows.

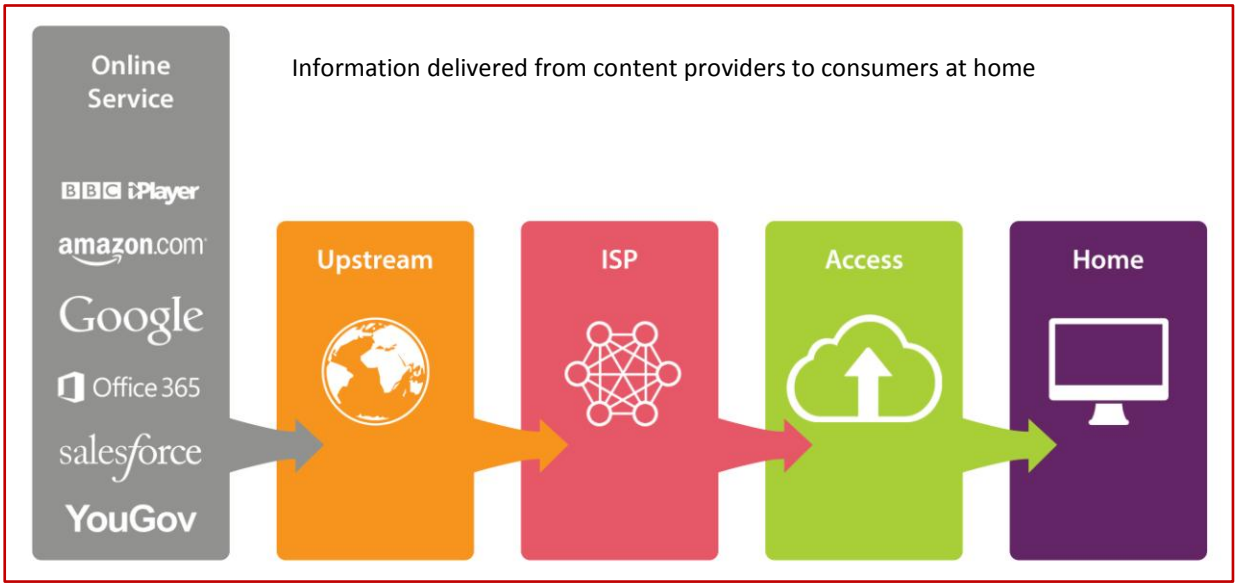

Figure 1 Delivery of content across Internet digital supply chains
Source Actual Experience plc

4.1 Home segment

Consumers contract with Internet service providers to obtain access to the global Internet but the consumer is almost always responsible for the equipment, network and usage within their own premises. Within a customer's premises there are three types of equipment :

- Computing equipment, historically desktop and laptop computers and now with increasing numbers of devices such as notebooks, tablets, smartphones and Internet enabled brown goods such as Digital TVs and rich media streaming devices. The range of Internet connected equipment is expected to increase significantly in coming years as the "internet of things" expands.

- A router which connects the computer equipment to the Access Network. Consumers are generally free to supply their own routers although a number choose to use a router supplied by their ISP as part of their service contract. Even if the router is supplied by the ISP, the consumer is usually responsible for its operation.

- A means of connecting the computing equipment to the router, thus conveying data within the consumer's premises. Typically connection methods are WiFi and Ethernet cabling and it is not unusual for there to be a combination of these methods used within any one premises.

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Early WiFi systems typically carried traffic reliably at c10Mbps over distances of c50 metres. Newer systems offer speeds of up to 1Gbps but to achieve this they use higher frequency radios and need greater signal strength to be able to deliver traffic over the same distances as earlier systems. Being based on radio technology, WiFi connections are subject to signal attenuation, and thus service degradation, as a result of the distance the signal has to travel and any radio absorbent materials in the signal's path. In-door distances of more than 30m are generally considered to be problematic, as are transmissions through dense materials such as granite, cinder/concrete blocks, bricks, glass and thick wooden doors[6]. The higher the speed of a WiFi system the more it is susceptible to such issues.

Because they do not rely on radio signals, Ethernet connections are considered to be more reliable than WiFi connections and are capable of delivering the full bandwidth available from access networks over distances of many hundreds of metres[7].

4.2 Access segment

ISPs require a means of connecting their centralised equipment with the consumer's premises. To do this they use either their own access network connection or an access network connection leased from another telecommunication company. In the Channel Islands there is a well-developed wholesale regime that enables retail ISPs to use JT and Sure's access networks in Jersey and Guernsey respectively.

Access network technologies in the Channel Islands include copper twisted pairs, fibre-optics and fixed-wireless (WiMax). Each has its own characteristics as a transmission medium and the range of services available to the consumer is dependent on the type of access network technology available at their premises. Technological advances over the years have resulted in higher speeds being made available to consumers and whereas, when broadband services first become available, a high speed connection was 2Mbps, it is now in the range 20Mbps to 1Gpbs.

Consumers rarely have the benefit of the full physical capabilities of the access network connection. For reasons of efficiency of resource usage a connection is often contended (shared) among consumers in the same geographic area.

4.3 ISP (Internet Service Provider) segment

The ISP segment contains the networks belonging to the service provider. These lie upstream of the local access network and downstream of the Upstream segment; they are mainly located in the islands but also extends to the physical points where they meet the global Internet, which are typically in London.

It is to be noted that consumers contract with their ISP for Internet access at a given speed and contention ratio but contention often also exists at points further along the DSC where service providers aggregate the traffic of large numbers of consumers; this is especially so within the ISP segment and at the point where the ISP segment meets the Upstream segment.

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[6] Useful information on the attenuation values of different types of building material can be found at http://www.moonblink.com/radio-wave-attenuation-at-2-4-ghz/#

[7] High specification cabling may be required for 1Gbps transmissions.

4.4 Upstream segment

This segment contains the telecommunications networks that form the global Internet. While this segment is outside of the direct control of the Channel Island service providers it is within their power to choose where they connect to the global Internet, whom they connect to and the capacity of the connection. These choices affect the service obtained and

4.5 Content providers

These are the organisations that supply the content and functionality that customers seek to access to, for example Netflix, Amazon, YouTube, Dropbox, BBC and on-line travel booking sites. This content and functionality is usually hosted in computer servers whose locations are not apparent to the customer and, with the notable exceptions such as the States of Guernsey and States of Jersey websites, are rarely located in the Channel Islands. Control of content is almost always beyond the influence of Channel Island government, companies and consumers.

5 STUDY PARAMETERS AND OBJECTIVES

This section describes the parameters of the Channel Island's broadband environment that were considered relevant to the study's overall goals. It sets out specific study objectives for examining these parameters. These parameters were selected on the basis of CICRA's knowledge of the Channel Islands' broadband networks and DSC, the types of issue that broadband customers and other stakeholders often raise and issues identified by Ofcom in its study of the Internet experience in the UK.

5.1 Geography (Islands and Parishes)

Study objective 1 : Compare and contrast customer experience within the primary (island) and secondary (parish) geographies.

The study considered two levels of geography : islands and parishes.

5.1.1 Primary geography (Islands)

At the primary level of geography there are the islands of Jersey, Guernsey and Alderney. Each island has a different set of technical elements in its DSC but since Alderney's broadband traffic transits Guernsey the two islands have the same elements in their ISP and Upstream segments.

As well as being different jurisdictions with different government policies and objectives, Jersey and Guernsey also have different regulatory environments and it was therefore important to understand the difference between the islands so that recommendations appropriate to the islands can be made.

5.1.2 Secondary geography (Parishes)

A secondary level of geography within each island was intended to examine the differences in customer experience in different parts of each island. Alderney was considered a unified location and thus not broken down into smaller areas for this purpose.

A common reason for considering secondary geographies in jurisdictions such as the UK is that they have significant issues with urban/rural divides and factors such as line length[8] in rural areas tend to have poorer levels of broadband service than urban areas. While Guernsey and Jersey have rural and urban areas, unlike in the UK, nowhere is more than a few kilometres away from a POP[9] and, in telecoms terms, the nature of any urban/rural divide is not as accute.

In Jersey line length is not easy to determine. Also it is not an issue for consumers using FTTH services (where fibre optics are brought all the way to the customer's premises). While WiMax technologies

[8] The length of the, usually copper, connection between the customer's premises and their local exchange..

[9] Point of Presence. A place where the service provider has equipment from where service can be provided. This may be an exchange building or a street side cabinet.

are affected by factors such as the distance between the customer's premises and the WiMax base station, performance is also affected by factors such as whether there are radio signal absorbent materials between the two.

In Guernsey Sure has excellent data on the line length for every property in the island but concerns regarding potential disclosure of the identity of the study's participants (which is unacceptable to CICRA) precluded its use.

As an alternative to line length, geographical variations within the islands were considered on the basis of parishes and study participants were mapped to their parish using their post code (see annex A).

5.1.3 Alderney and Sark

Although this study was intended to examine consumer broadband experience on a pan Channel Island basis, it was recognised at the outset that achieving a highly reliable result for the small outlying islands of Alderney and Sark would require a disproportionally large sample in those islands compared to the main islands of Guernsey and Jersey[10]. This would be a particular issue for Sark with its population of only a few hundred. Budget constraints meant that the smaller outer islands could not be sampled to an ideal level but it was considered as acceptable because the outer islands have the same ISP and Upstream segments as Guernsey and the Home segment is independent of the other segments; only the Access segments differ.

It was considered important to include Alderney to the fullest extent possible and, since Alderney and Sark are both connected to Guernsey by microwave links in their access networks, Alderney would stand as a reasonable proxy for Sark. The number of customers in Sark is shown in the tables below only for comparison and completeness and the results gathered in Sark are not otherwise considered in the analysis.

5.2 Service providers

Study objective 2 : Compare and contrast customer experience of the service providers in the different primary geographies.

During 2015 there were three service providers providing fixed network broadband services within the Channel Islands[11].

JT	JT (Jersey) Limited is the incumbent telecommunication company in Jersey and CICRA has decided that it has SMP[12] in Jersey's fixed network wholesale market. It owns the majority of the fixed network infrastructure in these islands and is obliged to treat other licensed operators in a non-discriminatory manner; it operates a wholesale/retail arrangement for broadband products.

[10] http://www.surveysystem.com/sscalc.htm

[11] Airtel does not provide fixed network broadband services and is not included in this study.

[12] Significant Market Power. Licence holders with SMP have addition licence conditions applied to them so as to ensure they do not abuse their power within the market.

JT (Guernsey) Limited is an alternative service provider in Guernsey and providing broadband services through Sure's wholesale portfolio.

Sure

Sure (Guernsey) Limited is the incumbent telecommunication company in Guernsey, Alderney and Sark. It owns the majority of the fixed network infrastructure in these islands and CICRA has previously decided that it has SMP in Guernsey's fixed network wholesale market.

Sure (Jersey) Limited is an alternative service provider in Jersey and provides broadband services through JT's wholesale portfolio.

Newtel

The collective name 'Newtel' is used in this report to refer to the related group of companies that supply fixed network broadband services in Jersey (YTel and Home Net, which was previously known as Interactive Online). Newtel does not provide service in Guernsey, Alderney or Sark.

Newtel provides broadband services in Jersey using a combination of its own WiMax and FTTH infrastructure as well as products from JT's wholesale portfolio.

Based on figures provided by the three service providers, at the end of 1Q2015 there were 62,783 fixed network broadband customers distributed across the islands.

	Jersey	Guernsey	Alderney	Sark	Total
JT	24,103	3,820	125	9	28,057
Sure	6,521	22,606	1,047	290	30,464
Newtel	4,262	n/a	n/a	n/a	4,262
Total	34,886	26,426	1,172	299	62,783

Figure 2 Numbers of fixed network broadband customers per service provider
Source Data supplied by service providers 1Q2015

5.3 Access network technology

Study objective 3: Compare and contrast customer experience where service is delivered over different access technologies in the different primary geographies.

Four types of access network technology were in use; not all were available in all islands :

ADSL

Delivered over twisted pair copper wires that run from the customer's premises to the local exchange or street cabinet (fibre optic connections are used to connect from there) and capable of providing service up to about 24Mbps. The length of this copper connection (which may be far greater than the straight line distance between the two locations) is a major factor in the speed and quality of the broadband service that can be provided.

FTTC/ VDSL [13] Also delivered to the customer's premises over twisted pair copper connections but at higher speeds than ADSL. This is generally achieved by locating a street cabinet close to the customer's premises and thus shortening line length. Typically capable of providing service in the 50Mbps to 80Mbps range and, with projected future technological developments, expected to be able to reach 300Mbps.

FTTH Fibre optics are used all the way between the customer's premises and the local exchange thus eliminating the limitations of transmission over copper connections.

WiMax A wireless technology that uses radio links to connect the customer's premises to a location where it can be carried over a fibre optic backbone network. As with FTTC, WiMax brings fibre optics close to the customer's premises but not all the way too it.

The different technologies have different abilities to carry customer data at different speeds but all provide service on a contended basis[14].

A variety of services are provided over these technologies.

Island	Service based on underlying Access Network	Technology	Contention ratio	Download speed (Mbps)	Upload speed (Mbps)
Jersey	JT's home ADSL	Copper	50:1	20	0.736
	JT's pro ADSL	Copper	20:1	20	0.736
	JT's SDSL	Copper	10:1	2	2
	JT's home fibre 50	FTTH	40:1	50	1
	JT's home fibre 100	FTTH	40:1	100	20
	JT's home fibre 1G	FTTH	40:1	1,000	100
	JT's pro fibre 50	FTTH	20:1	50	1
	JT's pro fibre 100	FTTH	20:1	100	20
	JT's pro fibre 1G	FTTH	20:1	1,000	100
	Newtel's FTTH	FTTH	40:1	40	10
	Newtel's WiMax	WiMax	40:1	20	1
Guernsey, Alderney & Sark	Sure's unlimited broadband	Copper / FTTC	40:1	20	1
	Sure's unlimited pro broadband	Copper / FTTC	20:1	20	1
	Sure's superfast broadband	Copper / FTTC	40:1	40	5
	Sure's superfast pro broadband	Copper / FTTC	10:1	40	5

Figure 3 Services available in each island based on access network technology
Source Data provided by the Service Providers (1Q2015)

Sure in Guernsey, Alderney and Sark, and JT in Jersey make their networks available to other service providers through the local wholesale regimes. Newtel uses JT's network on a wholesale basis but also provides access for some of its customers using its own FTTH and WiMax infrastructures (which are not available to Sure and JT). Figure 4 shows the numbers of customers of each services provider using each type of access technology in each island at the end of 1Q2015.

13 CICRA understands that Sure, in Guernsey, serves ADSL and VDSL customers from both exchange and street deployed MSANs unlike the BT model where VDSL is only served from street units. There is no technological difference in the way the services are provided from exchange or street MSANs and customer's geographical location will determine which they are served from to maintain the shortest possible line length.

14 Customers requiring uncontended services can obtain these through the use of business oriented private circuits; these also offer symmetrical data flows and higher level service specification.

	Jersey				Guernsey	Alderney	Sark	Total
	JT's copper	JT's FTTH	Newtel's WiMax	Newtel's FTTH	Sure's copper/FTTC			
JT	14,334	9,769	n/a	n/a	3,820	125	9	28,057
Sure	4,984	1,537	n/a	n/a	22,606	1,047	290	30,464
Newtel	2,489	5	1,525	243	n/a	n/a	n/a	4,262
Total	21,807	11,311	1,525	243	26,426	1,172	299	62,783

Figure 4 Numbers of broadband customers per service provider per access network
Source Data provided by the Service Providers (1Q2015)

The three service providers supply a range of services under different product names to their customers using the different access networks. These services are distinguished from one another by commercial factors, such as price and data caps, and by technical characteristics such as contention ratios and upstream and downstream data rates. Different product names and commercial factors play no part in the performance of the network, or the experience of the customers that use them, and were not considered by this study.

Note : There are microwave links in the transmission networks between Alderney and Guernsey, and Sark and Guernsey. Since Actual Experience's methodology is to measure performance at layer-3, it was not expected that the specific effects of these micro-wave links, which operate at a lower layer, would be identified as part of this study. However, if they do exert undue influence then they would contribute to impairment in the Access segment and thus be detectable.

5.4 Home networks

Study objective 4 : Compare and contrast customer experience according to the types of home network in use.

Home networks are the computers, routers, and Ethernet and WiFi networks within the customer's premises.

There are claims by the service providers, and there is supporting evidence from elsewhere, that problems with customer Internet experience are often related to poor quality networks and equipment within the customer's own premises. This can be a result of faulty or low capability equipment and overloaded networks which have too low a capability for the demand.

While Ethernet network are not immune from technical problems, for WiFi networks there are the particular issues of the distance between the customer's computer and the router and what materials lay between the two. WiFi is not considered reliable beyond 30m and this distance falls as the frequency, and thus signalling speed, of the router uses rises. Dense building materials such as granite, glass and metal absorb more of the WiFi signal than plasterboard[15].

[15] Useful information on the attenuation values of different types of building material can be found at http://www.moonblink.com/radio-wave-attenuation-at-2-4-ghz/#

To make allowance for both distance and intervening materials, for the purposes of this study, a customer using WiFi was considered to have their computer "near" to their router if the computer and router were :

- in the same room or on the same floor,
- in different rooms but less than 10 metres apart, or
- the property type is an apartment/flat which can be assumed to on a single floor.

All other routers were considered as "far away".

5.5 Demand for network resources

A number of factors contribute to the demand for network resources generated by a household, especially the number of people and devices concurrently accessing the Internet and the type of Internet services they use.

5.5.1 Number of concurrent users

Study objective 5 : Compare and contrast customer experience according to the number of people sharing the same broadband connection.

Recent years have seen a sharp rise in the amount of bandwidth consumed by households in the UK[16] and there is no reason to think that the situation is any different in the Channel Islands. This rise results of a move away from there being a single desktop computer in a household to the situation where many people in a household have their own personal, Internet connected, devices such as laptop computers, smart phones and tablets. This is added to by the emergence of Internet connected brown goods such as TVs. The "Internet of Things" can be expected to result in further increases. This increasing demand for bandwidth can be expected to continue to rise in the medium term.

While the Internet experience of a single user in a household may be satisfactory, multiple concurrent users will put stress on the Home and Access segments which could result in unsatisfactory experience for one or more of the users. While it is not possible to estimate the level of simultaneous usage or to measure it, a reasonable indicator for this is the number of people in a household that share the same broadband connection.

5.5.2 Nature of Internet application/service being accessed

Study objective 6 : Compare and contrast customer experience of the different Internet applications.

Broadband networks are, generally, designed for situations where there is more downstream traffic (i.e. traffic flowing from the content provider to the customer) than upstream traffic (content flowing away from the customer). This asymmetry is a design decision rather than a physical constraint and is set by the Access Network operator so that it can meet the requirements of a majority of customers

[16] Ofcom. The Communications Market Report, 6th August 2016. Figure 4.73 Average fixed broadband data use per month.

most of the time at an economic price[17]. While this asymmetry remains important for the economics of the networks it does not always reflect the types of services and content accessed by customers today. Different types of services make different demands on the networks over which their traffic has to travel.

For the purpose of this study three basic Internet services were considered. These were selected to be representative of the applications commonly used by broadband users and for the different traffic profiles they create.

Netflix

Asymmetric streaming of audio visual content. Characterised by high volumes of data, which are increasing with the introduction of high definition films and TV, flowing downstream from the content provider to the customer. Each Netflix session typically requires c3Mbps for standard definition TV and c5Mbps for high definition at a reasonably continuous data rate else buffering will occur[18]. High definition was used for the purposes of this study.

Netflix was chosen over iPlayer and 4OD because it is in widespread use and none of its content is stored in the Channel Islands, thus requiring its traffic to traverse all segments of the DSC.

Dropbox

Asymmetric file transfer. Data transfers go in either direction but not typically at the same time. Downloading of files is suited to the asymmetric nature of most broadband services (which have greater downstream capacity than upstream) but files being uploaded can be hampered by the low levels of upstream capability provided by most ADSL networks.

While data volumes are potentially large their delivery is less time sensitive than streamed multimedia content or VoIP.

Dropbox was chosen as it is commonly used by businesses exchanging documents with clients and suppliers, students accessing coursework and friends sharing audio visual material.

VoIP

Characterised by symmetric data transfer at relatively low data rates (Skype : c100Kbps for a voice only call and between c500Kbps and c1.5Mbps for a video call, in each direction[19]) but low latency is required to maintain the human to human, real time exchange.

VoIP services, such as Skype, operate on a peer to peer basis and user experience depends mainly on network capability; there is no server as with Netflix and Dropbox adding to service times. To examine the effect of the amount of network between the two ends of the user connection two variants of VoIP application were used in the study :

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[17] Symmetrical services (e.g. SDSL) are possible but they are usually aimed at business users and come with a higher price than asymmetric services.

[18] https://help.netflix.com/en/node/306

[19] www.skype.com

- Calls where one end is in the Channel Islands and the other in the UK.
- Calls where one end is in the Channel Islands and the other in Australia (i.e. with substantially more of the global Internet between the parties).

By their nature network and application infrastructures have behaviours and sensitivities that can affect the consumer's digital experience. At the network level there are issues of packet loss, delay and delay variation. At the application level there are sensitivities to these issues, e.g. file transfer is not especially sensitive to delay variation, whereas voice is extremely sensitive. The services chosen here (Dropbox, voice and streaming video) represent a wide range of sensitivities to different infrastructure behaviours thus creating an envelope of behaviour within which most typical Internet usage would fall. Thus the results from these applications give a good indication of expected general quality for consumer experience, as well as the explicit results for digital experience quality for these particular services.

5.6 Upstream

Study objective 7 : Compare and contrast customer experience associated with the upstream segment of the DSC.

While the design, capacity and operation of the global Internet beyond the Channel Islands is outside of the control of the local service providers, service providers are responsible for providing access to it as part of the service they provide to customers.

While all three Channel Island service providers use broadly similar technologies, they have different upstream network designs, capacities and commercial partners, and they can influence the service they provide to their customers by their choices in these areas.

6 METHODOLOGY

This section describes the methodology used for the study; it looks at the basic method of data gathering and analysis as well as how the study participants were recruited.

6.1 Actual Experience

In selecting a methodology CICRA viewed it as important to be able to test all segments of the DSC in a cost effective manner and without disruption to customers.

A preliminary study in 2013 selected Actual Experience's methodology and tool set for this. Actual Experience has a well-developed methodology which has been proven by extensive use in similar work for Ofcom in the UK. Actual Experience uses a software agent[20] installed in volunteer's computers (i.e. at the very end of the DSC) rather than special equipment.

Actual Experience's report to CICRA explains its methodology in detail and is not reproduced here. It is however important to understand that Actual Experience's software agent tests the real DSC all the way between the consumer's computer in their premises and the servers providing the content the consumer is seeking. While doing this it does not record or report what the consumer is doing personally with their computer or any aspect of the Internet services they access. Whenever the consumer's computer is switched on and connected to the Internet, the Actual Experience software sends test messages across the DSC to the remote servers and then measures and analyses the responses it receives. By measuring various aspects of the responses it receives from each segment of the DSC it can determine the experience the consumer would be receiving if they were using the application service and determine where any impairment to that experience is. The software is not limited to measuring the data transfer rate the users obtains from the Access network, it is measuring the performance of the end to end DSC.

6.2 Volunteer recruitment method

CICRA sought to recruit study participants through advertisements and news items in a wide range of Channel Island media including local governmental and organisational newsletters and mailing lists, popular Internet channels and through the public radio and print media. Given the range of media used it is expected that a significant proportion of the Channel Island's population will have heard about the study at some point in time and thus had the opportunity to participate.

People willing to participate in the study were directed to an on-line web page which provided information about the nature of the study and a questionnaire which gathered data about their suitability, e.g. the type of connection they used, their service provider and whether they had computing equipment that was supported by the available Actual Experience software agent. From

[20] At the time of the study known as BbFix and now known as Actual Home.

this suitable participants were directed to an Actual Experience web page that enabled them to download and install the software agent and start contributing data.

The recruitment questionnaire also gave CICRA the opportunity to collect additional information on how all potential participants use the Chanel Island Internet services and any issues that have with them. Analysis of some of this information can be seen in Annex B of this report.

CICRA recognises that this recruitment method is essentially self-selecting which brings with it the possibility of sample bias. To counter this, potential volunteers that met the selection criteria were manually screened for suitability; a number were rejected for reasons such as that they would create duplicate data.

A further safeguard against the effects of sample bias existed in that the Actual Experience software agent generates its own traffic flows rather than relying on actual user activity; there was therefore no opportunity for the participant to influence the data collected. In effect, as long as the participant had their computer turned on and connected to the Internet, data designed by the study team would be collected from them and the their identity and personal Internet use would not influence the study.

7 SAMPLE OBTAINED AND STATISTICAL SIGNIFICANCE

It was recognised from the outset of the study that while Actual Experience's data collection and analysis methodology was reliable, the reliability of its findings would depend on there being a sufficiently large and representative sample for each objective. This section presents the numbers of participants recruited, how they were grouped for the purposes of the study's objectives and the statistical reliability to be expected of Actual Experience's findings based on the sample samples.

954 people responded to the on-line recruitment questionnaire. Some 59% of these did not match the study's criteria, or otherwise dropped out of the questionnaire, for reasons such as having tablet or smartphone computing devices which were not supported by Actual Experience's software agent.

391 respondents registered for the study of which 350 successfully installed the Actual Experience software agent and contributed data.

The following sections of the report break the numbers of actual participants by the various parameters of the study and discuss the statistical significance of the sample sizes and thus the reliability of the conclusions that can be drawn.

7.1 Geography

7.1.1 By Island

Figure 5 shows the numbers of volunteers participating from each island compared to the number of broadband subscribers in that island.

	Number of study participants	Number of fixed broadband connections
Jersey	152	34,886
Guernsey	186	26,426
Alderney	11	1,172
Sark	1	299

Figure 5 Number of study participants and broadband subscribers per island

Recognising that there is a risk of bias from the self-selecting nature of the participants it is nevertheless useful to consider what levels of confidence could be placed in samples of this size if the sample had been drawn on a truly random basis (which samples rarely are) from a population with a Normal distribution.

Figure 6 shows the margins of error at the 95% confidence level for the sample sizes obtained in each island.

	Margin of error
Jersey	8%
Guernsey	8%
Alderney	30%
Sark	98%

Figure 6 Margins of error for numbers of participants per island

Results relating to Jersey and Guernsey as a whole can therefore be considered as reliable. As was predicted during the design of the study, it was difficult to obtain a sufficiently large sample in Alderney and Sark and results from these would require more detailed sampling to be able to draw more than suggestive findings. For current purposes result from Alderney are considered as indicative and results from Sark are disregarded.

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7.1.2 By Parish

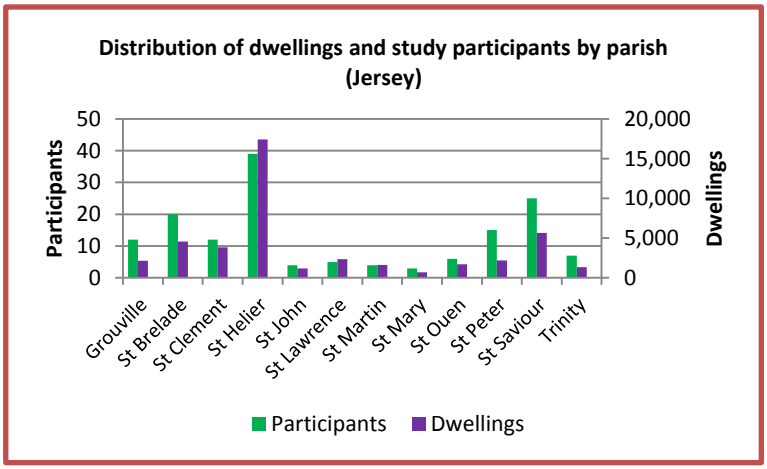
No values were readily available for the numbers of fixed broadband connections in each parish and thus the numbers of dwellings has been used as a proxy for the numbers of such connections. This is considered a reasonable proxy because, typically, a dwelling has only one broadband connection.

Figures 7 and 8 show that the sample sizes for each parish; these were small and as a consequence of have large statistical margins of error. The parish level samples are nevertheless useful in suggesting where variations in Internet experience exists within each island.

Jersey [21]

Parish	Number of study participants	Number of dwellings
Grouville	12	2,142
St Brelade	20	4,547
St Clement	12	3,843
St Helier	39	17,417
St John	4	1,184
St Lawrence	5	2,350
St Martin	4	1,621
St Mary	3	696
St Ouen	6	1,698
St Peter	15	2,207
St Saviour	25	5,641
Trinity	7	1,352
Totals	152	44,698

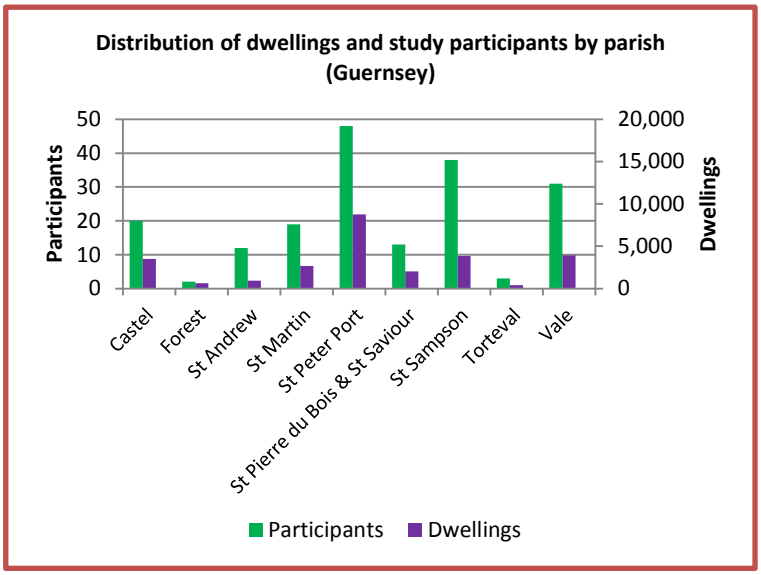
Figure 7 Distribution of dwellings and study participants by parish (Jersey)



Guernsey [22]

Parish	Number of study participants	Number of dwellings
Castel	20	3,507
Forest	2	633
St Andrew	12	935
St Martin	19	2,680
St Peter Port	48	8,742
St Pierre du Bois & St Saviour [23]	13	2,034
St Sampson	38	3,842
Torteval	3	405
Vale	31	3,914
Totals	186	26,692

Figure 8 Distribution of dwellings and study participants by parish (Guernsey)



[21] Jersey Census 2011. Bulletin 3: Households and Housing. At March 2011. www.gov.je/SiteCollectionDocuments/Government%20and%20administration/R%20CensusBulletin3%2020120113%20SU.pdf

[22] Guernsey Facts and Figures www.gov.gg/CHttpHandler.ashx?id=97608&p=0. At December 2014.

[23] These parishes share postcode district and sector codings and could not be distinguished from one another using the anonymised data collected from study participants

Note that a χ^2 goodness of fit tests between the number of participants and dwellings in each parish shows fit at better than the 0.95% confidence level. This shows that the distribution of study participants across parishes was representative of the numbers of dwellings, and thus by proxy the number of broadband connections, within each parish.

7.2 Service providers

The following numbers of participants were recruited from the subscriber bases of the service providers in each island.

	Participants	Subscribers	Margin of error at 90% confidence level
JT in Guernsey	59	3,820	11%
Sure in Guernsey	128	22,606	8%
JT in Jersey	74	24,103	10%
Sure in Jersey	52	6,521	12%
Newtel in Jersey	25	4,262	17%
Sure in Alderney	9	1,047	28%
JT in Alderney	2	125	58%
Total	349	62,484	

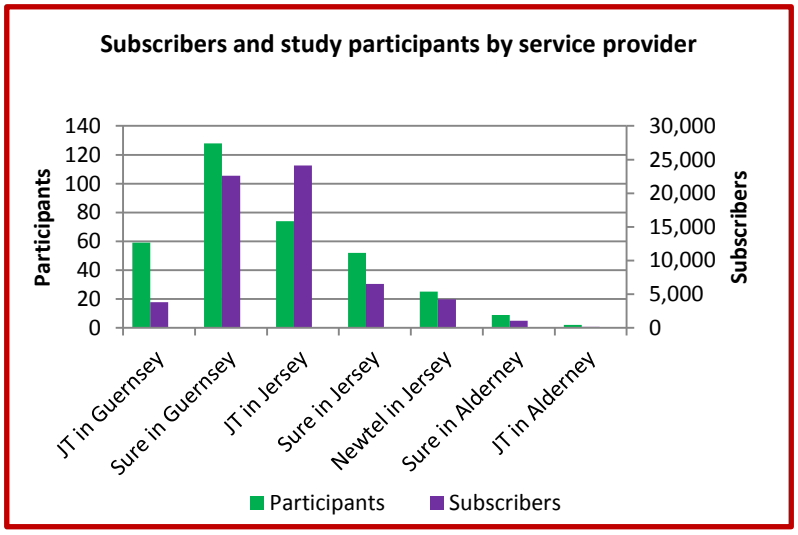


Figure 9 Subscribers and study participants by service provider
Source CICRA study recruitment questionnaire

These sample sizes provide acceptable margins of error for both JT and Sure in both Guernsey and Jersey.

Sample sizes in Alderney are small but can still provide acceptable results for the ISP and Upstream segments because these segments are shared with subscribers in Guernsey and Alderney and can thus be considered to be part of a larger, combined sample.

The margin of error for Newtel (in Jersey) falls to 13% at the 80% confidence level. It can nevertheless provide indicative results.

7.3 Access technologies

The following numbers of participants were recruited for each type of access technology in each island. These sample sizes provide acceptable margins of error for JT's copper, JT's FTTH and Sure's copper & FTTC networks but not for the other access network technologies.

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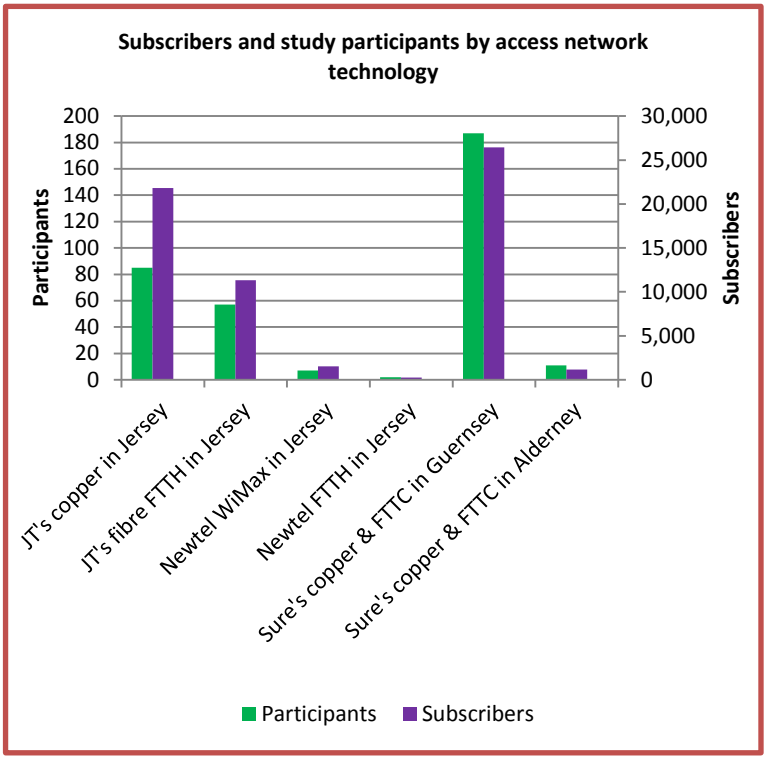
	Participants	Subscribers	Margin of error at 90% confidence level
JT's copper in Jersey	85	21,807	9%
JT's FTTH in Jersey	57	11,311	11%
Newtel WiMax in Jersey	7	1,525	31%
Newtel FTTH in Jersey	2	243	58%
Sure's copper & FTTC in Guernsey	187	26,426	6%
Sure's copper & FTTC in Alderney	11	1,172	25%
Total	349	62,484	

Figure 10 Subscribers and study participants by access network technology
Source CICRA study recruitment questionnaire



These sample sizes provided acceptable margins of error for the main access networks in Jersey and Guernsey (JT's copper and FTTH, and Sure's mix of copper and FTTC).

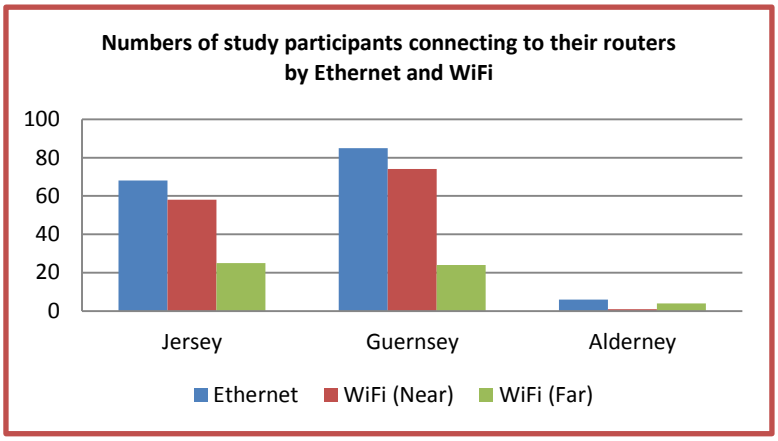
The sample for Sure's copper and FTTC network in Alderney and Newtel's WiMax were sufficient to provide indicative results. The sample for Newtel's FTTH network was too small to be useful.

7.4 Home networks

Figure 11 shows the numbers of study participants recruited for each method (Ethernet and WiFi) of connecting computers to routers; the numbers of WiFi connection is further broken down by how many were "near" their router and how many were "far" from their router. WiFi was the most common method of connection, with "near" connections being more common that "far".

	Ethernet	WiFi (Near)	WiFi (Far)
Jersey	68	58	25
Guernsey	85	74	24
Alderney	6	1	4

Figure 11 Numbers of study participants connecting to their routers by Ethernet and WiFi
Source CICRA study recruitment questionnaire



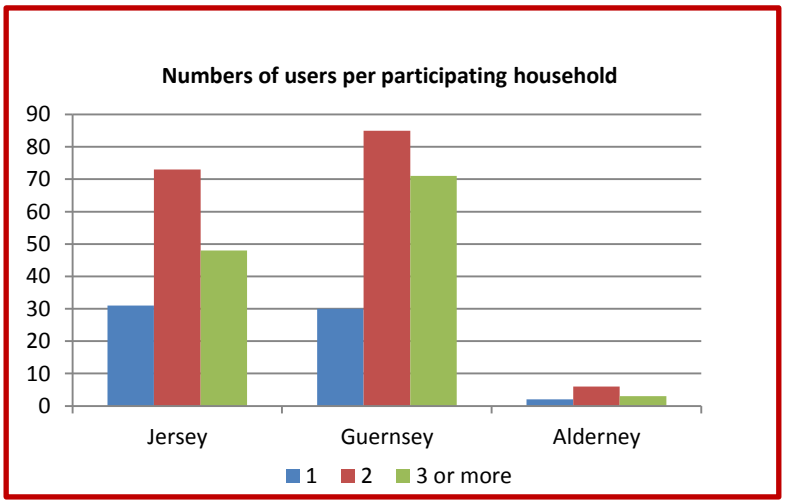
Across the entire Channel Island broadband consumer base these sample sizes give an 8% margin of error at the 95% confidence level for both Ethernet and WiFi and can thus be considered reliable.

7.5 Broadband users per participating household

Figure 12 shows the number of people in study participant's households that use the Internet. Multiple occupancy, and thus the potential for concurrent broadband usage and higher demand, is far more prevalent than single occupancy.

	Users per participating household		
	1	2	3 or more
Jersey	31	73	48
Guernsey	30	85	71
Alderney	2	6	3

Figure 12 Number of broadband users per participating household
Source CICRA study recruitment questionnaire



8 INTERPRETATION OF ACTUAL EXPERIENCE'S FINDINGS

This section describes Actual Experience's analysis of the data collected from the study participants and the conclusions that can be drawn from these; these conclusions are set within a Channel Island context.

There are three key findings. That :

- Channel Island customer experience of the Internet is not as good as that in the UK and, while it can be satisfactory, is often frustrating.
- Approximately half of all impairment is in the Upstream segments of the Channel Islands' DSC. This applies in all locations and for all service providers.
- The remaining half of impairment is reasonably evenly distributed between the Home, Access and ISP segments.

It should be noted that to arrive at these findings extensive use has been made of Actual Experience's Digital Voice of the Customer (dVoC) scores. These are described in section 4.1 of Actual Experience's report to CICRA and are summarised as having the following broad meanings :

- A score of 80 or above indicates a typically perfect service – no problems in the digital supply chain that a consumer would experience as reduced quality;
- Scores below 80 indicate a general reduction in quality, with 70 suggesting an 'occasionally irritating but usable' service (e.g. a video stream that buffers or pixelates, but does play);
- Scores of 60 or below indicate a level of quality likely to be perceived as very frustrating and increasing the likelihood of users simply giving up.

8.1 Experience and impairment by geography

Study objective 1 : Compare and contrast customer experience in the various primary (island) and secondary (parish) geographies.

Figures 3 and 4 of Actual Experience's report show median dVoC scores throughout the Channel Islands consistently fall between 60 and 70, a range where services are usable but the experience is frequently frustrating. Scores rarely exceed 80, the level where experience is considered perfect, and at times fall below 50, a level where customers tend to find the service unusable. This coincides with much of the anecdotal evidence provided by consumers.

Figures 13 and 14 of Actual Experience's report show that approximately a half of all impairment of customer experience results from the Upstream segment and that the other half of the impairment is reasonably evenly distributed between the Home, Access and ISP segments.

It is notable that Actual Experience's figure 13 suggests that Alderney's Access segment exhibits greater impairment than the Access segments in Guernsey and Jersey suggesting that there is something different about it.

Actual Experience's figure 13 also indicates that impairment in the Home segment of the DSC is consistent across the islands and does not significantly impair customer experience. Consistency in the Home segment is a result one would expect but its low level runs counter to claims that the majority of problems customers experience result from their in premises environments. This finding is also shown by other parts of section 4 (impairment analysis) of Actual Experience's report.

Sample sizes and associated statistical margins of error for Guernsey and Jersey were such that these result can be relied on. While the sample size for Alderney was smaller than required for high levels of certainty, the result can nevertheless be taken as a good indication of customer experience there. This is especially so since Alderney shares much of the ISP and Upstream segments of its DSC with Guernsey, and Alderney's sample can therefore be aggregated with Guernsey's to provide a larger, and more reliable, sample for examining impairment in these segments.

8.2 Experience and impairment by service provider

Study objective 2 : Compare and contrast customer experience of the service providers in the different geographies.

Actual Experience's figure 7 compares the dVoC scores for the customers of the three service providers in each of the islands where they operate. It aggregates all the customers of the service provider, regardless of access network technology, and thus gives a view of the different levels of impairment contributed by the parts of the DSC the individual service providers are directly responsible for (the ISP and the Upstream segments).

The range of scores suggest that the service providers, on occasion, all deliver a perfect level of service (score of 80) but that the service they deliver for much of the time falls to a level where consumers become frustrated (scores in the range 60 to 70).

Actual Experience's figure 17 shows the source of the impairment for each of the operators in each island; JT in Alderney should be discounted because of the small sample size. The impairment resulting from JT's ISP and Upstream segments in Jersey and Guernsey is generally less than those for Sure. Newtel has a higher level of impairment in its ISP segment than the other service providers but, as for all the service providers, impairment from its ISP segment is less than that from its Upstream segment.

The result for JT in Alderney should be disregarded because of the small sample size. The results for Sure in Alderney indicate higher levels of impairment in the Access segment than seen elsewhere.

As with the findings for geographic variations, impairment in the Home segment is reasonably consistent across all service providers and is a relatively small component of total impairment. This is to be expected as the Home segment is independent of the service provider.

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8.3 Experience and impairment by access network technology

Study objective 3 : Compare and contrast customer experience where service is delivered over different access technologies in the different primary (islands) geographies.

Actual Experience's figure 5 shows that the best customer experience is achieved by customers using JT's FTTH access network; they have the highest median dVoC score and the majority of scores are tightly grouped indicating consistency of experience. These customers do however, in common with customers using all other access technologies, have periods of poor experience.

Actual Experience's figure 5 also shows that customers using Sure's mix of copper and FTTC in Guernsey obtain Internet experience that is not as good as that for customers using JT's FTTH in Jersey; it has a slightly lower median dVoC and a longer lower quartile tail.

Actual Experience's figure 6 assists in disentangling Sure's FTTC and ADSL networks. It shows that Sure's Superfast products (which are based on FTTC/VDSL) are associated with better Internet experience than its Unlimited products (which are based on copper/ADSL). Also, customers using Sure's Unlimited products in Guernsey have an almost identical experience to those using JT's Home ADSL products in Jersey. The conclusion is therefore that customers using JT's FTTH obtain only slightly better Internet experience than customers using Sure's FTTC/VDSL all of which have better experience than customers using copper/ADSL networks.

With the exception of Newtel's WiMax, all access networks are associated with the ability of the customer, at times, to receive a perfect Internet experience (dVoC score of 80 or more). Newtel's WiMax is nevertheless associated, at times, with acceptable Internet experience (dVoC scores in the range 70 to 80).

8.4 Experience and impairment in customer premises/home

Study objective 4 : Compare and contrast customer experience according to the types of home networks in use.

Actual Experience's figure 8 shows the median and spread of dVoC scores across all customers that connect to their router using WiFi and all those that use Ethernet. It is recognised that in any one home there may a mix of these methods but for the purpose of this study the participant's computer was normally connected by one or the other.

As should be expected, Ethernet connected equipment is associated with better Internet experience than WiFi connected equipment. While the difference is relatively small it is to be noted that the median dVoC score for Ethernet connected equipment is 70 (at and above which Internet experience is generally acceptable) and for WiFi connected equipment the median dVoC score is in the mid 60s (where there is increasing levels of customer frustration).

Actual Experience's figure 9 shows the average dVoC scores, across the entire Channel Islands, for customers that use WiFi and have their equipment at different distances from their router. As expected being 'near' to the router is associated with better experience than being 'far' away. However the difference is small.

Together with the results in Actual Experience's figures 13 and 18, it can be seen that, regardless of the type of connection technology in the customer's premises and the distance WiFi signals have to travel and the materials WiFi signals are required to pass through, impairment in the Home segment of the DSC has significantly lower impact on customer Internet experience than impairment in other parts of the DSC, especially impairment in the Upstream segment.

8.5 Experience and impairment by the number of people sharing a broadband connection

Study objective 5 : Compare and contrast customer experience according to the number of people sharing the same broadband connection.

Actual Experience's figure 11 correlates dVoC scores across the entire Channel Islands against the number of people that study volunteers reported as requiring broadband access at their property.

This correlation indicates that the number of people in a property that share a broadband connection had little effect on overall Internet experience, which in all cases had a median dVoC between 60 and 70, a level where customers start to become frustrated with the service.

This is an unexpected result given that the more people concurrently using a shared broadband connection the greater will be the demand on the Home and Access segments and the more these segments can be expected to contribute to impairment of experience.

It is perhaps as Actual Experience suggests, that this is relatively minor effect in comparison to other factors in the DSC. It is also possible that the network environments in the Home (both WiFi and Ethernet which commonly operate at 10Mbps or more and local access networks providing 20Mbps or more) have sufficient capacity to support present levels of concurrent usage, a situation that may change as, for example, demand for ultra high definition TV increases[24]. The 'Internet of things' can also be expected to increase concurrent demand in the future although it is unlikely that most Internet connected devices will create the levels of demand required to support applications such as TV.

8.6 Experience and impairment by Internet application

Study objective 6 : Compare and contrast customer experience of the different Internet applications.

Actual Experience's figure 12 illustrates customer experience, across all islands and all service providers, when accessing commonly used Internet services. Actual Experience's figure 19

[24] Netflix recommends 25Mbps for an Ultra HD TV stream. https://help.netflix.com/en/node/306

shows where the impairment exists for these services.

As expected, customer have a better experience with Internet services, such as VoIP, that require less network resources than services that are network resource intensive, such as video streaming. Also, for VoIP services, calls that traverse more of the global Internet (VoIP international) experience greater impairment in the Upstream segment than calls to closer destinations (VoIP national).

Actual Experience's results illustrate that while customer experience of VoIP services is, on average, acceptable, experience of services that require high, sustained data transfer rates (e.g. Netflix) are at best just acceptable, on average frustrating and occasionally unusable. The reason for this is impairment is mainly in the Upstream segment of the DSC.

Experience with Dropbox is also impaired in Upstream segment. However, given its characteristic of uploading data from the customer as well as downloading data to the customer, it does not appear to be adversely affected by constraints in the Access segment; which, typically, has greater download capabilities than upload capabilities and could therefore be expected to become impaired when data is uploaded. As with experience related to the Home, possible explanations for this are that the Upstream impairment is so great that it masks impairment elsewhere and that some Access networks already have sufficient capabilities to deal with moderate traffic flows moving upstream.

8.7 Experience and impairment associated with the Upstream segment of the DSCs

Study objective 7 : Compare and contrast customer experience associated with the upstream segment of the DSC.

It is seen consistently throughout Actual Experience's results that the Upstream segment contributes the largest single source of impairment in the Channel Islands' DSC.

This is seen for all three service providers in all geographies.

It is reasonable to infer that the causes of this are a combination of constraints on content provider servers and limitations in the off-islands network of the Channel Island service providers and their connection to the global Internet (in locations such as London).

9 RECOMMENDATIONS

This section presents recommendations for actions needed to reduce impairment in the Channel Islands' DSCs and thus improve the experience of consumers. These recommendations are based CICRA's knowledge of the Channel Island's broadband markets, the likely future demand for broadband services across the Channel Islands and the findings from Actual Experience's measurement and analysis of the actual performance of the islands' broadband services.

While no one change in the DSC is expected to result in a level of Internet experience that satisfies all the needs of all consumers all the time (some consumers will have particular requirements), some changes are likely to have a positive impact for the majority of broadband consumers and should be prioritised. This is particularly so for recommendation 7 (improvement of the Upstream segment).

CICRA recognises that implementation of these recommendations will require investment. This report does not attempt to accurately quantity the levels of investment required, or who should make that investment, or how such investment will be funded. Those decisions require careful evaluation of a range of options as well as what public and regulatory policies are to be applied.

The following recommendations relate to the various segments of the DSC.

9.1 Home segment

The Home segment is the responsibility of the consumer and there are a number of ways that the consumer can be helped to help themselves to reduce impairment within their premises. Ofcom publishes advice to UK consumers in this area[25] and, while broadband services in the UK are not entirely the same as in the Channel Islands, much of Ofcom's advice is applicable to local consumers who should be made aware of it and, where appropriate, assisted to implement it.

Recommendation 1 An on-going programme of work providing advice to consumers regarding how they can reduce impairment in their premises. This can be based on the advice provided by Ofcom, and other authorities, and tailored to the particular circumstances of the Channel Island.

Recommendation 2 In recognition that broadband services are increasingly important to all sections of society, consideration to be given to providing vulnerable consumers with practical assistance in implementing the advice referred to in recommendation 1.

9.2 Access segment

A key finding of Actual Experience's work, both in the Channel Islands and the UK, is that, for the average consumer, access speeds of at least 10Mbps are required for a satisfactory consumer

[25] Ofcom : Practical tips for improving your broadband speed
http://consumers.ofcom.org.uk/internet/broadband-speeds/broadband-speeds-2/

experience; above 10Mbps consumer experience continues to improve but with diminishing effect as speeds increase.

While copper based ADSL technologies are capable of delivering 10Mbps services they are limited by factors such as the distance of the consumer from the exchange and the physical properties and condition of the cables and associated jointing. The replacement of copper based technologies with fibre-optic based technologies removes these limitations and provides a pathway to higher speed and more flexible services thus providing a significant level of future proofing against rising demands.

Recommendation 3 Acceleration of the replacement of legacy ADSL access networks by Next Generation Access networks so that all consumers in all islands have access to fast and reliable services that can be expected to provide for their needs into the reasonably foreseeable future.

CICRA recognises that the reengineering of access networks is a non-trivial task with associated costs, time scales and disruption to customers and the public.

This recommendation for an accelerated migration from ADSL to NGA (whether that be through FTTH or FTTC) is not intended to suggest that there is no place in the access networks for wireless technology such as WiMax. Wireless technologies play an important role in offering consumers choice and for providing service at locations that are difficult and/or uneconomic to reach by physical, wire-line, technologies.

It is also to be noted that Internet access over 3G, 4G and future 5G mobile networks is expected to become increasingly important in the future and that the delivery of some services will become increasingly reliant on a blend of fixed and wireless access technologies, switching between them as bandwidth demand and availability change dynamically.

In addition to meeting the varying needs of retail consumers (e.g. occasional and low volume access to the Internet for say email, TV and music streaming, online gaming and telemedicine), it is anticipated that broadband services will become essential building blocks upon which other consumer services will be built (e.g. their use for back haul in mobile networks, especially those containing pico-cells).

Recommendation 4 That access networks be designed and configured to provide products (characterised by download speed, upload speed, contention ratio and price point) that satisfy a wide range of needs.

It is noted that the access networks of Alderney and Sark contain microwave links connecting them to Guernsey. Although the Actual Experience report does not attribute impairment in Alderney to the microwave links, it should be noted that it did find greater levels of impairment in Alderney's Access segment than in Guernsey's. This microwave link is a major difference between Alderney's and Guernsey' access networks and it is therefore reasonable to suspect that it is contributing to the impairment experienced by Alderney consumers. Similar concerns also affect Sark.

Recommendation 5 Sure to review the capability for Internet traffic of the microwave links between Guernsey and Alderney, and Guernsey and Sark, together with the effect of line length in those islands. Where necessary increase the capacity

and performance of these network elements to meet current and reasonably foreseeable future demand for Internet access in those islands.

9.3 ISP segment

Unlike locations such as the UK, where there are considerably larger numbers of customers to service and considerable greater numbers of nodes and associated complexity in the ISP segment, the ISP segment in the Channel Islands is comparatively small and thus easier to manage. Nevertheless, it requires continuous management to ensure that it is fit for purpose, operates at optimum levels and plays its part in delivering excellent customer experience.

Recommendation 6 Accepting economic constraints, service providers should proactively ensure that the components of their ISP segments perform in a way that minimises impairment and maximises customer experience. This may involve optimisation of traffic routing as well as investment in equipment and bandwidth.

9.4 Upstream segment

A primary finding of Actual Experience's work is that the majority of the impairment experienced by all Channel Island consumers is in the Upstream segment of the DSC. It can be expected that reducing impairment in this area will have the single largest impact on average consumer experience. Also, upgrades to networks at this level of the DSC can be expected to be achieved without noticeable disruption to customer service or to the public at large.

Recommendation 7 Service providers to improve the performance of their Upstream networks and/or locate larger amounts of content on the islands.

CICRA recognises that there are economic issues associated with increasing off island bandwidth. While IP transit prices in London, where the Channel Island service providers typically connect to the global Internet, have declined in recent years to a record low of approximately USD 1 per Mbps per month[26], these prices can only be achieved by purchasing capacity in large quantities (typically in units of 10Gbps) and this represents a potentially significant step change in provisioning for service providers.

There are also costs associated with the reaching locations such as London which may require the expansion of transmission paths, again in large units and again representing potentially significant step changes in provisioning for service providers.

For smaller service providers, purchasing in such large quantities will not always be warranted by the lower levels of demand associated with the size of their customer bases and may therefore be economically unviable. They face either disproportionate capital investment requirements or provisioning in small, and more expensive, quantities. In either case there is potential for them to be

[26] Footnote – explain IP transit, reference Telegeography
www.telegeography.com/press/press-releases/2015/09/09/ip-transit-prices-continue-falling-major-discrepancies-remain/index.html

squeezed from the market by service providers that can spread their costs across larger customer bases.

The possibility also exists for service providers to lower their requirement for Upstream upgrades by moving frequently accessed content on-island so as to be closer to the consumer [27].

CICRA recognises that content is diverse in nature and changes rapidly, also that its providers (e.g. Netflix and the BBC) are not typically subject to control by Channel Island authorities or service providers. However, access to content is the primary reasons consumers purchase access to the Internet, thus creating demand in the DSC. By caching content closer to the consumer it will be possible to lower the requirement for Upstream capacity and, at the same time, improve consumer experience. Service providers who make such arrangements with content providers can be expected to lower their Upstream cost and gain competitive advantage by offering enhanced service to consumers.

Recommendation 8 Service providers to be encouraged, and if need be assisted, to negotiate with content providers with the objective of locating content that is in high demand to the Channel Islands.

As with recommendation 7, CICRA appreciates that the buying power of dominant service providers may act to the detriment of smaller service providers.

9.5 General recommendations

Given the increasing importance of, and the changing technologies available for, access to Internet services for all parts of the Channel Islands' economy, it is important to ensure that the experience of Channel Island customers accessing Internet services is maintained at a satisfactory level.

Recommendation 9 Regular, objective and reported monitoring of consumer experience of Internet services throughout the Channel Islands, with remedial action where it is considered to be required.

The Internet has already become an important tool in consumers' life and is likely to become increasingly so. Competition in both the fixed and mobile broadband markets will bring an increasing range of services to meet this changing consumer demand. Consumers need to obtain the best available service as their needs change.

Recommendation 10 That Channel Island consumers should be made more aware of the different options they have for broadband services and CICRA to continue to ensure that barriers to switching service provider are minimised.

[27] During the production of this report Sure and JT informed CICRA that they have plans in place to cache Netflix content on island.

ANNEX A - PARISHES AND POSTCODES

Guernsey

Postcode district	Sector	Unit codes	Parish/Island
GY1	All but 3		Saint Peter Port
	3		Herm
GY2			Saint Sampson
GY3	all		Vale
GY4			Saint Martin
GY5			Castel
GY6	8	AA – QZ	Vale
		RA – ZZ	Saint Andrew
GY7	9		Saint Pierre du Bois
			Saint Saviour
GY8	0	AA – JZ	Forest
		KA – ZZ	Torteval
GY9			Alderney
GY10			Sark

Jersey

Postcode district	Sector	Parish
JE2	3	Saint Helier
	4	
	6	Saint Clement
	7	Saint Saviour
JE3	1	Saint Lawrence
	2	Saint Ouen
	3	Saint Mary
	4	Saint John
	5	Trinity
	6	Saint Martin
	7	Saint Peter
	8	Saint Brélade
	9	Grouville

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ANNEX B - SUBJECTIVE FINDINGS FROM THE RECRUITMENT QUESTIONNAIRE

The volunteer recruitment questionnaire gave respondents an opportunity to leave a free form comment and 256 respondents did so.

The subjective nature of the comments, and respondents being self selecting, does not permit hard and fast conclusions to be drawn about the concerns and attitudes of the Islands' populations as a whole, but they do suggest areas for consideration. In order to make use of the comment they have been manually classified and tallied as follows :

Category	Meaning	Number of comments		
		Jersey	Guernsey	Alderney
Customer service	Dissatisfaction with some element of the non-technical aspects of the service, e.g. speed of response to enquiries and billing.	8	5	1
Data volume limit	JT caps the amount of data customers can transfer at certain times with extra usage charged for; the respondent disliked this aspect of the service.	5	-	-
Installation	Problems experienced during installation of the service.	8	-	-
Not as advertised / the 'upto' speed not achieved	Respondent does not feel they receive the service speed they pay for.	6	3	-
Praise	Where the respondent has left a comment praising some aspect of the service they receive.	6	1	1
Price / value for money	The service does not represent value for money.	15	22	2
Reliability	Dissatisfied with the reliability of the service.	10	28	2
Speed	Service is too slow for requirement.	11	24	-
Upgrade unavailable	No upgrade is available either at the respondent's location or from their current service.	22	24	3
	Totals	91	107	9

Notes :

(a) Some respondent's comments covered more than one topic and have been counted under multiple categories. Unsurprisingly respondents' comments were generally negative in nature but where praise was given it has been recorded.

(b) Some comments did not relate to relevant issues and have been discounted for current purposes.

(c) Categories such as 'not as advertised', 'price/value for money' and 'speed' are similar and such comments have not been double counted.

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Figure 13 shows the percentage of comments for each category in each Island (e.g. c11% of comments from Alderney respondents, c5% of comments from Guernsey respondents and c8% of comments from Jersey respondents relate to customer service issues).

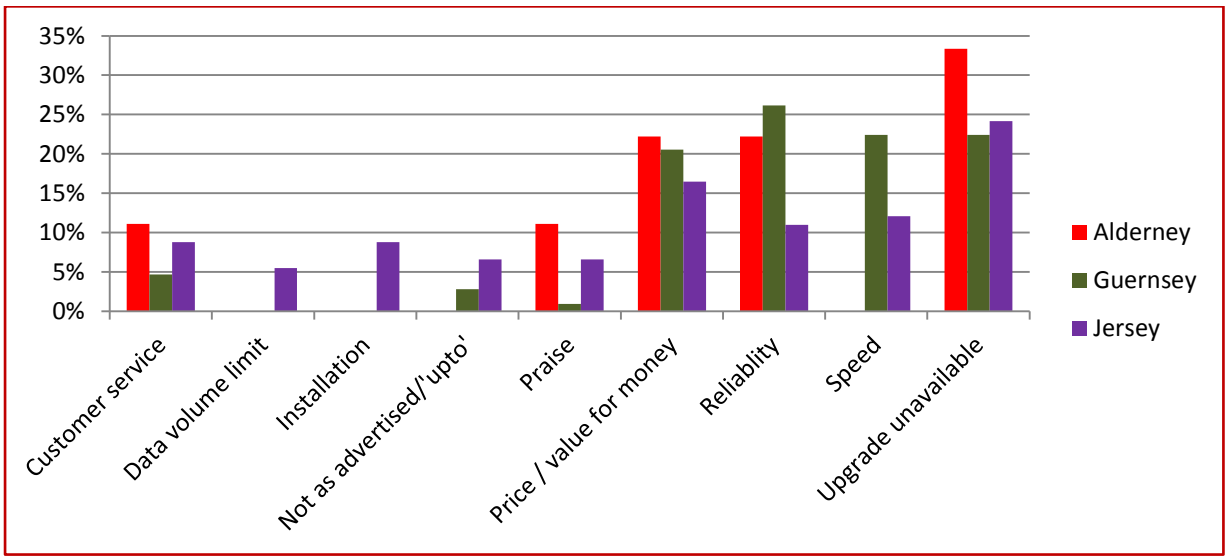

Figure 13 Analysis of comments provided by respondents to the recruitment questionnaire
Source CICRA study recruitment questionnaire

The nature and distribution of these comments is similar to that of the reasons given by people contemplating switching provider when sampled for CICRA's May 2015 broadband satisfaction study[28].

From this it will be noted that :

(a) While 'price/value for money' and 'speed' predominate there are a significant number of comments that relate to the reliability of the service and the unavailability of service upgrades.

(b) The significant numbers of comments relating to the unavailability of service upgrades suggests there is demand for higher speed services. It is unclear whether this demand is a result of the need for higher speeds to access richer content or some expectation that higher speeds would overcome the low levels of service being experienced.

[28] CICRA 15/34 Customer Satisfaction Survey Broadband Results (May 2015)

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ANNEX C - GLOSSARY

ADSL (Asymmetric Digital Subscriber Line)	A technology used for sending data quickly over a conventional copper telephone lines. The asymmetric element refers to the download speed being different from the upload speed and usually reflecting the generally greater volumes of data passing downstream from upstream as experiences in a typical Internet browsing session.
DSC (Digital Supply Chain)	A term used to describe the amalgamation of the home computers and networks, local access networks, the equipment and networks of the service providers, the upstream communications paths across the global Internet and the servers of the organisations whose services the customer is accessing.
Ethernet	A widely used local area networking technology for data transmission over physical cables.
FTTC (Fibre to the Cabinet)	An access network structure in which the optical fibre extends from the exchange to the cabinet. The street cabinet is usually located only a few hundred metres from the subscriber's premises. The remaining part of the access network from the cabinet to the customer is usually copper wire but could use another technology, such as wireless.
FTTH (Fibre to the Home)	An access network structure in which the optical fibre runs from the local exchange to the end user's premises.
NGA (Next Generation Access)	New or upgraded access networks that allow substantial improvements in broadband speeds and quality of service compared to ADSL type services. Can be based on a number of technologies including cable, fixed wireless and mobile. Most often used to refer to networks using fibre optic technology.
SDSL (Symmetric Digital Subscriber Line)	Similar to ADSL but with symmetrical upstream and downstream data rates. Sometimes used as an alternative to a leased line.
VDSL (Very high bit rate Digital Subscriber Line)	An upgrade to ADSL technology allowing for faster Internet access over copper lines. Frequently associated with FTTC deployments.
WiFi	Short range wireless technologies that allow an over-the-air connection between a wireless device and a base station, or between two wireless devices. WiFi has a range of over 30 metres indoors, and around a kilometre out-doors.
WiMax (the Worldwide Interoperability for Microwave access)	A wireless technology, similar to WiFi, but with a longer range which can cover many kilometres. WiMax has been considered as a wireless alternative for an access technology to provide high speed access links instead of using copper or fibre cables to properties.

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ANNEX D – ACTUAL EXPERIENCE REPORT TO CICRA

A copy of this report can be obtained separately from CICRA (www.cicra.gg or www.cicra.je).