STATE OF ICT IN BERMUDA

2016

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Ministry of Economic Development
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SAMPLE/METHODOLOGY

Residential Statistics

1. **Department of Statistics (December 2016)**
   400 households in Bermuda were interviewed.

   The sample was randomly selected.

   The margin of error for this segment is +/– 5%.

2. **E-Commerce Residential Technology Benchmarking Research (November 2016)**
   Computer Assisted Telephone Interviewing (CATI) was used to interview a representative sample of 402 Bermuda residents aged 18 years and older.

   The data was weighted to be representative of Bermuda's population on the following factors: age, gender, and nationality.

   The margin of error for the study is +/- 4.9%.

Corporate Statistics

1. **E-Commerce Corporate Technology Benchmarking Research (November 2016)**
   Computer Assisted Telephone Interviewing (CATI) was used to interview a representative sample of 200 Bermuda professionals aged 18 years and older. Where possible, the results obtained in 2016 are directly compared to the 2015 and 2012 results.

   The margin of error for the study is +/- 7%.

Contents

INTRODUCTION

The purpose of the Department of ICT Policy and Innovation's *State of ICT in Bermuda* Report is to assess the prevalence of Information and Communication Technologies (ICT) in Bermuda from an infrastructure, usage and skills perspective. Given the rapidly changing nature of technology and its impact on and implications for Bermuda and its residents, regular and in-depth quantitative data is gathered and examined regularly.

Many of the indicators used here are consistent with those used by the International Telecommunication Union (ITU) in the *Measuring the Information Society* Annual Report, which requires that certain ICT indicators be reported annually. Other indicators used are also consistent with those of leading international organisations such as the World Economic Forum and their *Networked Ready Index* (NRI) Framework, the Economic Intelligence Unit's *Digital Economy Readiness Rankings* and the *Partnership on Measuring ICT for Development* Core ICT Indicators.

ICT indicators track the state of a country's digital economy and progress by assessing elements such as infrastructure and penetration rates and the use of ICT by individuals and organisations. These indicators also can show a jurisdiction's ability to innovate or leverage technology to benefit society or the economy.

This analysis of the Bermuda ICT landscape uses benchmarks developed over time, against which progress is compared, shortcomings are spotted and new trends and opportunities are identified. The resulting report provides information for policy-makers, businesses and other organisations, educational institutions, technophiles and others, to assist with decision-making and forward planning.

Although we do introduce new questions in respect to recent developments in the technology landscape, we employ comparisons with findings of prior years where possible.

Highlights in the 2016 State of ICT in Bermuda Report include:

Household Data:

Internet Penetration:

92% of residents have Internet access at home.

General Attitudes towards Technology

- 99% of residents believe that in order to compete in the global economy, Bermuda must continue to meet or exceed global technology standards.
- 98% of residents believe that it is important for Bermuda to continue adopting new technology products and services in order to remain competitive.

- 97% of residents believe that having a strong knowledge of technology is essential in getting ahead today.

Technology Ownership & Usage

- 93% of households own at least one computer.
- 91% of households own at least one smartphone.
- 90% of homes have a computer network, 88% of which are wireless, a further 88% of which are secure.

ICT Education

- 98% of residents indicated their strong belief in including computer science and programming in the public school curriculum.

Protection of Personal Information

- 100% of residents believe that it's important to protect personal information online and offline.
- 98% of residents would prefer doing business with organisations that protect their personal information.
- 91% percent were concerned that personal information was possibly being used in a manner with which they did not agree.
- 15% of residents do not have access to the Internet at home for privacy/ security concerns.

Corporate Data:

General Attitudes towards Technology

- 97% of professionals believe that in order to compete in the global economy, Bermuda must continue to meet or exceed global technology standards.
- 96% of professionals believe that having a strong knowledge of technology is essential to a firm's success today.

Technology Ownership & Usage

- 100% of businesses have Internet access, mostly using broadband connection speeds of 10MB (23%) and 8MB (19%).
- 97% of businesses own desktop computers.
- 94% of businesses use technology for internal functions.
- 94% of businesses use Government websites or local public service websites, such as Bermuda Weather or Bermuda Airport.

Outsourcing

- 98% of businesses do not intend to outsource any of their IT departments in the next 6 months.

ICT Education

- 96% of professionals believe that public education in Bermuda should offer courses in computer science and programming.

Information Security

- 90% of businesses have a disaster recovery or business continuity plan in place.
- 85% of businesses have a common server, of which 98% are secure.

RESIDENTIAL FINDINGS

Attitudes toward Technology

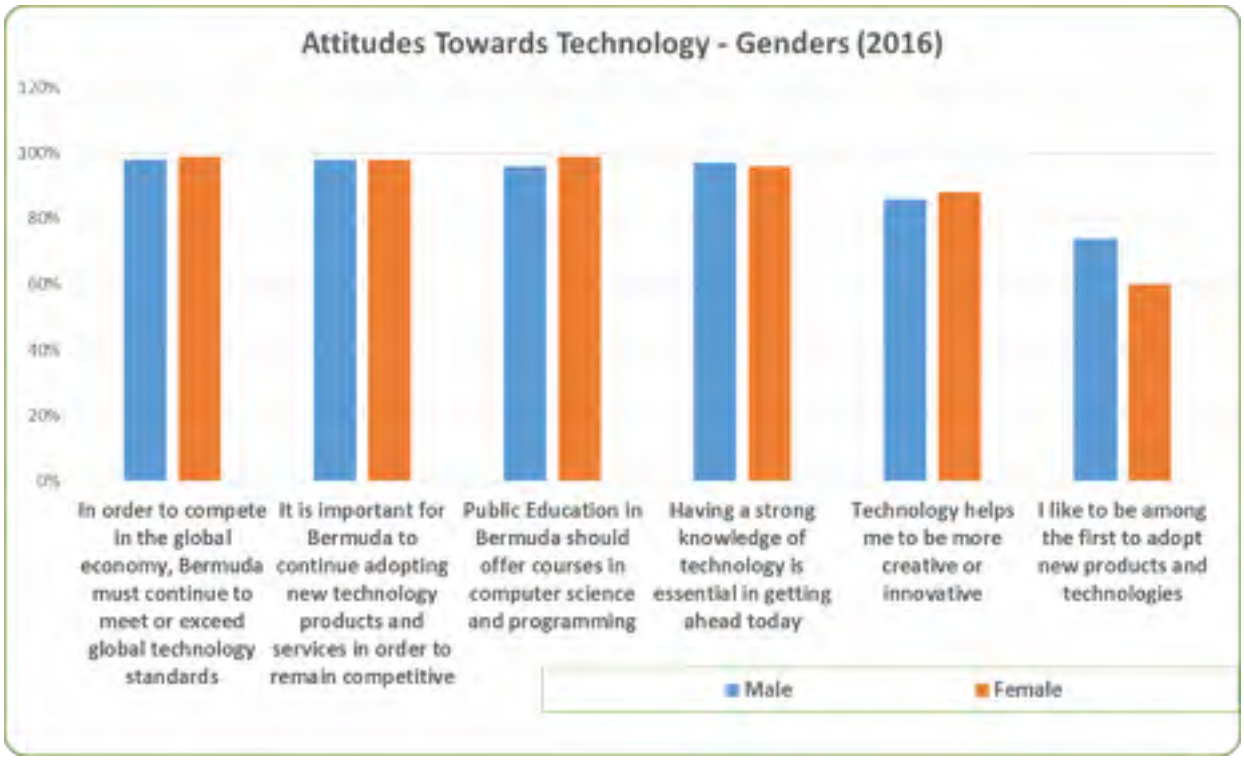
In 2016, one new question was added to identify the extent to which residents believed that computer science should be taught in Bermuda's schools, specifically public schools. 98% of residents indicated their strong belief in including the subject in the public school curriculum.

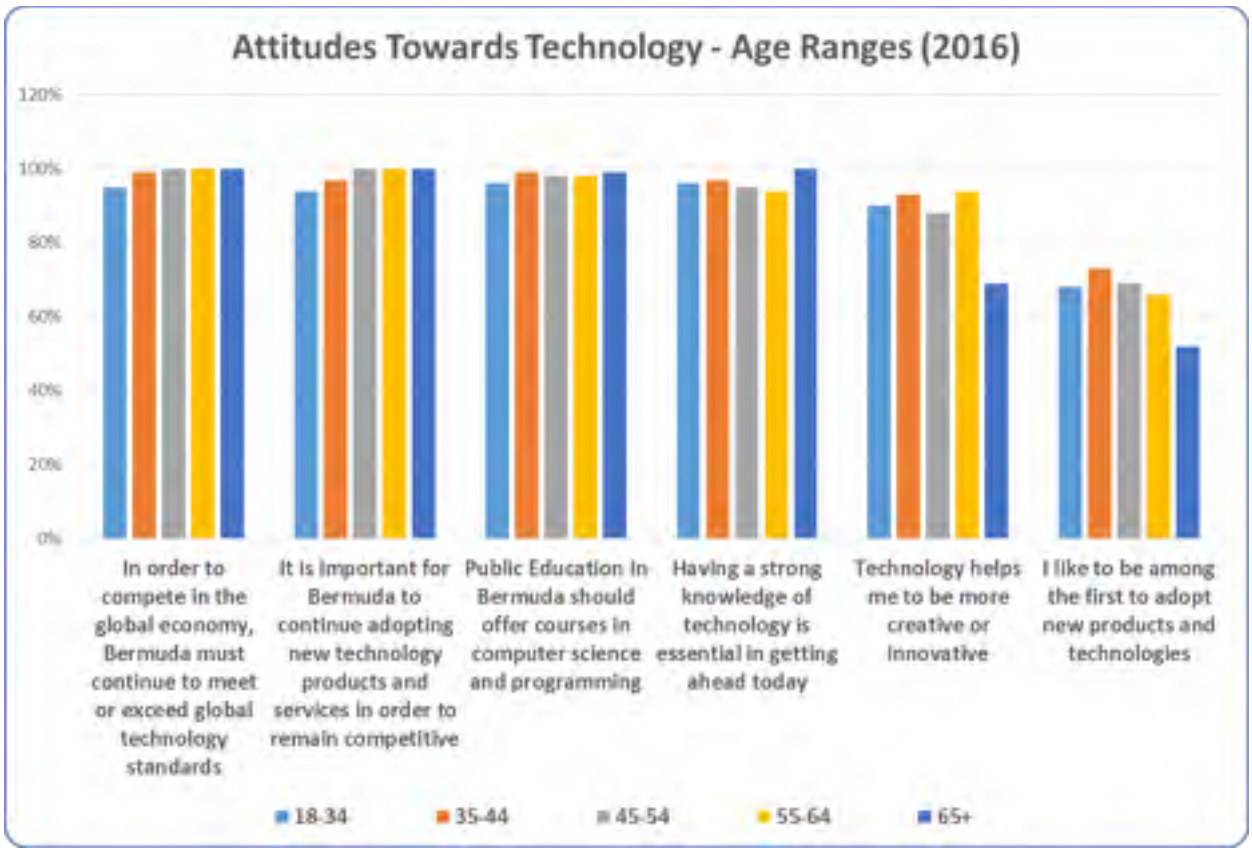
Regarding the other questions, answers continue to be consistent.

How much do you agree with each statement?			
	2012	**2014/15**	**2016**
Public Education in Bermuda should offer courses in computer science and programming	n/a	n/a	98%
In order to compete in the global economy, Bermuda must continue to meet or exceed global technology standards	97%	94%	99%
Having a strong knowledge of technology is essential in getting ahead today	95%	90%	97%
It is important for Bermuda to continue adopting new technology products and services in order to remain competitive	n/a	96%	98%
Technology helps me to be more creative or innovative	90%	85%	87%
I like to be among the first to adopt new products and technologies	54%	66%	66%

While most answers were even between genders and across the ages, the last statement ("*I like to be among the first to adopt new products and technologies"*) is not balanced between males and females.

A breakdown of attitudes towards technology along gender lines can be seen below, together with a breakdown along age ranges.


Attitudes Towards Technology - Genders (2016)
120%
100%
80%
60%
40%
20%
0%
In order to compete in the global economy, Bermuda must continue to meet or exceed global technology standards
It is important for Bermuda to continue adopting new technology products and services in order to remain competitive
Public Education in Bermuda should offer courses in computer science and programming
Having a strong knowledge of technology is essential in getting ahead today
Technology helps me to be more creative or innovative
I like to be among the first to adopt new products and technologies
Male
Female

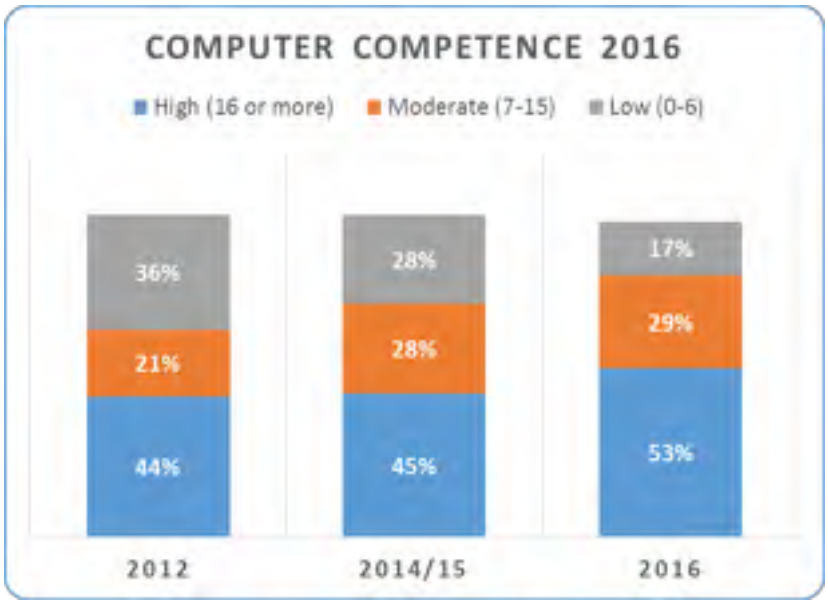

Attitudes Towards Technology - Age Ranges (2016)
120%
100%
80%
60%
40%
20%
0%
In order to compete in the global economy, Bermuda must continue to meet or exceed global technology standards
It is important for Bermuda to continue adopting new technology products and services in order to remain competitive
Public Education in Bermuda should offer courses in computer science and programming
Having a strong knowledge of technology is essential in getting ahead today
Technology helps me to be more creative or innovative
I like to be among the first to adopt new products and technologies
18-34
35-44
45-54
55-64
65+

Overall Technology Competence

Residents were asked to rate their level of expertise in 25 technology areas relating to general computing, internet usage, cell phones, smart phones, and other technologies. Based on these ratings, they were classified as having either low, moderate, or high technology competence based on the number of areas for which they expressed a high level of expertise.

Using this scale, one can note that:

- 53% of residents self-rated as having high technology competency, up from 45% in 2014/15,
- 29% showed a moderate level of technology competency, up from 28% in 2014/15, and
- 17% showed a low level of technology competency, down from 28% in 2014/15.

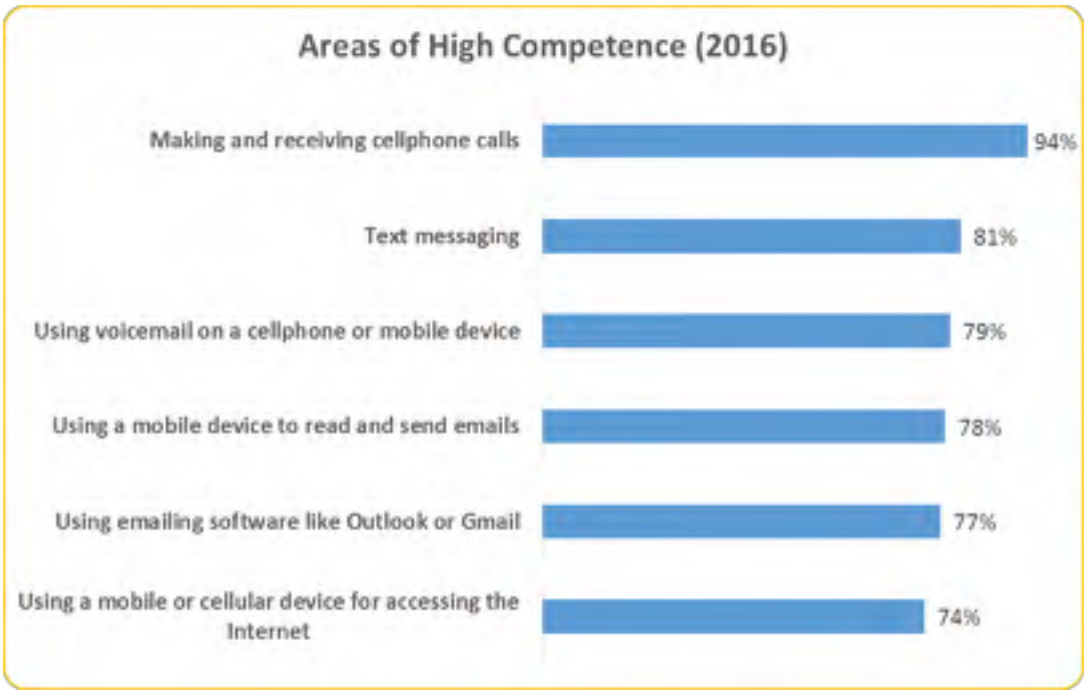


It is worth noticing the continuous trend in attaining higher competency levels. Specifically, 82% of Bermuda's residents reported a moderate to high level of ICT competence, which shows a 12% increase from prior years: 73% in 2014/15 which itself was a 12% increase from 65% in 2012. The 2010 figure (not shown here) was 69%.

This may be the result of the increased normalization and commodification of personal devices including smartphones and tablets, which continue to perform ever-increasing numbers of computer-like functions.

High Competency Areas

The areas where residents expressed a high degree of competency are shown in the chart below. Please note that most respondents who self-rated this way fall in the 18 to 34 year-old group.



For more detail, below is a list of the top two most-commonly mentioned areas of competency:

General Computing

1. Email: 77%, up from past years (63% in 2014/15 and 43% in 2012.)
2. Word processing: 51%, which was also up from past years (40% in 2014/15 and 34% in 2012.)

Internet Usage

1. Online banking/ bill payments: 71%, up from past years (60% in 2014/15 and 49% in 2012.)
2. Shopping online: 69%, up from past years (56% in 2014/15 and 44% in 2012.)

Mobile Devices

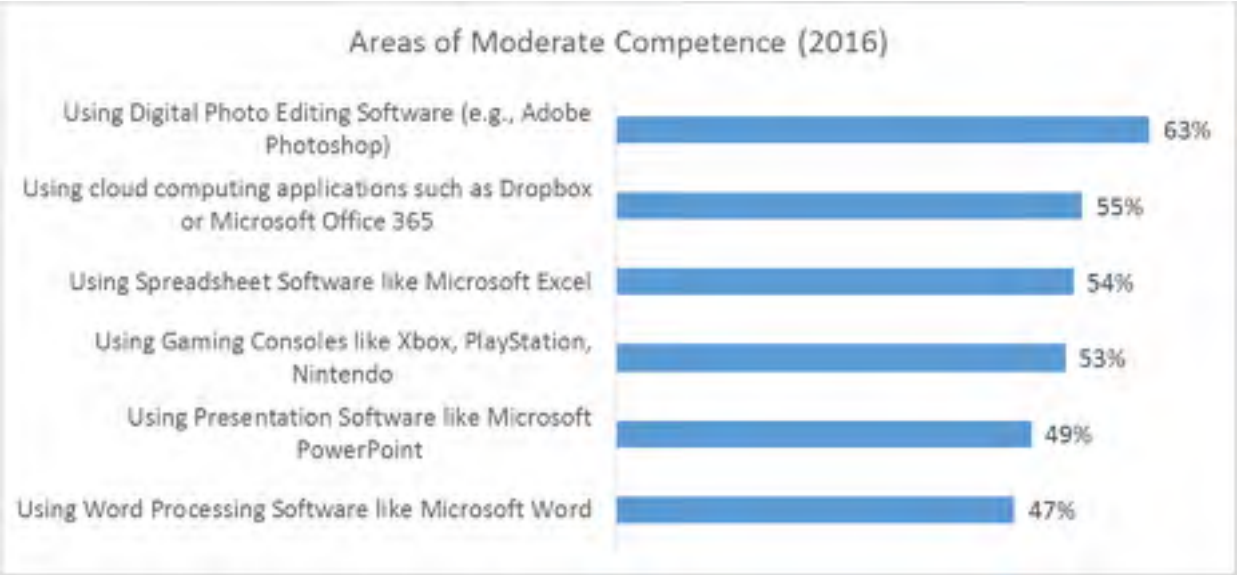
1. Making and receiving cell phone calls: 94%, up from past years (75% in 2014/15 and 74% in 2012.)
2. Text messaging 81%, up from past years (67% in 2014/15 and 60% in 2012.)

Other Technologies

1. Using a tablet or similar device: 63%, which was up from last year (51%) this question having only been introduced then.
2. Using a digital camera 59%, which was up from past years (49% in 2014/15 and 46% in 2012.)

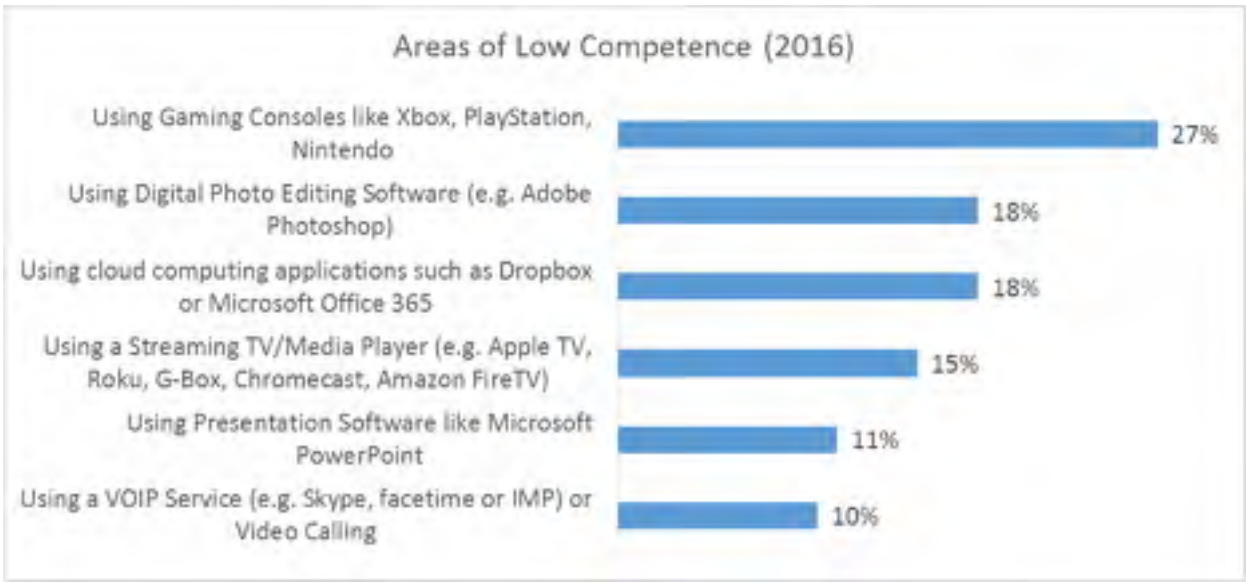
Moderate Competency Areas

The areas where residents expressed a moderate degree of competency are shown in the chart below. A majority of respondents in this category fell in the 45 and up group (subgroups being 45-54, 55-64, and 65+).



Low Competency Areas

The areas where residents expressed a low degree of competency are shown in the chart below. Please note that all of these areas predominately reflect the 65+ group among the survey's respondents.



Ownership, Purchasing Habits, and Usage

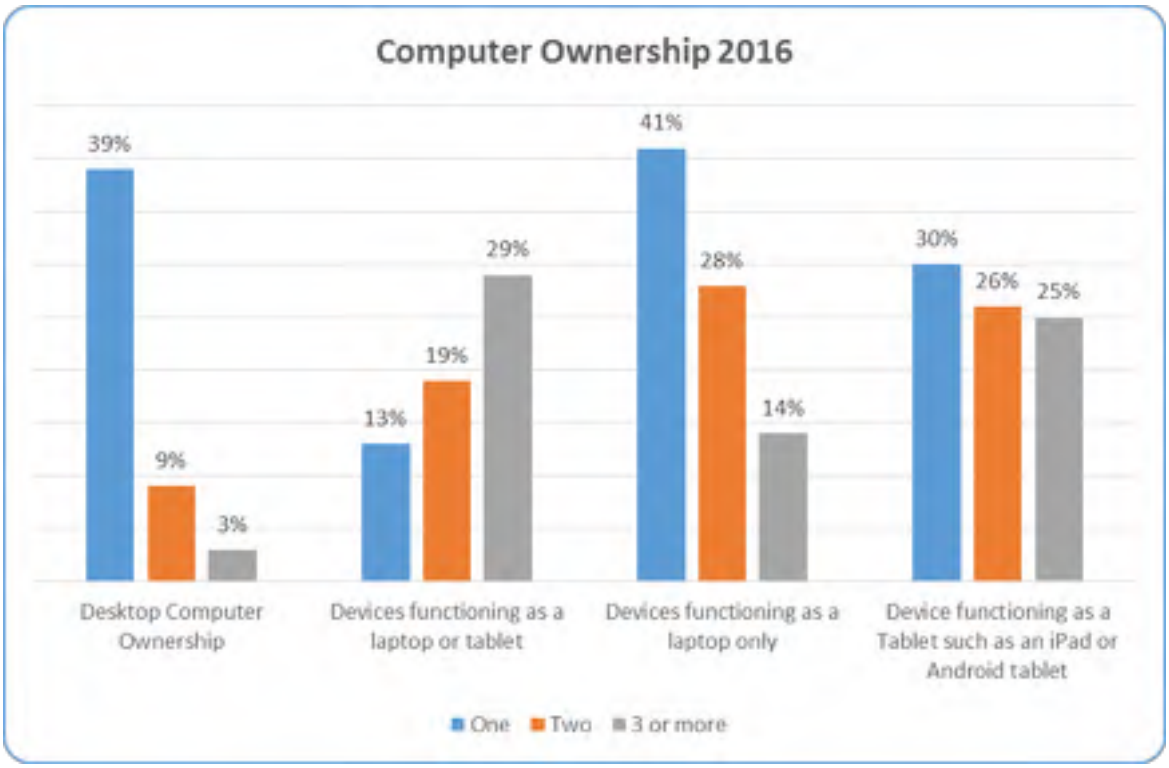
Computers and Internet-Ready Devices

Bermuda continues to have a high computer ownership rate for residents (93% this year, vs. 85% in 2014 and 90% in 2012).

To this set of questions, we made a few changes in the 2016 study. While we customarily asked about "Wi-Fi-ready devices," we decided to obtain more specific information: which kind of device, specifically. In doing so:

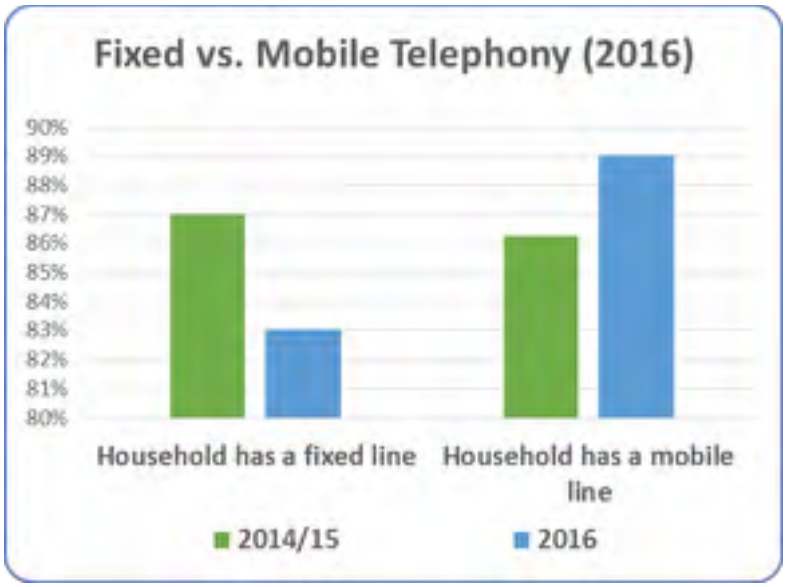
- We added one query that specifically asked the residents if they owned a "device that functions as a laptop or tablet," considering the increased presence of items like the Microsoft Surface which is such a hybrid, and which falls into this category. The "yes" answers amounted to 61% of the residents polled.
- We asked about the percentage of households which owned a device that functions as a laptop only, which clarified that the upsurge in laptop ownership continues (83%, up from 77% in 2014/15 and 71% in 2012). In prior years, this was to the detriment of desktop ownership.
- Lastly, we asked about the percentage of households which owned a device that functions purely as a tablet such as an iPad. The "yes" answers amounted to 81% of the residents polled, up from 78% in 2014/15 and 54% in 2012).

Unlike last year, there was a surprising uptick in the proportion of residents who own a desktop computer (50%) after a continuous decrease over the past few years (44% in 2014/15 and 53% in 2012 and 62% in 2010.)



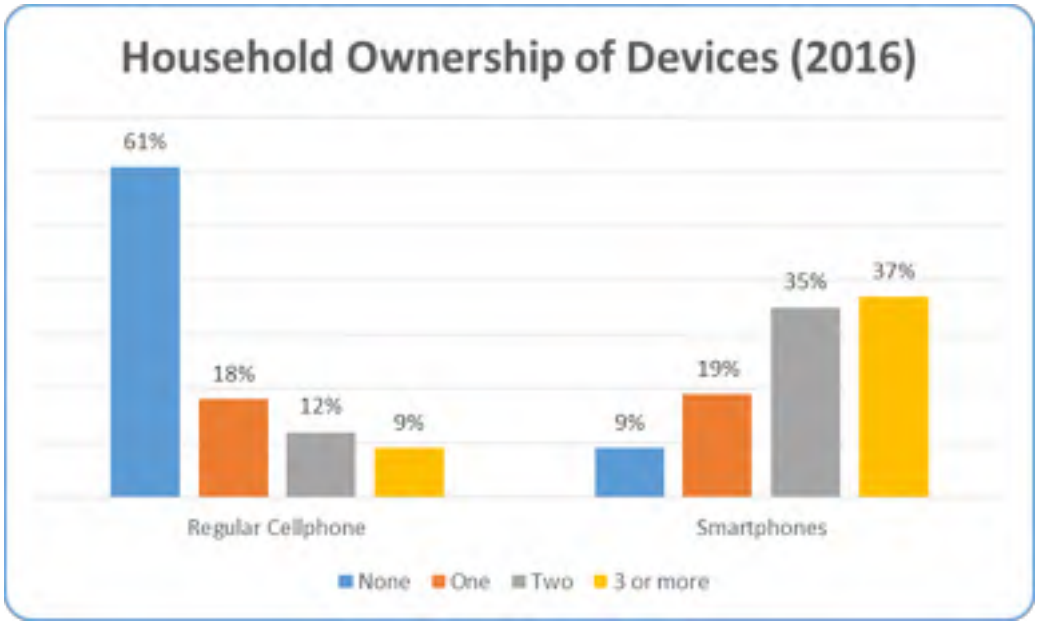
Mobile Telephony

While 87% of households still own a fixed telephone line, mobile telephone line ownership is at 86% this year.



Continuing to make the distinction between regular cellphones and smartphones yielded the following results: the number of households that own a smartphone continues to increase (91% vs.

85% in 2014/15, 78% in 2012, and 76% in 2010). Regular cellphone ownership continues to decrease (39% vs. 46% in 2014/15, 50% in 2012 and 63% in 2010).



Purchasing Habits

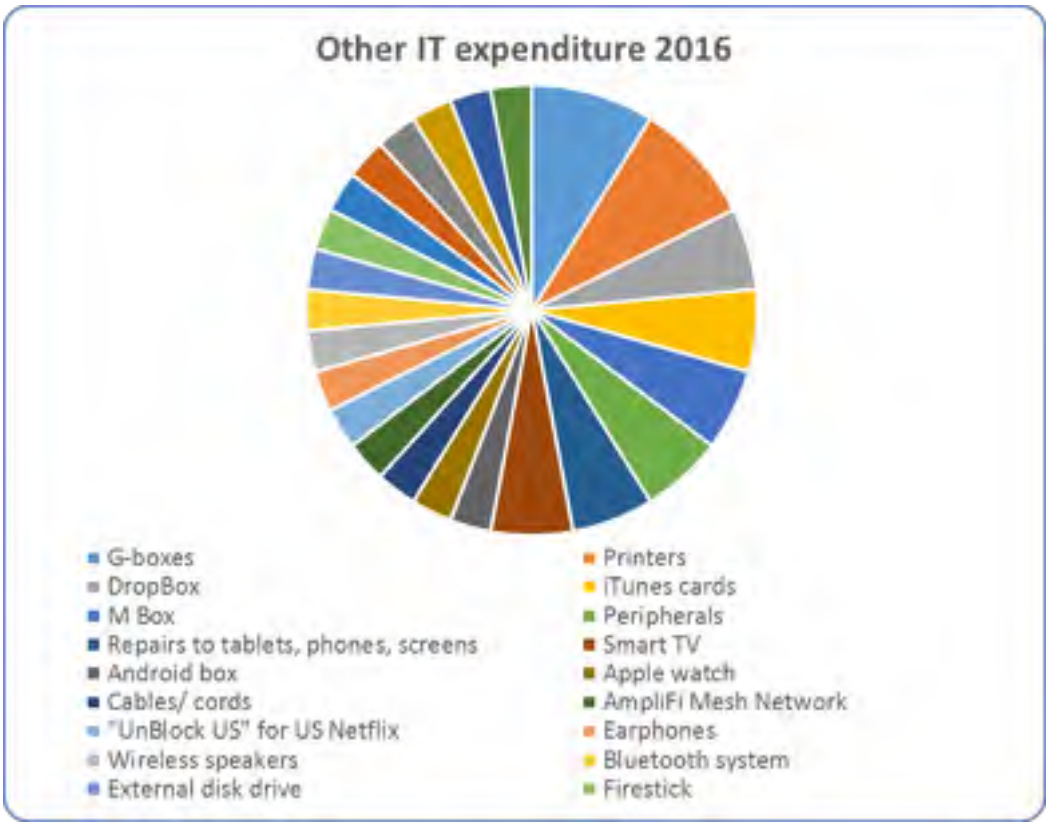
Bermuda residents show high competency in online shopping. In dollar terms, respondents indicated an annual local online expenditure of $804.55 and an annual overseas online expenditure of $3,491.44, leading to a total of$4,295.99 for the year.

39% percent of respondents are likely to upgrade to a new computing device in the next 6 months, with the most desired computing devices being laptops (26%) and Apple computers (18%).

The breakdown of household expenditures on IT-related products is as follows:

	2016	2014/15	2012
Monthly spending on Communication (Internet, voice, other data devices)	n/a	n/a	$ 187
Services (include Internet, cellphone bill, cable bill, Netflix, etc.)	$ 2,641	$ 2,368	n/a
Phones (regular cellphones and smartphones)	$ 581	$ 415	$ 319
Computers (desktops or laptops)	$ 357	$ 386	$ 388
Software	$ 185	$ 59	n/a
Tablet or similar device	$ 175	$ 194	$ 232
Other IT product expenditure (specified in the chart below)	$ 90	$ 39	$ 16
Gaming consoles	$ 43	$ 67	$ 83
TOTAL (ANNUAL)	**$ 4,072**	**$ 3,527**	**$ 3,279**

The 4% "Other IT product expenditure" category mentioned in the chart above includes the following:

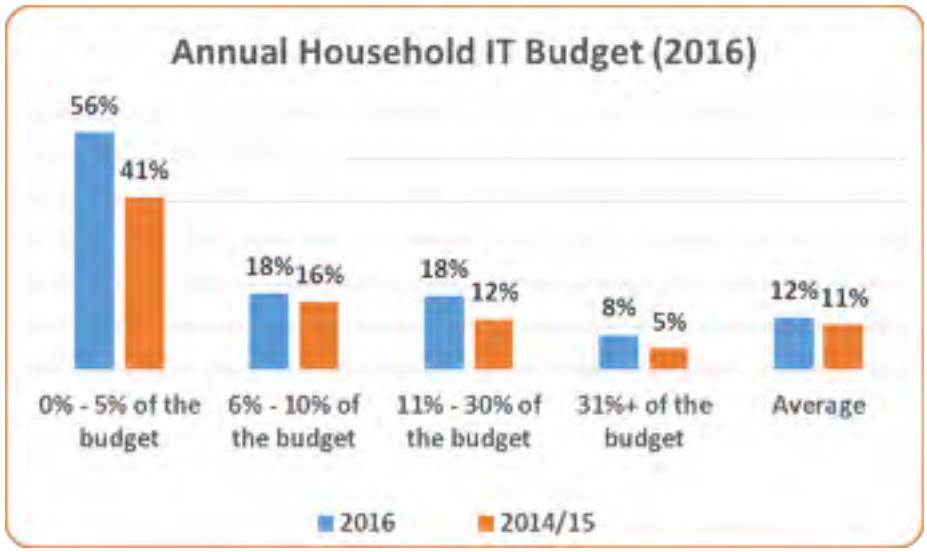


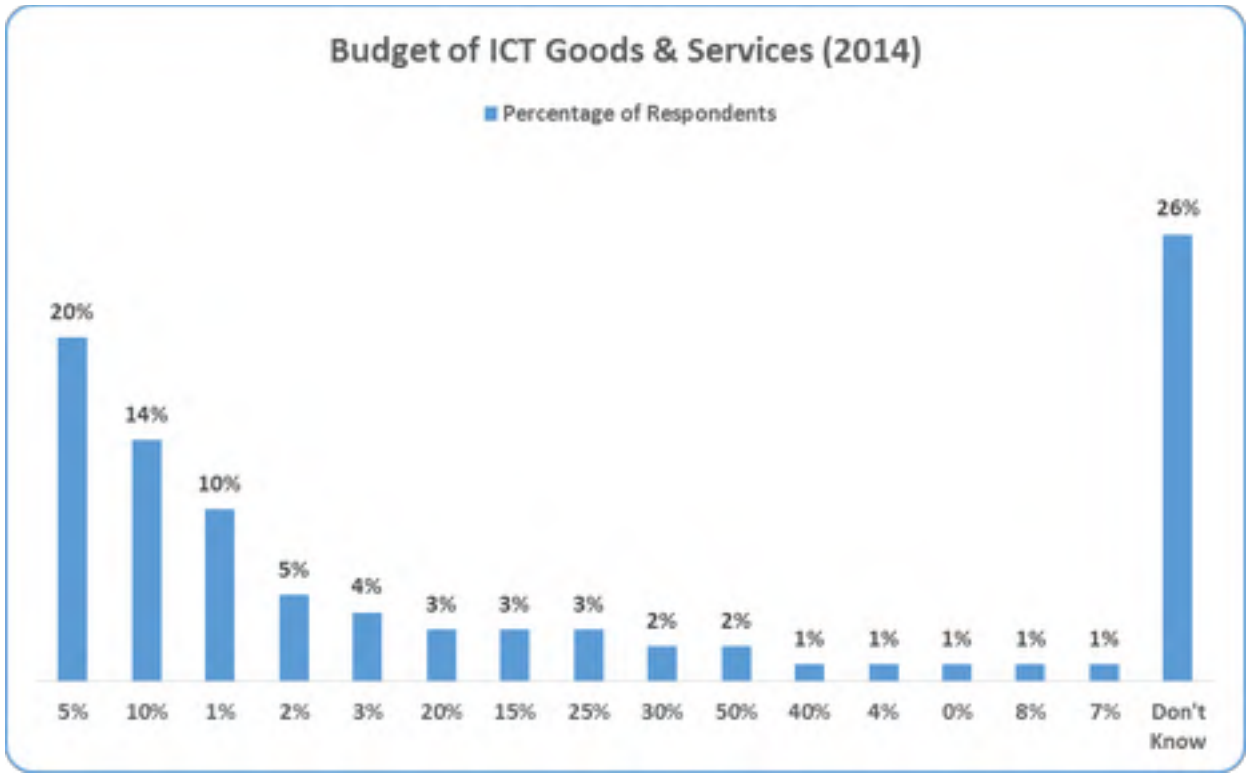
In terms of dollar values, it was found that on average, residents spend $4,072.41 a year on various IT-related purchases, which represents an increase close to twice the increase between 2014/15 and 2012.

	2016	2014/15	2012
Estimated annual spending on IT-related products	$ 4,072	$ 3,527	$ 3,279
$ Change 2014/15 to 2016	$ 546		
$ Change 2012 to 2014/15	$ 248		
% Change 2014/15 to 2016	15%		
% Change 2012 to 2014/15	8%		

Then respondents were asked to estimate the percentage of their annual budget that is spent on IT. Each respondent gave an estimate number (e.g. 5%, 10%, 7%) which were then grouped into ranges as shown below. The 400 individual responses were then used to obtain the average household spend on IT.

On average, it was found that residents spend 12.37% of their annual budgets on IT. Note the increase across all budget ranges over last year's findings.





When tracking online purchasing habits, it was found that residents spend the most on overseas online purchases. In fact, the aggregate amount of online purchases is witnessing a drastic increase year-after-year, again significantly increasing between 2014/15 and 2016.

	2016	2014/15	2012
Total online expenditure on IT-related products	$ 4,296	$ 2,290	$ 1,333
$ Change 2014/15 to 2016	$ 2,006		
$ Change 2012 to 2014/15	$ 957		
% Change 2014/15 to 2016	88%		
% Change 2012 to 2014/15	72%		

Specific IT equipment purchases are done both locally and overseas. The top 3 reasons for choosing to purchase IT equipment locally are:

- the accessibility, ease, and convenience of doing so,
- the quality of local customer service and tech support, as well as
- the availability of warranty services.

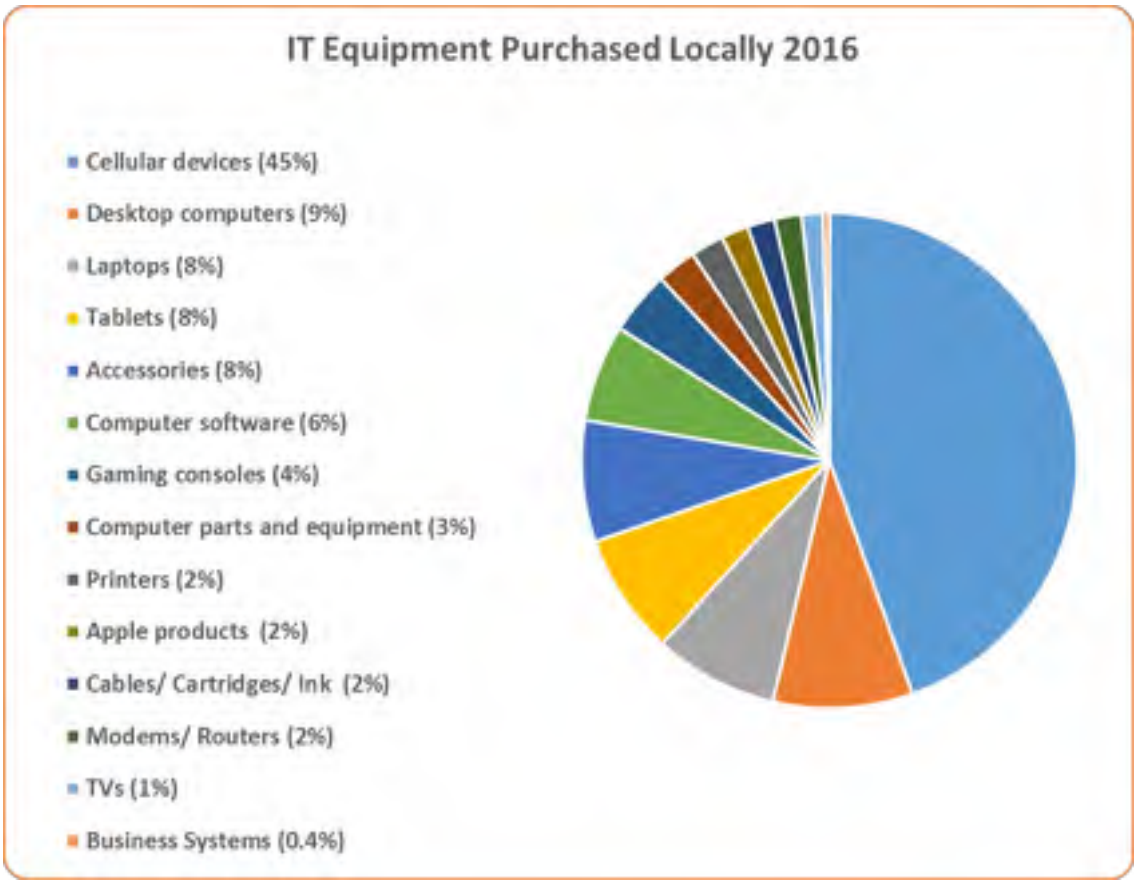
The top reasons for choosing to purchase IT equipment abroad, on the other hand, are:

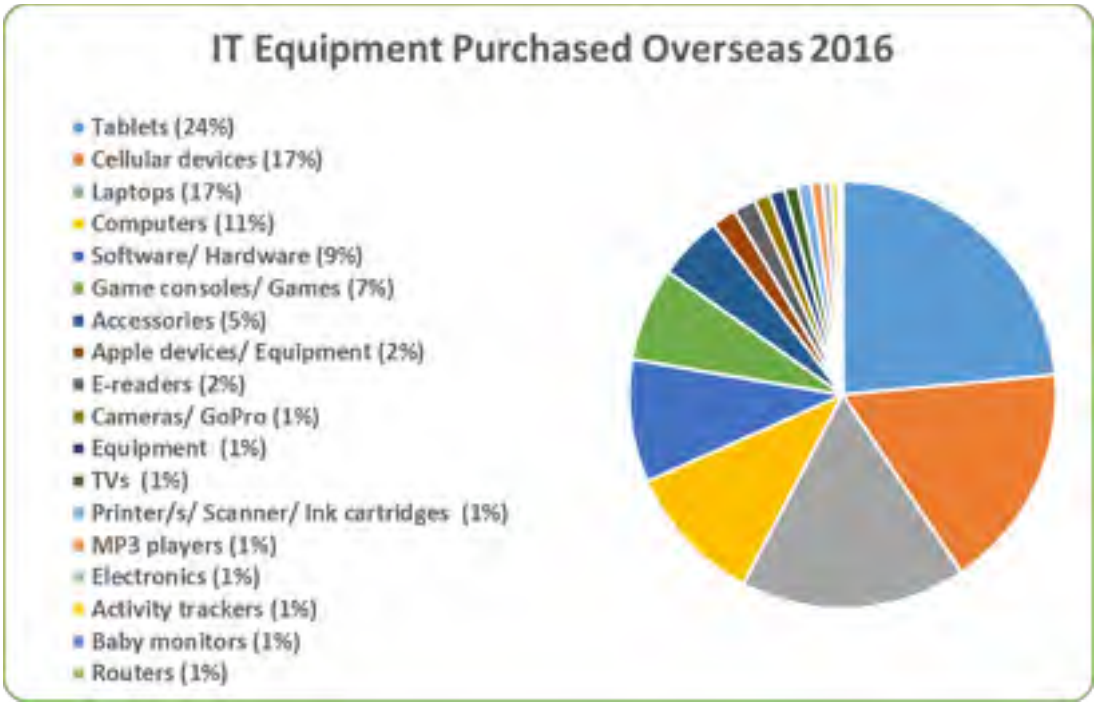
- better pricing and
- a better selection of products overseas.

The top reasons for choosing to purchase IT equipment both locally and abroad are:

- More affordable pricing abroad,
- Choosing wherever the cheaper option is, and
- Better selection abroad.

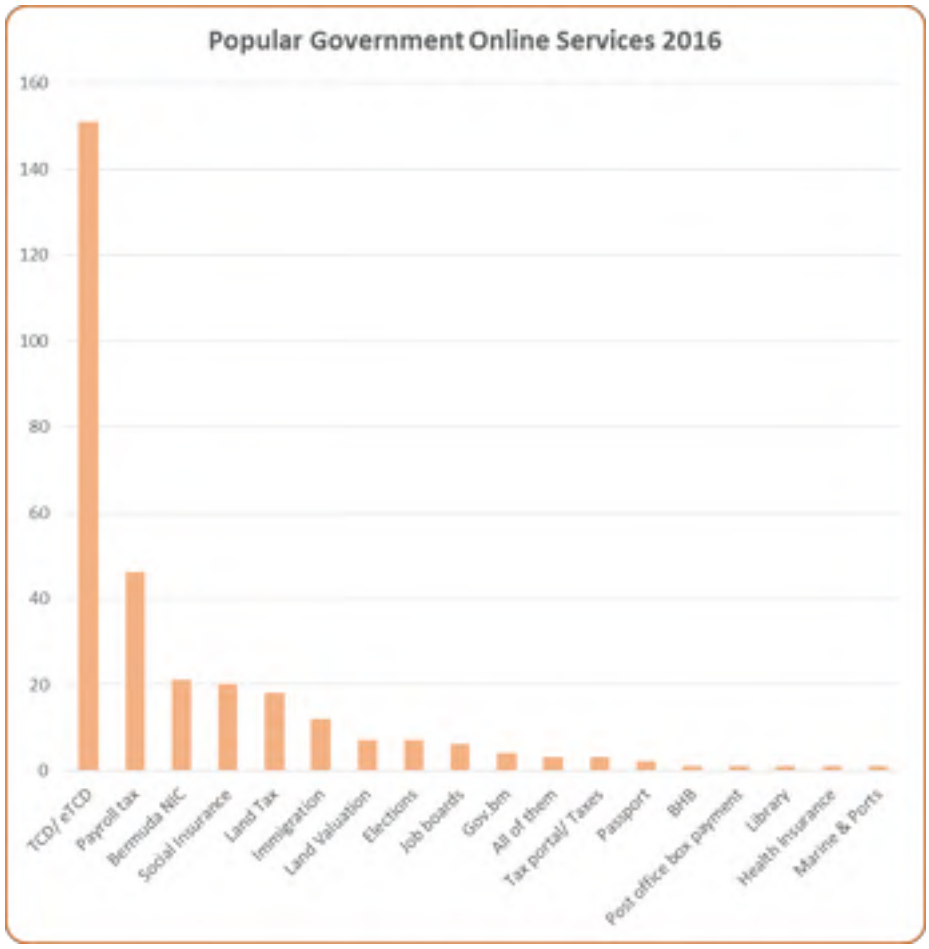
While the most popular IT devices purchased locally are cellular devices, desktop computers, laptops and tablets, the most popular IT devices purchased abroad are a more fragmented group, topped by tablets, cellular devices, and laptops.


IT Equipment Purchased Locally 2016
Cellular devices (45%)
Desktop computers (9%)
Laptops (8%)
Tablets (8%)
Accessories (8%)
Computer software (6%)
Gaming consoles (4%)
Computer parts and equipment (3%)
Printers (2%)
Apple products (2%)
Cables/ Cartridges/ Ink (2%)
Modems/ Routers (2%)
TVs (1%)
Business Systems (0.4%)


IT Equipment Purchased Overseas 2016
Tablets (24%)
Cellular devices (17%)
Laptops (17%)
Computers (11%)
Software/ Hardware (9%)
Game consoles/ Games (7%)
Accessories (5%)
Apple devices/ Equipment (2%)
E-readers (2%)
Cameras/ GoPro (1%)
Equipment (1%)
TVs (1%)
Printer/s/ Scanner/ Ink cartridges (1%)
MP3 players (1%)
Electronics (1%)
Activity trackers (1%)
Baby monitors (1%)
Routers (1%)

Government Services Online

51% percent of residents confirmed using online Government services, up from 40% in 2014/15. Of said services, the most popular by far remains TCD, followed by Payroll Tax, which is well in line with the last survey's findings. The 3rd most popular site, which was Land tax previously, is now BermudaNIC, which deals with the registration of the ".bm" domain name.



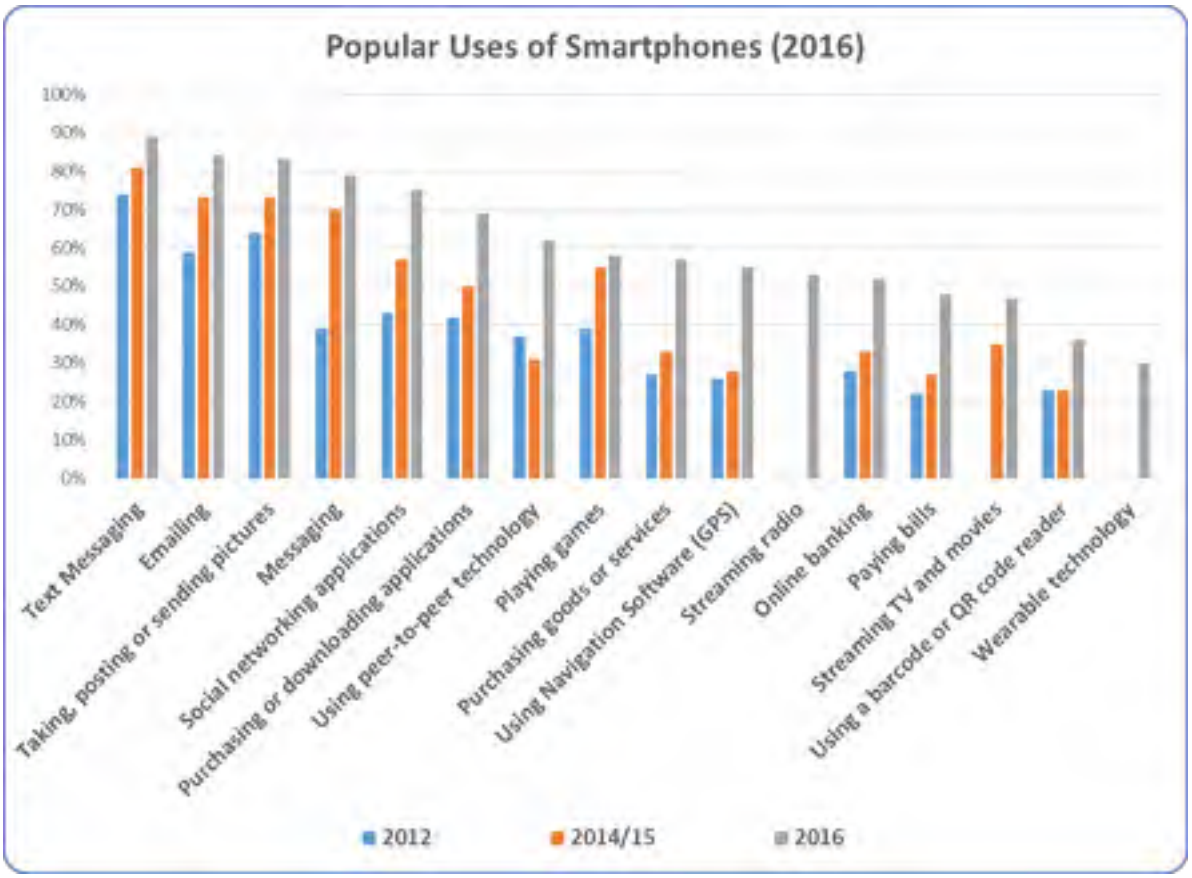
Other Uses

Residents use smartphones for a variety of purposes, which is increasingly allowing them to perform functions that were one only available through the use of computer. Smartphones are often, conveniently, allowing such functions to be performed anywhere and on-the-go.

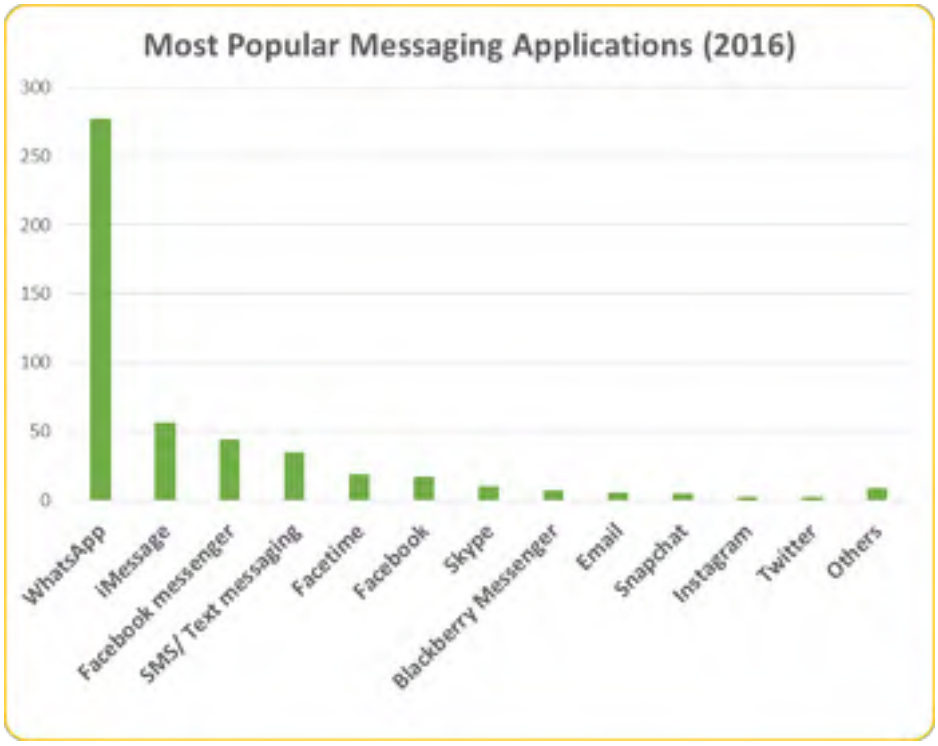
Beyond the now-customary, multiple ways to communicate, residents are increasingly using their smartphones for other purposes. For instance, there has been a marked increase in:

- Using navigation software (27% increase over 2014/15's numbers),
- Purchasing goods or services (24% increase over 2014/15's numbers), and
- Paying bills (21% increase over 2014/15's numbers).

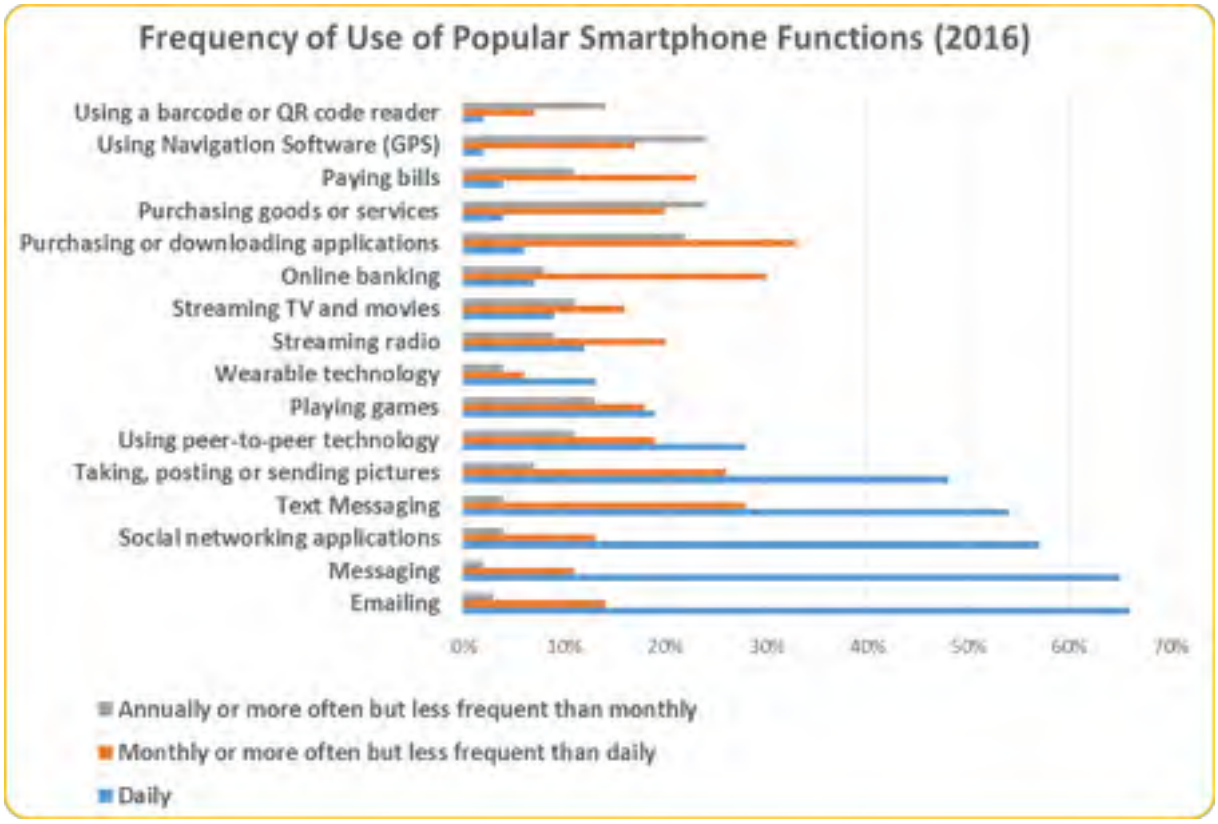
While there's no comparison to prior years, the new question enquiring into the popularity of wearable technologies such as the Fitbit and the Apple Watch showed that 30% of respondents use it.



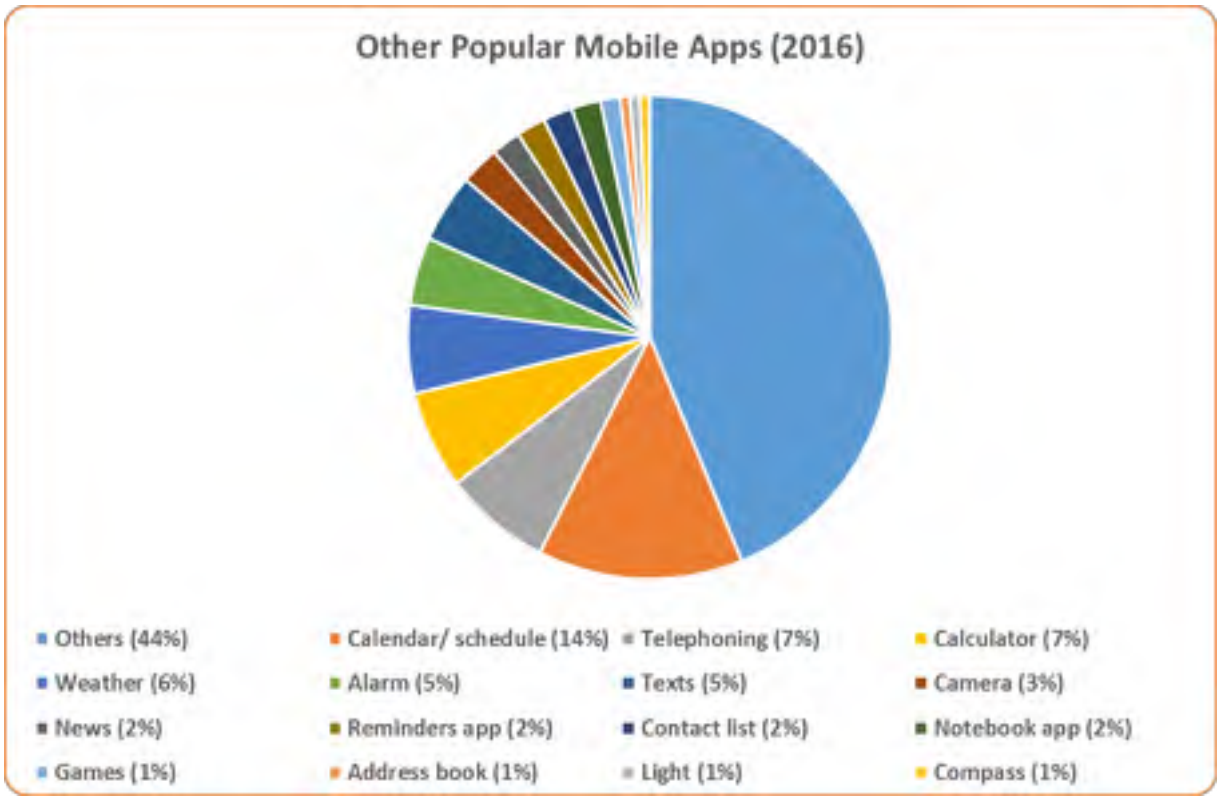
The most-commonly used applications that aid in communications are shown below.



The apps mentioned above, which aid in the different kinds of communication, are largely used on a daily basis. Others, such as those which assist in paying bills, are used less frequently.



In more general terms, residents also use a variety of apps, primarily the smartphone-embedded calendar and calculator apps. Other applications mentioned by name include the Step Counter, iHeartrate, iTunes, and Instagram.

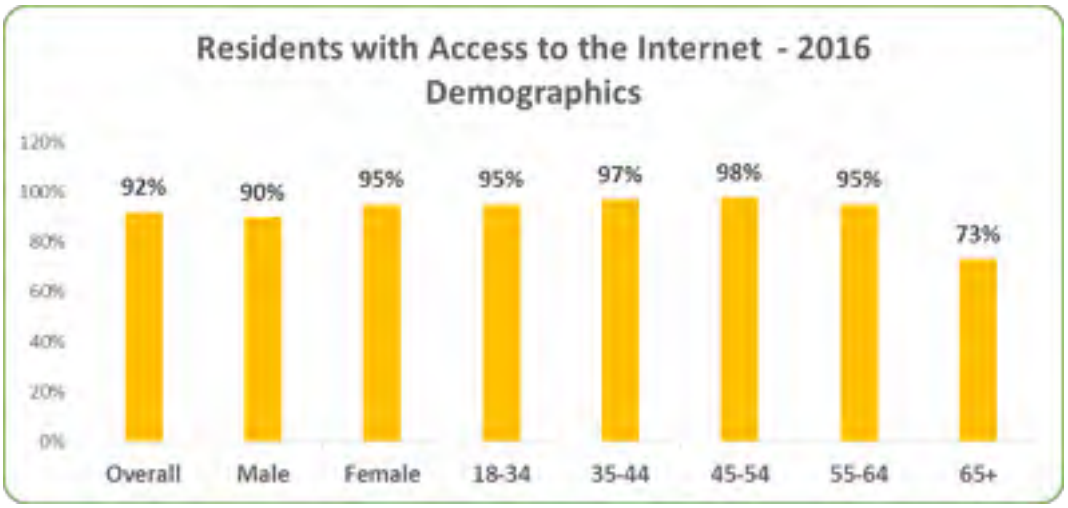


Computer, Mobile and Internet Usage

Internet Access & Use

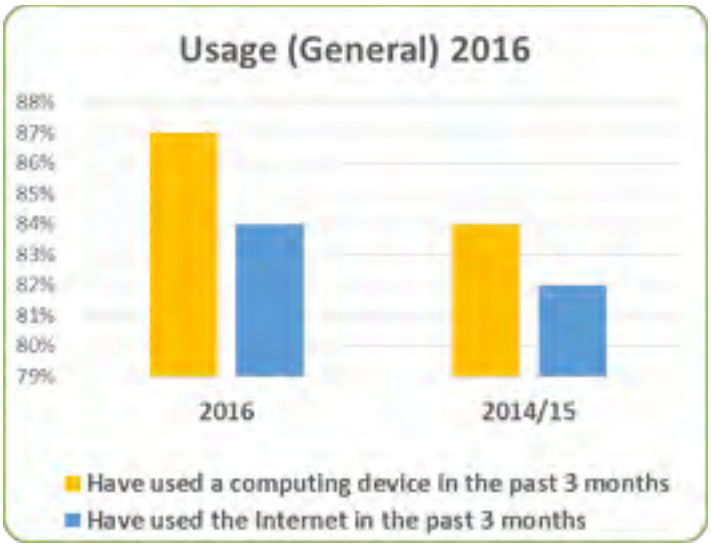
This report revealed above that Bermuda has a high computer ownership rate for residents (93%) and a high Internet penetration rate (92%) which makes computer and Internet use increasingly common.

Demographically, Internet access is distributed as follows:

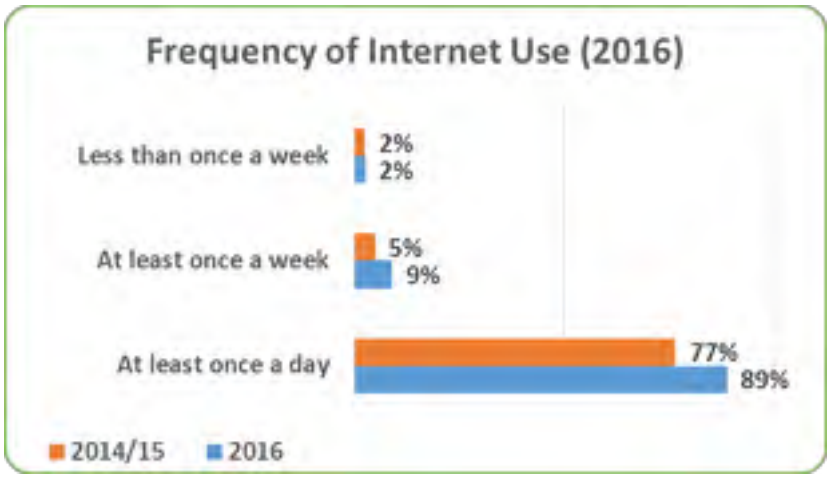


Householders were asked if they had, in the past three months, used:

- A computer (desktop, laptop, tablet or similar) from any location, and/or
- The Internet from any location.

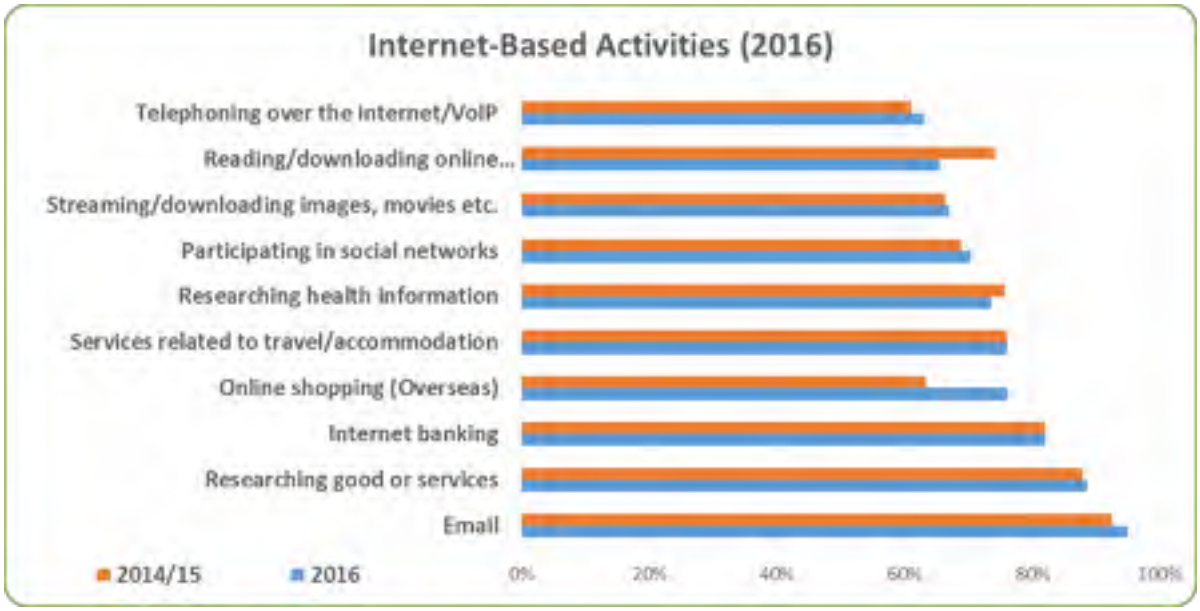


Most respondents (89%) use the Internet at least once a day.



Regarding the purpose of accessing the Internet, residents listed several, the most popular of which are:

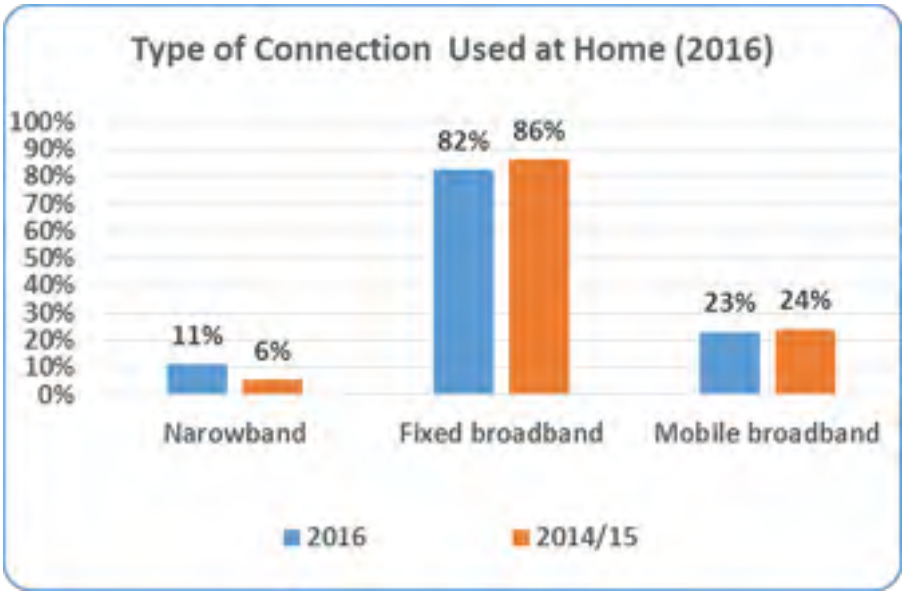
- email (95%),
- researching good or services (89%),
- Internet banking (82%), and
- online shopping for overseas products and services (76%).

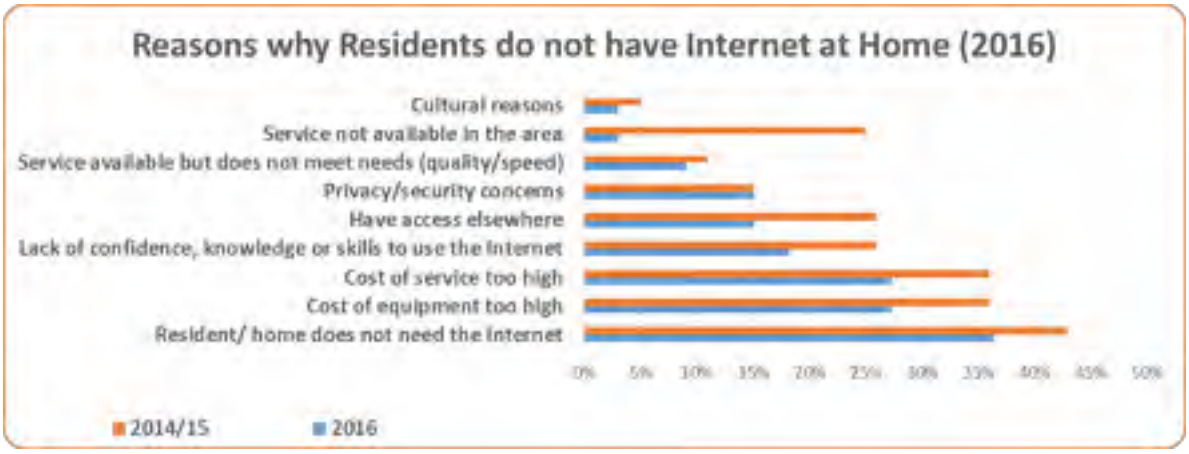


Broadband/ Connection

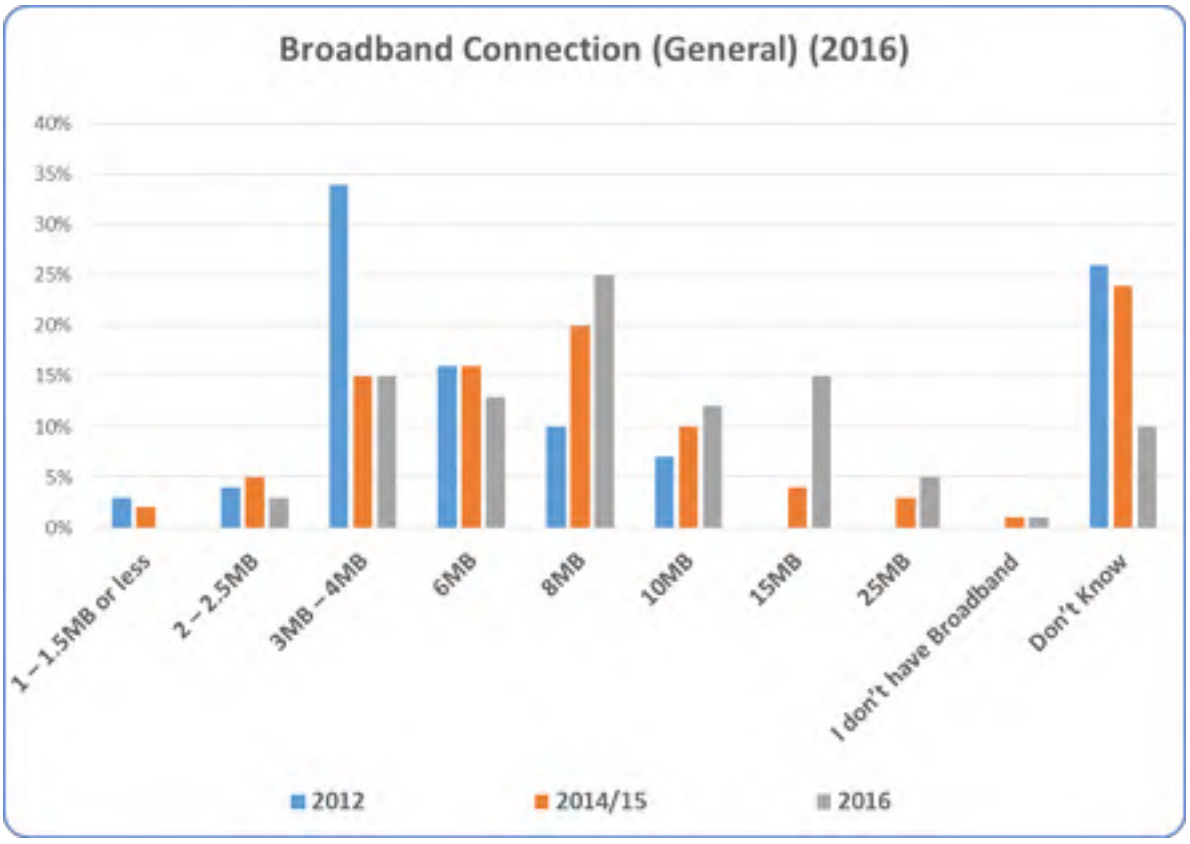
92% of residents have Internet access at home. When asked, those who do not have Internet at home provide different reasons why not, most commonly that they do not need it or that it is too costly.

Fixed broadband remains the most common type of connection in Bermuda households.

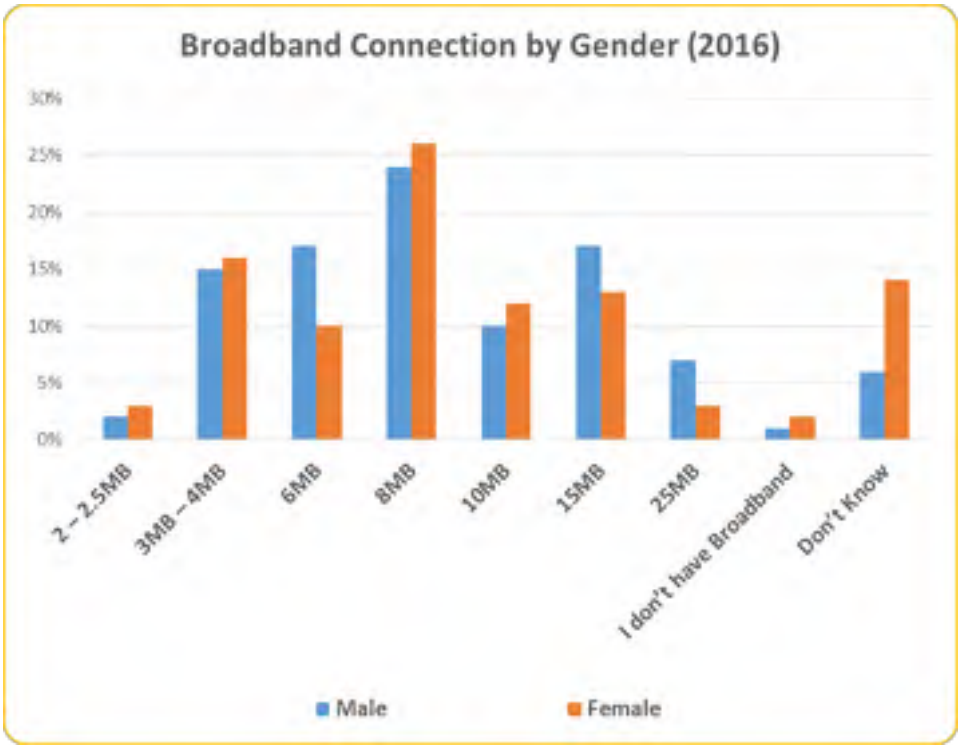


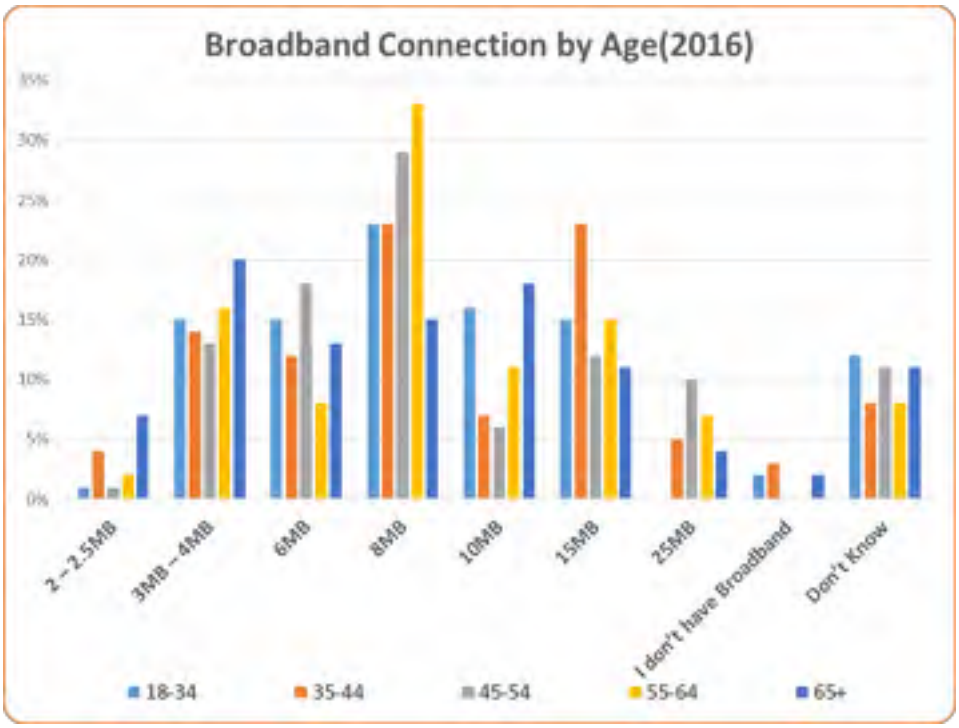


Most often, households are using a 8Mb broadband speed although 78% confirmed that they would upgrade to fibre-to-the-home if it were available.

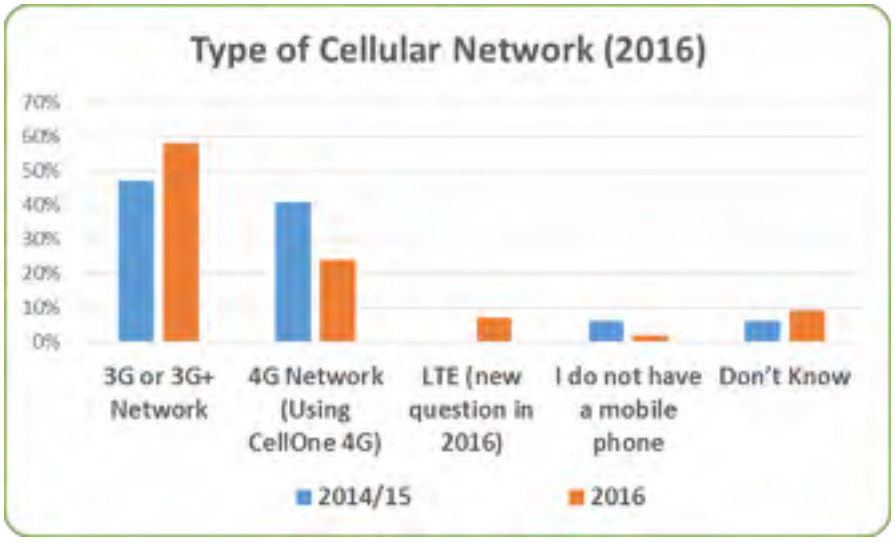


The above chart consists of aggregate data. However, the distribution of the households in terms of demographics is unpacked in the charts below.



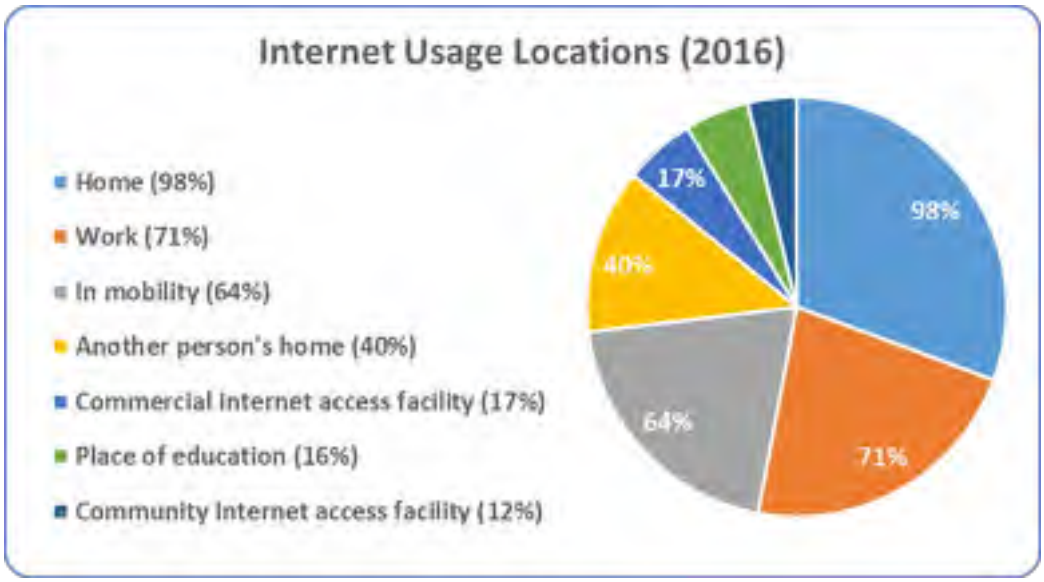


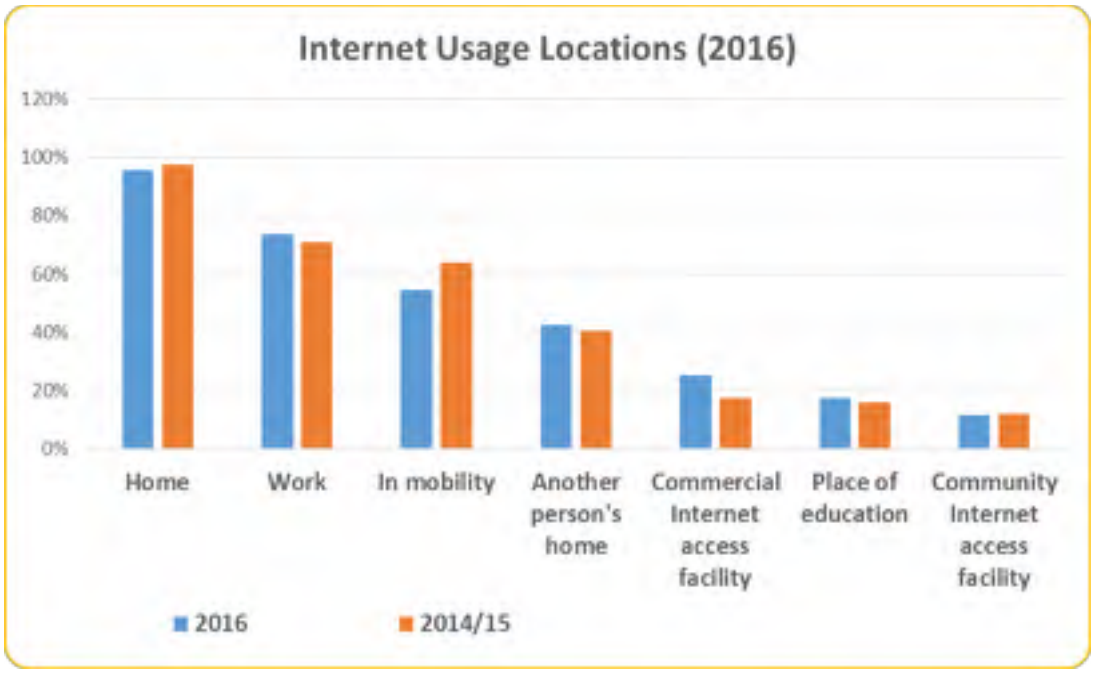
58% of residents use a 3G or 3G+ cellular network (vs. 47% in 2014/15), followed by those using 4G (24% in 2016 vs. 41% in 2014/15).



Computer Use and Locations

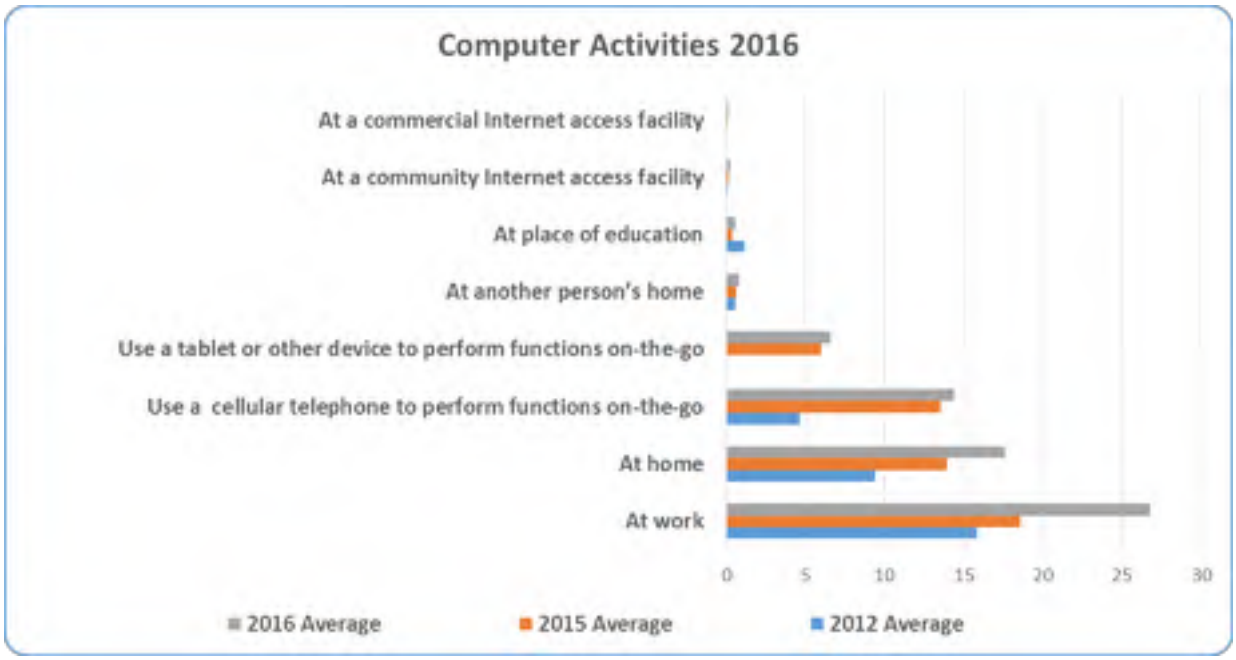
When asked where they had accessed the Internet from, respondents gave more detail which is in line with last year's findings. The Internet is most-commonly accessed from home and work, and on-the-go:





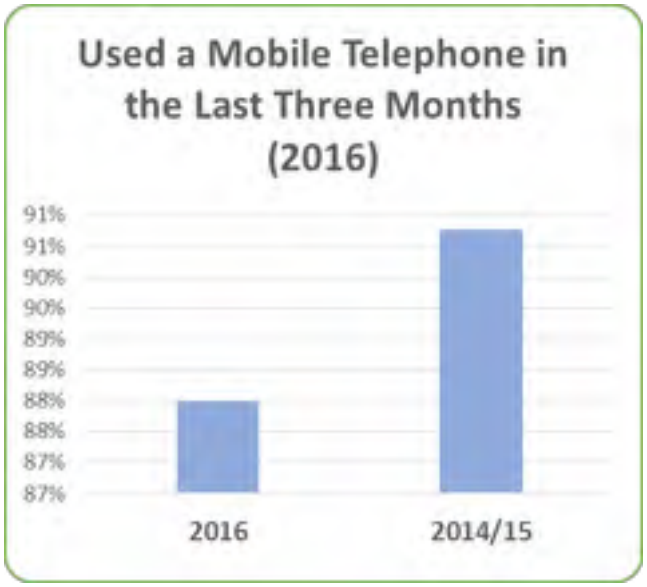
On average, residents use computers mostly at work (26.76 hr/wk), at home (17.60 hr/wk), and on their portable devices (14.42 hr/wk) to perform computer functions anywhere on-the-go.

It is worth noting that all of those percentages represent a consistent upward trend from prior years.



Cellphone & Smartphone Use

88% of Bermuda residents reported using a mobile telephone in the last three months.



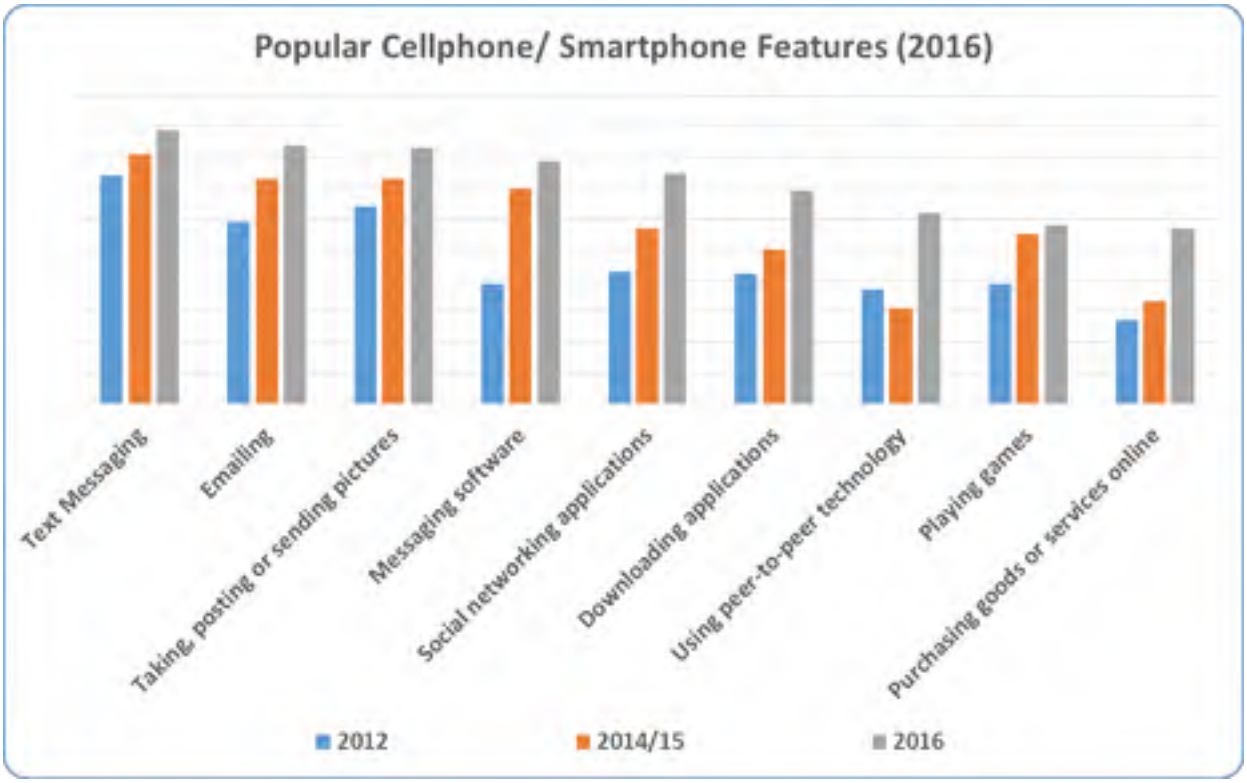
As Wi-Fi enabled devices are undergoing a significant surge in popularity, their proliferation and that of their features, together with the abundance of applications that can be installed on them, has increased their usability and user-friendliness.

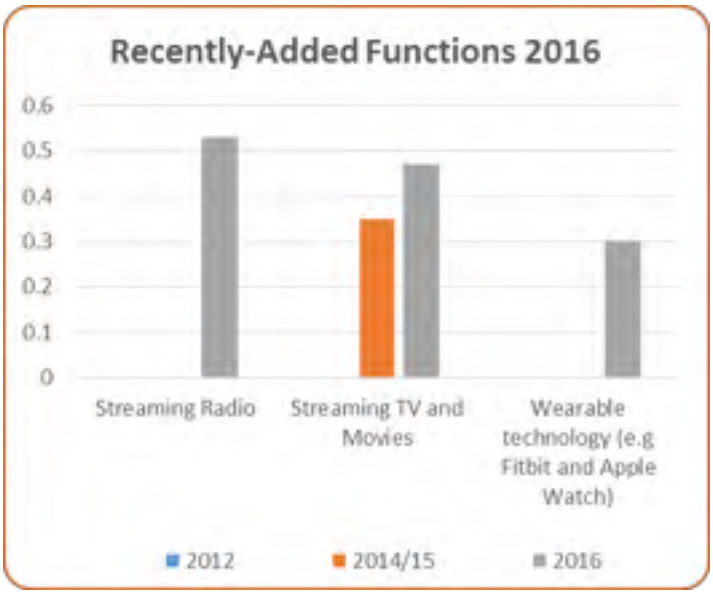
As a result, some features that did not exist until very recently (such as wearables) have taken Bermuda by storm, now becoming widely-used commodities. Others, such as using messaging software, saw their usage rates double from 38% in 2012 to 79% to 2016. For instance, "using

navigation software (GPS)" increased from 26% in 2012 to 55% to 2016, while "bill payment" surged from 22% in 2012 to 48% to 2016.

When asked about usage of cellphone or smartphone features, 89% referenced text messaging first (89% vs. 81% in 2014/15, 74% in 2012). 83% mentioned taking pictures (83% vs. 83% in 2014/15, 72% in 2012) as the second most-popular activity.

Note that peer-to-peer technologies (mentioned in the chart below) include such applications as iMessage and Facetime.

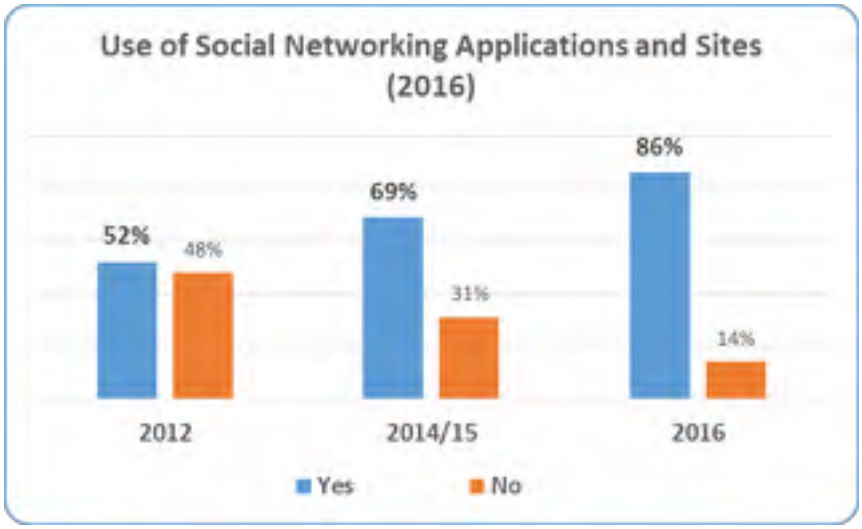




Social Networking and Websites

86% of residents use social networking applications or sites. It is worth noting that the percentage of those using social networking increased by 33% between 2012 and 2014/15, then by a further 25% between 2014/15 and 2016.

Equally as noteworthy is the gap between the number of residents who do use social networking and those who don't: from a mere 5% in 2012, that gap has shot up to 38% in 2014/15 and 72% in 2016.

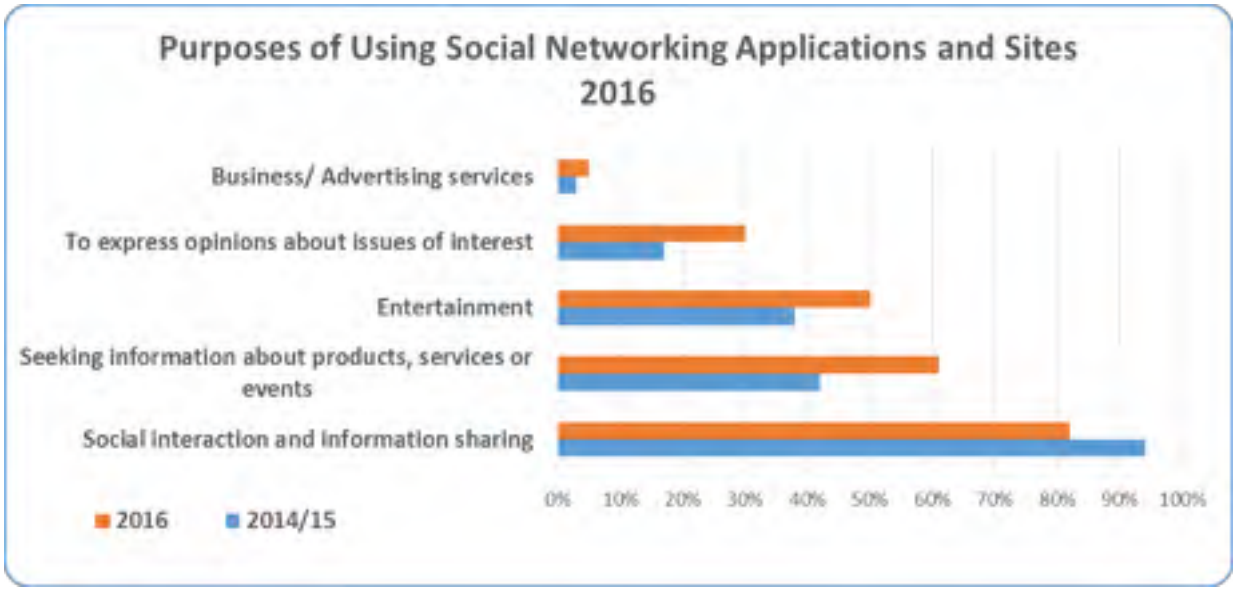


Of those who use social networking, 82% do so for the purposes of social interaction and information sharing, down from 94% as per the prior survey.

Note the significant increase in other popular uses of these tools:

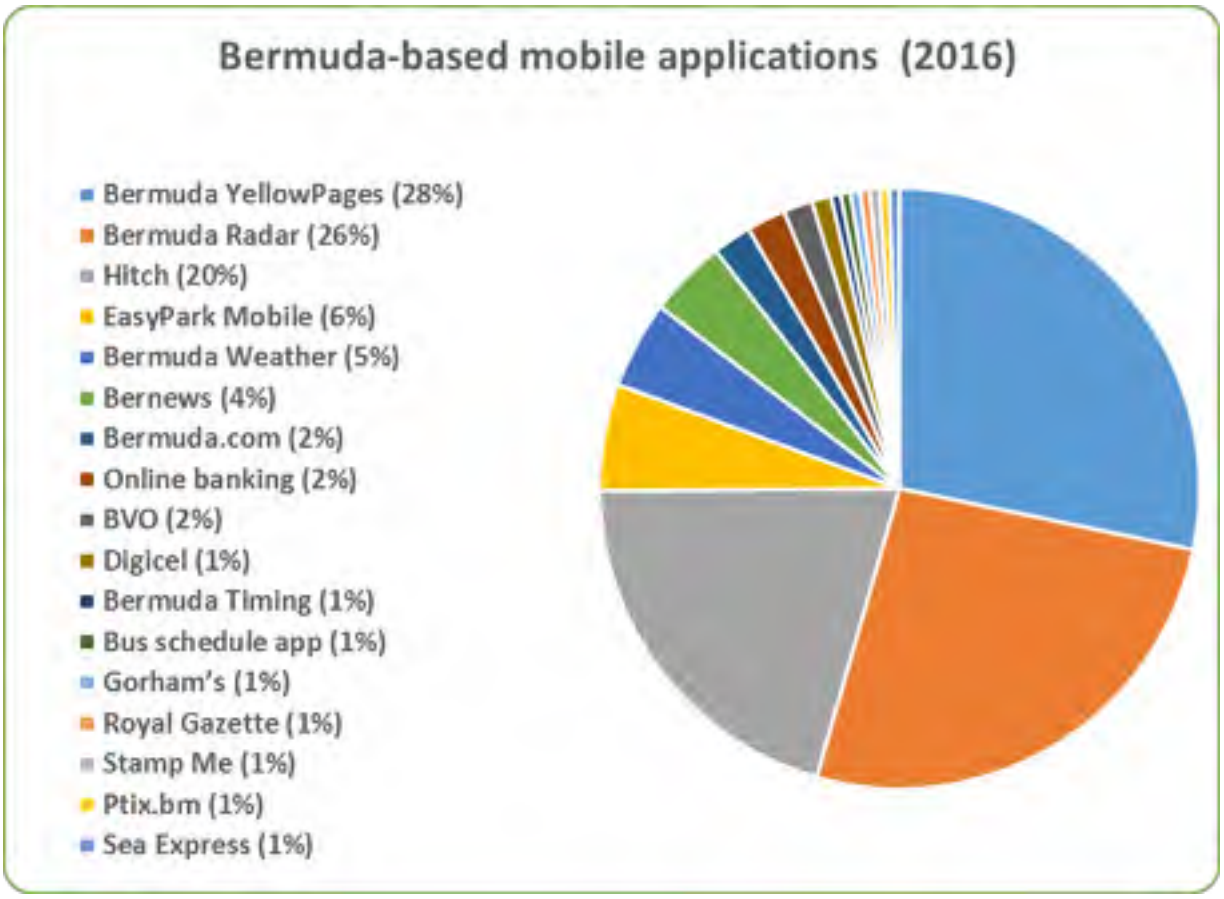
- research on consumer products and services (19% increase),
- expressing opinions (13% increase), and
- entertainment (12% increase).

Also, note the increase in the use of social media advertising by businesses. Additional information is presented in the corporate section of this report.



Bermudian Apps

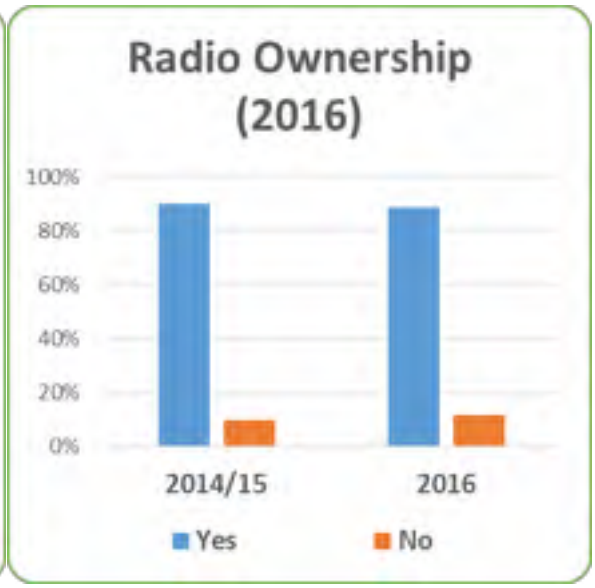
This year, we included a question that specifically enquired about Bermuda-developed mobile applications. Evidently, the three most popular Bermuda-based mobile applications used are the Bermuda Yellow Pages app, the Bermuda Radar app, and Hitch.

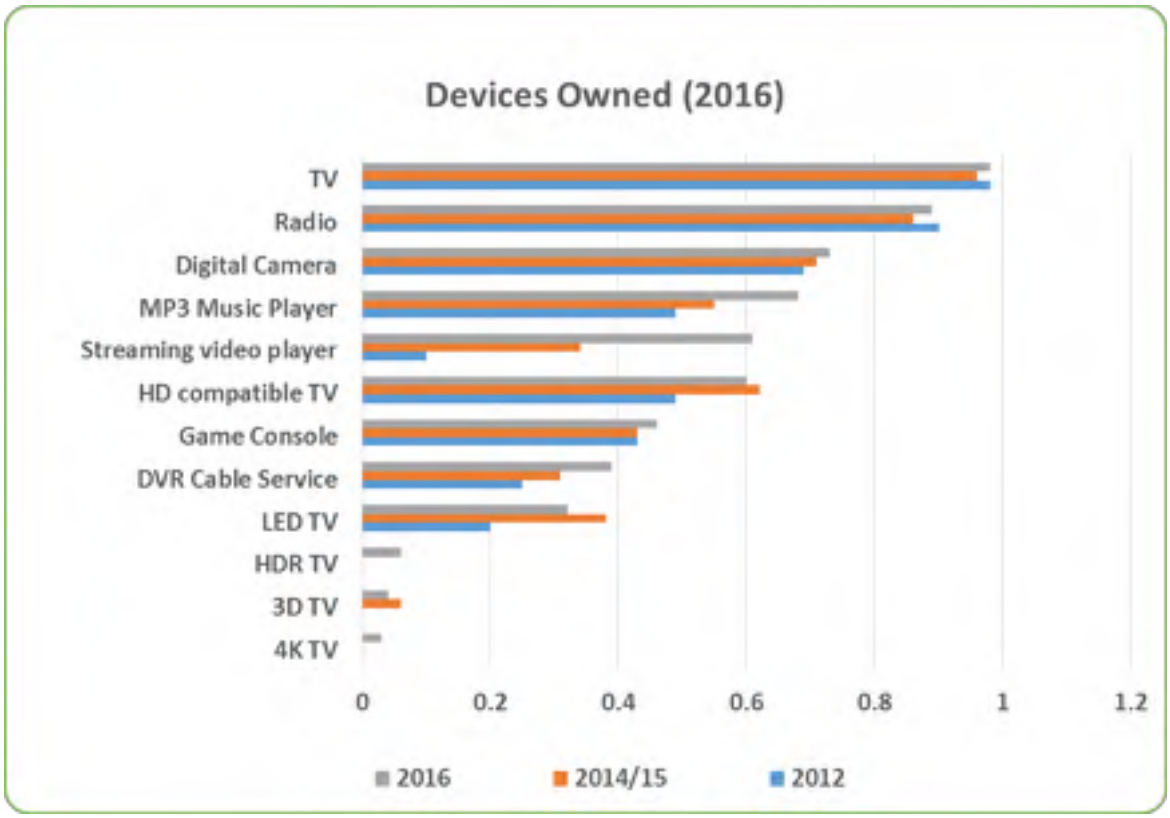


Other Devices/ Activities:

Looking at other technologies, the most popular items owned by households continued to be:

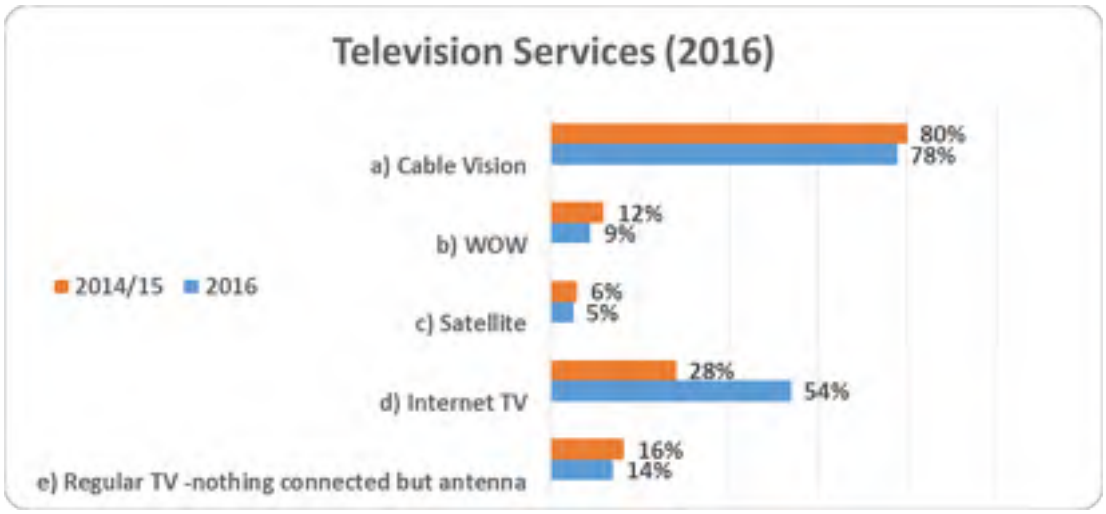
- televisions (98%, vs. 96% in 2014/15 and 98% in 2012),
- radios (89% vs. 86% in 2014/15 and 90% in 2012) and
- digital cameras (73% vs. 71% in 2014/15 and 69% in 2012).



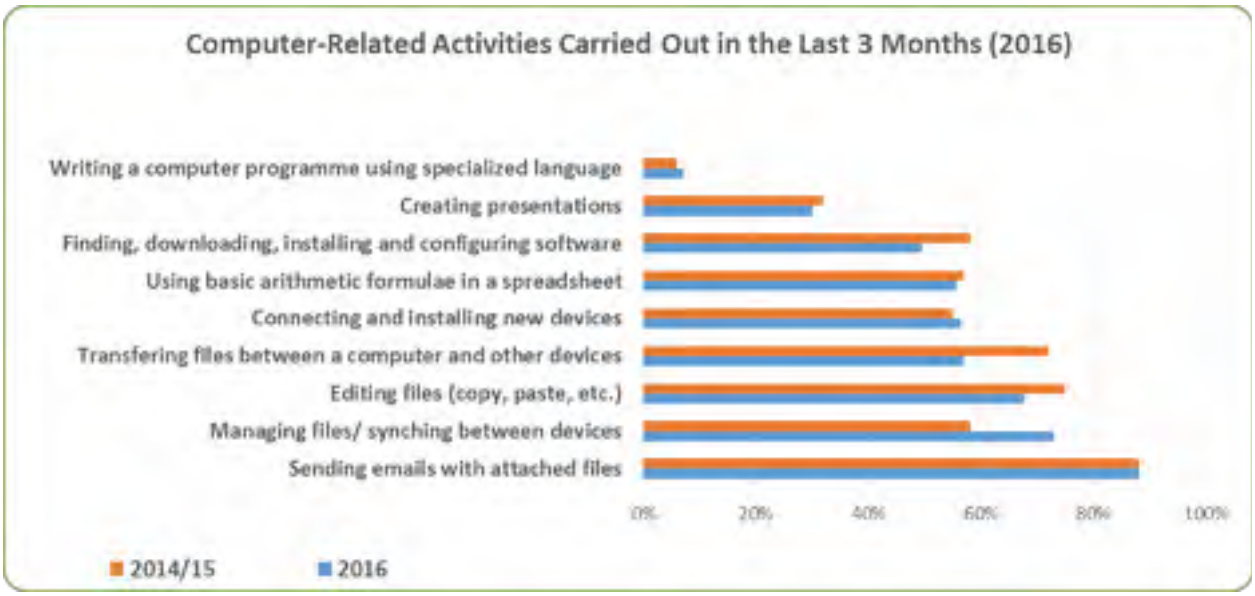


Worth noting:

- Using streaming video player increased manifold from 10% in 2012 to 61% in 2016.
- Possible emerging trends such as HDR TV (6%), the 3D TV (4%) and the 4K TV (3%).
- Most television watchers subscribe to cablevision (78%), closely followed by Internet TV (54%).
- There remains a section of households who continue to have regular TV with no subscription attached to it (14%).



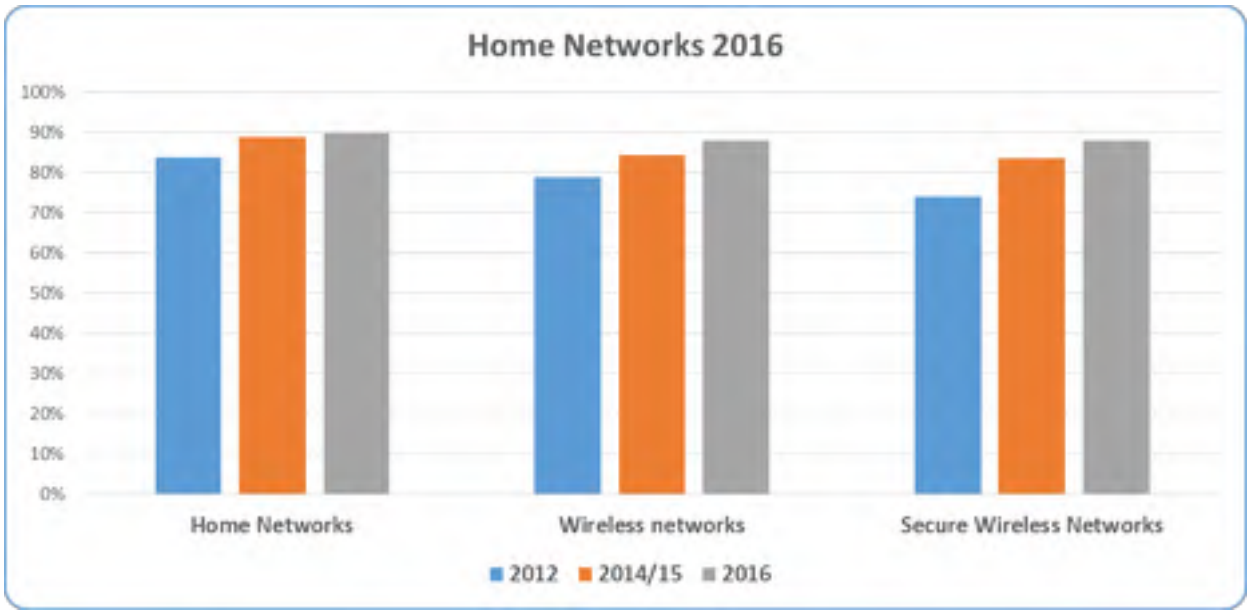
When asked specifically about computer-related activities that they have carried out in the last three months, residents provide additional information.



Internet Safety

Internet Safety at Home

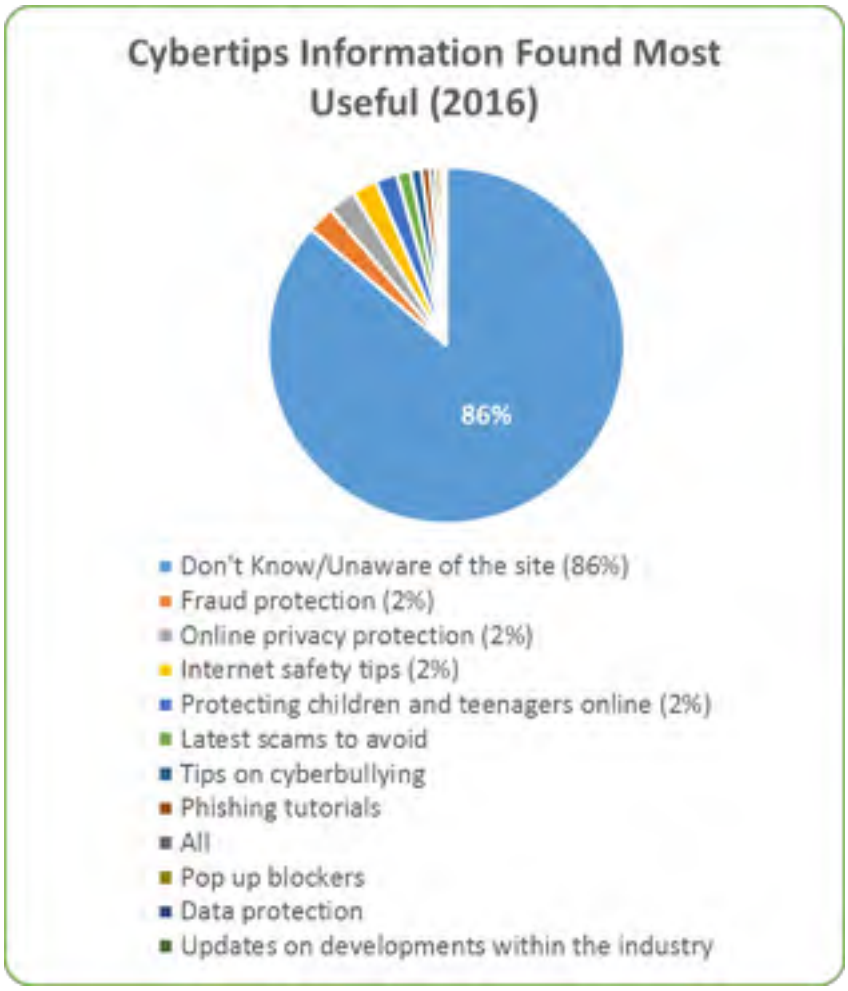
90% have a computer network at home (vs. 89% in 2014/15 and 84% in 2012), 88% of which are wireless (vs. 85% in 2014/15 and 79% in 2012) and 88% of which are secure (vs. 84% in 2014/15 and 74% in 2012). 78% have security/ virus protection software installed on their computer.

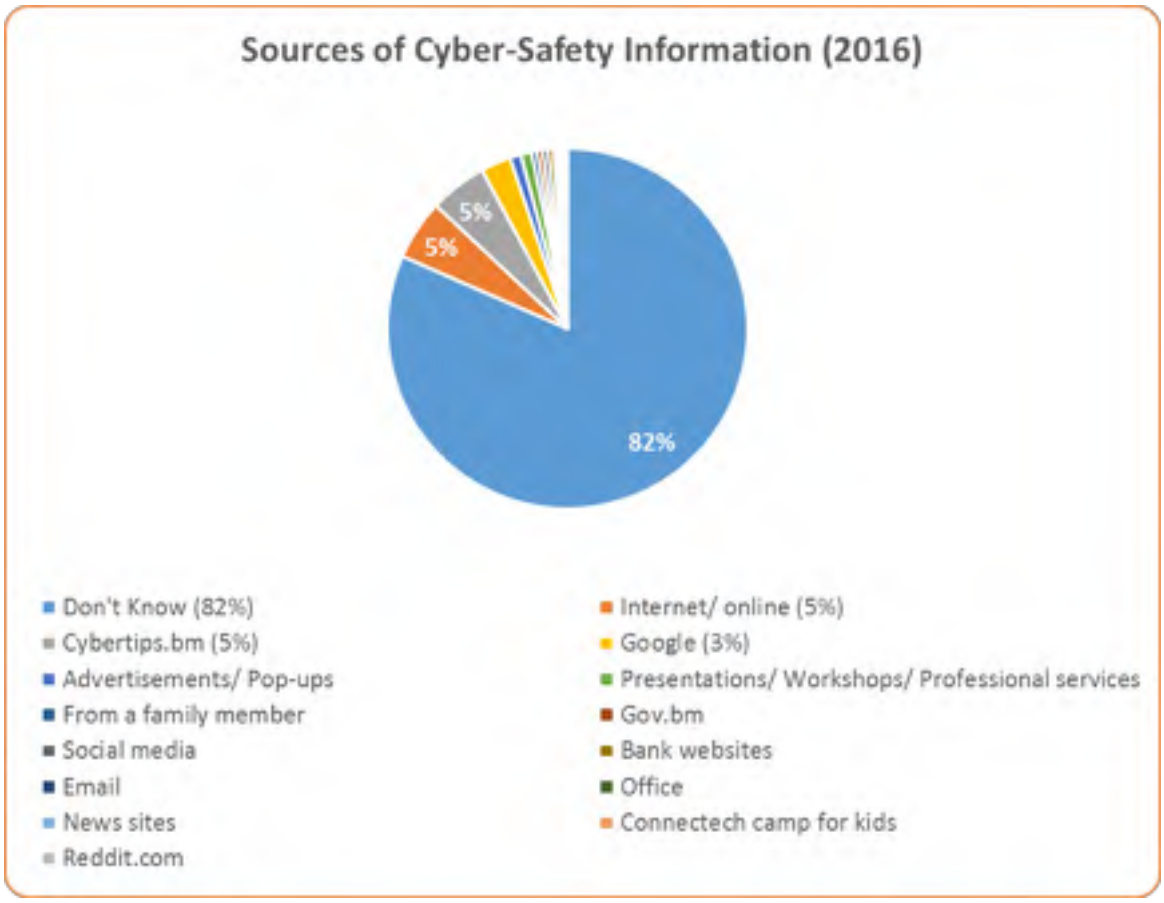


Cybertips.bm

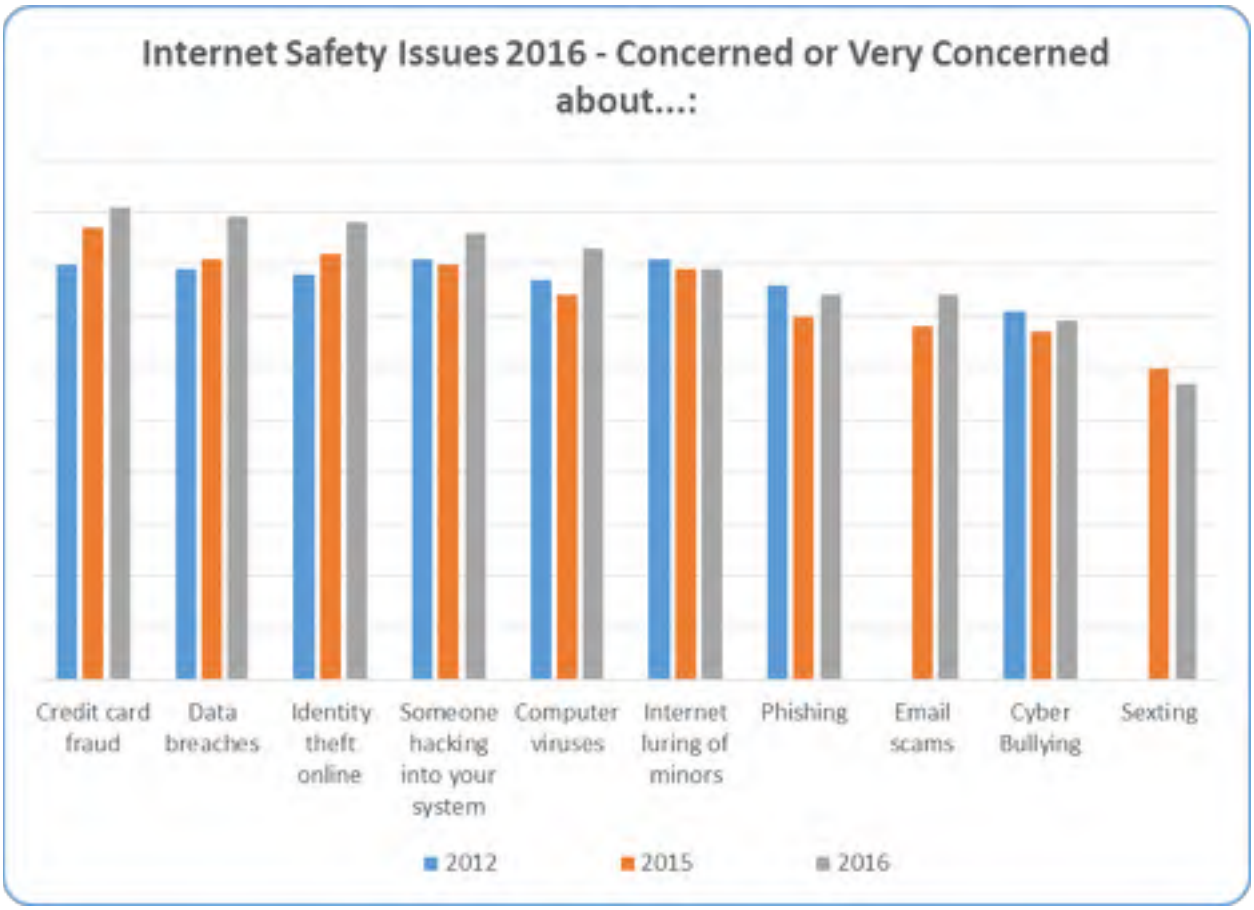
8% of residents are familiar with www.cybertips.bm, a decrease from 2014/15's 12%. Those who know about the website say that they visit it to obtain information about fraud protection, online privacy protection, and Internet safety tips.

Residents were also asked where they would find that information outside of Cybetips.bm. The majority of respondents did not know. Others said they would find the information elsewhere online or through Google.


Cybertips Information Found Most Useful (2016)
86%
Don't Know/Unaware of the site (86%)
Fraud protection (2%)
Online privacy protection (2%)
Internet safety tips (2%)
Protecting children and teenagers online (2%)
Latest scams to avoid
Tips on cyberbullying
Phishing tutorials
All
Pop up blockers
Data protection
Updates on developments within the industry



It is becoming clear that increasing numbers of residents are concerned about Internet safety areas, particularly credit card fraud, data breaches, and online identity theft.



Personal Information Protection Act 2016

40% of residents are aware of the Personal Information Protection Act 2016 (PIPA) and 100% believe that it is important to protect one's personal information both online and offline.

How important is it to you that your personal information is protected both online and offline? Would you say that it is...?	Total (2015)	Total (2016)	Male	Female	18-34	35-44	45-54	55-64	65+
Top 2	97%	100%	98%	100%	98%	100%	100%	100%	100%
5 - Very Important	87%	92%	89%	95%	86%	91%	92%	97%	97%
4 - Somewhat Important	10%	7%	10%	5%	12%	9%	8%	3%	3%
3 - Neither Important Nor Unimportant	2%	-	1%	-	2%	-	-	-	-
Somewhat Unimportant	-	-	-	-	-	-	-	-	-
Very Unimportant	1%	-	-	-	-	-	-	-	-

Further, 98% would prefer doing business with organisations that protect their personal information.

Using a scale of 1 to 5, where 5 is "Strongly agree" and 1 is "Strongly disagree", how much do you agree with the following: I would prefer doing business with organisations that protect my personal information.								
	TOTAL (2016)	Male	Female	18-34	35-44	45-54	55-64	65+
Top 2	98%	98%	98%	96%	97%	100%	100%	99%
5 - Agree Strongly	93%	93%	92%	87%	95%	97%	94%	91%
4 - Agree Somewhat	5%	5%	6%	9%	3%	3%	6%	8%
3 - Neither Agree Nor Disagree	2%	2%	1%	4%	3%	-	-	1%

In fact, 91% percent were concerned that personal information was possibly being used in a manner with which they did not agree.

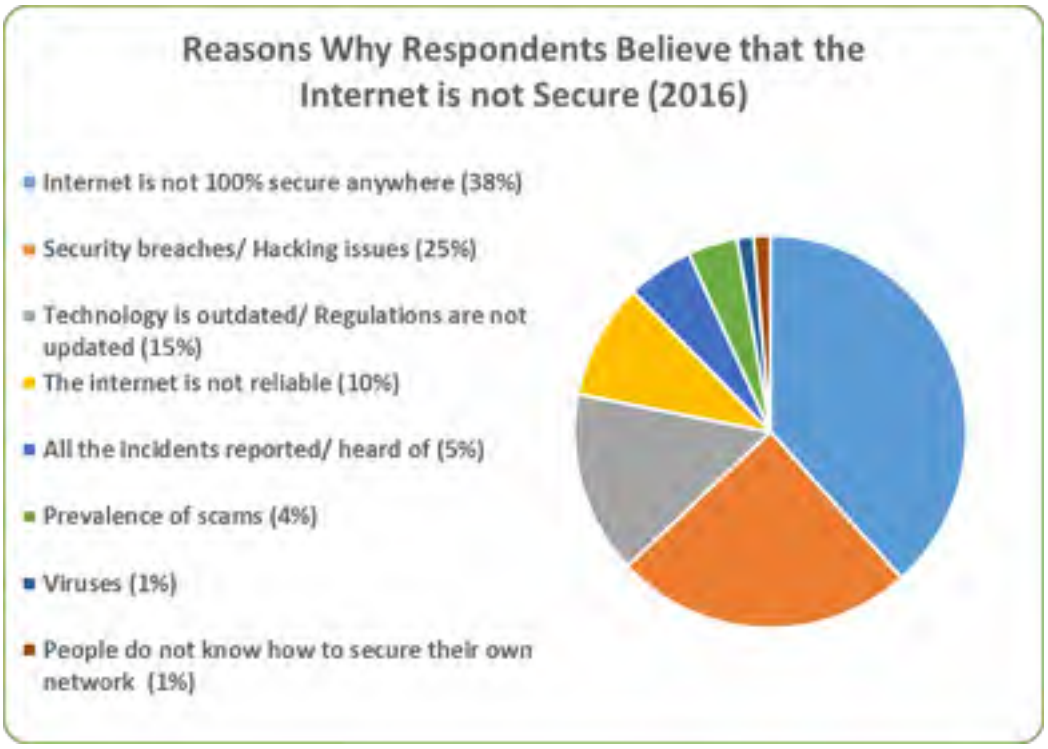
Using a scale of 1 to 5, where 5 is "Strongly agree" and 1 is "Strongly disagree", how much do you agree with the following: I am concerned that personal information held by organisations might be used in a manner that I don't agree with.								
	Total 2016	Male	Female	18-34	35-44	45-54	55-64	65+
Top 2	91%	92%	90%	85%	87%	92%	97%	98%
5 - Agree Strongly	55%	56%	54%	38%	47%	66%	52%	76%
4 - Agree Somewhat	36%	35%	36%	48%	39%	26%	44%	20%
3 - Neither Agree Nor Disagree	7%	7%	7%	13%	11%	5%	2%	2%
2 -Disagree Somewhat	2%	2%	2%	2%	3%	2%	2%	-
1 - Disagree Strongly	-	-	1%	-	-	1%	-	1%

Internet Security

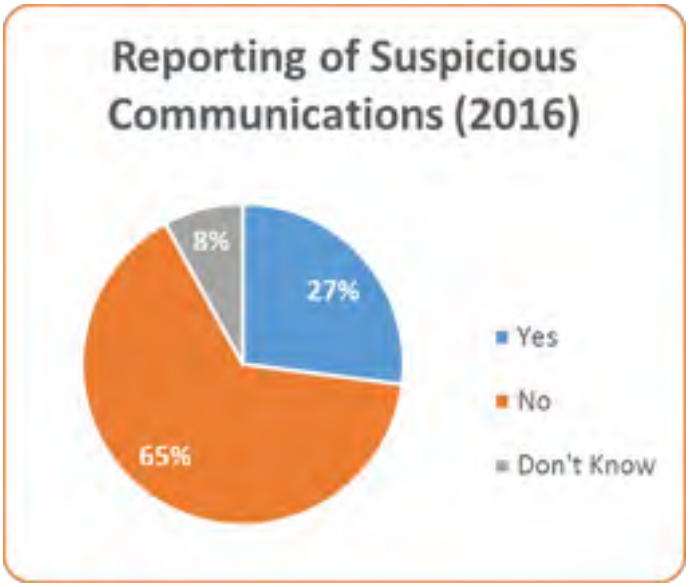
58% of residents feel that the Internet is secure in Bermuda, which shows a marked decrease from last year's findings (62%). Similarly to last year, however, the answers were consistent across respondent ages.

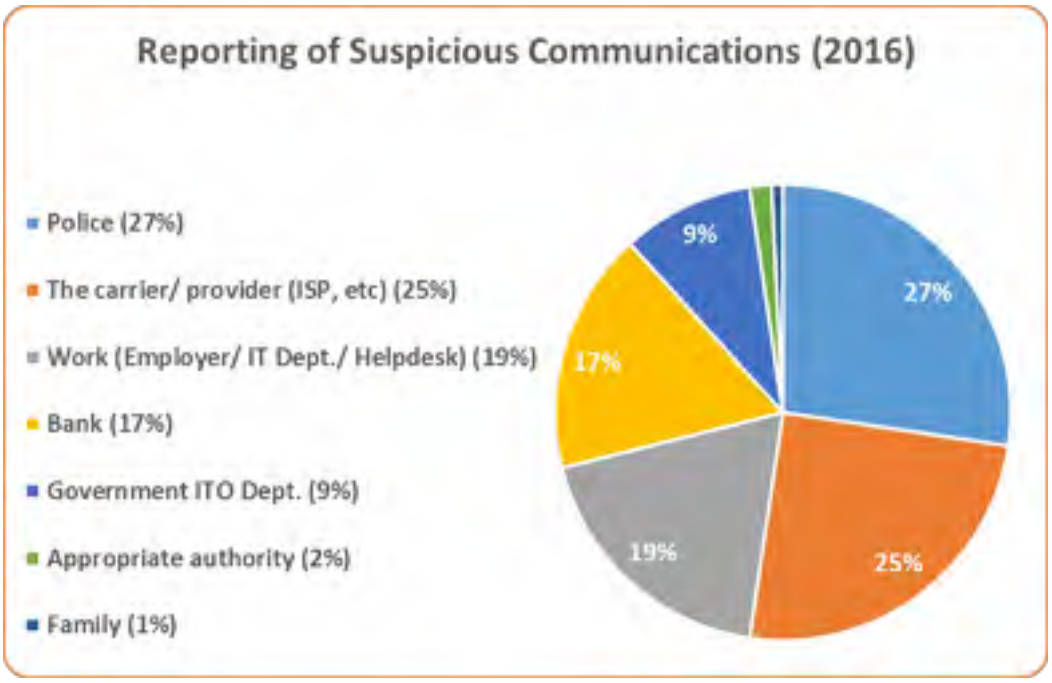
Do you feel that the Internet is secure in Bermuda?								
	Total	**Male**	**Female**	**18-34**	**35-44**	**45-54**	**55-64**	**65+**
Yes	**58%**	60%	56%	58%	57%	56%	52%	65%
No	**20%**	17%	22%	17%	17%	23%	22%	21%
Don't Know	**22%**	23%	22%	25%	25%	21%	27%	13%

Those who do not believe that the Internet is secure cited that the Internet is not 100% secure anywhere, and mentioned security breaches/ hacking issues. Other reasons are shown in the pie chart below.



When asked if they report suspicious emails, texts and calls, and to whom, only 27% of respondents say that they do make a report to an entity in Bermuda, with the top three contacts for suspicious emails/ texts/ calls being the Bermuda Police Service, the respondent's place of employment, and the bank.




Reporting of Suspicious Communications (2016)
Police (27%)
The carrier/ provider (ISP, etc) (25%)
Work (Employer/ IT Dept./ Helpdesk) (19%)
Bank (17%)
Government ITO Dept. (9%)
Appropriate authority (2%)
Family (1%)
27%
25%
19%
17%
9%

CORPORATE FINDINGS

Many of the questions asked show results according to company size. For reference, please not them below:

- Small company: 1 to 9 staff.
- Medium-sized company: 10 to 30 staff.
- Large staff, over 30 staff.

Attitudes and Overall Technology Competence

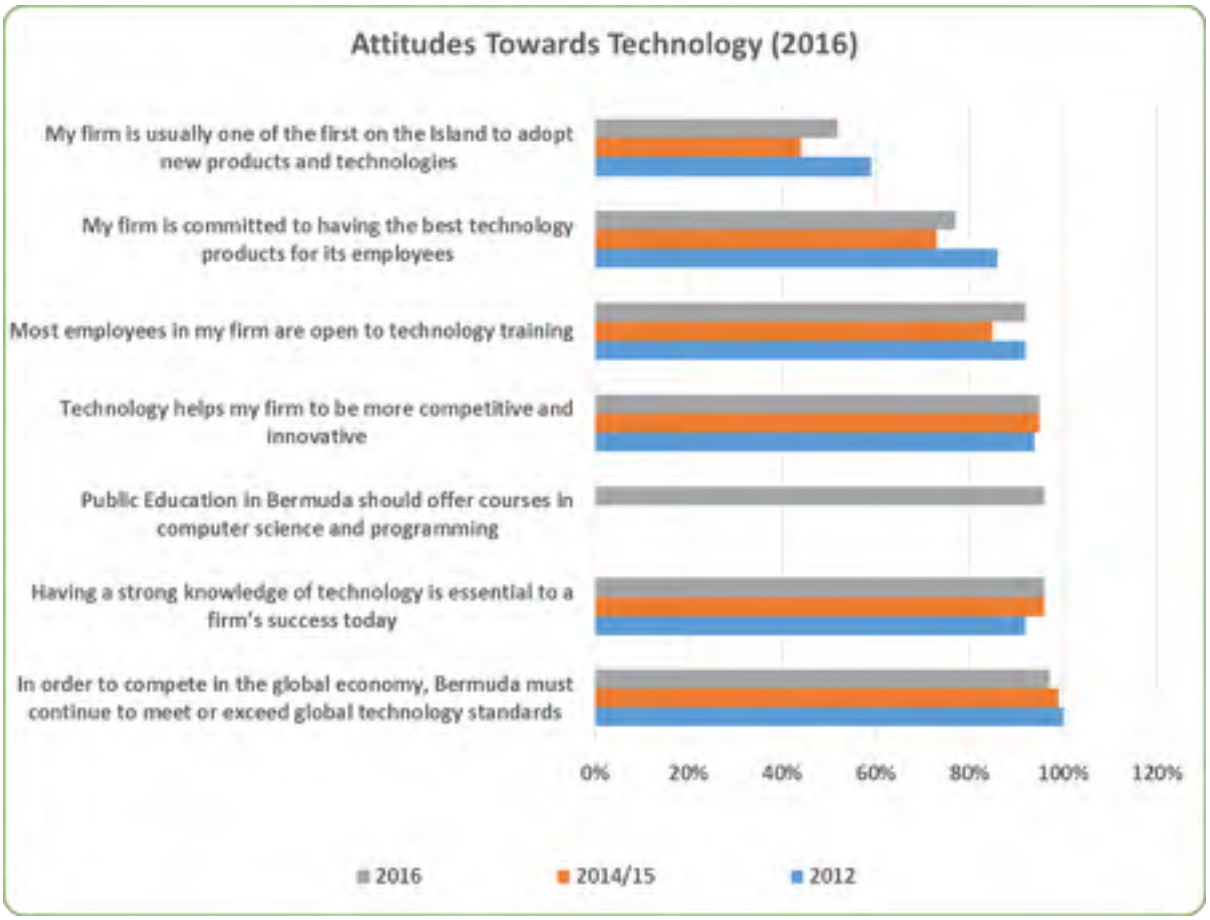
Attitudes Towards Technology

The chart below details the attitudes of professionals toward technology. Respondents were more likely to agree that:

- In order to compete in the global economy, Bermuda must continue to meet or exceed global technology standards (97%),
- Having a strong knowledge of technology is essential to a firm's success today (96%), and
- Public education in Bermuda should offer courses in computer science and programming (96%).

It is worth noting that the areas that saw a drop in the responses in 2012 witnessed a rebound:

- The companies' openness to technology training (92% in 2012, 85% in 2015, now back up to 92%),
- The companies' commitment to having the best technology products for their employees (86% in 2012, 73% in 2015, now up to 77%), and
- The companies as early adopters of new products and technologies (59% in 2012, 44% in 2015, now up to 52%).



Technology competence

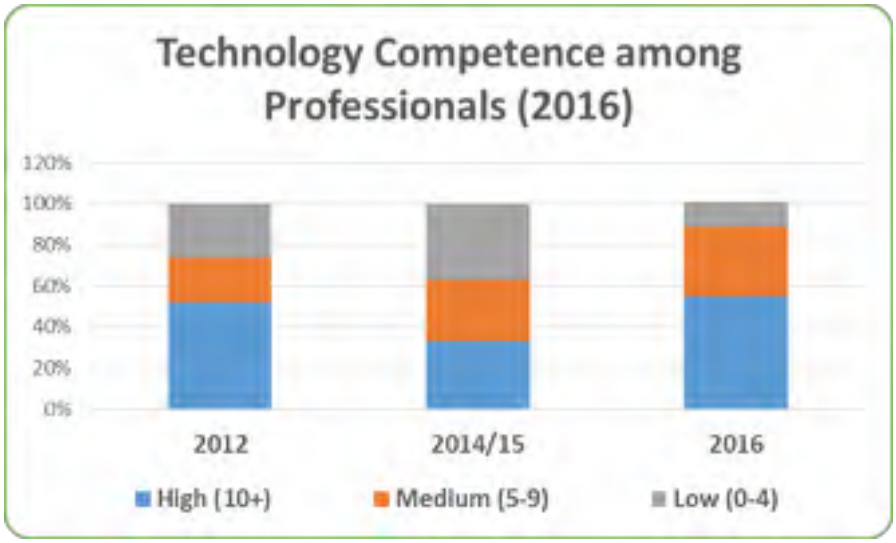
Professionals were asked to rate their level of expertise toward 18 technology areas relating to general computing, internet usage, cellphones, smartphones, and other technologies. Based on these ratings, they were found as having either low, moderate, or high technology competence based on the number of areas for which they expressed a high level of expertise as detailed in the table below.

High technology competence	Rating of 9 or 10 across 10+ areas
Moderate technology competence	Rating of 9 or 10 across 5 - 9 areas
Low technology competence	Rating of 9 or 10 across 0 - 4 areas

Using this scale:

- 55% of professionals were rated as having high technology competency this year, up from 33% in 2014/15 and 52% in 2012,
- 34% were rated as having a moderate level of technology competency, up from 30% in 2014/15 and 22% in 2012, and

- 12% were rated as having a low level of technology competency, down from 37% in 2014/15 and 26% in 2012.



General Computing

The top two areas where businesses showed the greatest level of competency were using e-mailing software (66%) and using industry-specific computer applications (56%).

Internet Usage

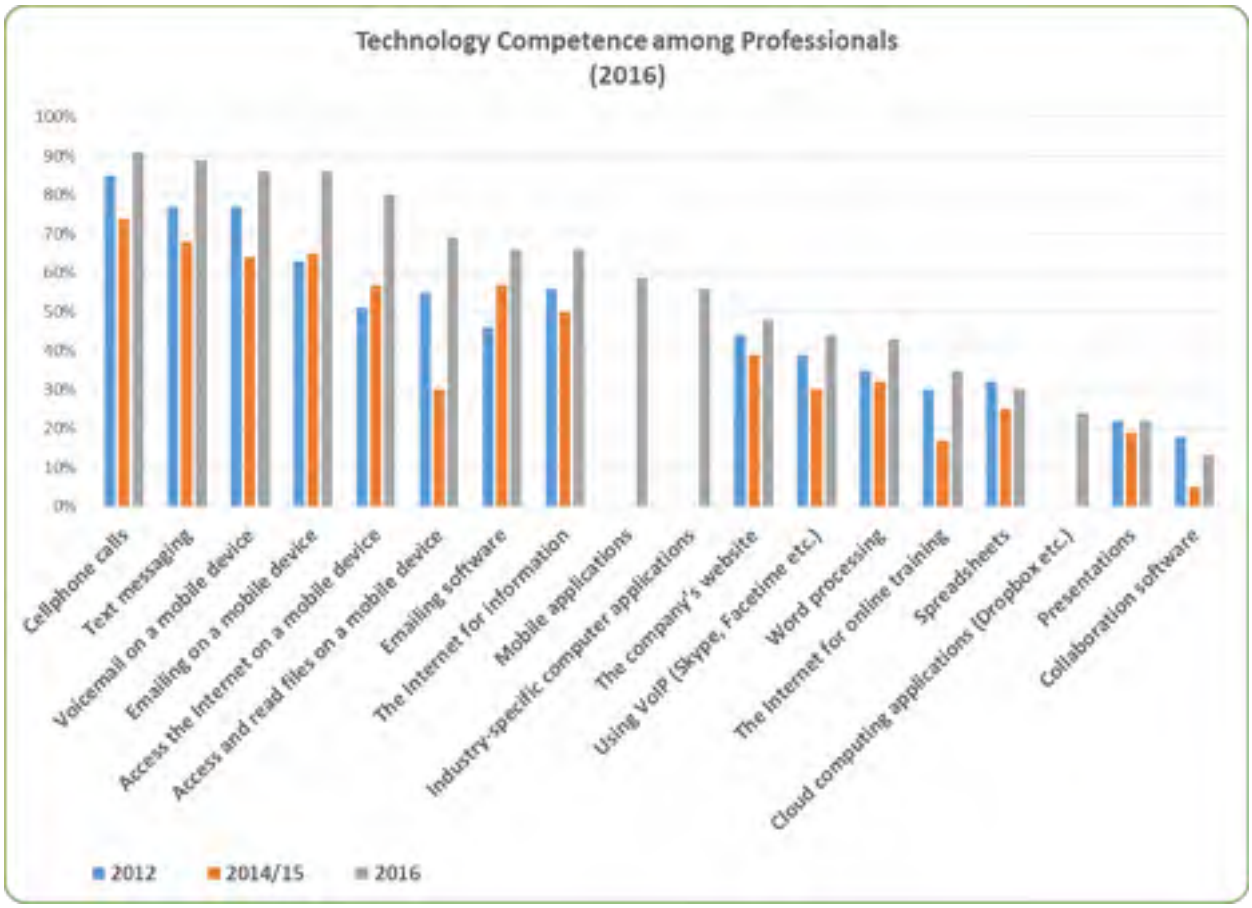
The top two areas where businesses showed the greatest level of competency were using the Internet for business-related information gathering (66%) and using their company's website (48%)

Mobile Cellular Devices

The top two areas where businesses showed the greatest level of competency were making and receiving cell phone calls (91%) and text messaging (89%).

Other Technologies

44% of business professionals have a high level of competency using VoIP.



Computer, Mobile and Internet Usage

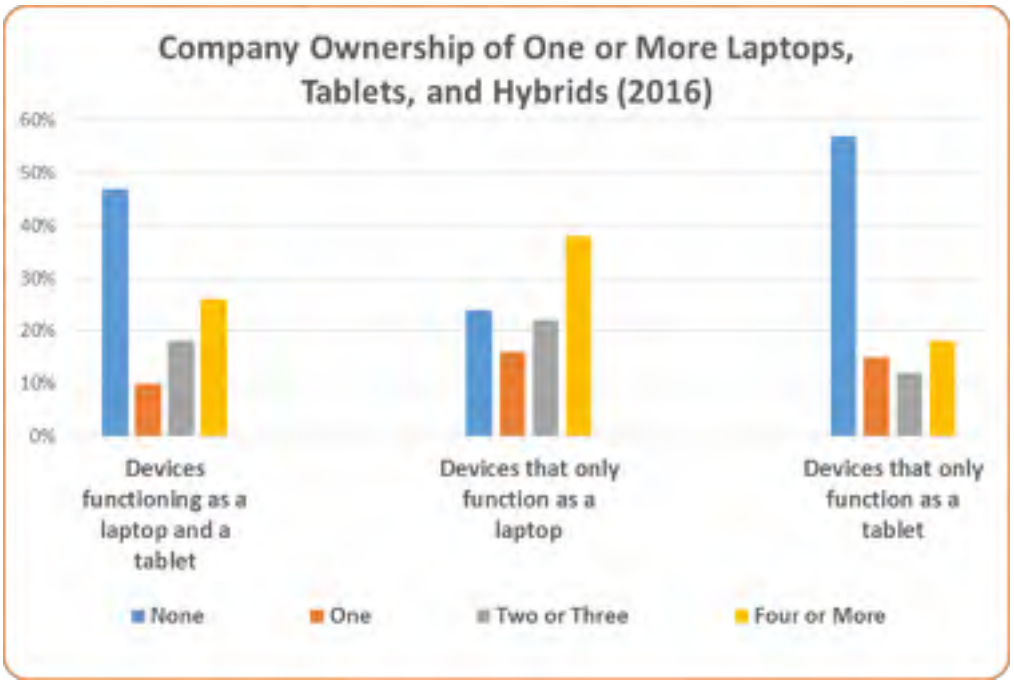
Ownership – Computing

97% of businesses own desktop computers while 81% own laptop devices, 53% own devices that function as a laptop and tablet, 76% own devices that only function as a laptop, 43% own devices that only function as a tablet, and 65% Wi-Fi or Internet ready devices such as tablets or similar devices.

Laptops, Tablets, and Hybrids

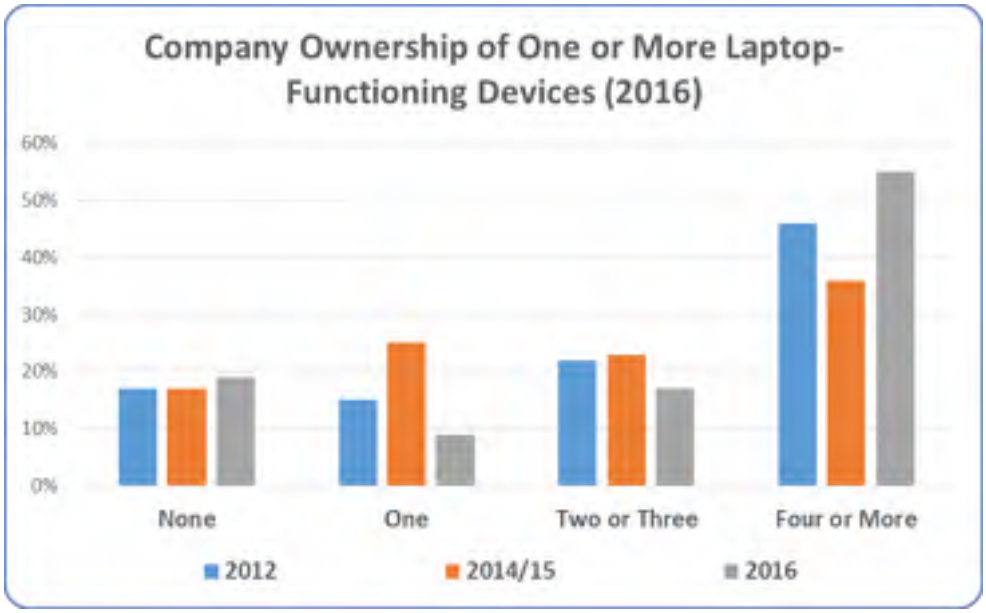
This year, we decided to make the distinction between three popular devices which are increasingly acting as one:

- laptops,
- tablets, and
- hybrids, which are tablets that act as laptops and vice versa. An example of that is the Microsoft Surface.



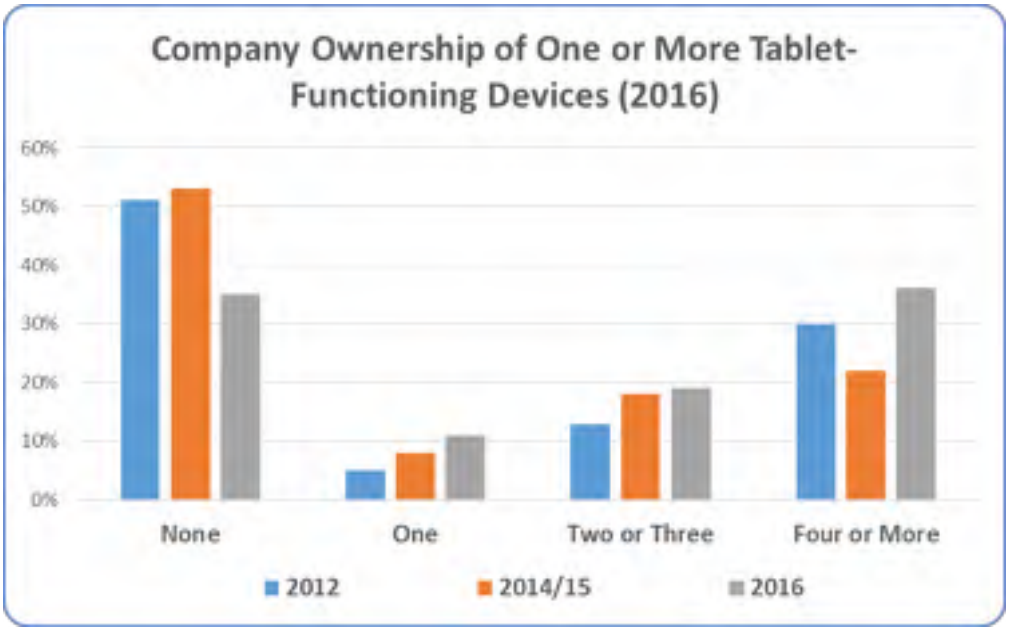
All Laptop-Functioning Devices

It is worth noting that company ownership of 4 or more devices has seen a significant spike up to 55%, bouncing back from the dip down at 36% in 2014/15 from 46% in 2012.



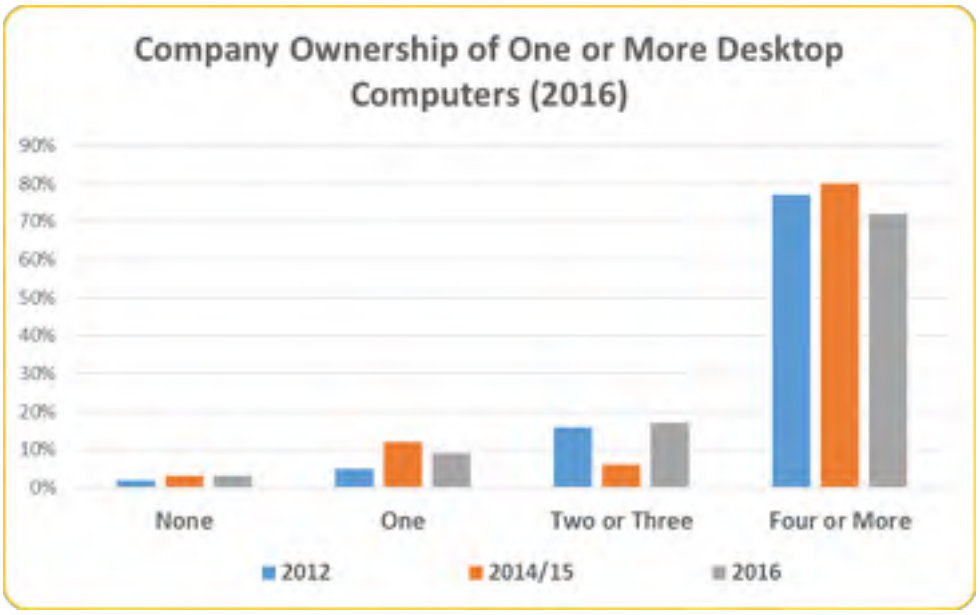
All Tablet-Functioning Devices

Company ownership of 4 or more devices has seen a significant increase to 36%, bouncing back from 22% in 2014/15 from 30% in 2012. In parallel, companies who answered "none" to the question saw their numbers drop from 53% in 2014/15 to 35% in 2016, indicating increased computerization of the Bermudian workplace.



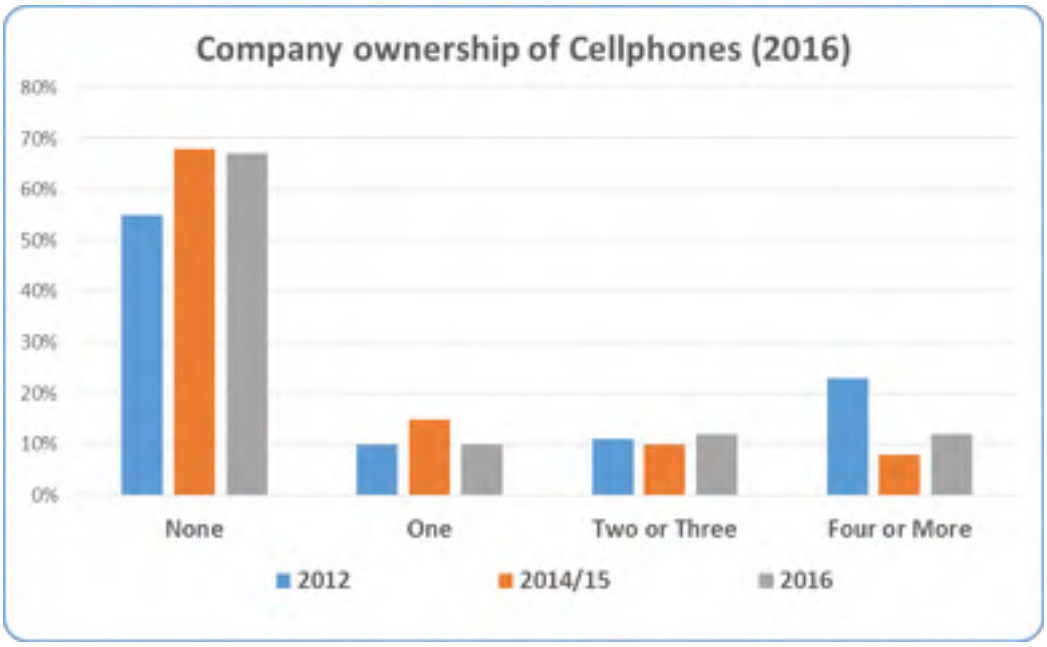
Desktop Computers

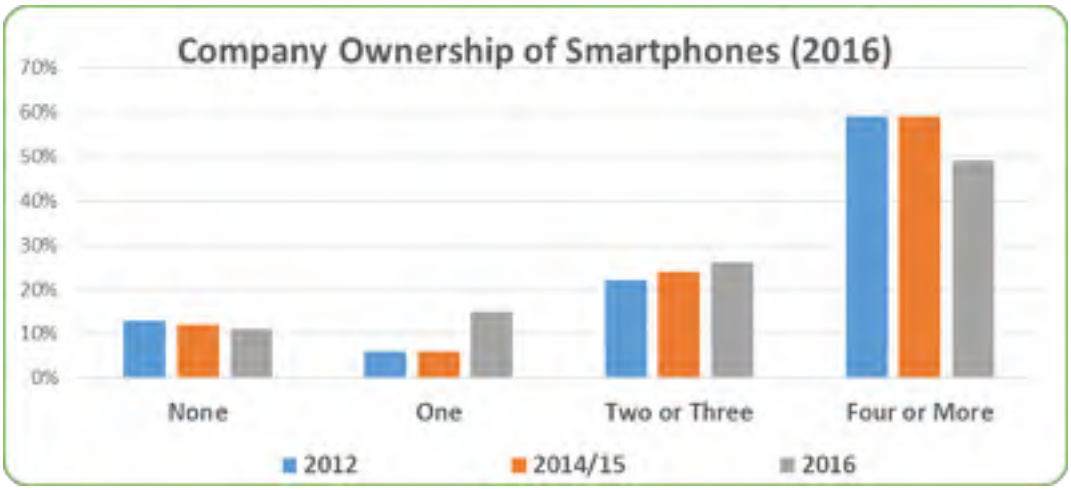
Company ownership of 4 or more desktops is at 72%, from 80% in 2014/15 from 77% in 2012. In parallel, companies who answered "none" to the question saw their numbers stay at 3% in 2016.



Ownership – Telephony

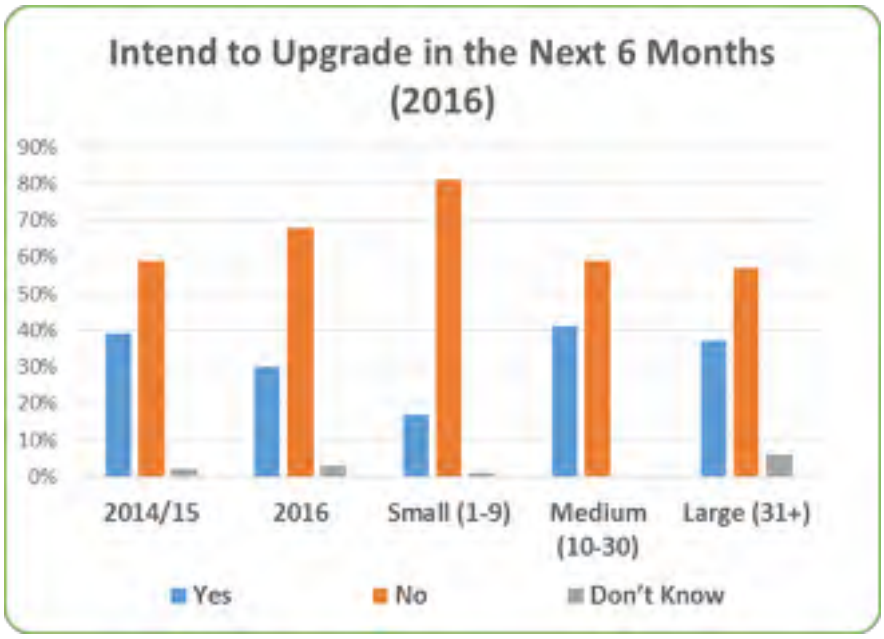
Only 33% of businesses own one or more regular cellular phone, to the advantage of smartphone ownership: 89% of businesses own one or more smartphone devices.

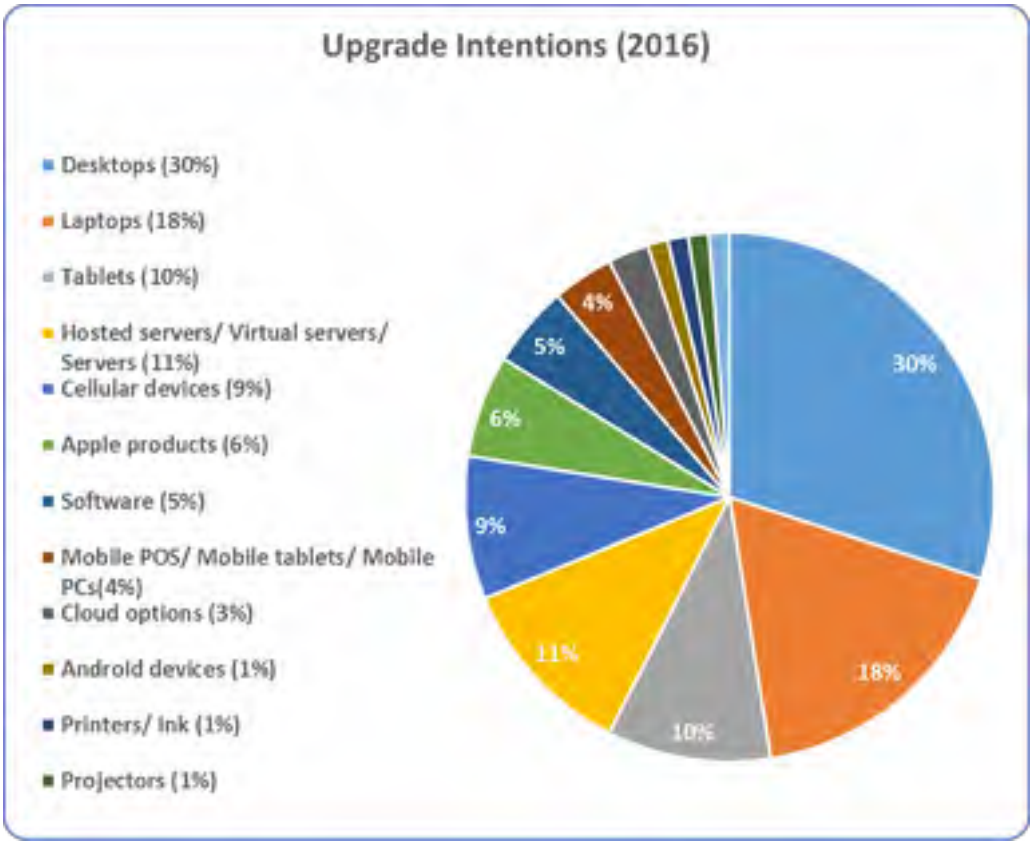




Intention to Upgrade Technology Products

When asked, only 30% of businesses responded that they were likely to upgrade to new computing devices in the next 6 months, with the top two most-often mentioned devices being desktop computers and laptops.



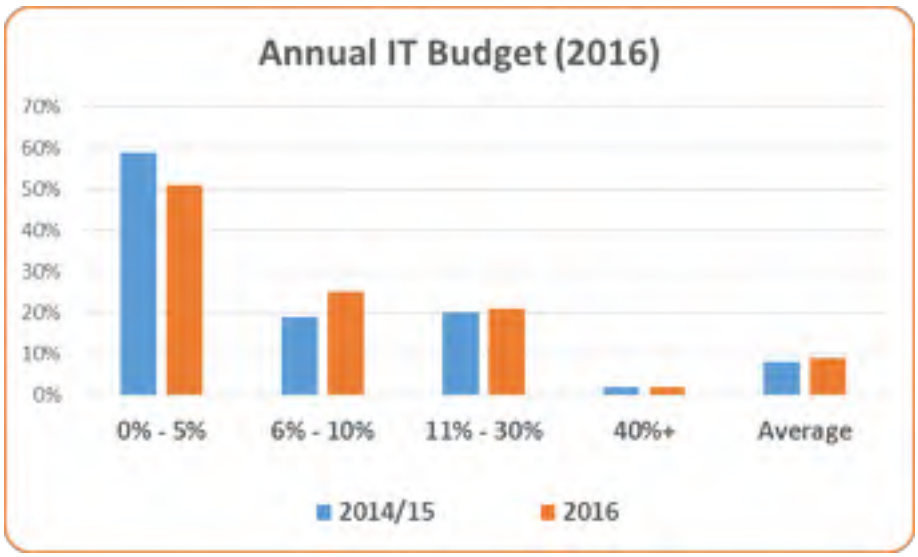


Annual IT Budget

Respondents were asked to estimate the percentage of their annual budget that is spent on IT. Each respondent gave an estimate number (e.g. 5%, 10%, or 7%) which were then grouped into ranges

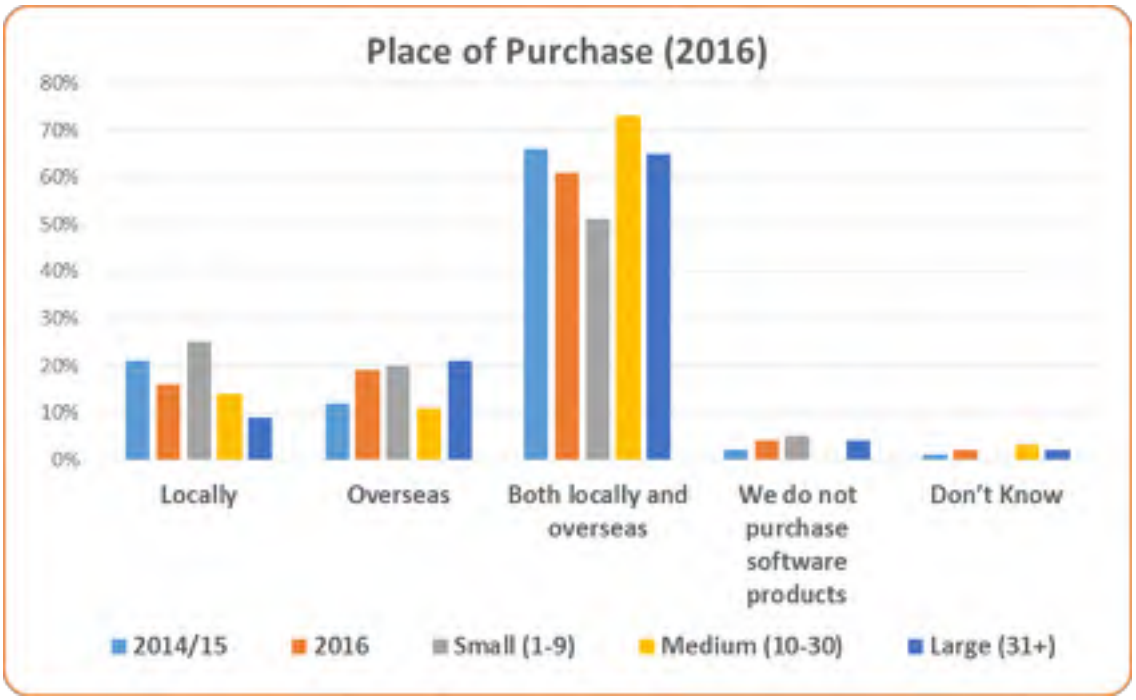
as shown below. The 200 individual responses were then used to obtain the average spend on IT relative to companies' annual budget.

On average, businesses spend 9% of their annual budgets on IT, which is in line with the 8% found in the 2014/15 study.



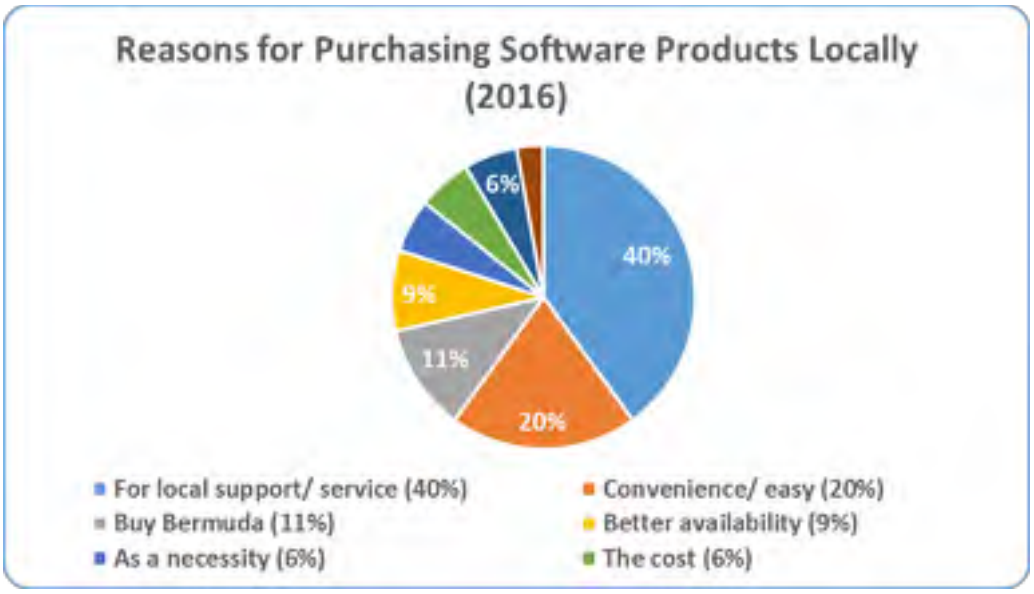
Purchasing Technology Products – Locally vs. Overseas

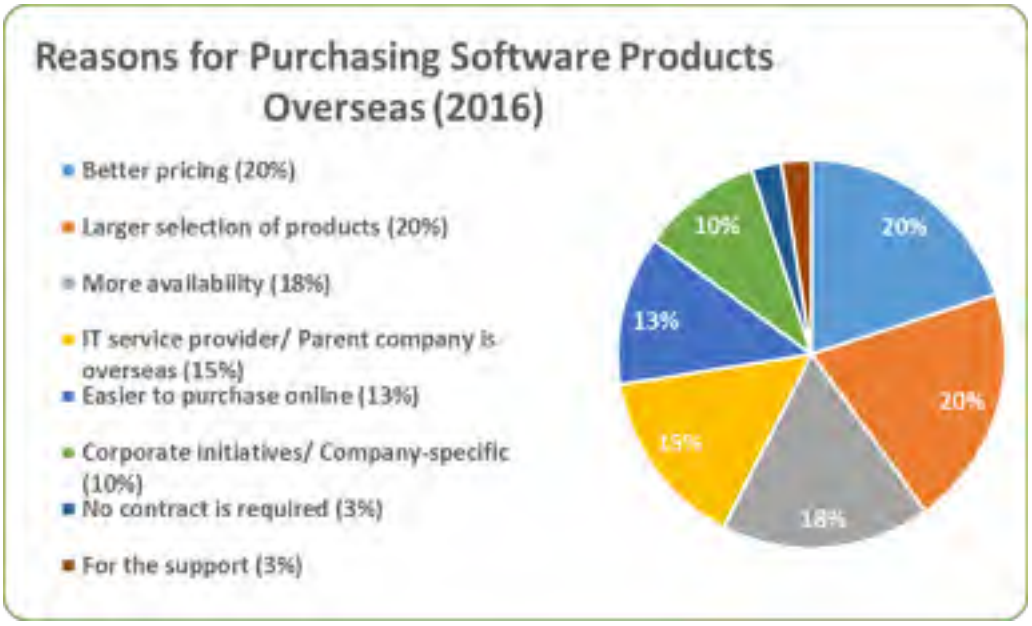
The majority of businesses (61% of respondents) purchase technology products both locally and overseas.

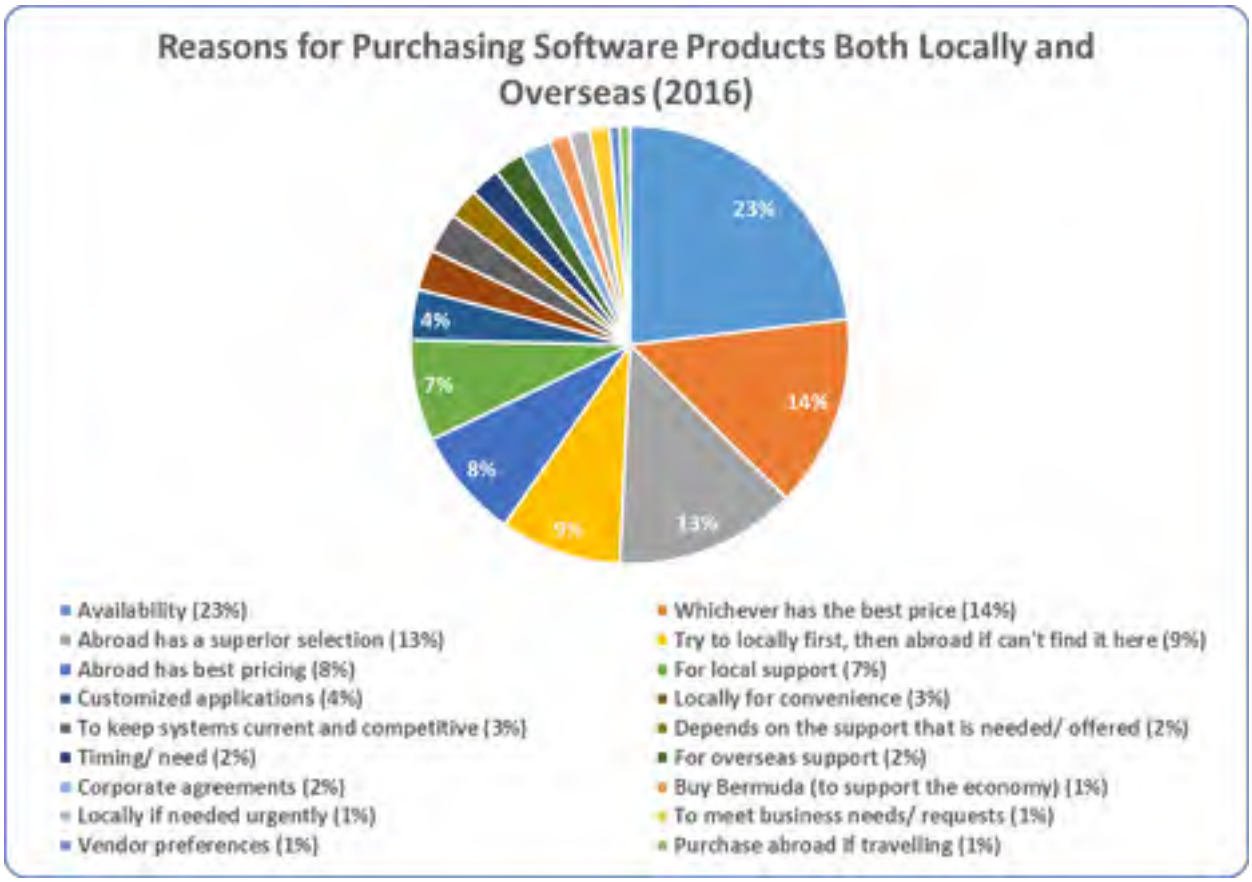


Software Purchases

The most popular reasons for choosing to purchase software locally vs. overseas are shown below.

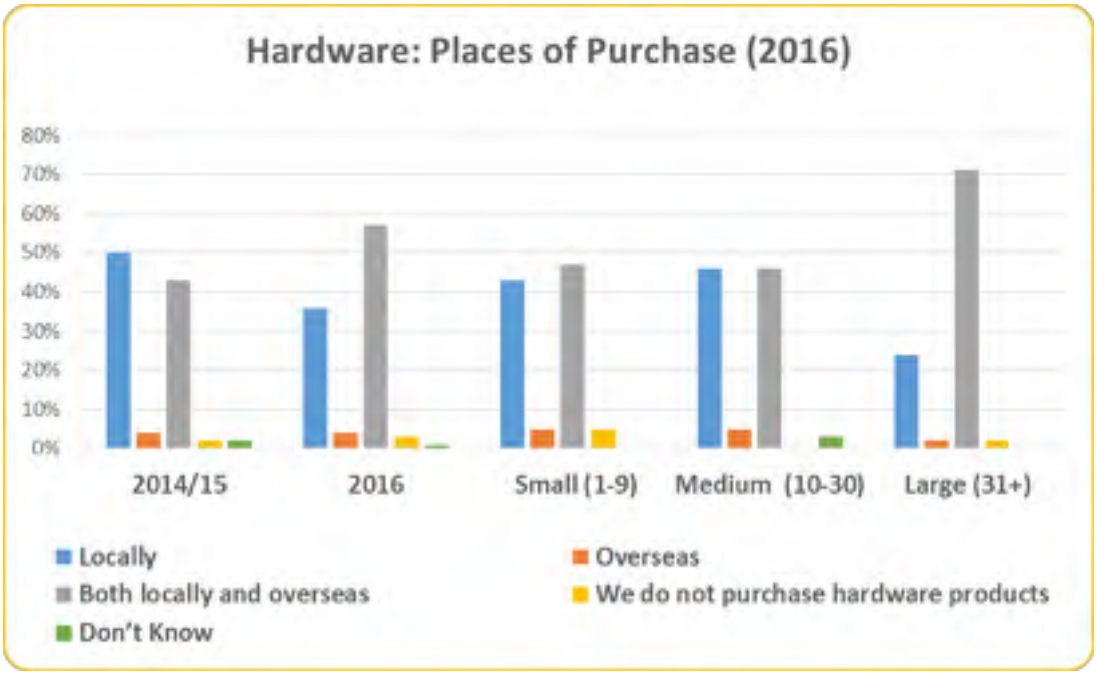




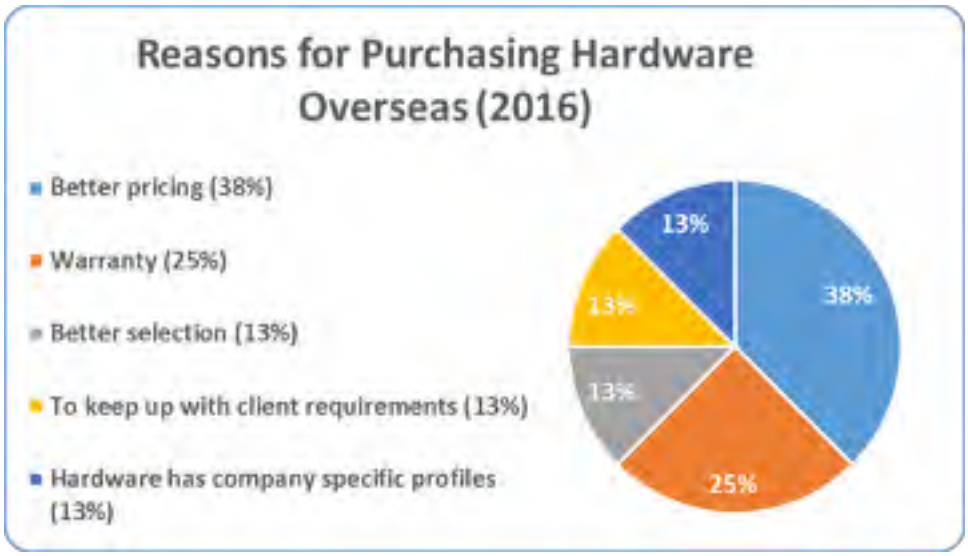


Hardware Purchases

The majority of businesses purchased hardware products locally and overseas (57%).



The most popular reasons for choosing to purchase hardware locally vs. overseas are shown tables below.



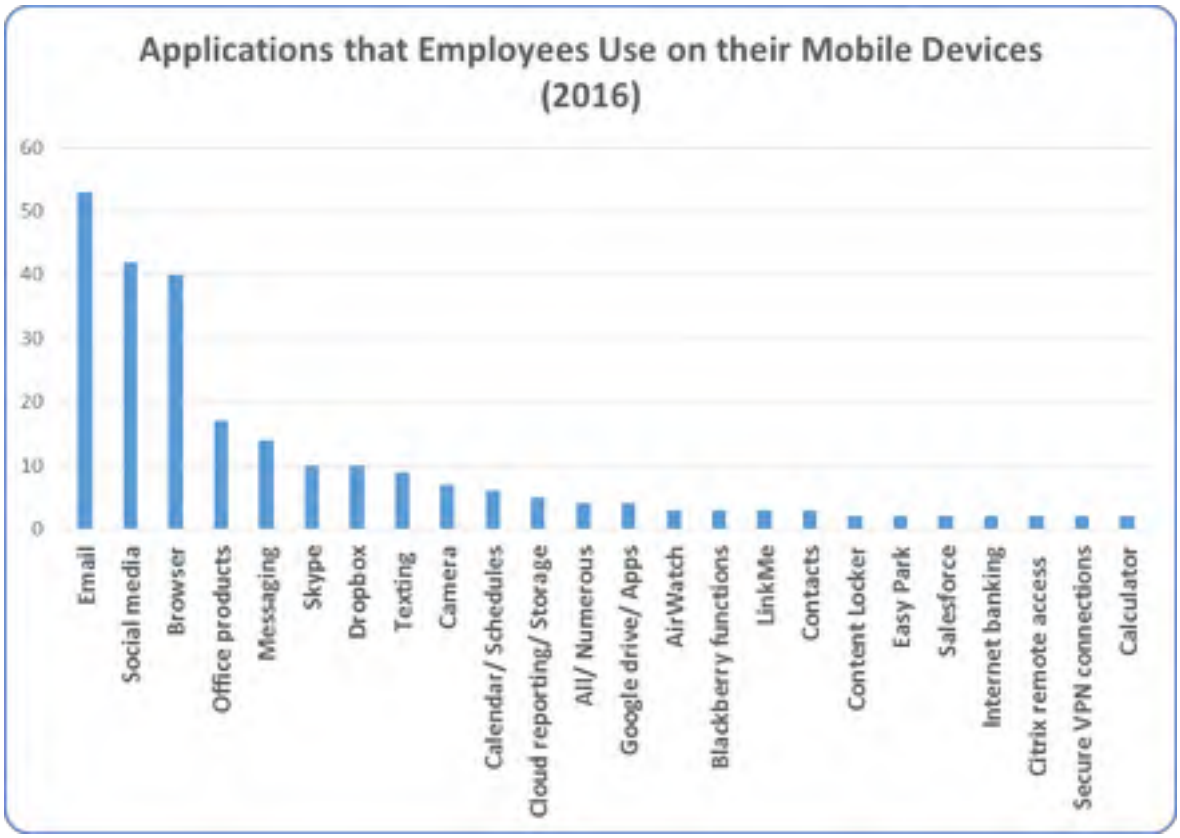
The top three elements into the decision-making process (whether to make the purchase locally or overseas) are:

1. availability of the products,
2. whichever location offers the best price, and
3. there is better pricing abroad.

Corporate Use of Technology and the Internet

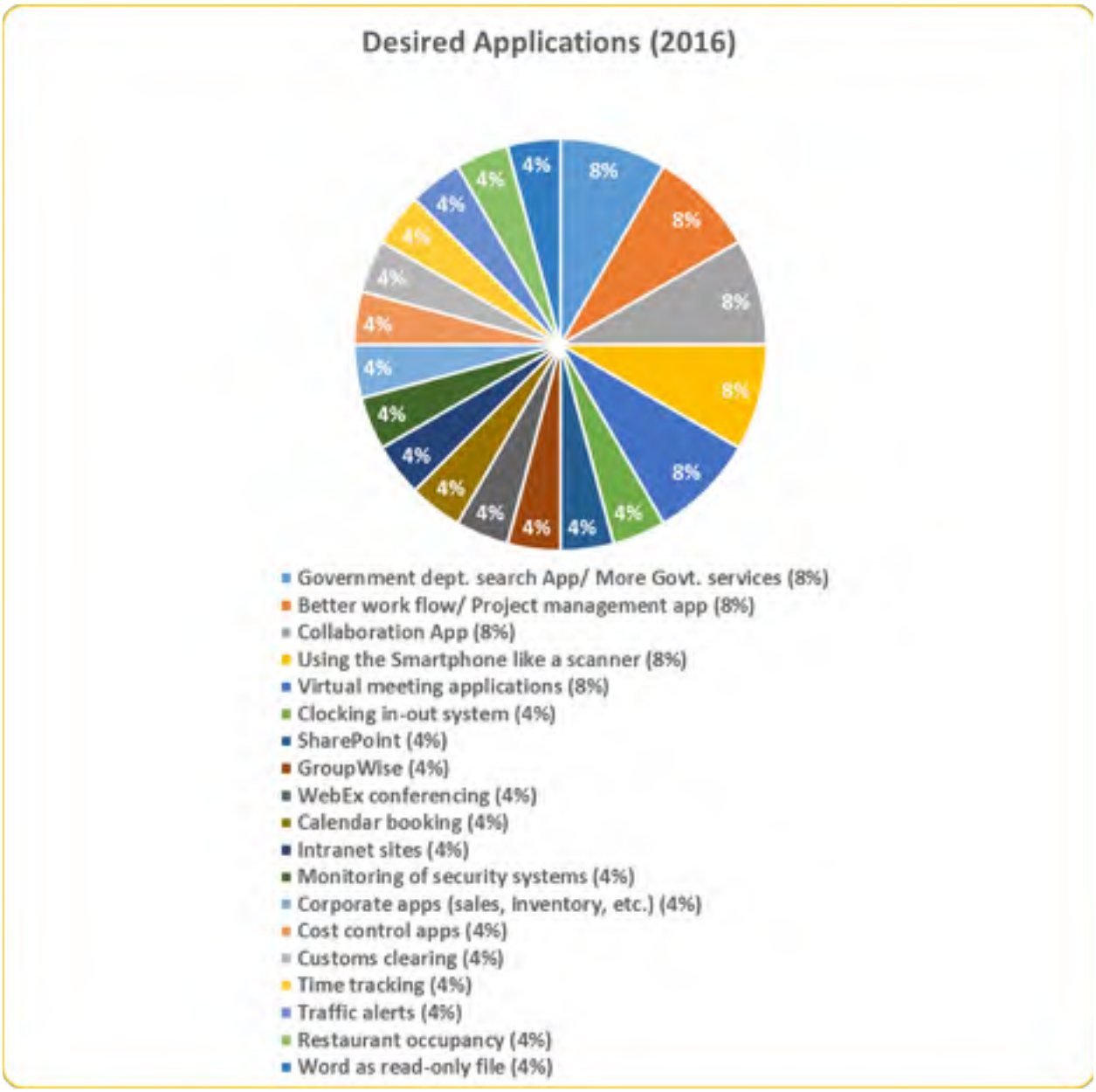
Popular Uses of Mobile Devices

As expected, the most common applications used by employees on their mobile devices are email, social media, and Internet browsers.



Desired Applications

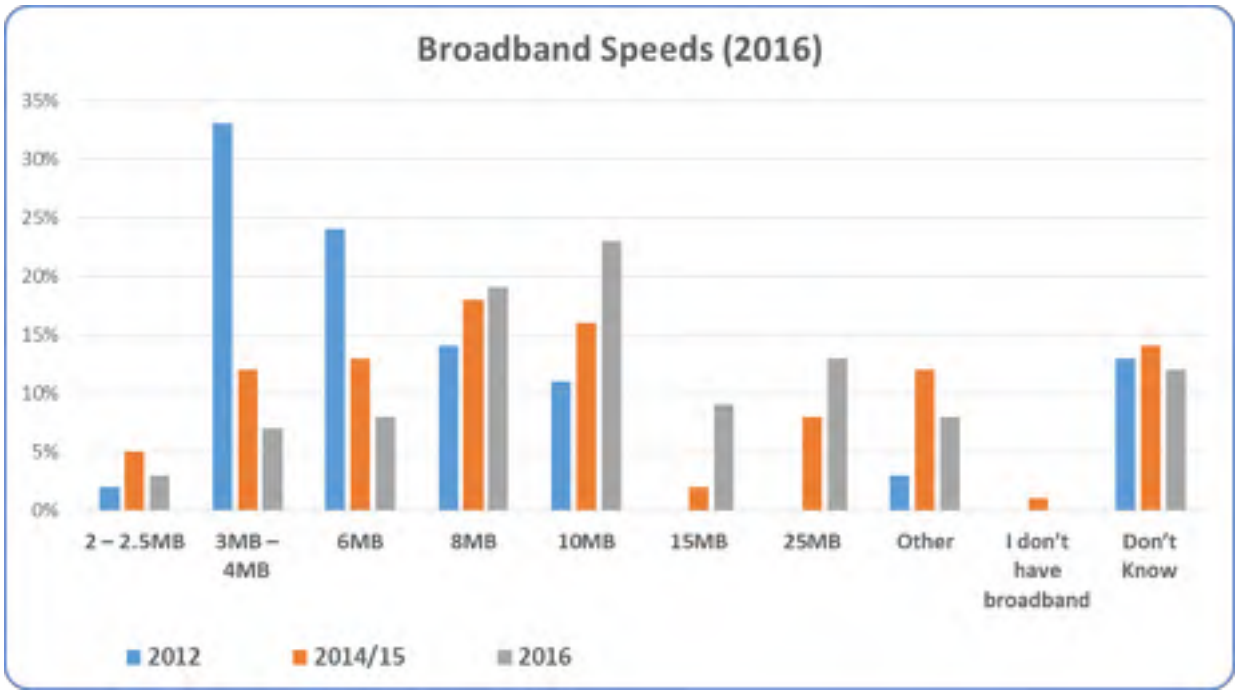
The applications that businesses would like to see developed are detailed in the table below.



Internet Connection

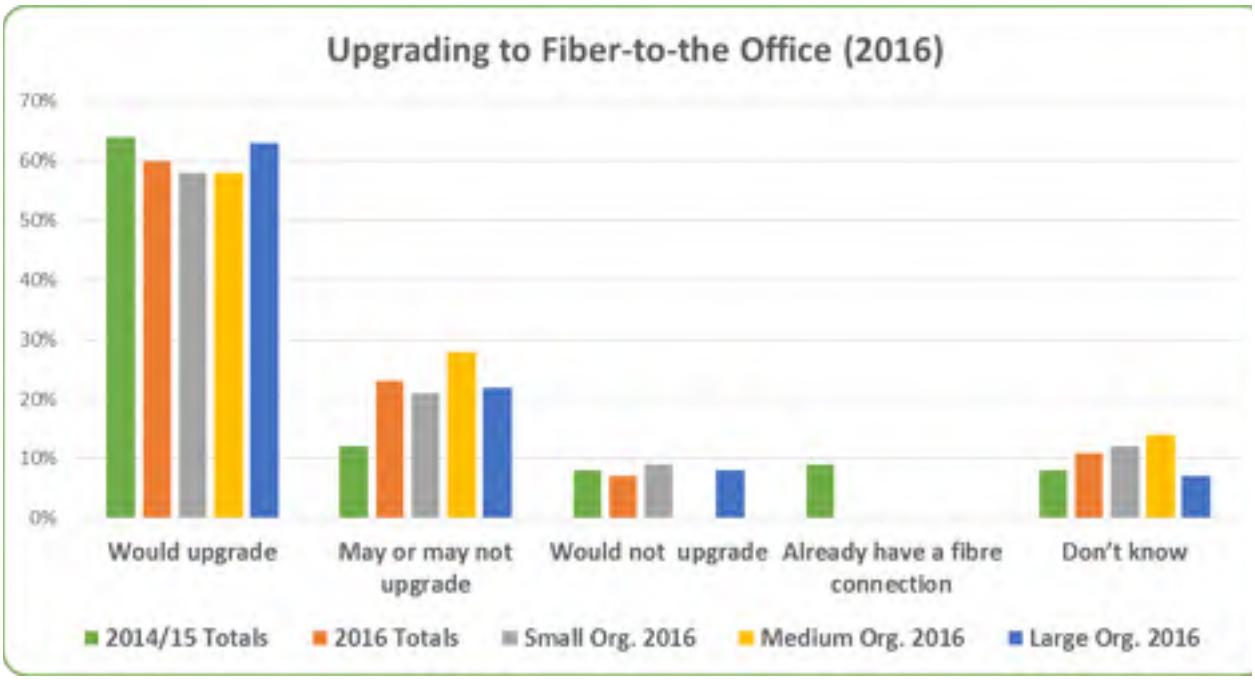
100% of businesses have Internet access, mostly using broadband connection speeds of 10MB (23%) and 8MB (19%).

Tracking broadband speeds over time, it becomes clear that those of 10MB and lower have decreased in popularity after 2012, while higher speeds have become more popular. Subscriptions to speeds above 10MB area are spiking, showing a clear appetite for faster connections over time.



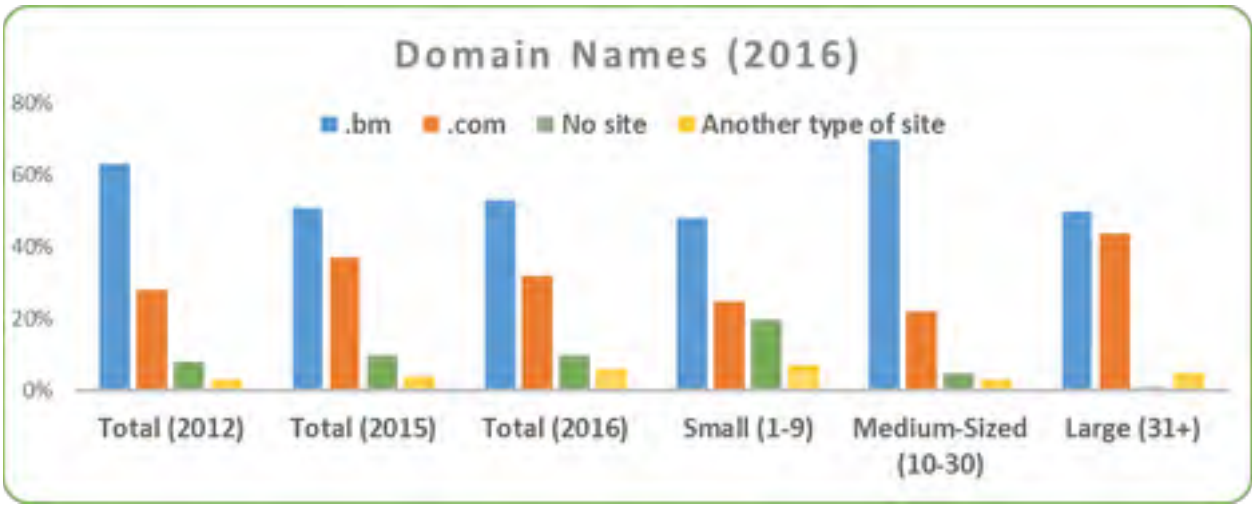
The "other" category includes the following speeds: T1 lines, 100MB, 20MB*2 Circuits, 35MB, 40MB, 55MB, 70MB, a mixture of IPLC's, and Broadband aggregated over 30MB.

60% of respondents would upgrade to fibre-to-the-office if it became available. More details are shown in the two charts below.



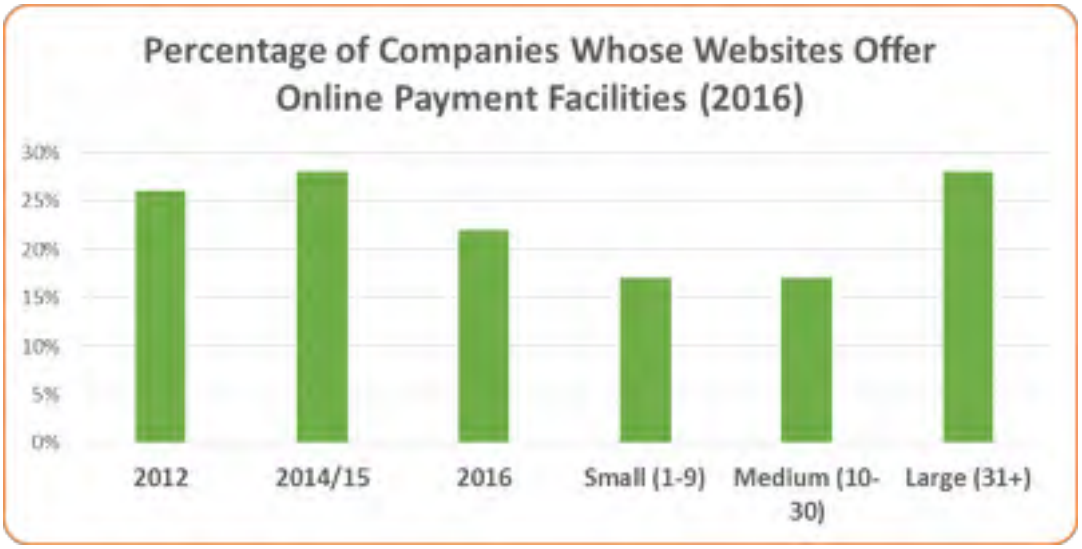
Domain names

When asked about their domain names, 53% of local companies respond having a ".bm" followed by 32% who operate a ".com."

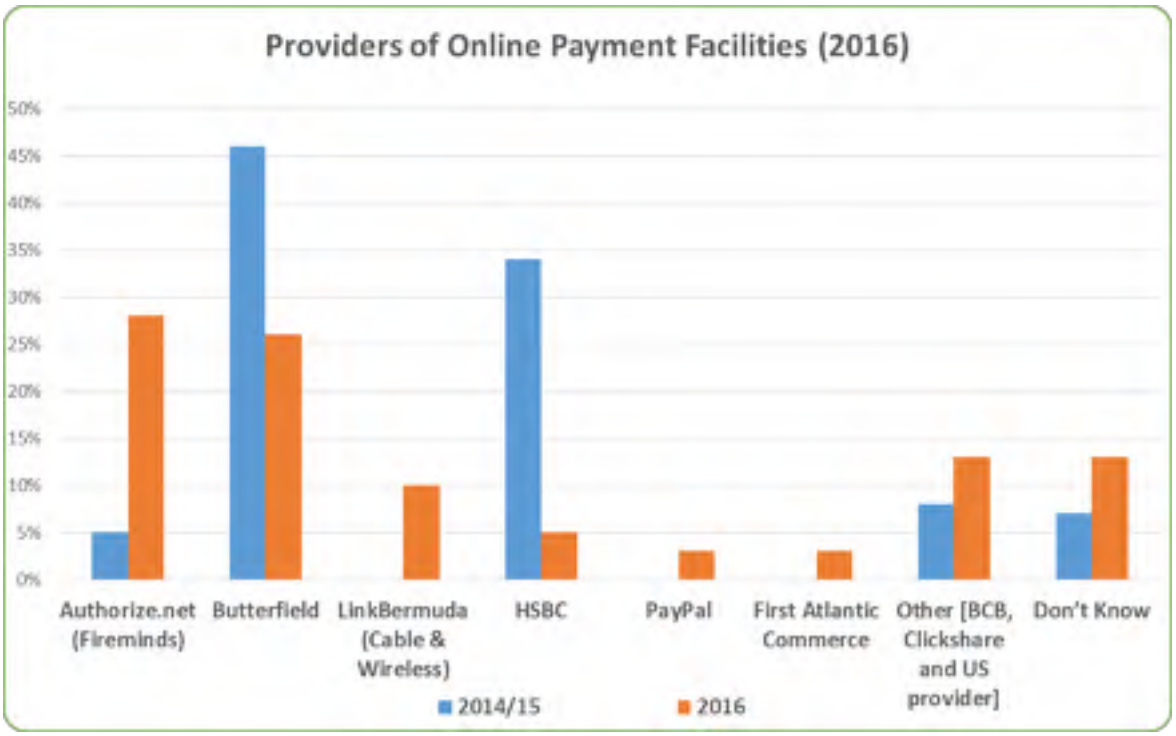


Online Payment Facilities

22% of local businesses have an online payment facility on their website, with the majority using Authorize.net or Butterfield.

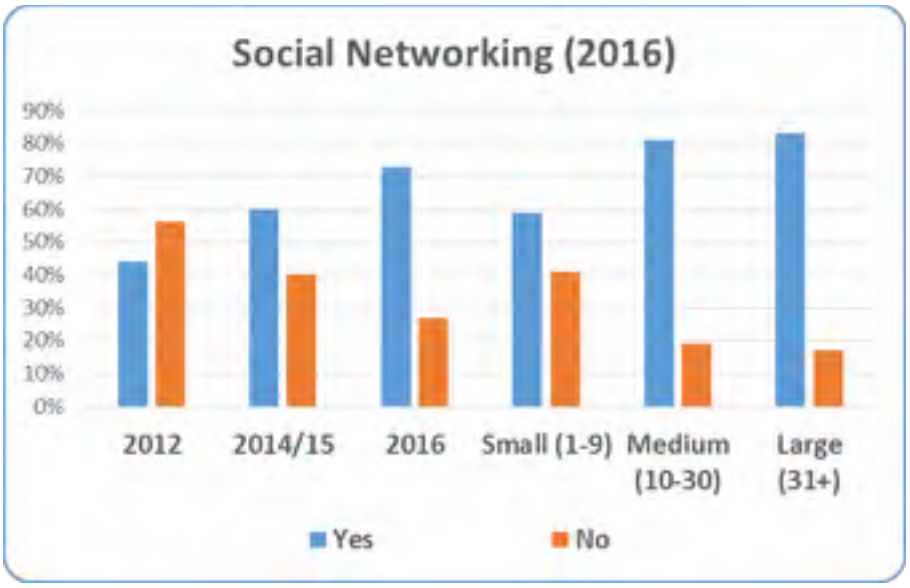


As is shown below, the distribution of providers of said online payment facilities have dramatically changed since 2014/15.

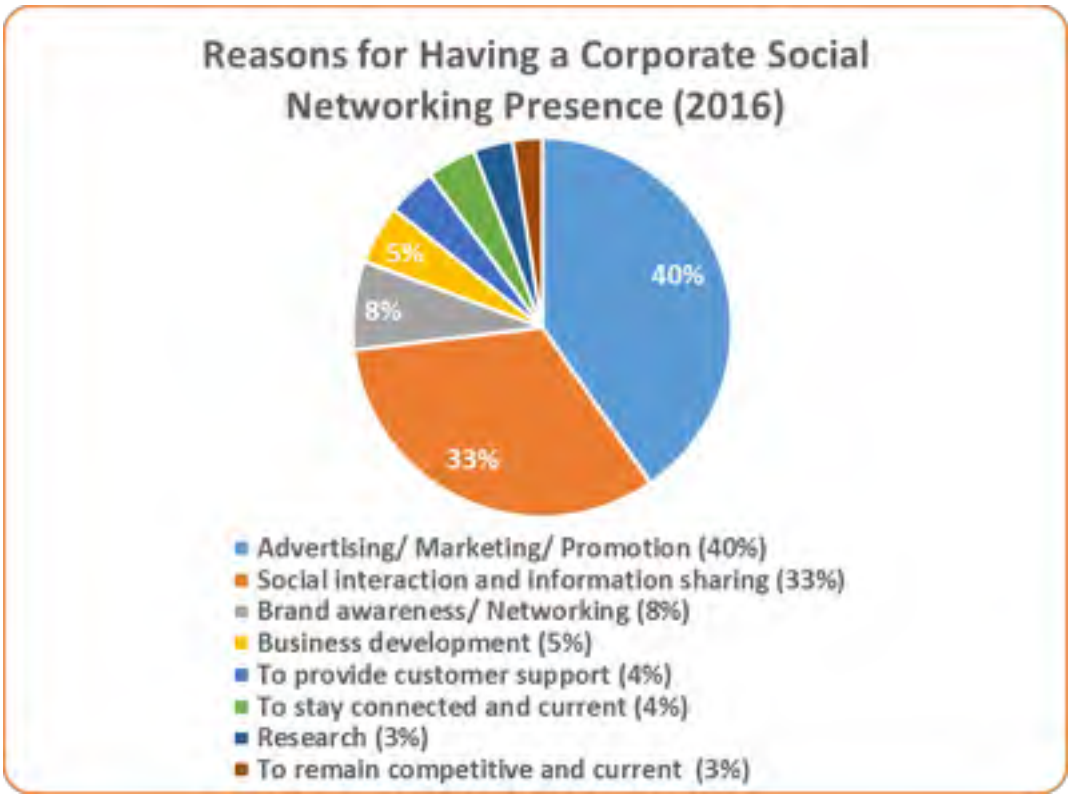


Social Networking

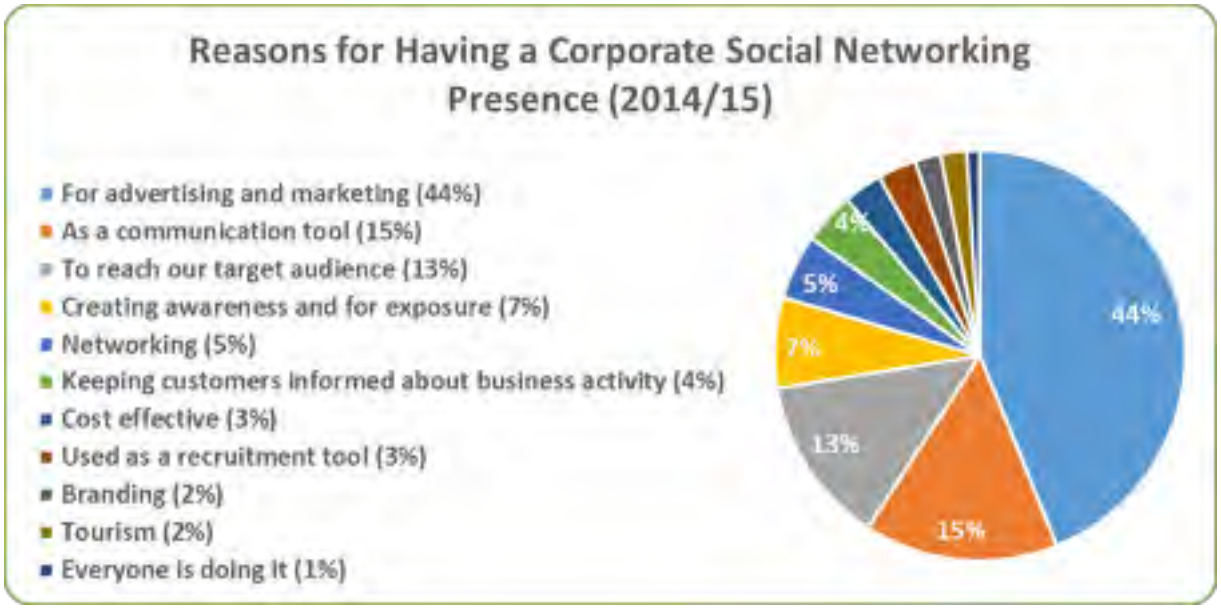
When it came to social media, 73% of businesses confirmed having a corporate social networking presence. This represents an increase from previous years and a predictable trend upwards.



According to respondents, and similarly to the findings of the 2014/15 survey, the main reason for having a corporate social networking presence was for advertising their products and for the promotion and marketing of their services.

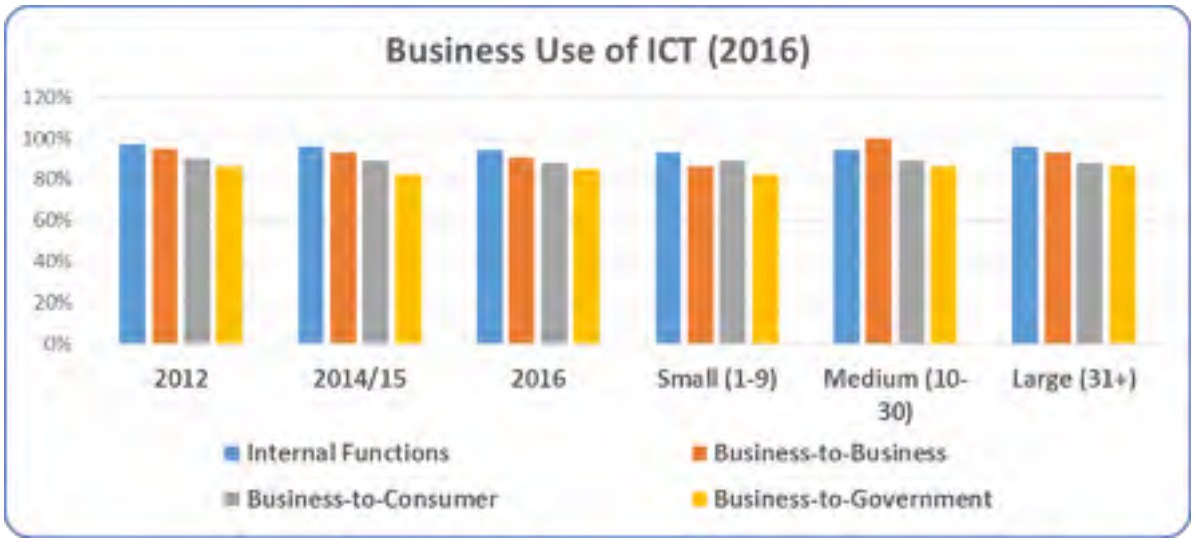


Below are the answers to the same question, for the 2014/15 survey:



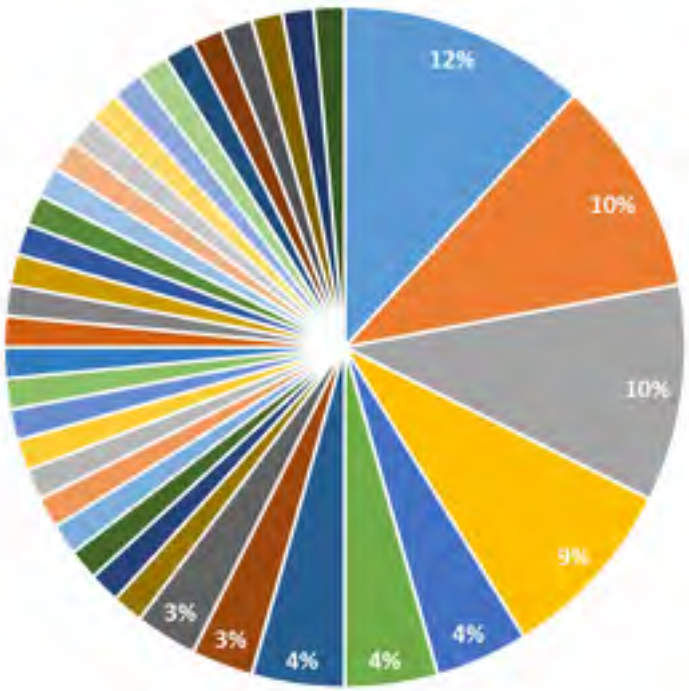
Business Use of ICT

The majority of businesses use technology for internal functions (94%) followed by Business-to-Business work (91%).



As shown below, the top three "other" ways that businesses used technology are communication, research and "everything." The variety of said uses reflects the wide palette of uses that companies find and/or create to assist them in achieving their objectives, another indicator of how pervasive technology is today.

Business Uses of ICT (2016)



- Communication (internal and external) (12%)
- Everything we do is technology-based (10%)
- Research (10%)
- Advertising/ Marketing/ Graphic design (9%)
- Investment decisions/ Trade selection (4%)
- Sales and purchasing (4%)
- Tech support (4%)
- Conference calls/ Video conferencing
- Document management
- Audio/ Visual/ Still production
- Banking
- CAD drawings
- Point of sale
- Design services
- Digital record keeping
- Collaboration Software development
- Education Instructional integration
- Maintaining student records
- Engineering design
- Filing of corporate requests
- Real estate intelligence
- Insurance risk modelling and tracking
- Lighting and energy management systems
- Modeling
- Newsfeed based on subscriptions
- Operations management
- Ordering of products
- POS system
- Hotel management
- Surveillance/ Security
- Temperature monitoring
- Scanning barcodes
- Training and teaching
- Travel reservations
- Energy management
- Volunteer website

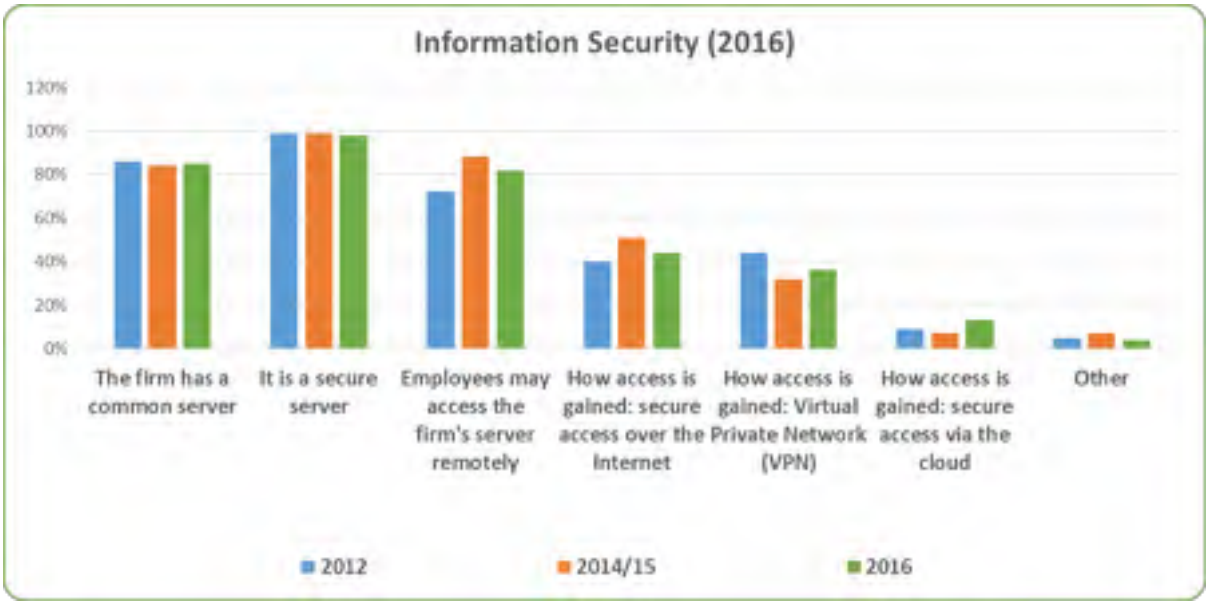
Data Protection

Information Security

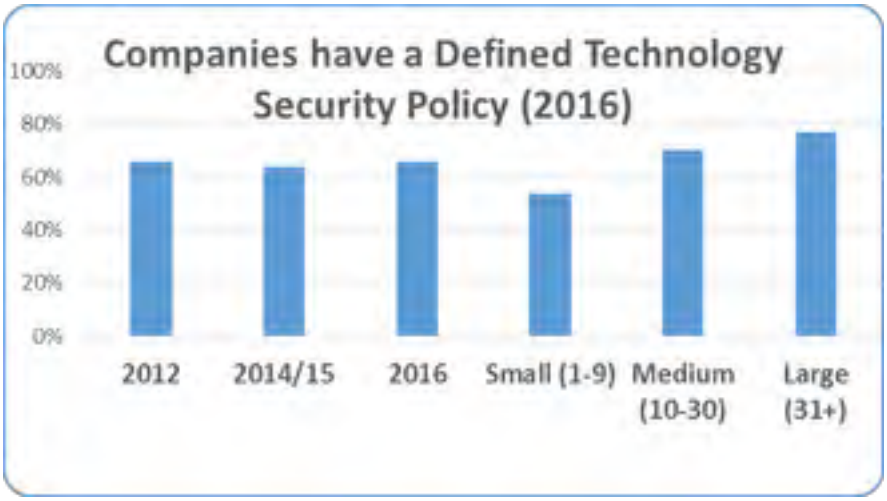
85% of businesses have a common server, of which 98% are secure.

82% have a server that can be accessed remotely, most popularly through secure access over the Internet (43%), through a virtual private network (35%), and on the Cloud (12%).

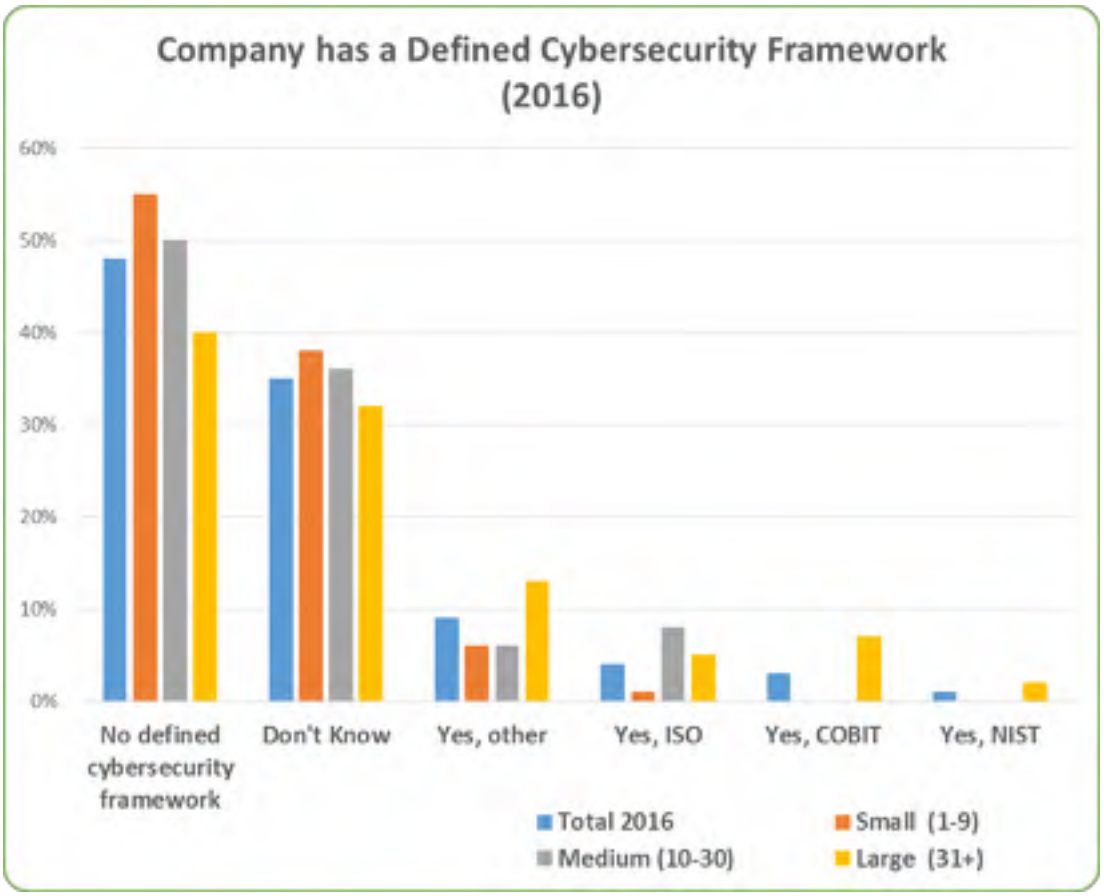
"Other" responses include: RDP, Citrix, multiple encrypted methods, remote desktop connection, VPN & Citrix and VMware VDI.



66% of businesses have a defined technology security policy.

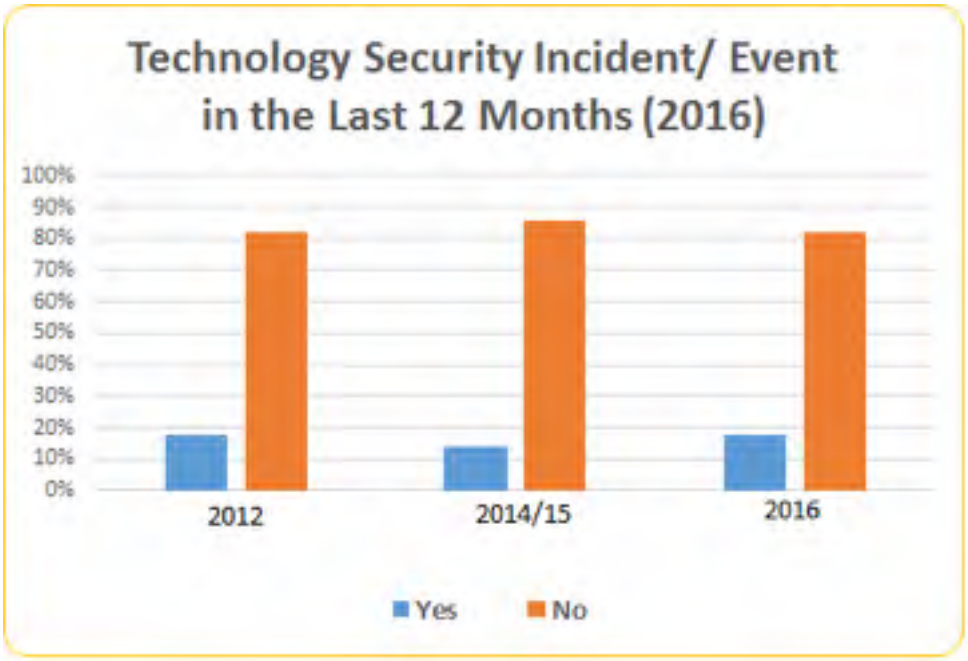


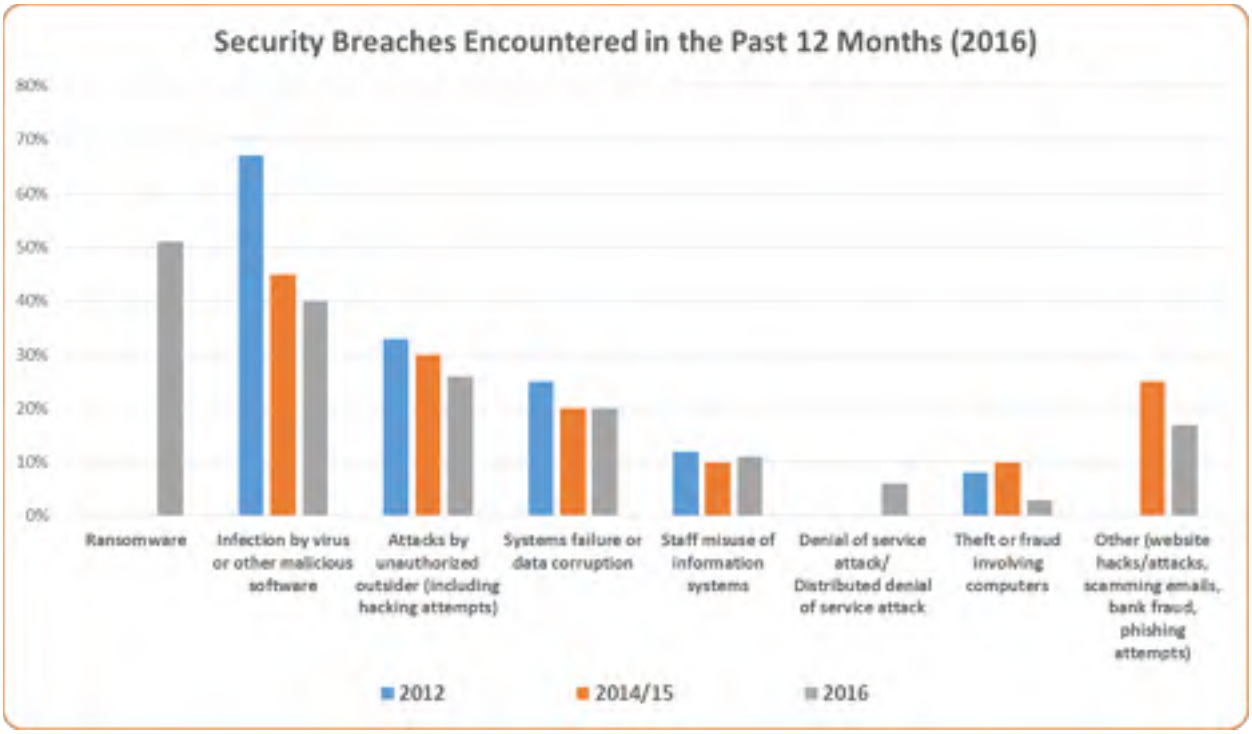
On the other hand, 48% of businesses do not have a defined cybersecurity framework. This new set of questions, added only this year, also shows that companies, in smaller numbers, use frameworks other than the ones listed in the question, including some that are internally developed, as well as COBIT, ISO, and NIST (barely a combined 8%).



Additional questions show that for the majority of businesses (68%) technology security expenditure has not increased over the past 12 months.

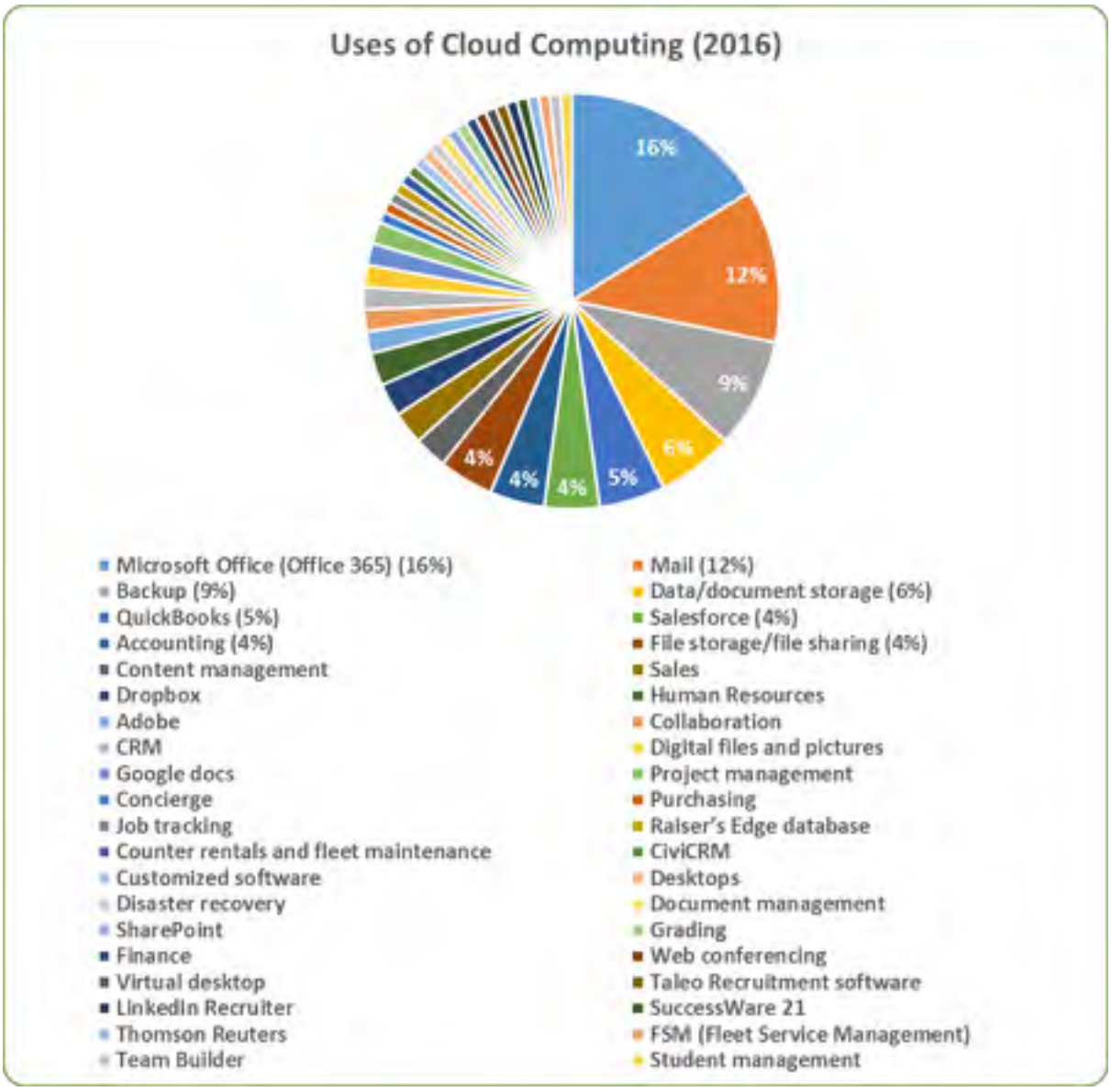
Only 18% or respondents indicate that their businesses had a technology security incident in the past 12 months, the most common types of which were Ransomware (e.g. CryptoLocker) (51%) and infections by virus or other malicious software (40%).



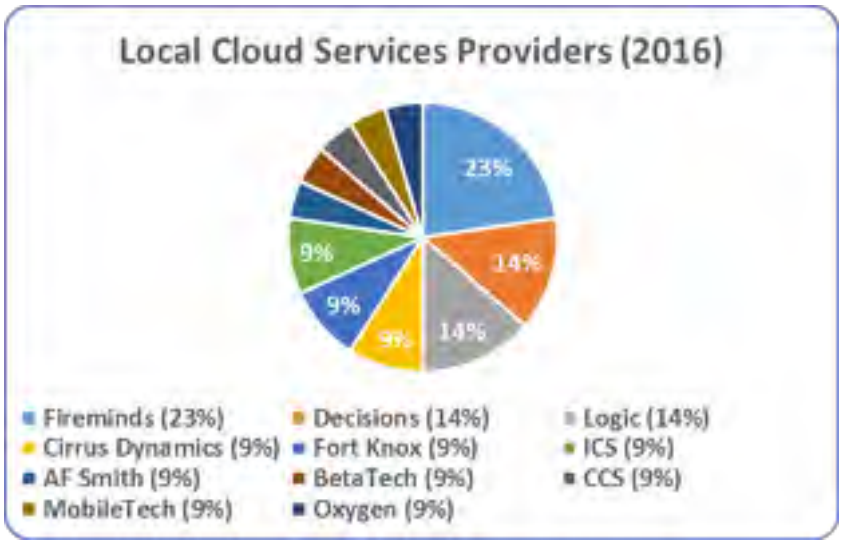


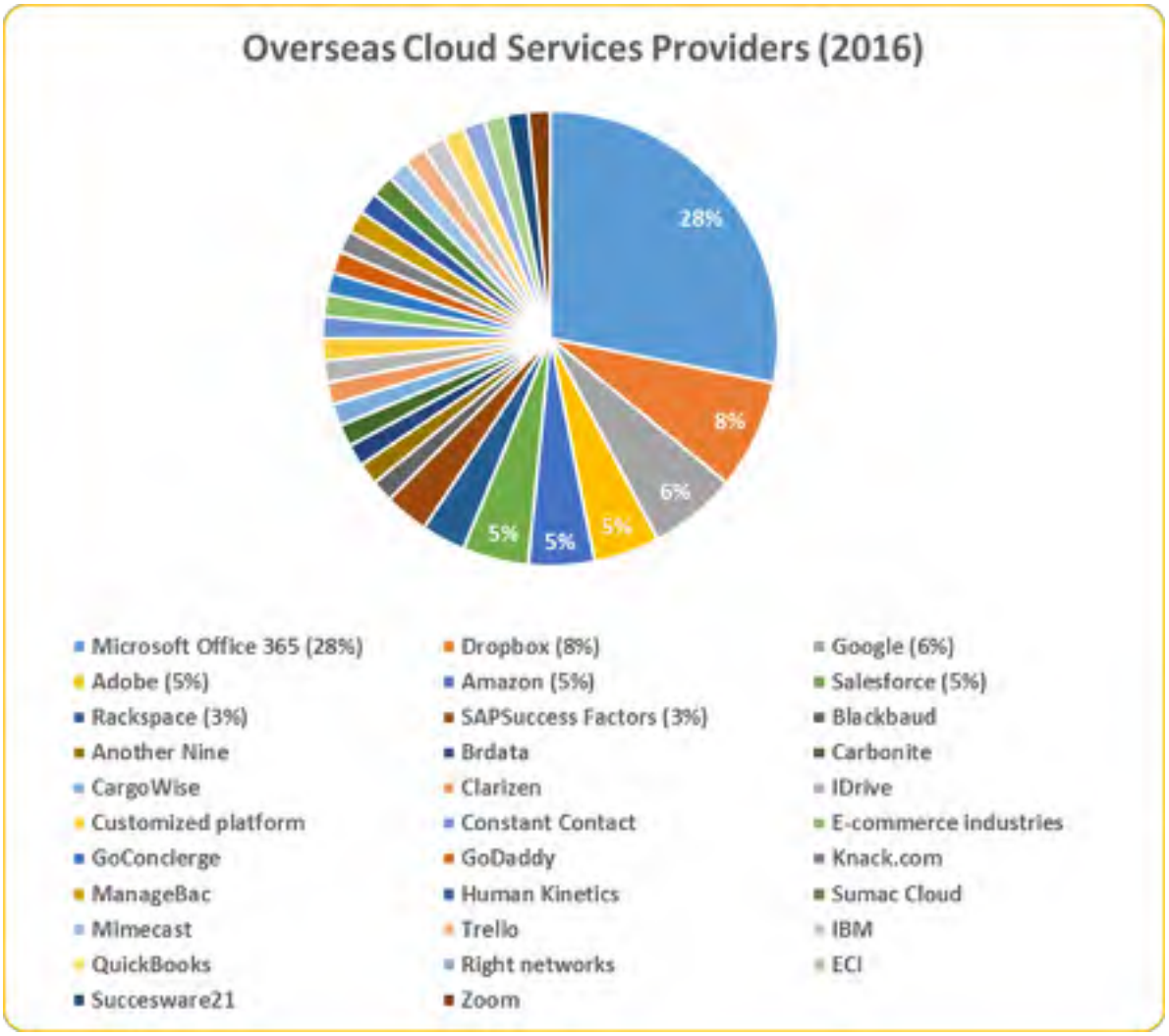
Cloud Computing

70% of respondents say their company uses cloud computing, using it mainly for Office 365, email, and for backup purposes.

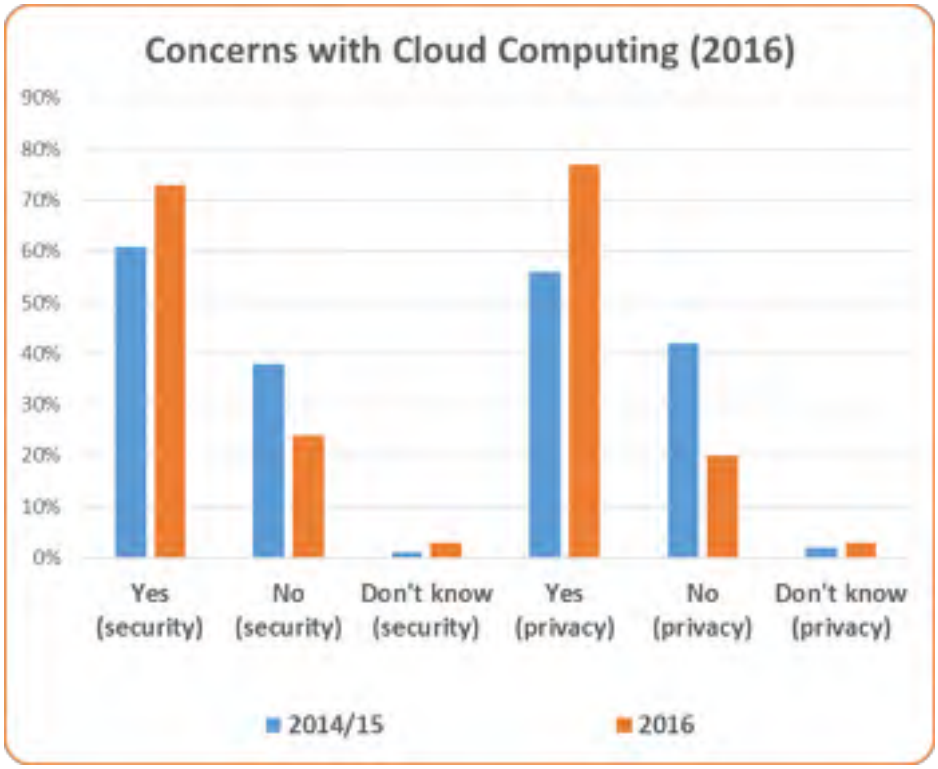


Asked about their cloud computing service provider, responses indicate that the top local provider is Fireminds, while the top overseas provider is Microsoft.


Local Cloud Services Providers (2016)
23%
14%
14%
9%
9%
9%
9%
Fireminds (23%)
Decisions (14%)
Logic (14%)
Cirrus Dynamics (9%)
Fort Knox (9%)
ICS (9%)
AF Smith (9%)
BetaTech (9%)
CCS (9%)
MobileTech (9%)
Oxygen (9%)

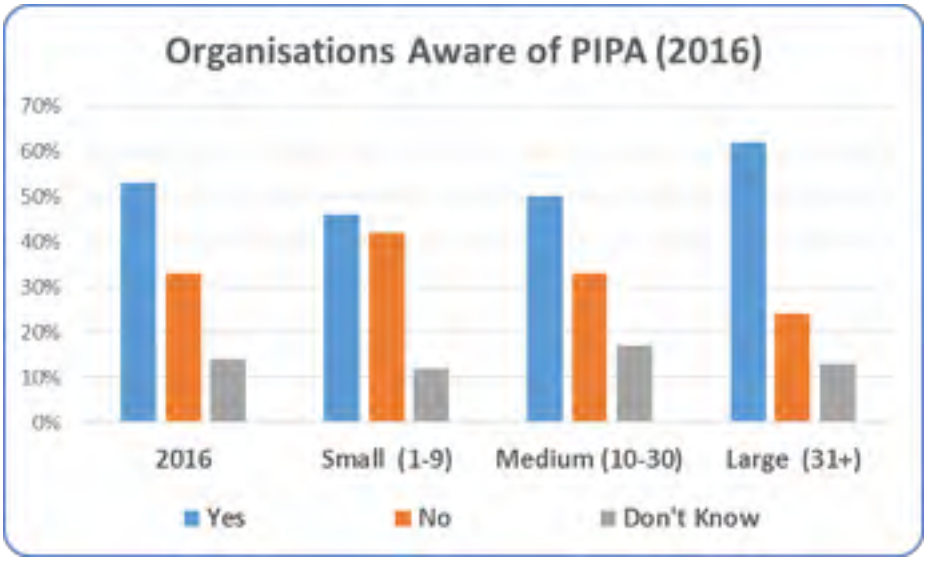

Overseas Cloud Services Providers (2016)
28%
8%
6%
5%
5%
5%
Microsoft Office 365 (28%)
Dropbox (8%)
Google (6%)
Adobe (5%)
Amazon (5%)
Salesforce (5%)
Rackspace (3%)
SAPSuccess Factors (3%)
Blackbaud
Another Nine
Brdata
Carbonite
CargoWise
Clarizen
IDrive
Customized platform
Constant Contact
E-commerce industries
GoConcierge
GoDaddy
Knack.com
ManageBac
Human Kinetics
Sumac Cloud
Mimecast
Trello
IBM
QuickBooks
Right networks
ECI
Succesware21
Zoom

When asked about concerns over cloud computing, 73% of respondents mention security and 77% make reference to privacy. This shows an increase in both categories over time.

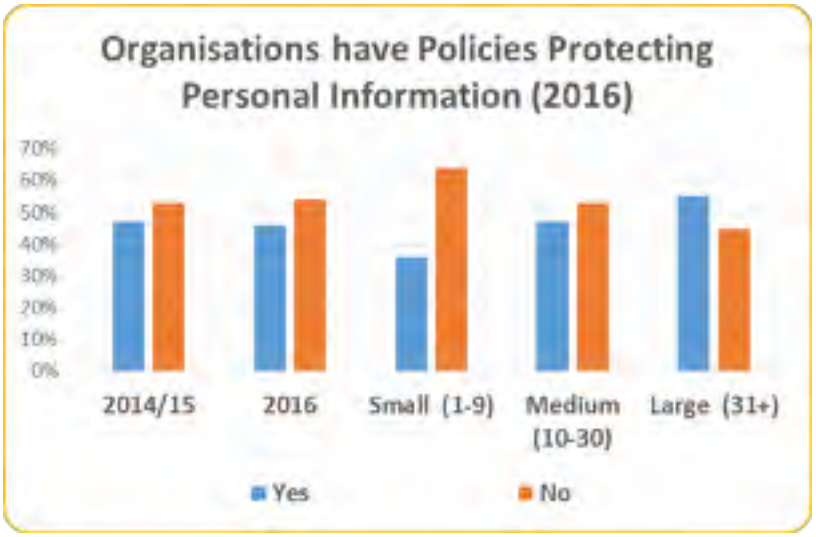


Personal Information Protection Act 2016

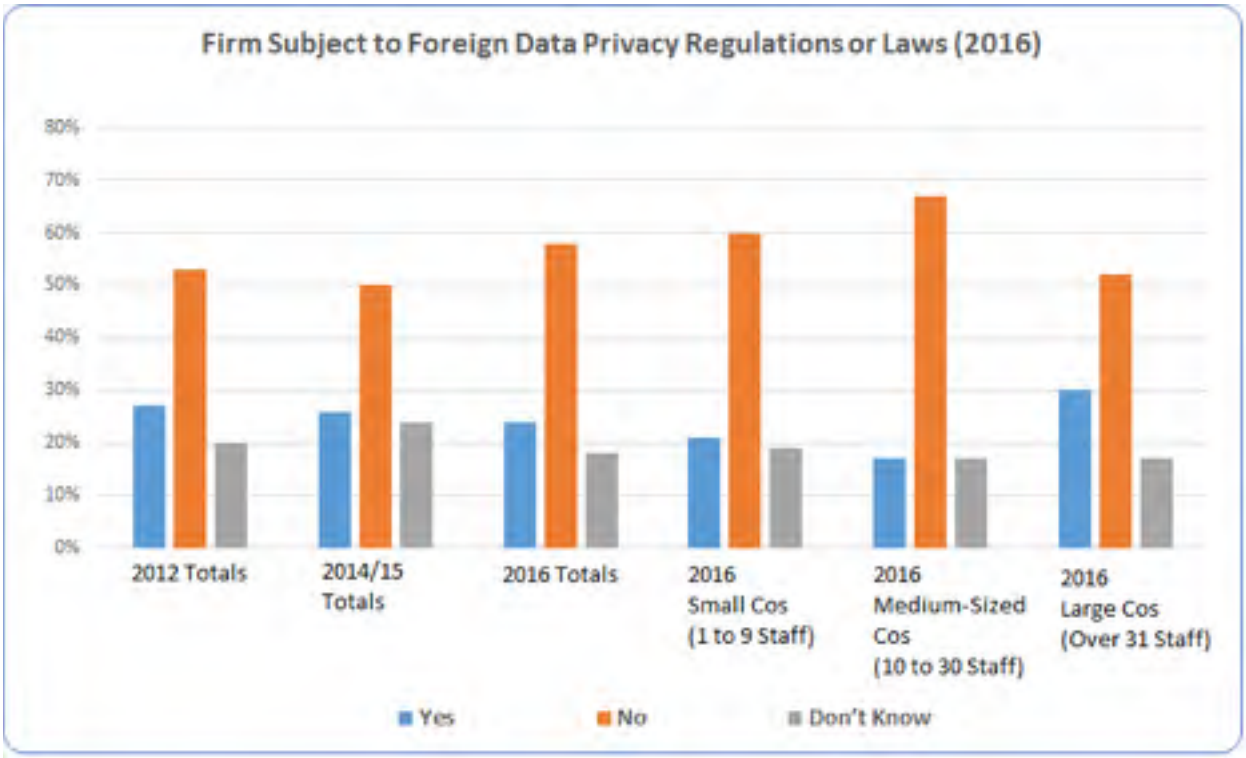
When asked if their organisation was aware of the Personal Information Protection Act (PIPA) which was passed in Bermuda in July 2016, 53% of respondents answered yes.

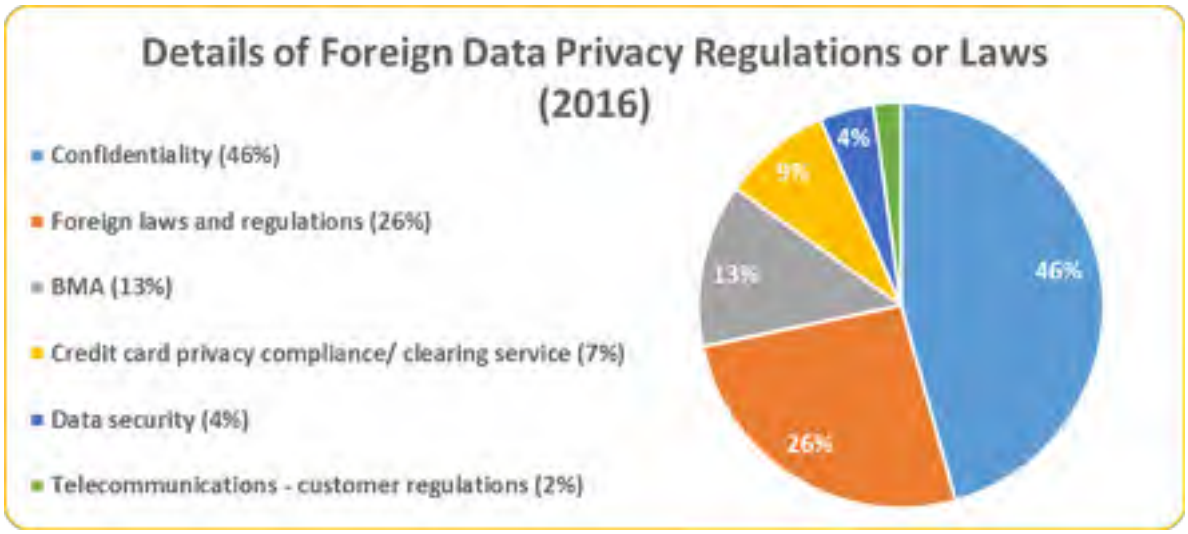


When asked if their firm had an internal privacy policy or policies in place to protect personal information, only 46% responded yes, which is very much in line with results from the most recent survey.



When asked if their firm is subject to any foreign data privacy regulations or laws pertaining to personal information, 24% said yes, which is also generally in line with findings from prior years.



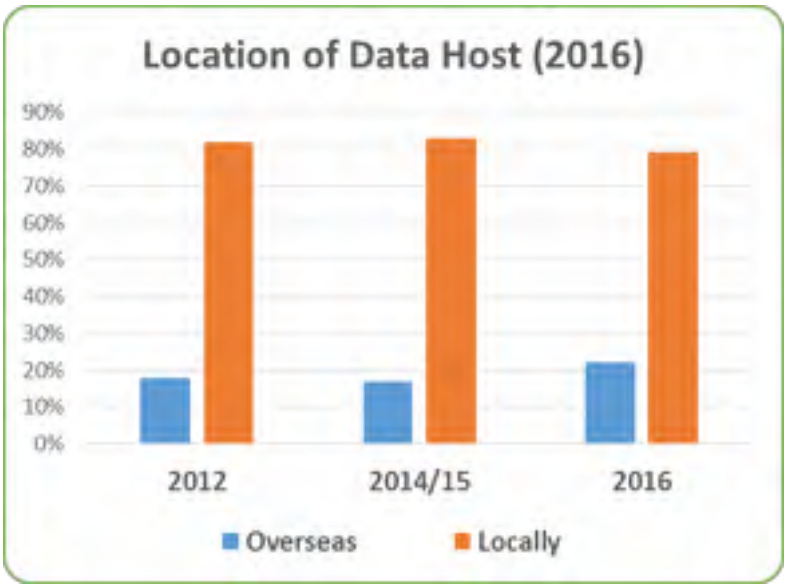


When asked to provide even more details, respondents listed:

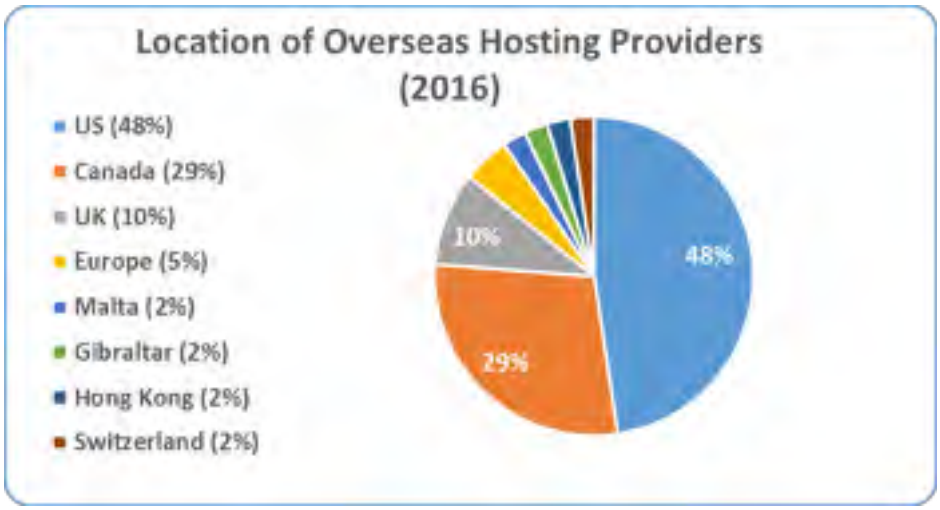
- Confidentiality (45%)
- Standard privacy policy (9%)
- Personal information is held in a secure area and is not shared (7%)
- Employee Act/ Internal guidelines (5%)
- Contract of employment (4%)
- Password secured (4%)
- Do not have personal information on computer (3%)
- Information Security and Information Classification and Protection Policies (3%)
- Credit card and personal information is not stored (3%)
- Limited access to files (3%)
- Staff training (3%)
- Barrister's code (1%)
- Govt. ITO (1%)
- EU compliance (1%)
- Info cannot be accessed outside the network (1%)
- PCI compliance (1%)
- PIPA (1%)
- Only share information if compelled by regulators (1%)
- Require and track access authorization (1%)
- Through parent company (1%)

Data Hosting

The majority of businesses continue to have their data hosted locally (79% in 2016 vs. 73% in 2014/15 and 82% in 2012).

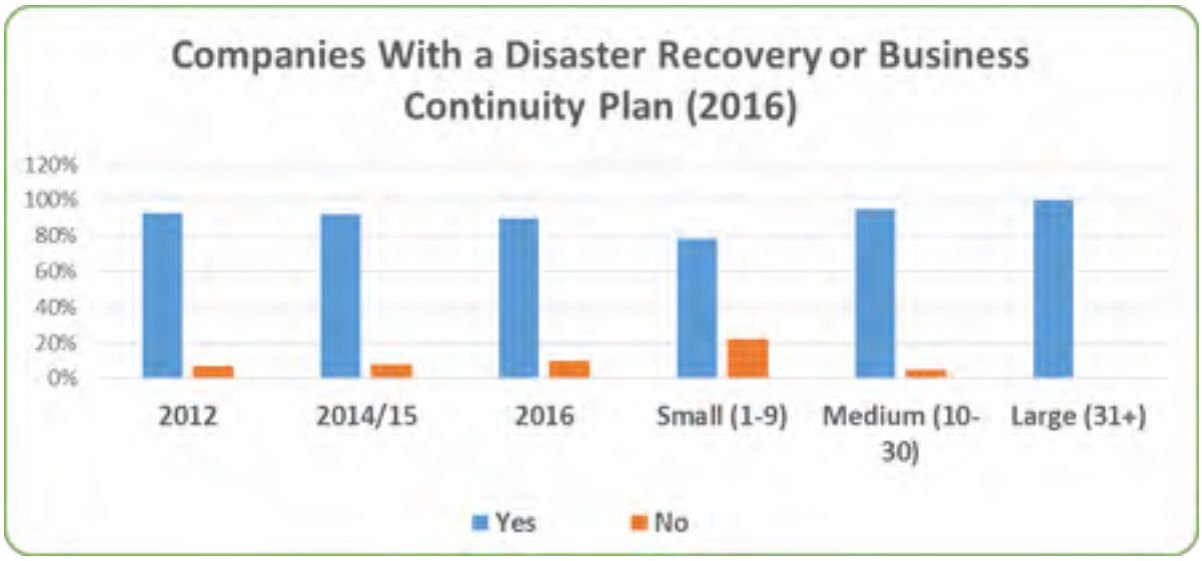


The most popular countries for hosting business data were the US (48%) and Canada (29%).

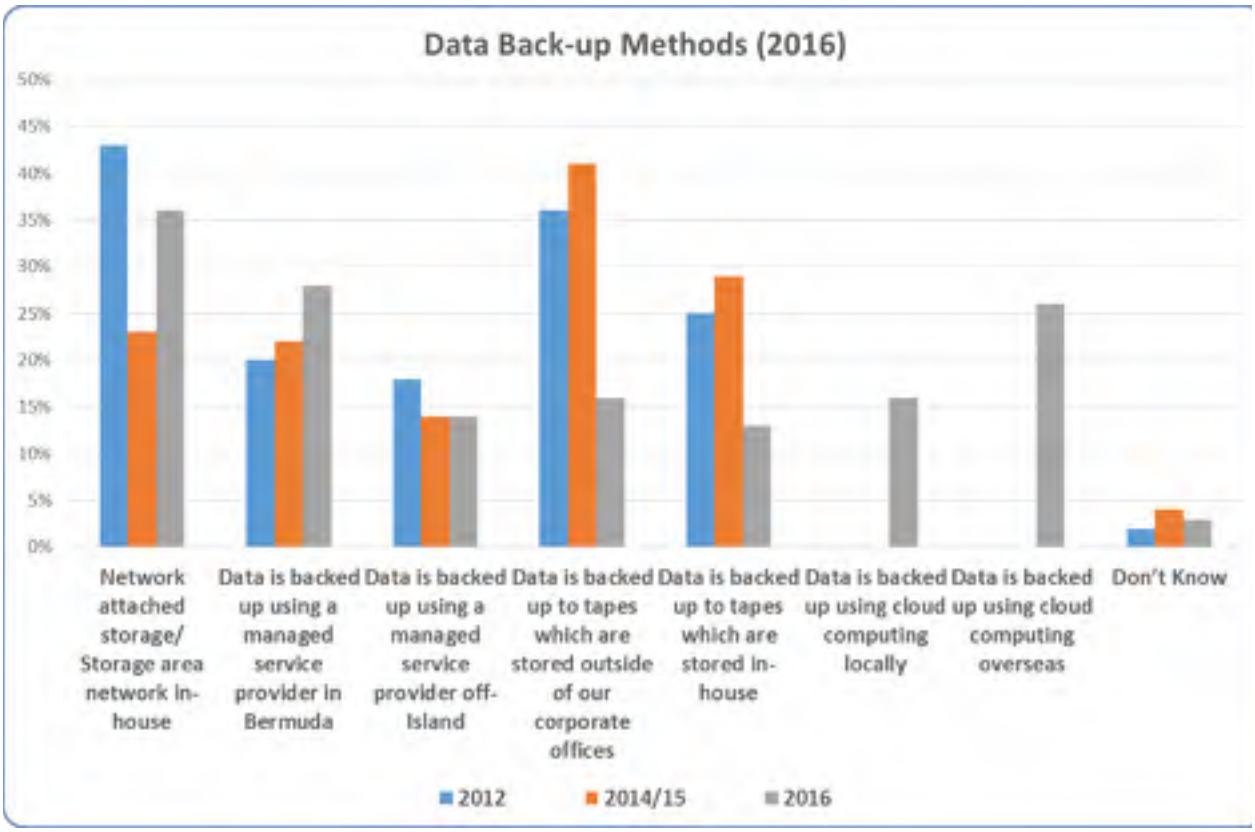


Back-Ups and Disaster Recovery

90% of businesses have a disaster recovery or business continuity plan in place. That percentage climbs to 100% for large organisations.

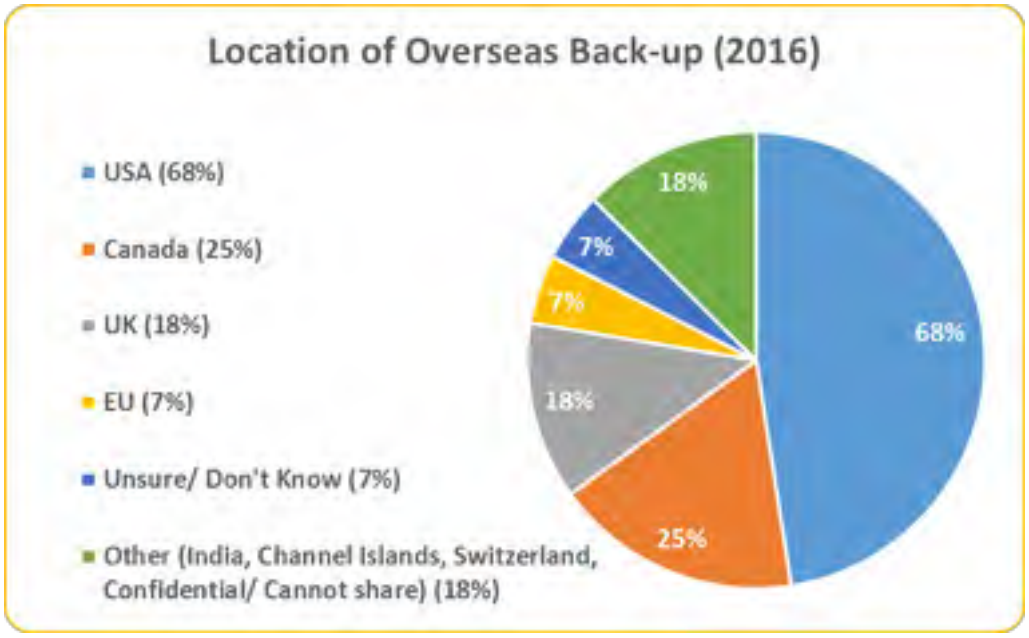


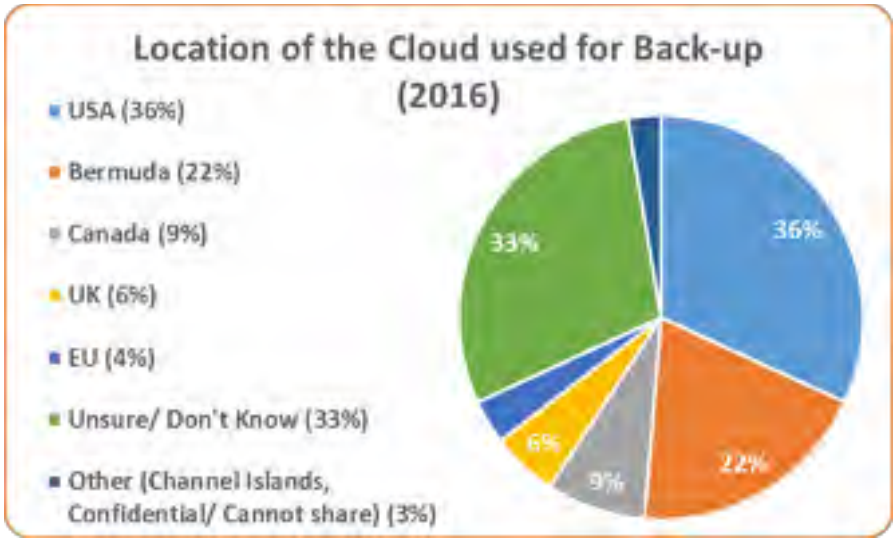
The most popular methods for data back-up are network attached storage/ storage area networks in-house (36%) or managed service providers that are in Bermuda (28%).



We added two new questions to this set, specifically enquiring about companies backing up their data on the cloud, and whether the cloud services provider is located locally or overseas. This allowed for a clearer distribution of information, separating out the third-party service providers more visibly.

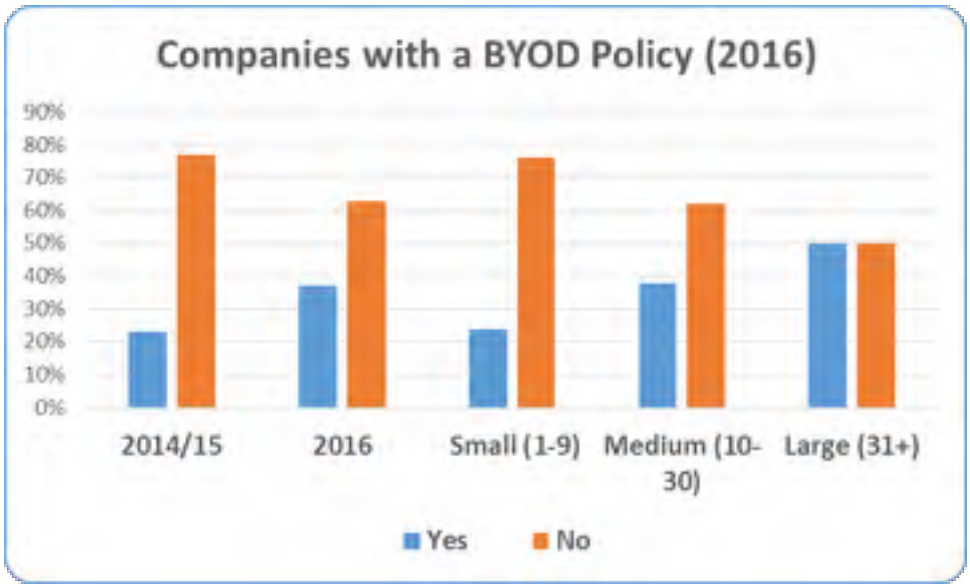
As a follow-up, we found out that the USA is the preferred location both for businesses who back up their data overseas (68%) and those who back up their data on the cloud (36%). It is worth noting that for that latter category, Bermuda follows as a close second to the USA (22%).

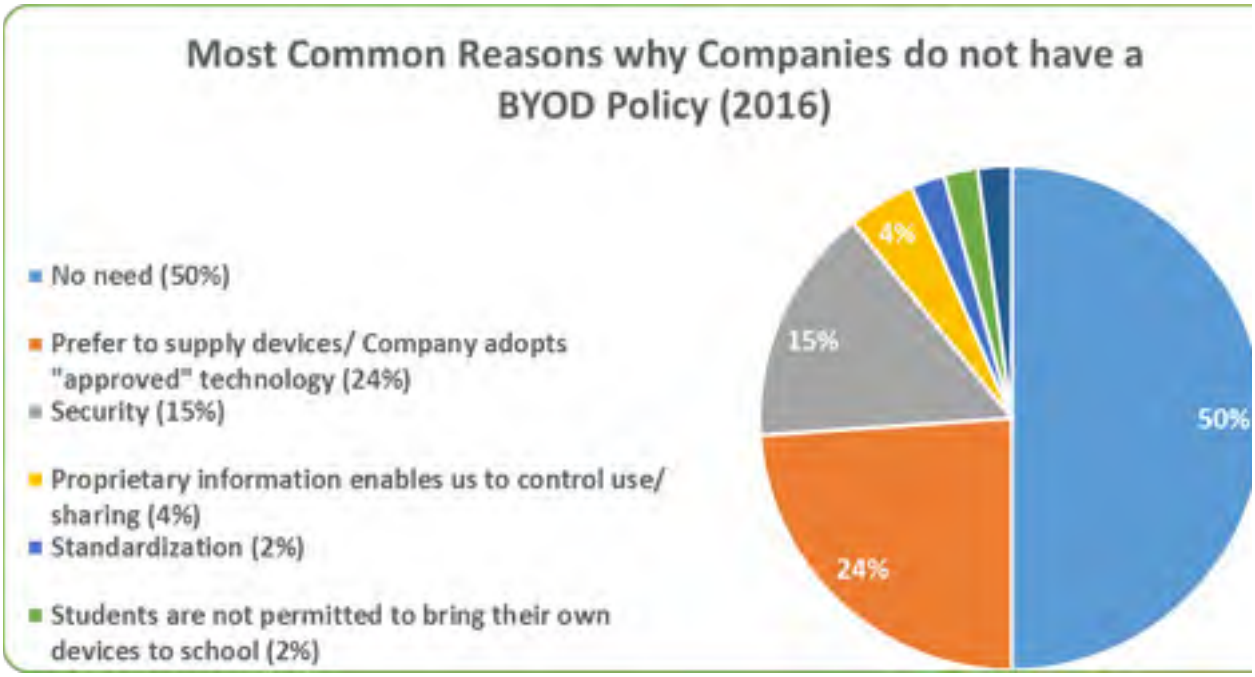




Bring Your Own Device (BYOD)

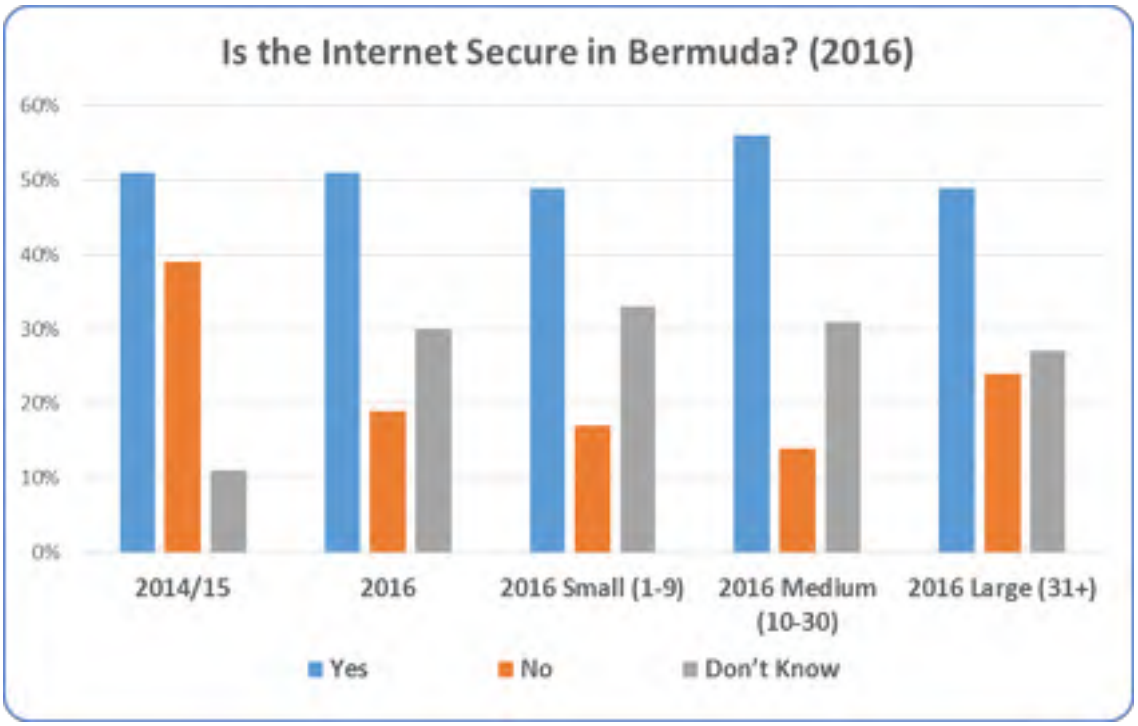
37% percent of businesses have a Bring Your Own Device policy (BYOD), a notable increase from our most recent findings (23% in 2014/15). When asked for more detail, half of the respondents explained that their respective companies did not have a need for such a policy (50%), followed by 24% who expressed that their companies preferred supplying the device itself, in the form of approved technology.



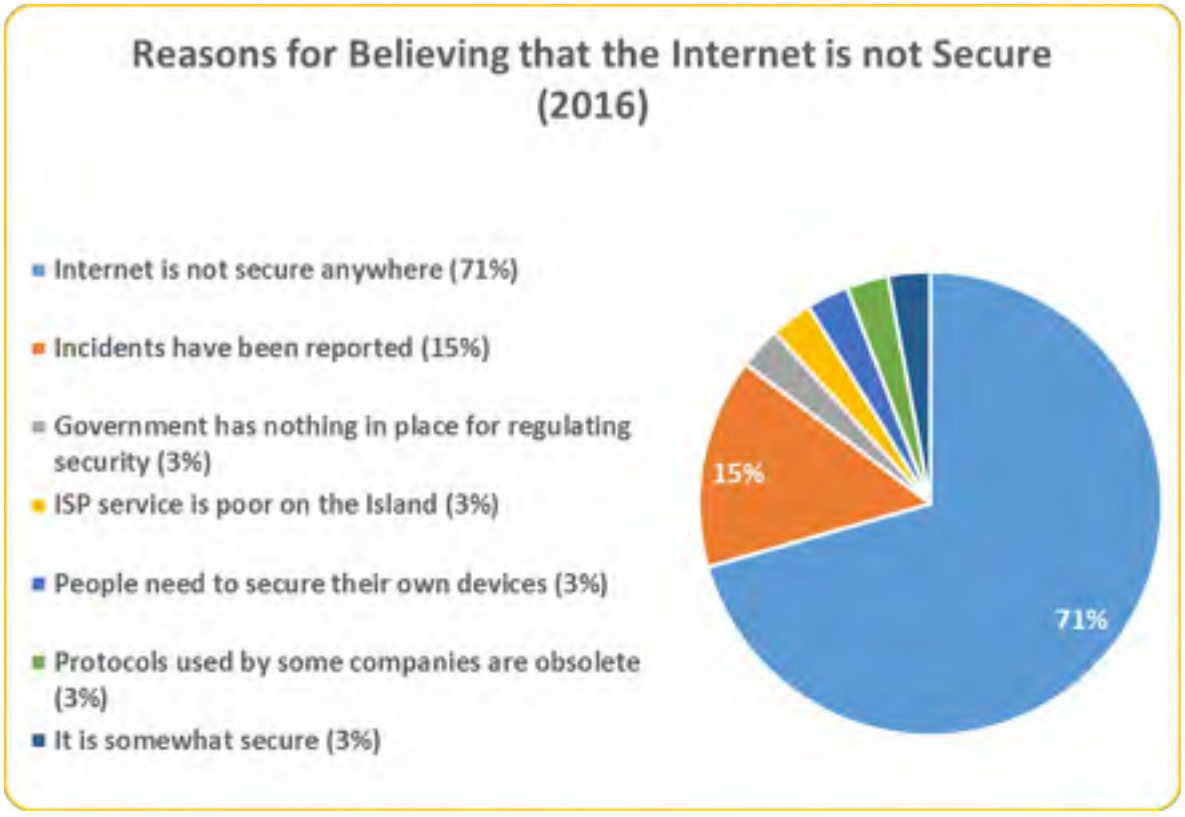


Internet Security

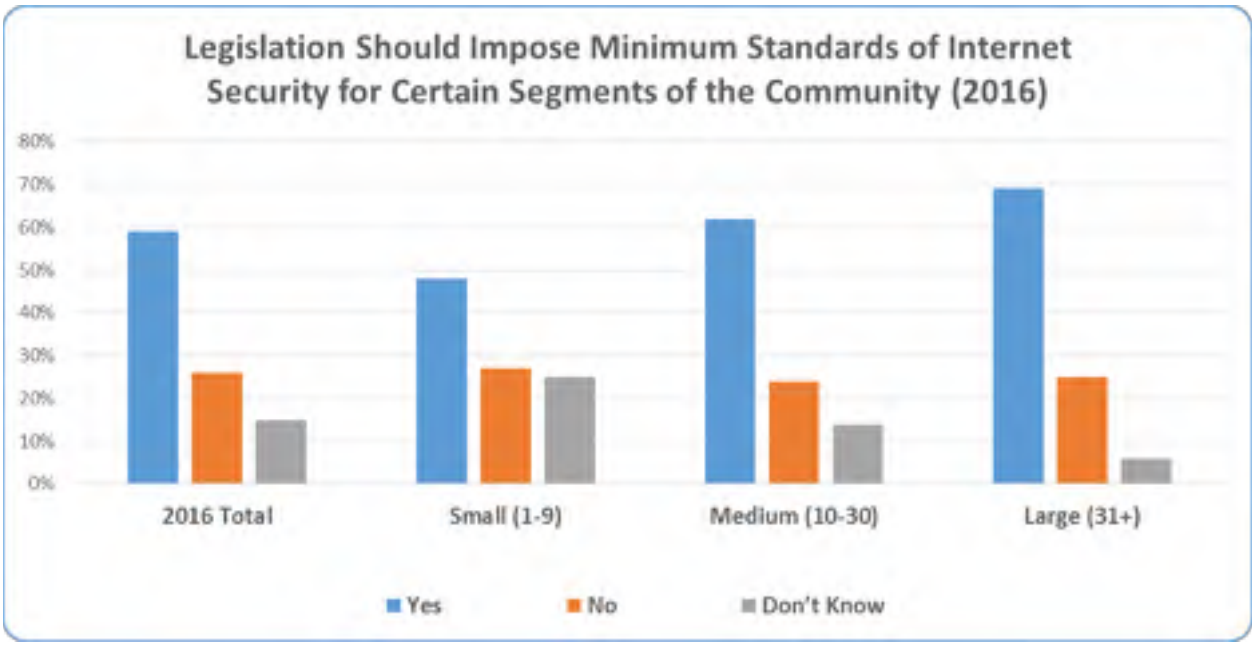
19% of businesses do not feel that the Internet is secure in Bermuda, a steep decline from the 39% expressed in 2014/15. Note that the "Don't Know" category shows a proportionate increase (30% in 2016 vs. 11% in 2014/15).



Those who do not believe that the Internet is secure believe that the Internet is not secure anywhere anyway (71%) which is made evident by the relevant incidents that have been reported (15%).

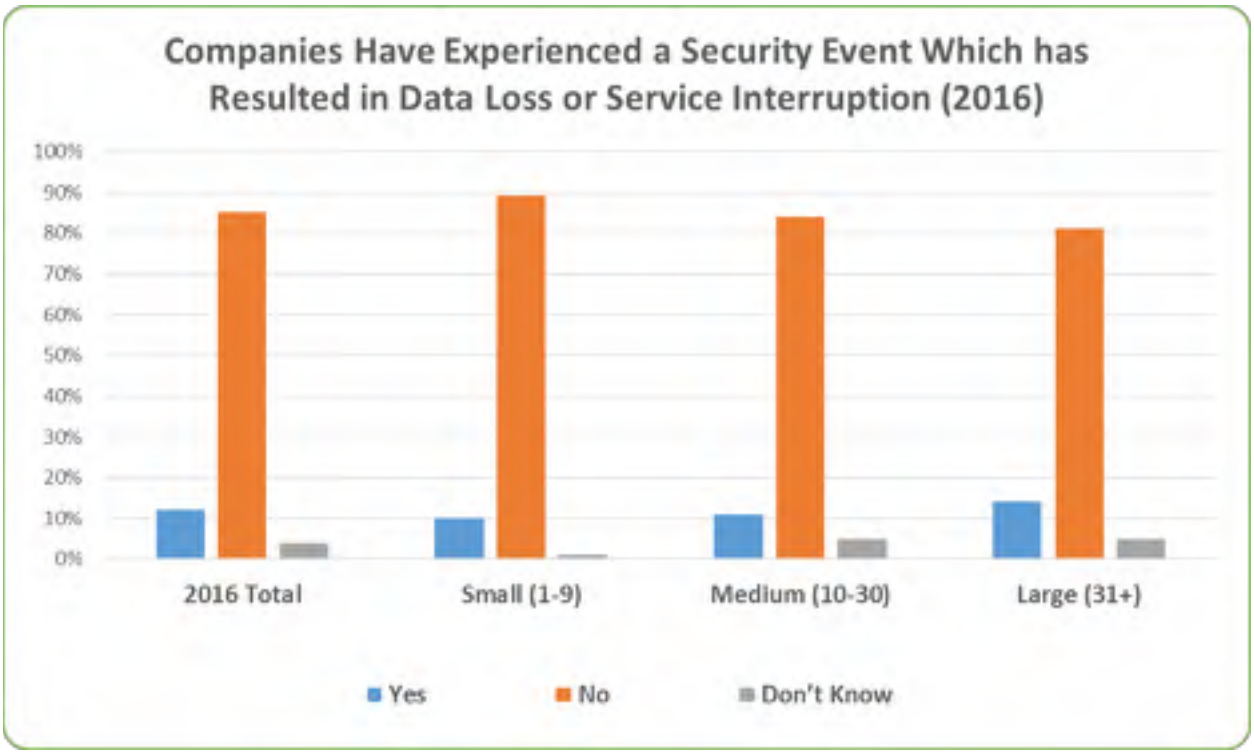


Notice that 3% of the respondents intimated that they believed that Government has nothing in place for regulating Internet security. In fact, when asked the direct question, 59% of all respondents made clear their belief that legislation is required to impose minimum standards of Internet security.



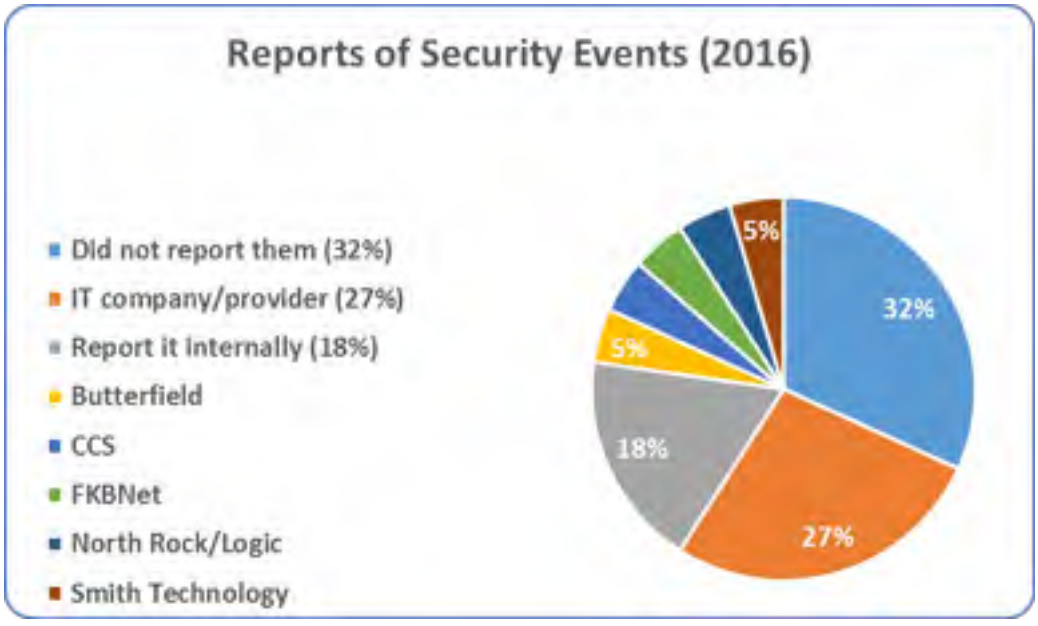
Security Events

12% of respondents have experienced a security event which resulted in data loss or a service interruption.

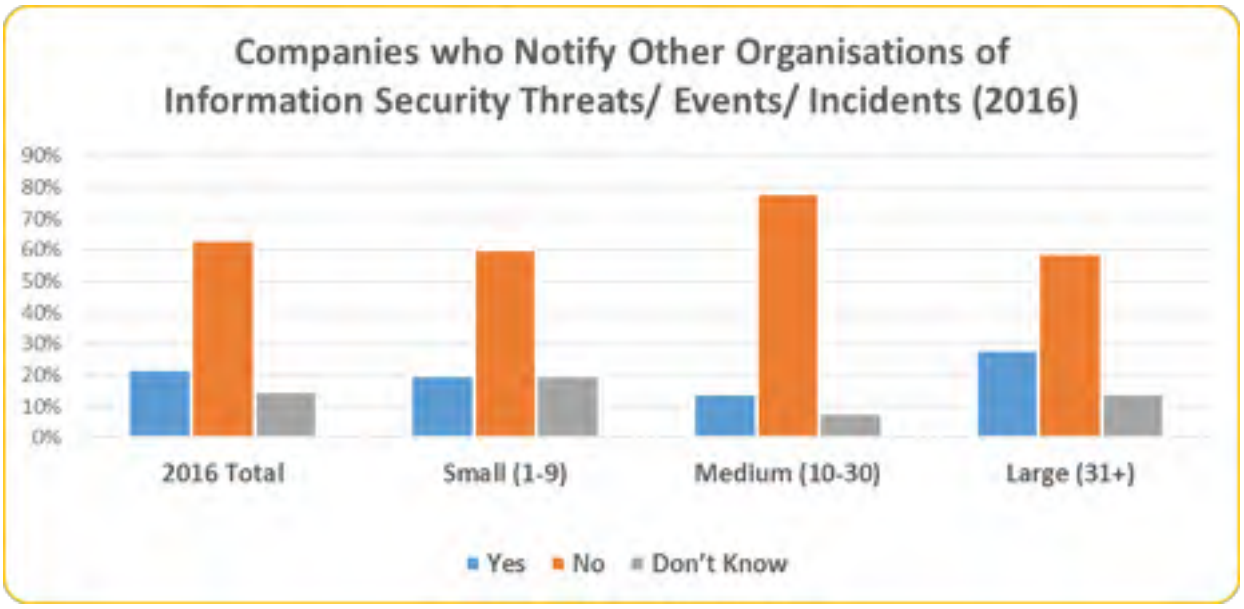


Of those who have experienced a security event, 27% reported it to their IT services provider and 18% reported it internally. Internal reporting includes reporting to the executive team, to the board of directors, to senior management, or to the IT Department.

Noticeably, 32% did <u>not</u> report the incident to anyone.

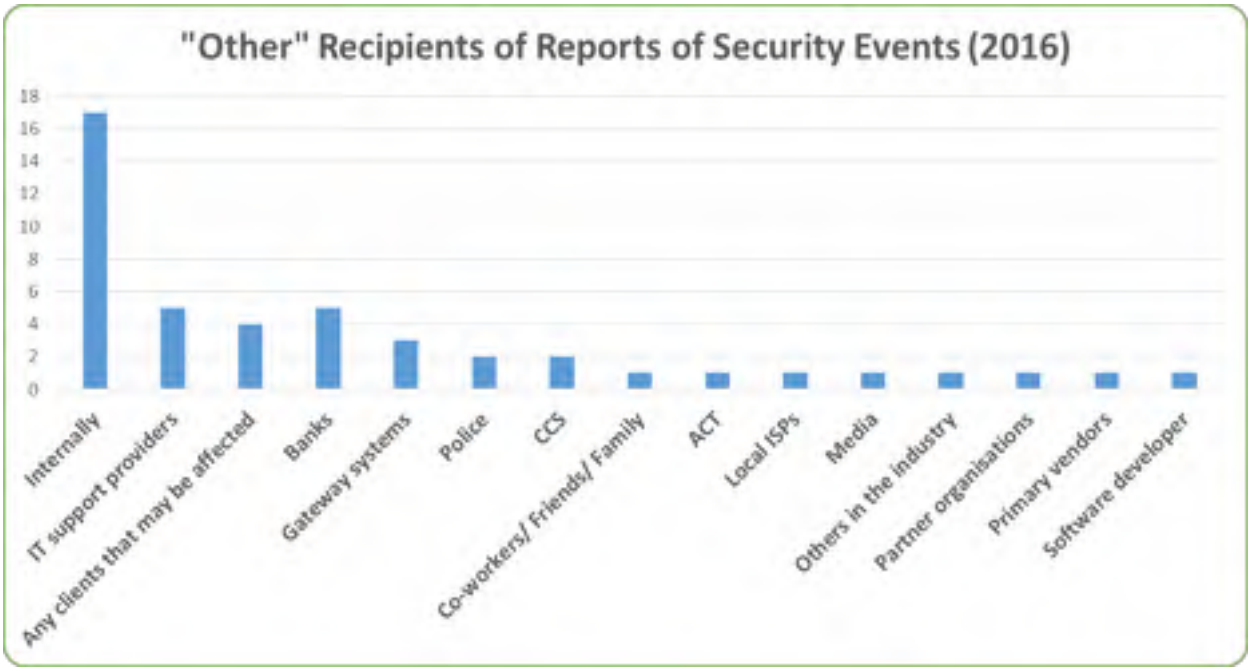


22% notify other organisations about information security threats.

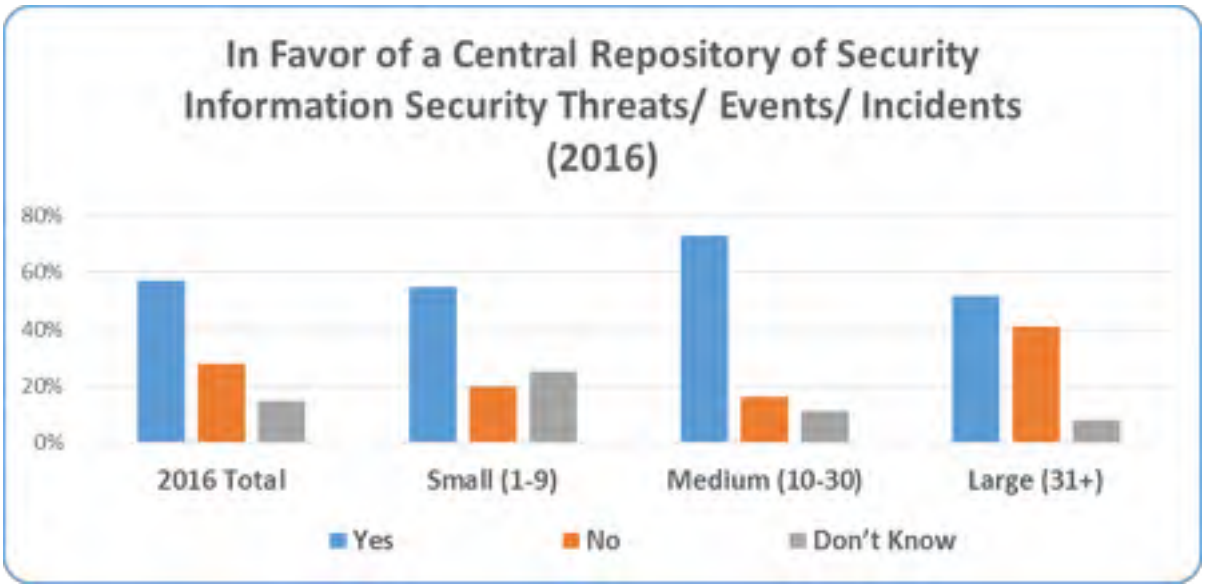


When asked "what other organisations do you notify of information security threats/ events/ incidents?" respondents have diverse answers, most common of which is "Internally" (37%). That category includes such elements as the internal IT team, the corporate security team, or, more generally, the head office.

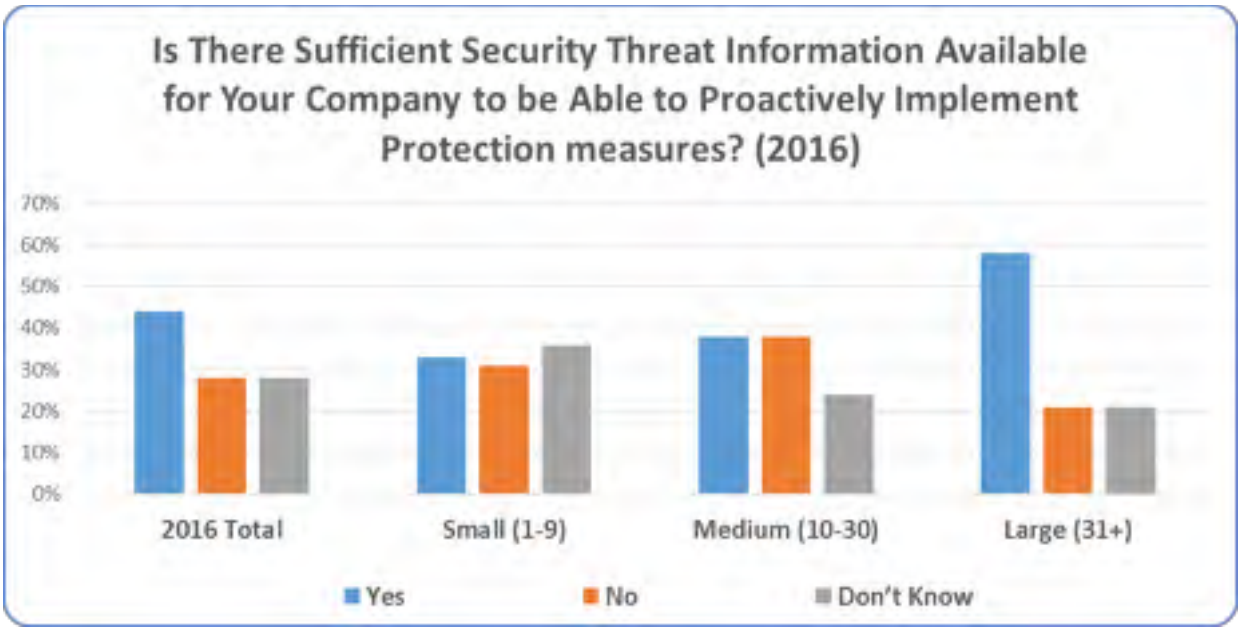
Notably, the Bermuda Police Service is only contacted in 4% of the cases.



57% of respondents believe that it would be beneficial to report all security-related incidences to a central repository.

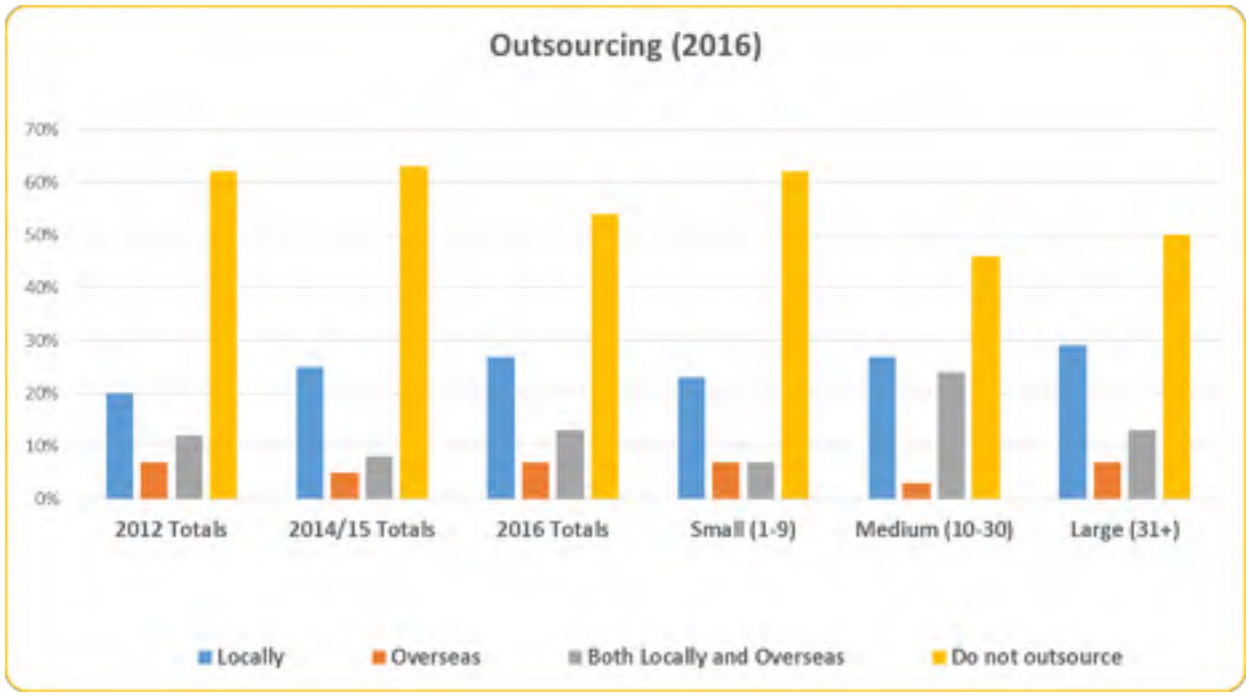


In response to another new question, regarding whether sufficient information is available for companies to proactively implement proper protection measures, 44% of respondents believe that yes, there is enough information available to them.



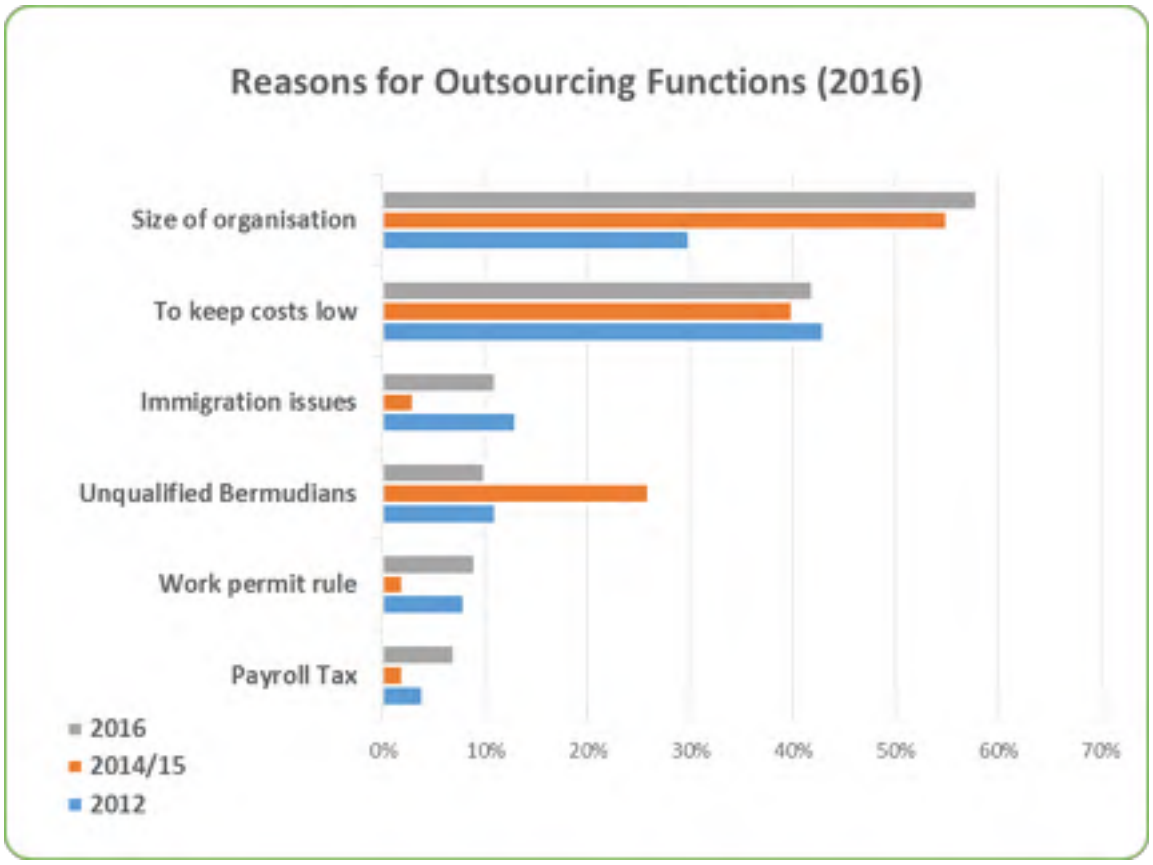
Outsourcing Services/ Business Functions

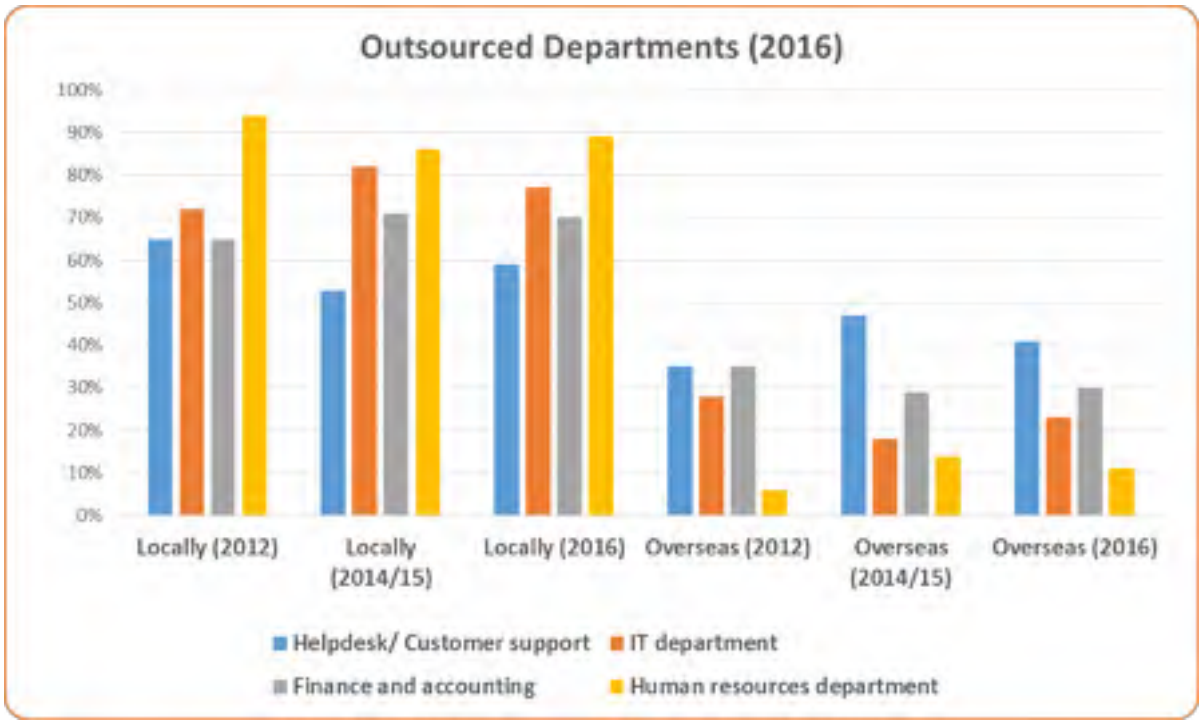
In an increase from the prior years' findings, 46% of businesses now outsource departments (vs. 39% in 2012 and 38% in 2014/15).



Follow-up questions delve into which departments were outsourced where. In 2016, businesses primarily outsourced locally.

The most popular motivators for outsourcing were the size of the organisation (58%) and cost pressures (42%).

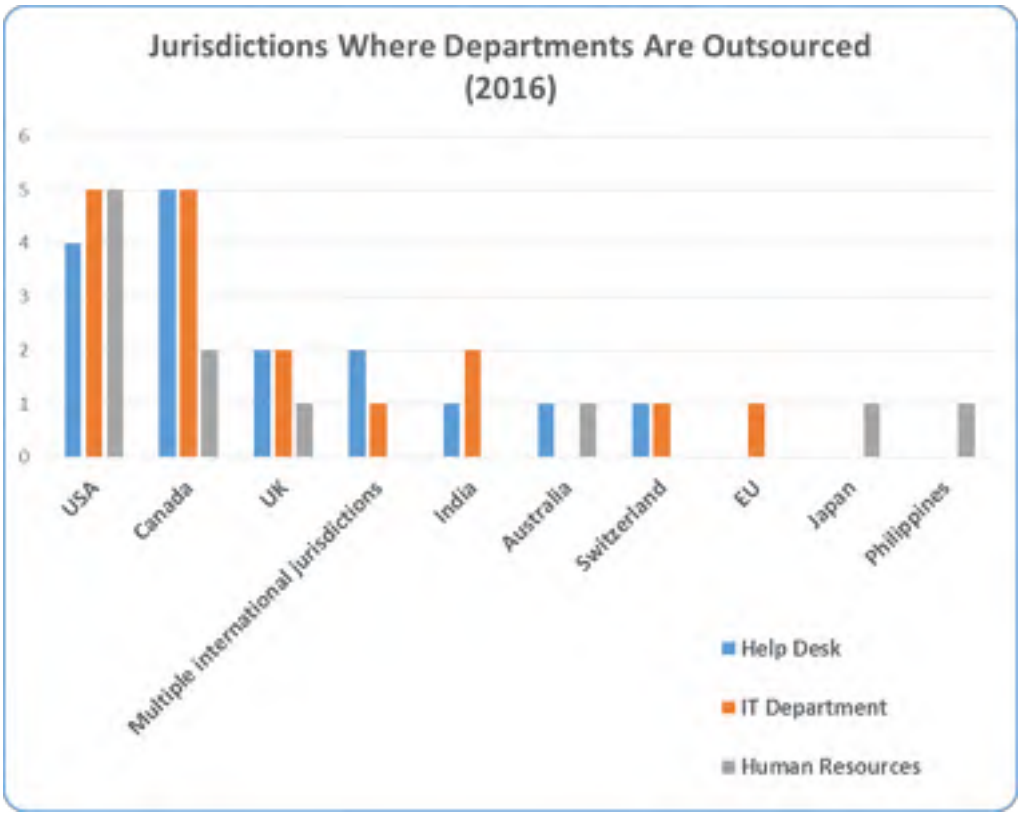




As seen above, the most commonly-outsourced business functions are finance/accounting, HR, and IT. A few other functions are also outsourced, though not as commonly:

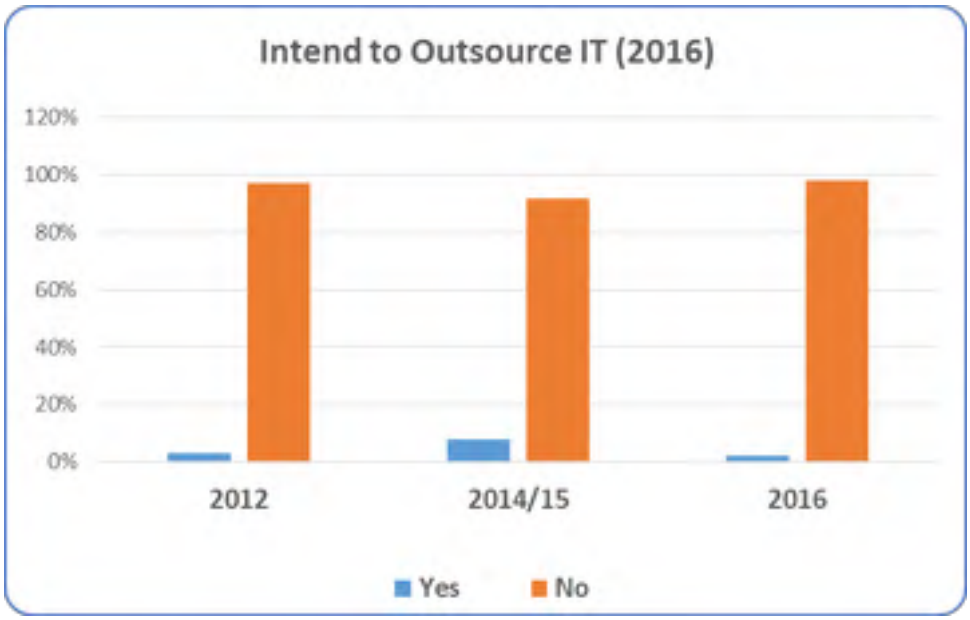
- Work permit applications
- Assistance with design services
- Engineering
- Marketing and sales
- Claims processing
- Pre-press
- Reservations
- Security monitoring
- Specialized training
- Website support

The jurisdictions where businesses most-often outsource their departments are detailed below.

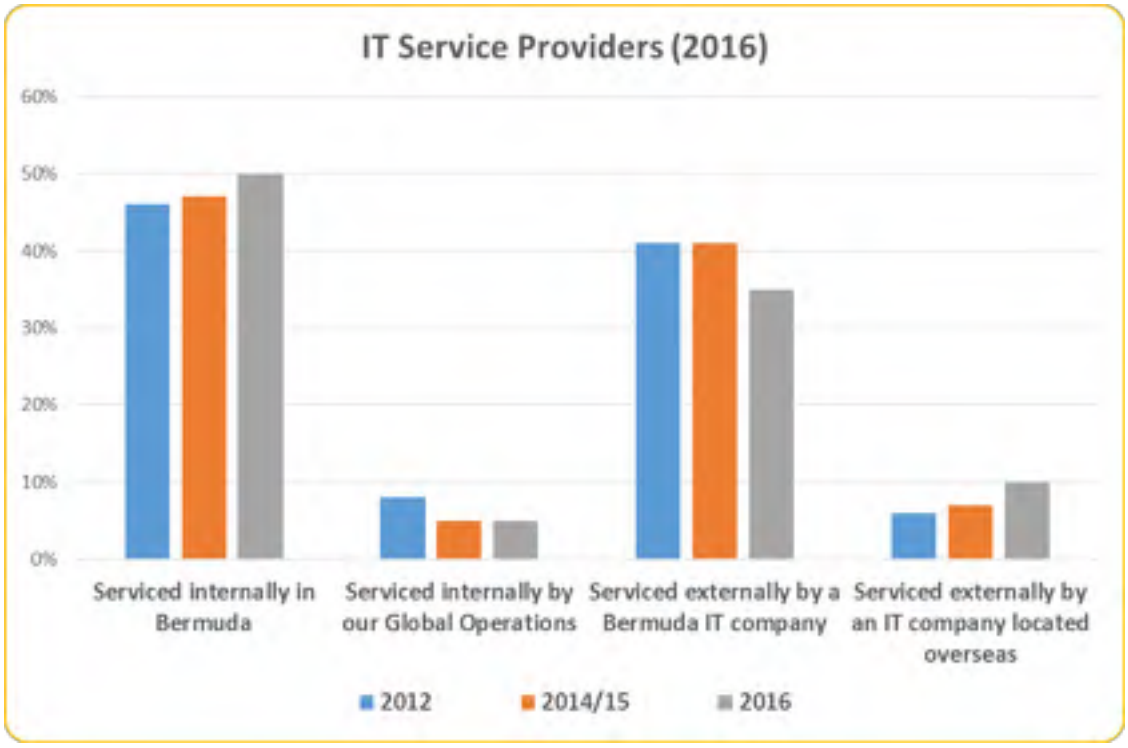


Outsourcing IT

Notably, and along the same lines as previous years, 98% of businesses do not intend to outsource any of their IT departments in the next 6 months.



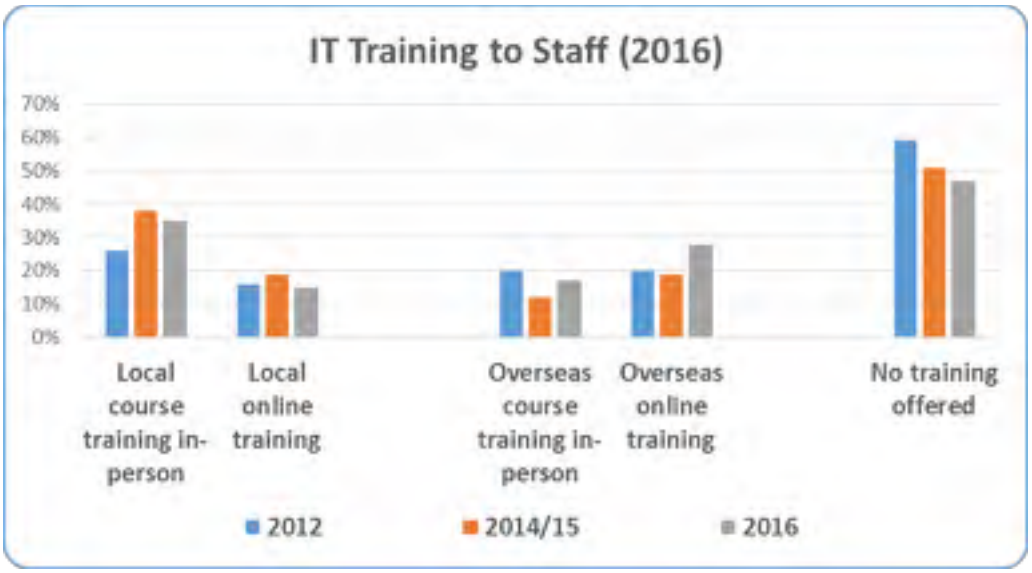
On average, 50% percent of company IT needs are serviced internally, 35% are contracted out to an IT company in Bermuda, and only 10% are contracted out to an IT company located overseas.



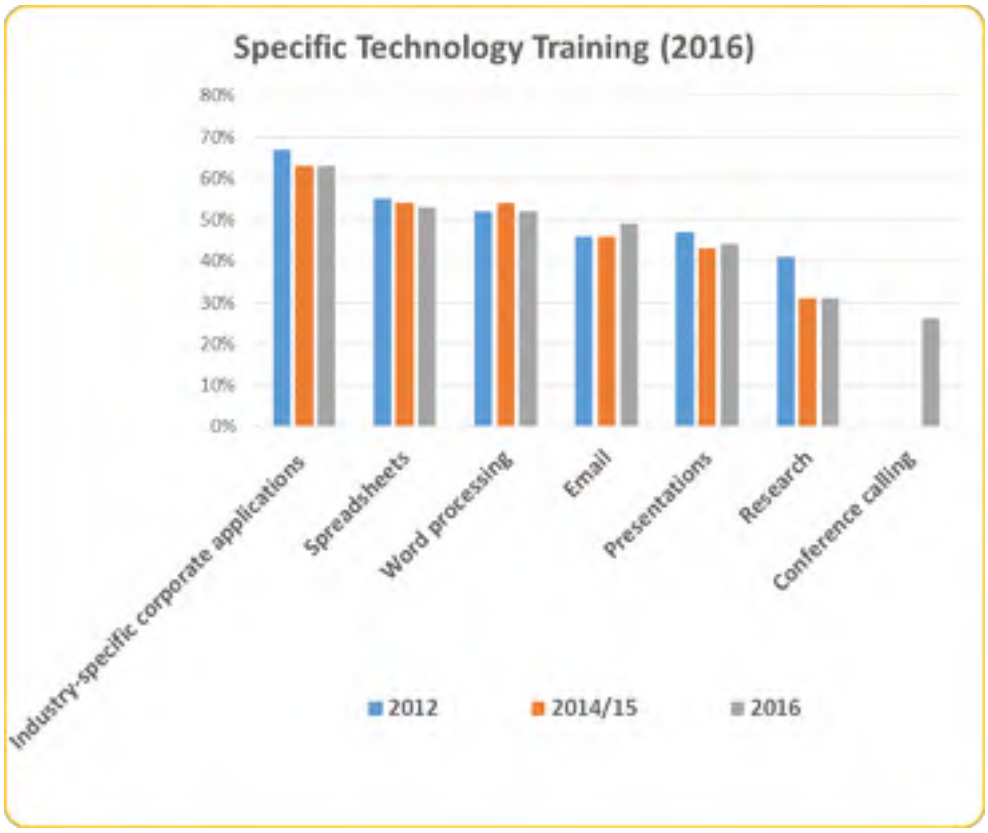
Human Capital

Training Programmes

While the majority of employers (47%) still do not offer any formal technology training to their employees, 35% percent do provide local in-person course training. Overall, most training that does take place, takes place in Bermuda.



The table below details the areas in which businesses offer technology training.



Other technology training offered covers the following areas:

- Business analysis
- Business marketing/ advertising
- Manufacturer training for sales and after sales
- Mediation
- Online bookkeeping/ QuickBooks
- Property Management
- Public speaking
- Sales training
- Student management

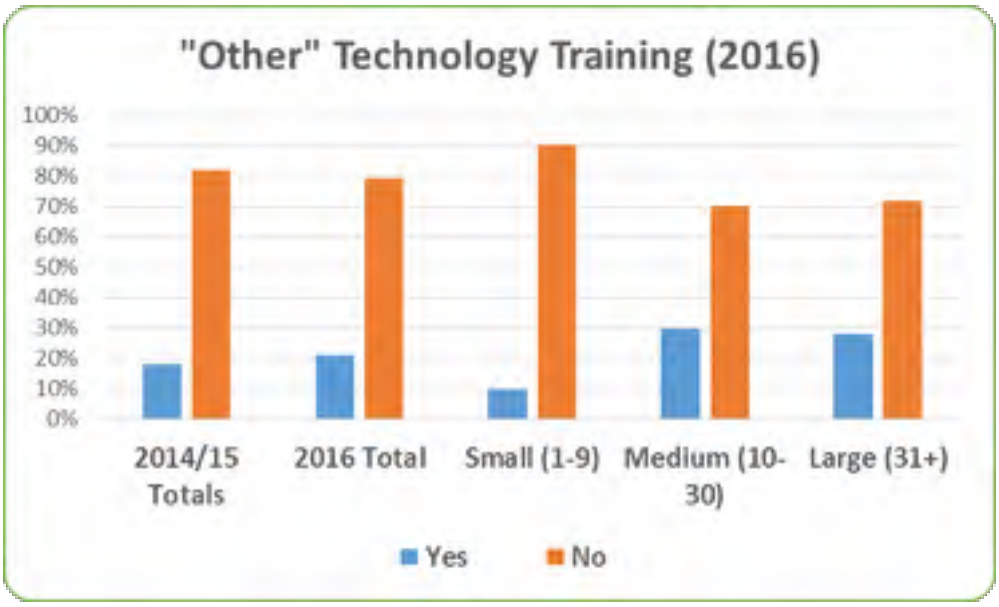
Specific applications were also mentioned, as an answer to the more general "technology training" question:

- Design software
- Renweb (grading)
- Great plains dynamics
- Construction management software
- FileSite
- International business applications
- Google Apps training
- NCR HQ
- INFOR SunSystems
- Proprietary apps used to configure products that we sell
- PSO
- VolvoECU
- Raisers Edge database
- Smartboard
- Web, mobile and graphic programs

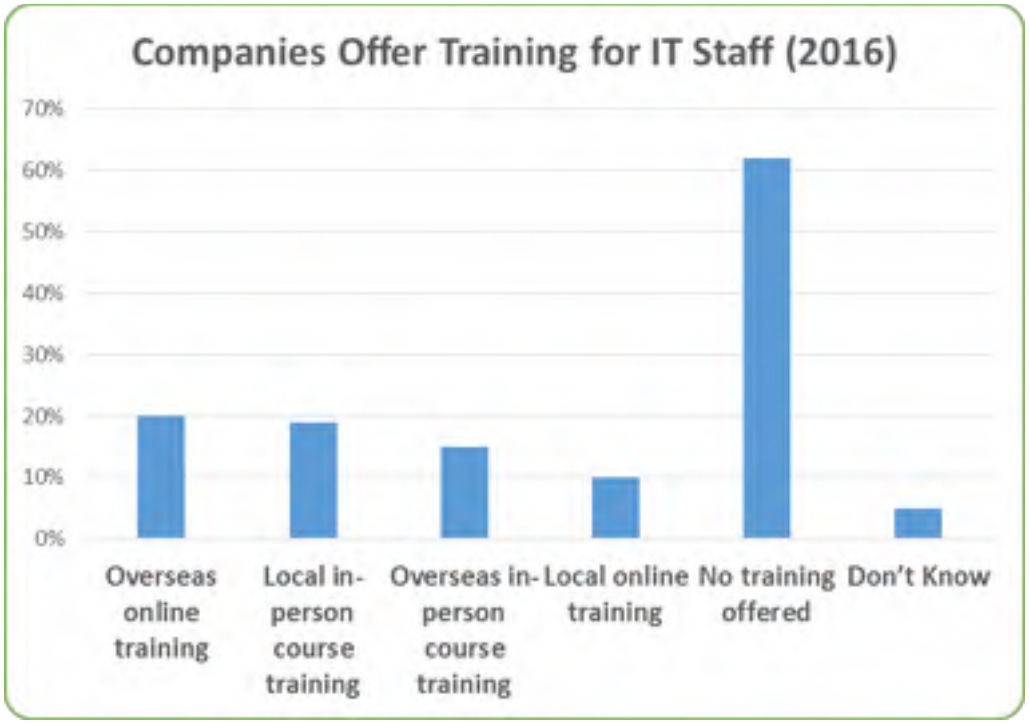
- Pastoral
- Virtual learning environment
- How to maximize the benefit of social media
- HTML
- CCS
- Python
- Java
- A+
- CCNA
- VMWARE
- Microsoft Dynamics
- Automoto troubleshooting

This survey also asks “Does your firm receive other technology training?” in order to glean as much information as possible. This year, the following were also mentioned:

- 20/20
- Adobe
- Air
- AutoCAD
- Birchstreet
- Bluebird Auto Rental System
- Campus management ERP
- CCNA
- Coding and programming
- CRM
- Customer information systems
- Data management systems
- Database and accounting
- DDMS software
- Education applications
- EQE
- Filesite
- Jonas
- LinkLend
- Media and design software
- Office 365
- Opera
- PC law
- Pitstop
- PMS
- Quorum (client database)
- RDPPronet
- Renweb
- Risk modeling/insurance accounting
- RMS
- Salesforce
- SAP
- SME service management
- Student Management Systems
- Taleo
- VCare
- WordPress

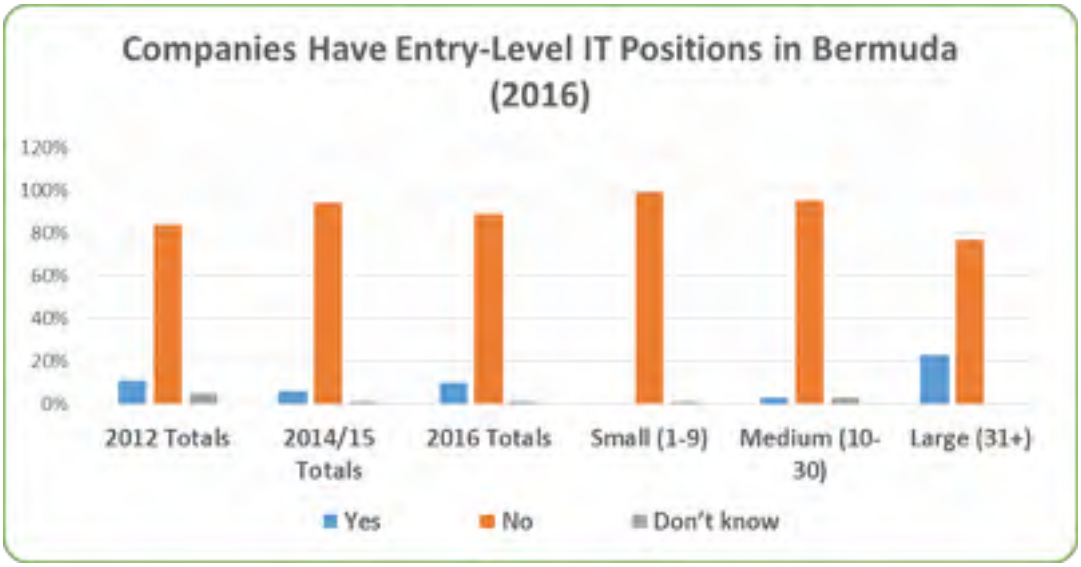


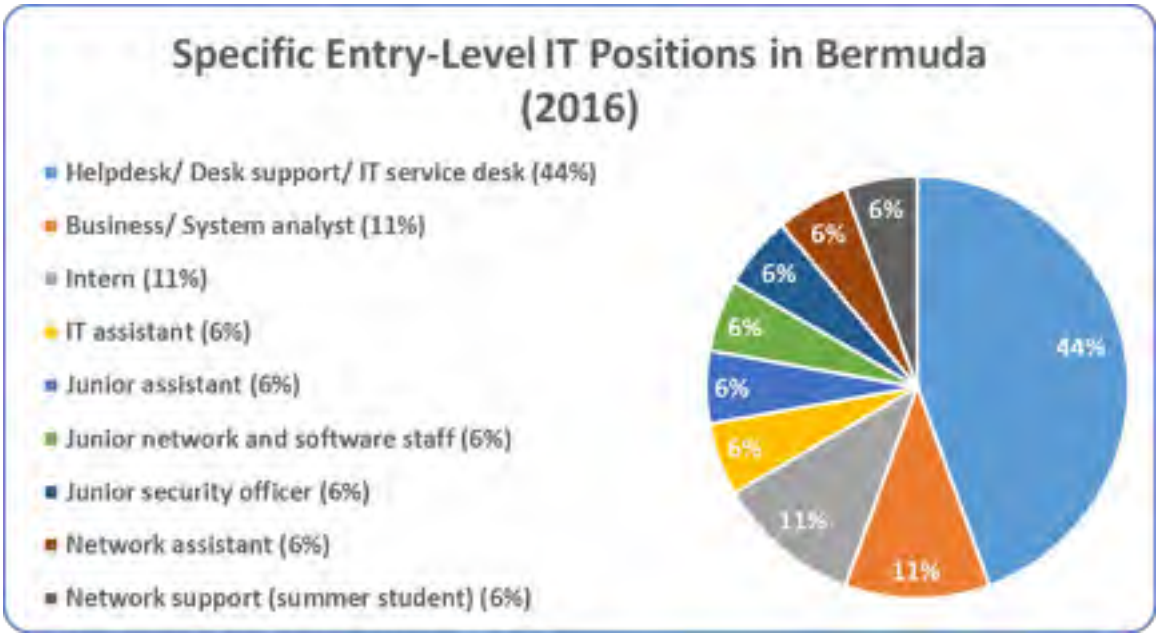
This survey also asked about training provided to IT staff specifically. According to the respondents, 62% of businesses do not offer any at all, while 20% offer overseas online training and 19% offer local in-person course training.



ICT- Related Positions and Skills

10% of businesses have entry level IT positions in their company, which is a slight increase from last survey (6% in 2014/15 and 11% in 2012). The most common entry level IT position is helpdesk/support/IT service desk.





When asked what other positions their workplace has, respondents answered the following:

- IT manager/ IT director (27%)
- Helpdesk/ Desktop support (11%)
- Network administrator (5%)
- CTO (4%)
- Software developers (3%)
- Project managers (3%)
- Network manager/ Network assistant (3%)

- Analyst (3%)
- Infrastructure/ Software engineers (2%)
- Business/ System analysts (2%)
- CIO (2%)
- L3/L2/L1 (2%)
- Assistant manager (2%)
- IT Engineer (2%)
- Web developer/ designer (2%)
- Operations/ Programming (2%)
- Security (2%)
- Systems admin (2%)
- BA (1%)
- SA (1%)
- PM (1%)
- Field service (1%)
- General IT services (1%)
- Audiovisual manager (1%)
- Infrastructure architects (1%)
- Marine mechanics (1%)
- Computer technician (1%)
- Software manager (1%)
- Graphics (1%)
- Senior consultants (1%)
- Senior managers (1%)
- Social media/ Facebook assistant (1%)
- Quality testing (1%)

Respondents also provided details about the IT training or certifications that are required for their IT staff:

- Microsoft/ Microsoft Engineering (13%)
- VMWare (11%)
- Cisco (10%)
- Network certificate/ Network + (7%)
- MCSE (6%)
- A+ certificate (4%)
- General knowledge/ Relevant experience (4%)
- College Degree (4%)
- Bachelors in Computer Science (4%)
- CCNA (3%)
- CCIE (3%)
- QuickBooks/ Accounting software (3%)
- Application Development certificate (1%)
- IT security certificate (1%)
- Citrix (1%)
- VBA (1%)
- Unified collaborations (1%)
- CCSE (1%)
- HP (1%)
- ASE (1%)
- CISSP (1%)
- Checkpoint (1%)
- MCT (1%)
- MSSQL (1%)
- CCN (1%)
- ACMT (1%)
- Maximo (Asset Management) (1%)
- Red Hat (1%)
- Oracle (1%)
- DBA (1%)
- Bachelor's Degree (1%)

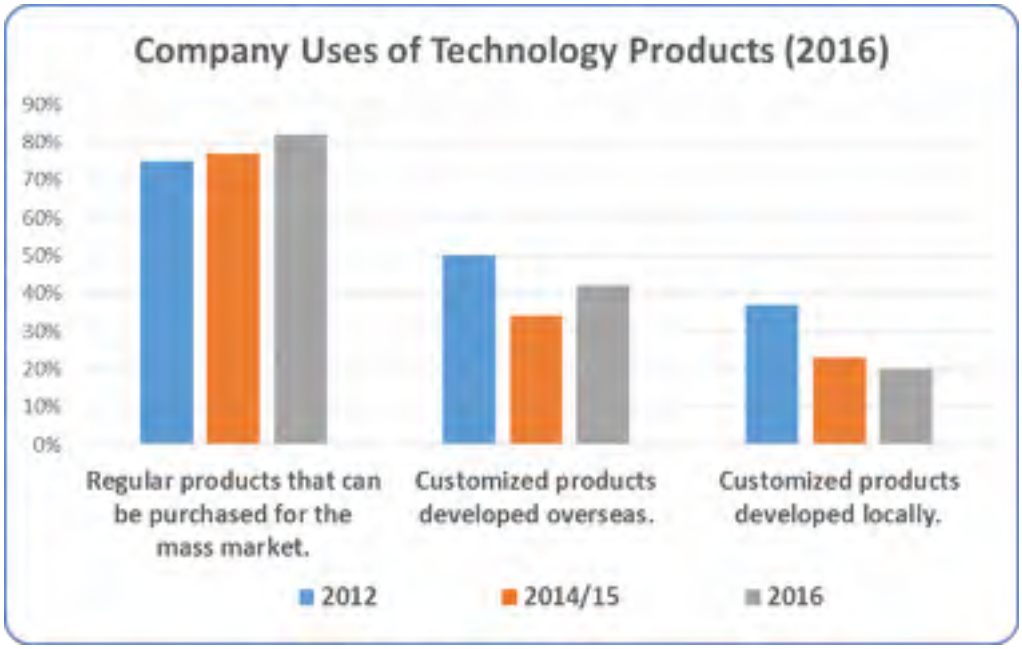
Asking about the most useful IT training that businesses would like if cost was not an issue resulted in a long list that was topped by Microsoft Office training (25% of respondents mentioned Microsoft Office (Excel/ PowerPoint/ Word/Outlook). The rest of the wish list is below:

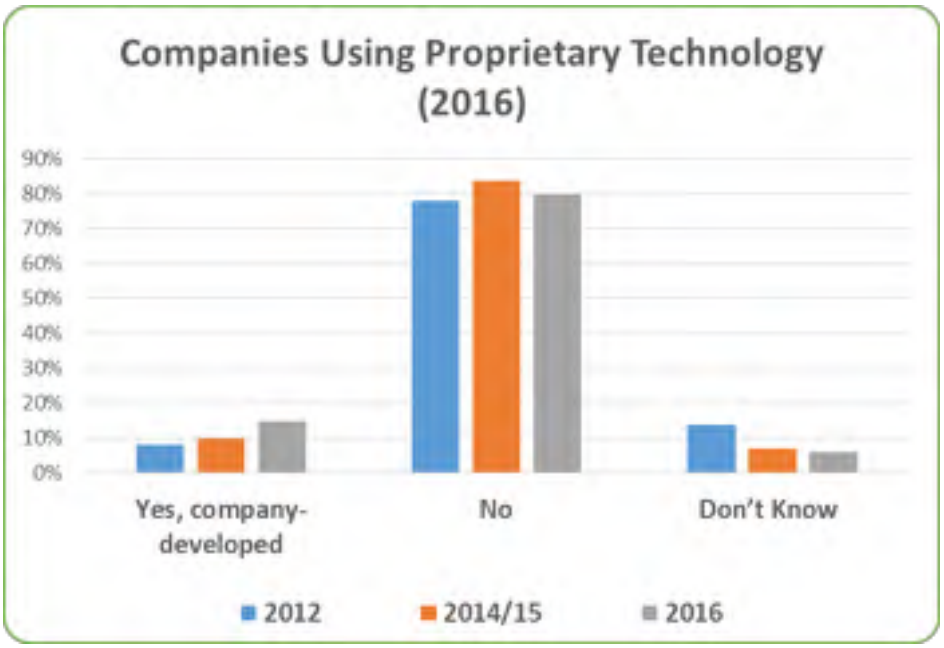
- QuickBooks/ Accounting software
- CISCO

- Basic training/ Troubleshooting
- IT/ Cybersecurity
- Networking
- Oracle
- Database management
- Firewall
- How to use social media
- POS system training
- Server admin/ Support
- Website design/ Management
- Graphics
- CCNE
- SQL
- Network certifications
- Application development
- Content creation
- Data modeling
- Cloud computing
- SharePoint
- MBA
- MCSE
- CCIE
- CCSE
- HP
- CISSP
- Conference calling
- Network security
- SCADA
- Red Hat
- Maximo
- Productivity software
- Proprietary application training for e-banking platform
- Renweb admin
- Sequel
- Google docs
- CCNA
- Server hardware
- Windows server
- Checkpoint

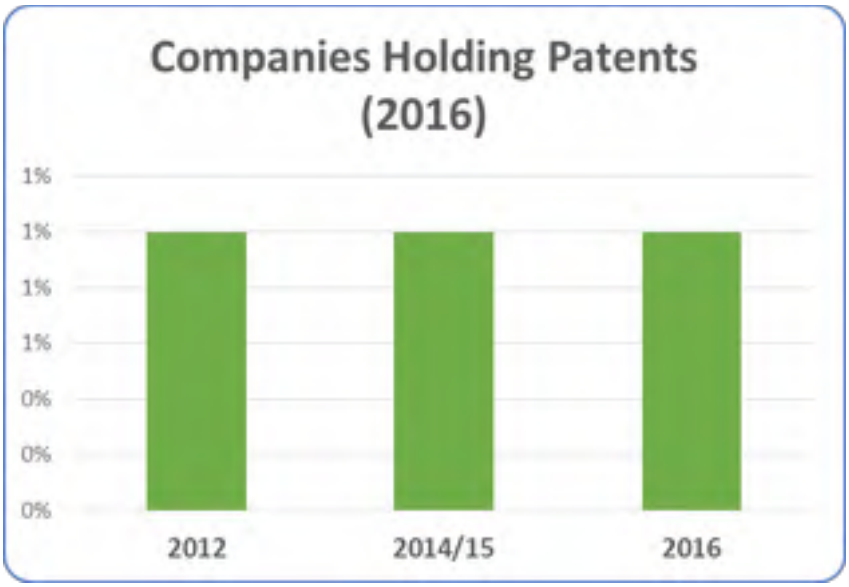
Corporate Technology Development and Innovation

82% of businesses use regular products that can be purchased for the mass market.

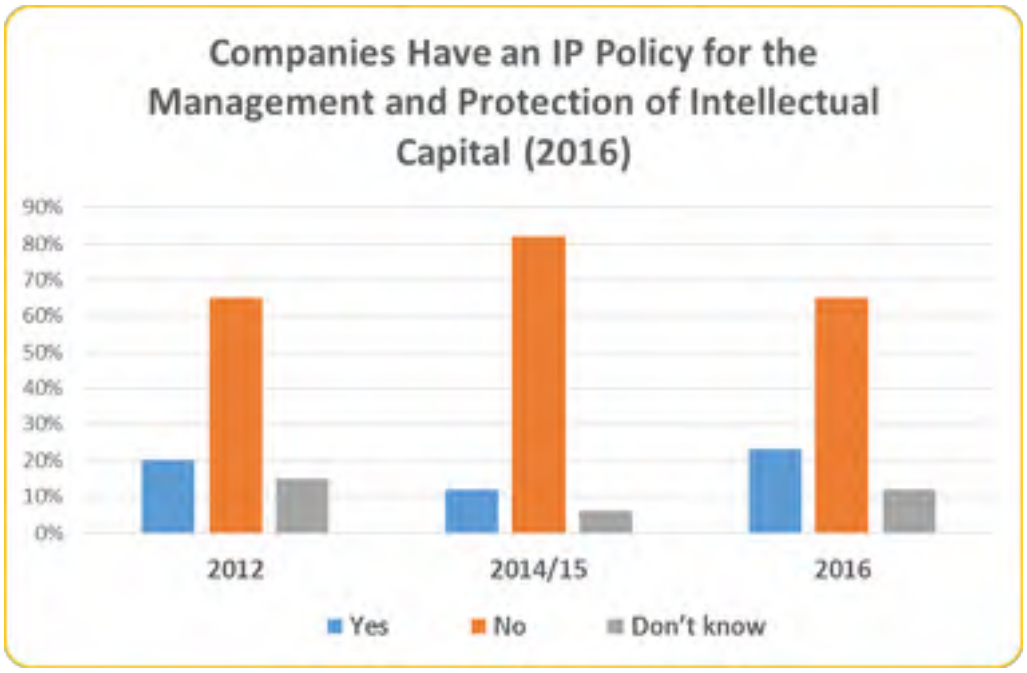




While 15% of responding employers have developed proprietary or adapted software or hardware, similarly to prior years, only 1% of businesses hold patents related to technology. Said patents are registered in the United States.



Also, of responding employers, 23% have an Intellectual Property (IP) policy for the management and protection of intellectual capital.



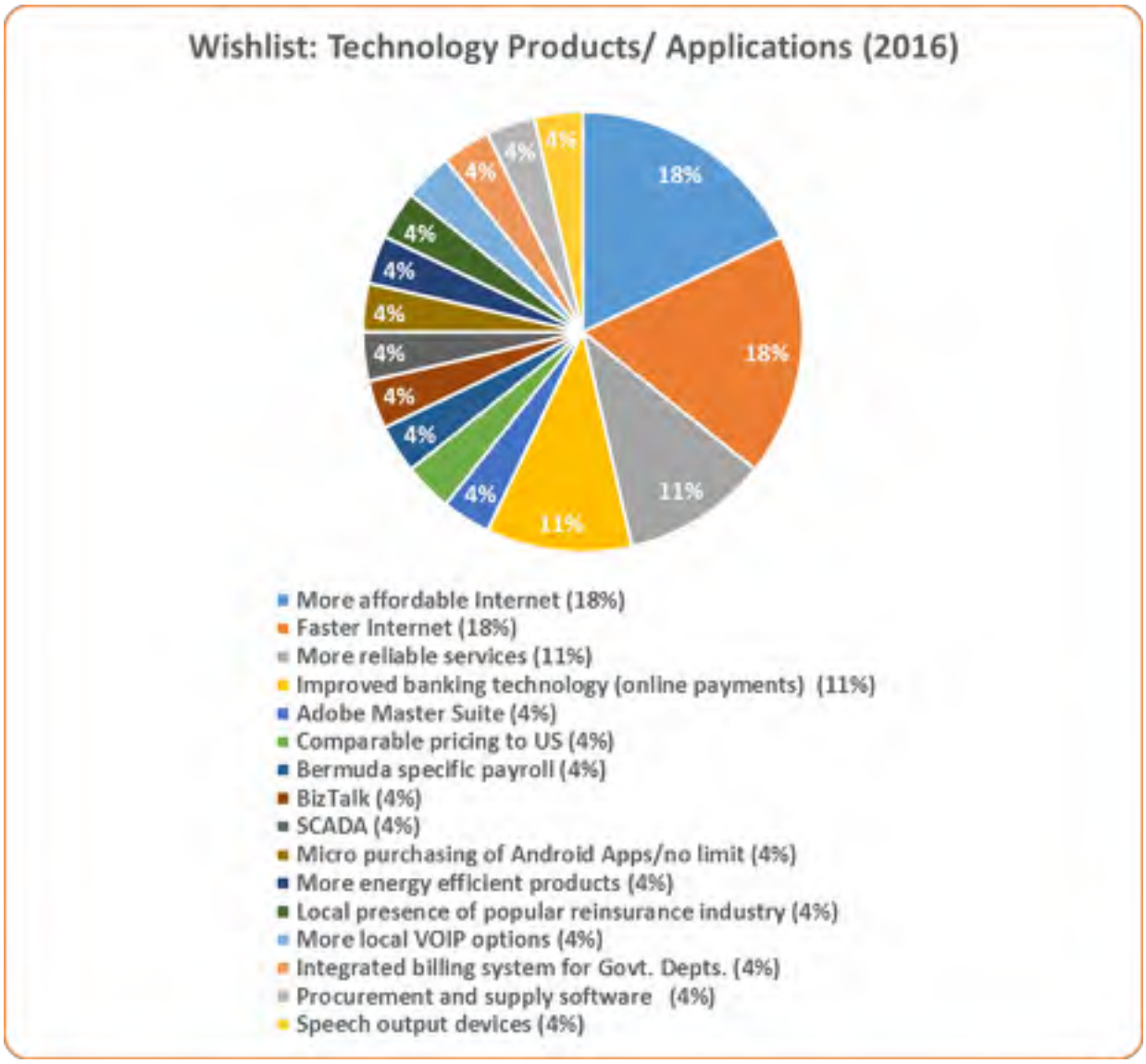
Company Wishlist

Respondents were asked: What IT skills are you looking for or that you foresee a need for in the future in your company? To that, the top answers were "Cybersecurity/ Security experts" (10% of respondents) and "Data management/ Administration" (7%).

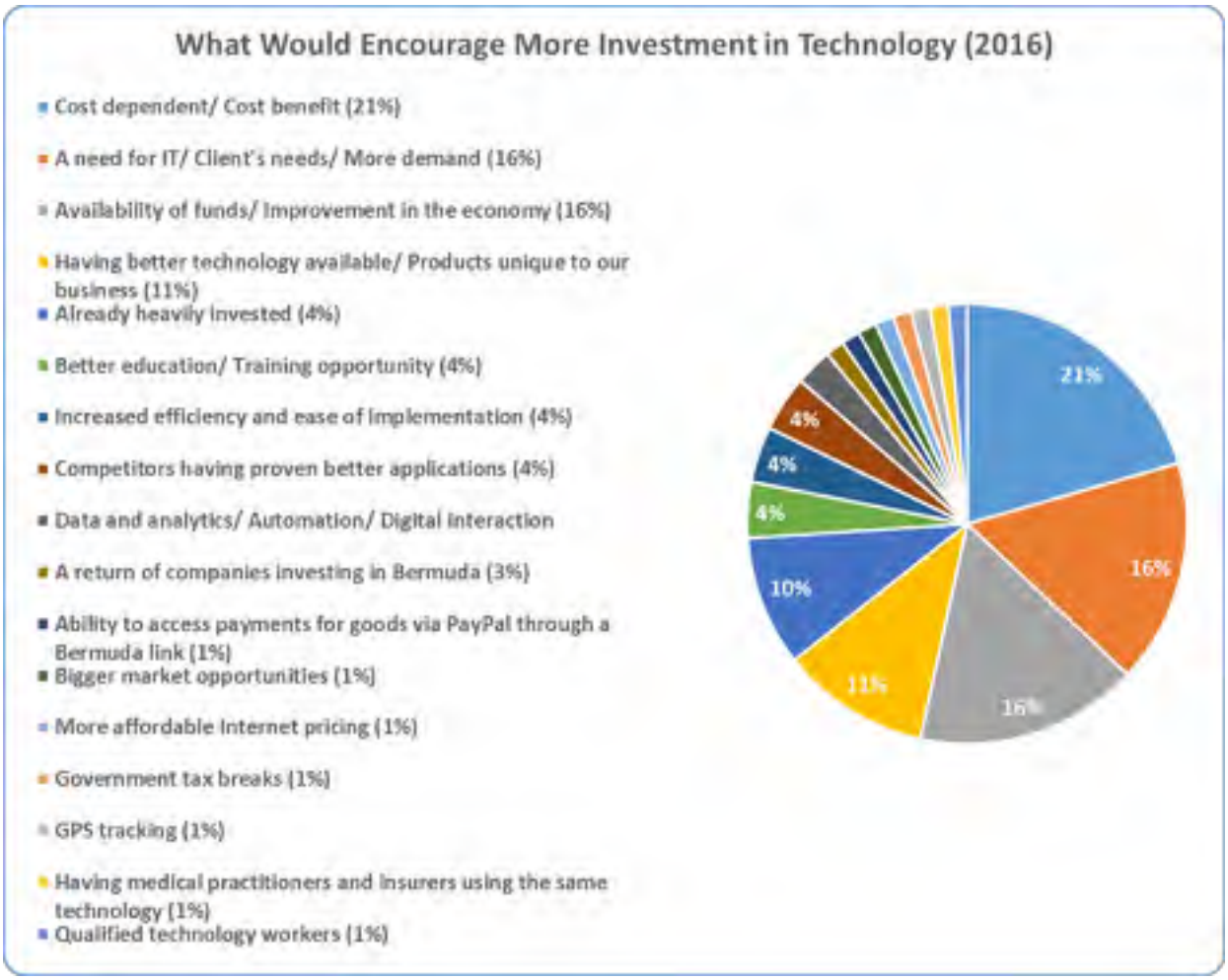
- Cybersecurity/ Security expert (10%)
- Data management/ Data administration (7%)
- More IT capability/ Formal training (5%)
- Data integration analyst/ Database analyst (5%)
- Architects (5%)
- Social media development (5%)
- Web development (5%)
- Network administrator/ Networking (5%)
- Software/ Systems engineers (3%)
- Network/ Infrastructure management (3%)
- Software development (3%)
- Virtual platform development/ Management (3%)
- Cloud services (3%)
- Application systems analyst (2%)
- DBA (2%)
- Business analyst (2%)
- BA (2%)
- Infrastructure engineers (2%)
- Data modelling (2%)
- SharePoint developer (2%)
- Help desk (2%)
- Microsoft Suite (2%)
- Office skills/ Basic computing (2%)
- Programming (2%)
- Retail IT (2%)
- Senior executive strategists (2%)
- Compliance (2%)
- Service mechanics (2%)
- IT trainer (2%)
- SQL server (2%)
- Multi-threaded development (2%)
- TDD methodology/BDD training (2%)

- Feed management (2%)
- Web sales (2%)
- Excel and accounting services (2%)

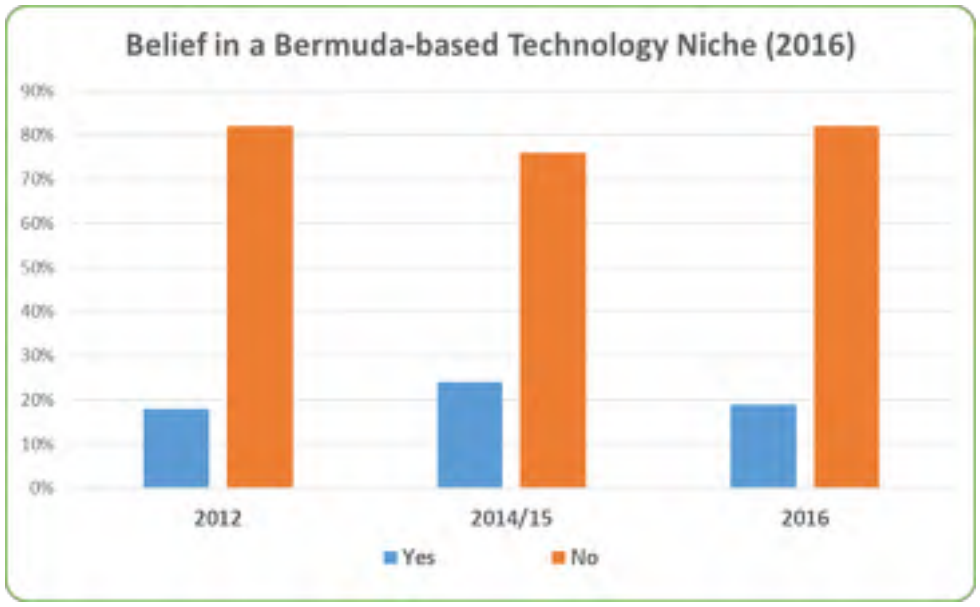
When asked "What technology products or applications that are not available in Bermuda today would you like to see offered in the future?" the most commonly-mentioned answers concerned the Internet. 18% of respondents would like to see more affordable Internet and 18% would like to see faster Internet.



The table below details circumstances that would encourage more investment in technology by the respondents. Topping the list are: that there would be cost-benefits (21%) and that an increased investment in technology would be client-driven (16%).

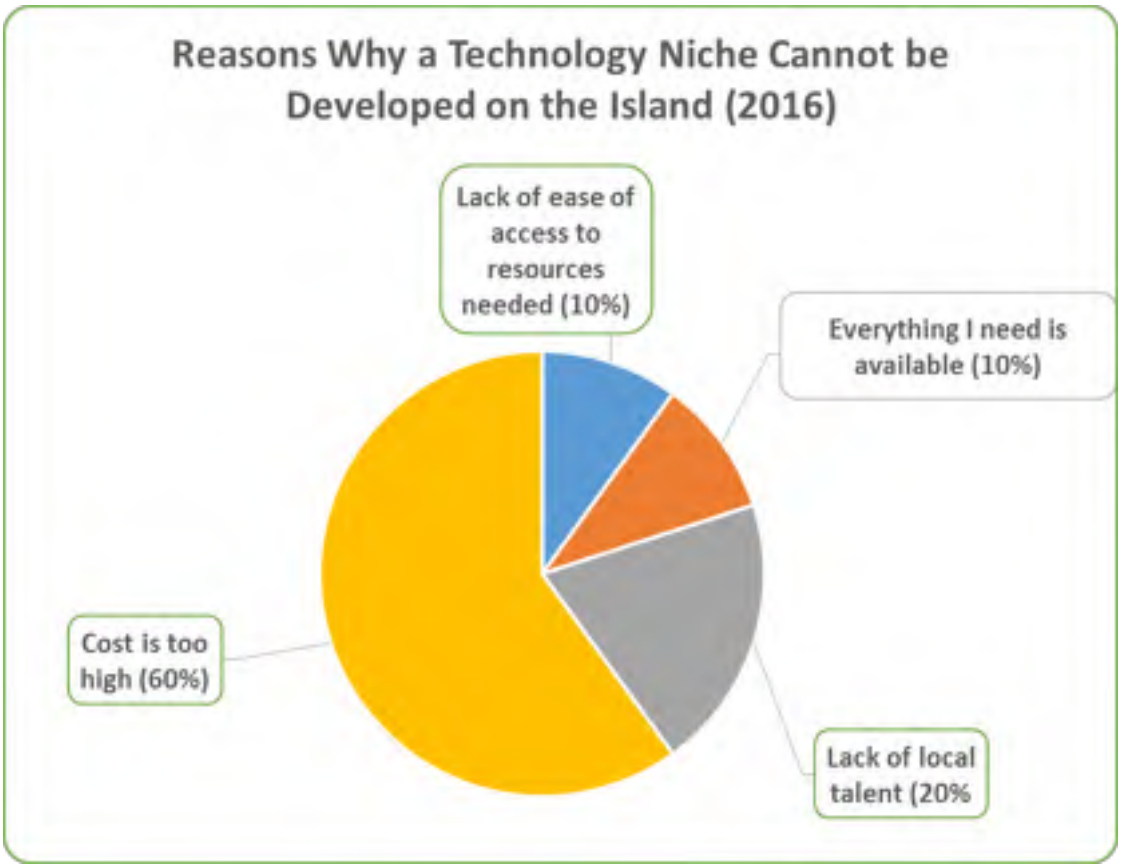


19% of respondents feel that there is a technology-related niche that Bermuda could develop further; said niches are listed in the table below the chart.


Belief in a Bermuda-based Technology Niche (2016)
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2012
2014/15
2016
Yes
No

What type of niche could be developed?	
Improved Internet service/ More Internet providers	12%
DBAs	6%
Development Applications	6%
Fin-tech	6%
Application/ Software Development	6%
Marine-related apps	3%
Startup funded like NSBI	3%
Software defined networking	3%
Be at the forefront of technology	3%
Island-wide Wi-Fi	3%
State of the art data storage facility	3%
Online offshore international business	3%
PMS related to Bermuda	3%
Cultivate venture capital infrastructure	3%
Global IT support for multinationals	3%
BizTalk	3%
ESB	3%
SCADA	3%
Tax efficient storage of IP	3%
Cybersecurity	3%
IT training for small businesses	3%
Mobile apps	3%
Wireless payments	3%
Online education	3%
Specialized hosting	3%
Intellectual Property rights	3%

The most popular reason for believing that a technology niche cannot be developed on the Island was because the cost of doing so in Bermuda was too high (60%).



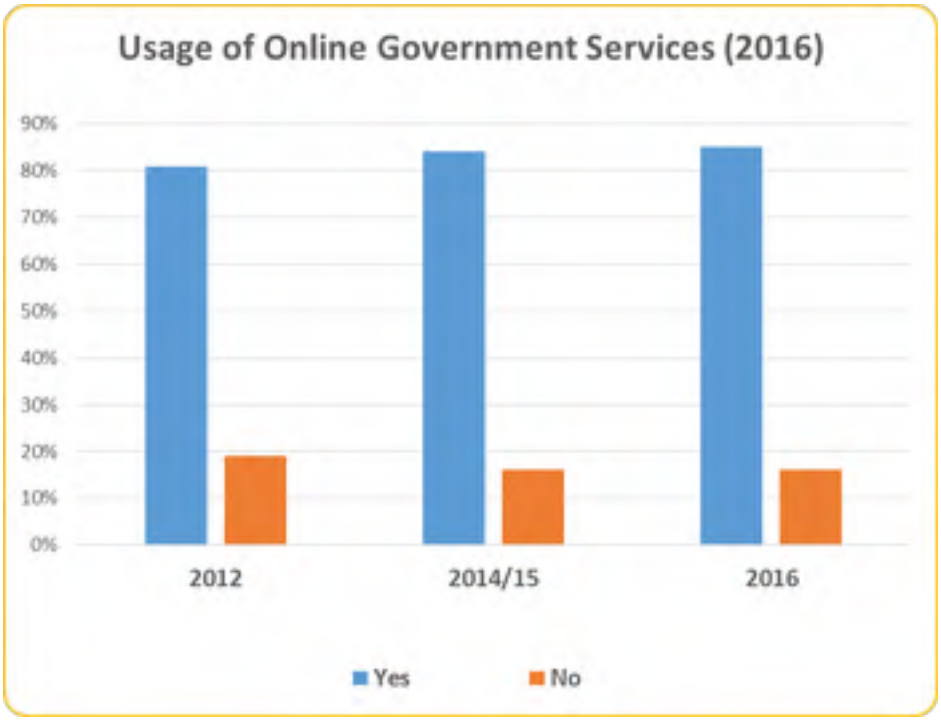
Business Use of Government Services

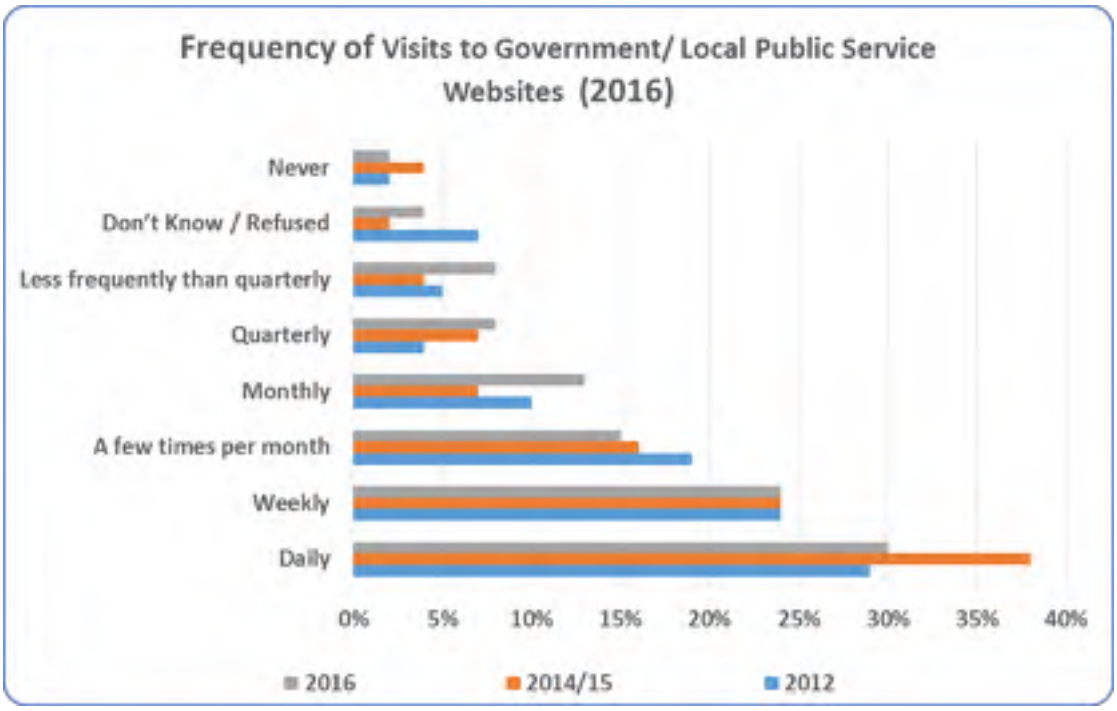
When asked what Government services – other than what is presently available, respondents would like to see online, the list was prolific, as shown below.

- Online payment options (parking, credit cards, Govt. fees, Corporate & service tax, TCD) (27%)
- All of them (17%)
- Immigration/ Work permits (ability to see the status) (7%)
- Social Insurance (7%)
- Pre-clearance for customs/ Custom forms (4%)
- Company registrations (3%)
- Dog licensing/ renewal (3%)
- Land Valuation (better mapping and information) (3%)
- Parliamentary Registry (search by street to find constituency) (3%)
- Registry General (electronic filing and searches) (3%)
- Supreme Court Registry (electronic filing and searches) (3%)
- Passports (3%)
- Statistics (3%)
- Downloadable forms (1%)
- Visual classrooms online (1%)
- Govt. traffic ticket system (1%)
- Online tutoring/homework helpline (1%)
- Marine & Ports (1%)
- Land Tax (1%)
- Personnel Directory (1%)
- List of fees and scheduling (1%)

- Planning submissions (1%)
- Post office (1%)
- Live chat (1%)
- Telecom failure notices (1%)
- Transport (bus times) (1%)

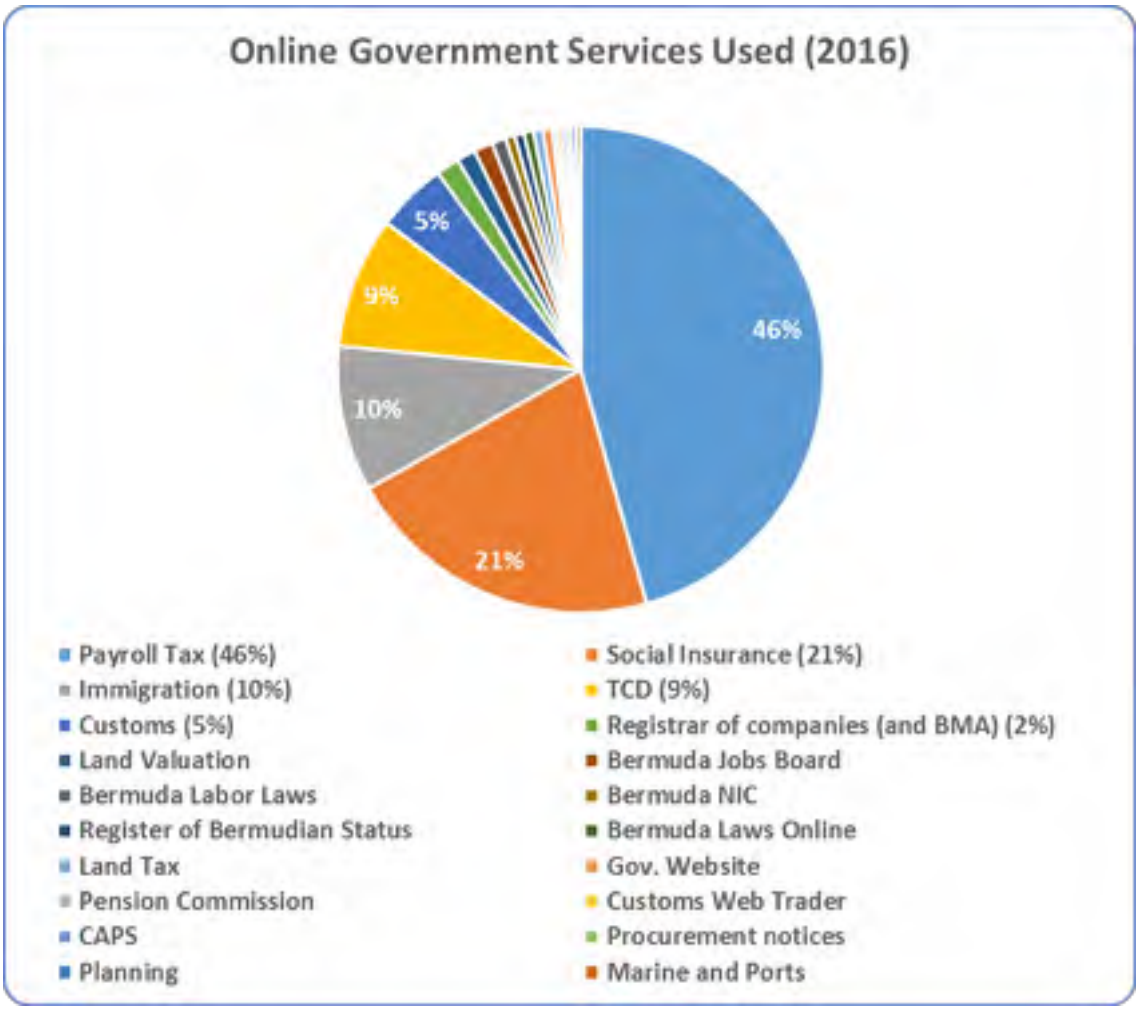
94% of businesses use Government websites or local public service websites, such as the Bermuda Weather Services or the LF Wade International Airport.



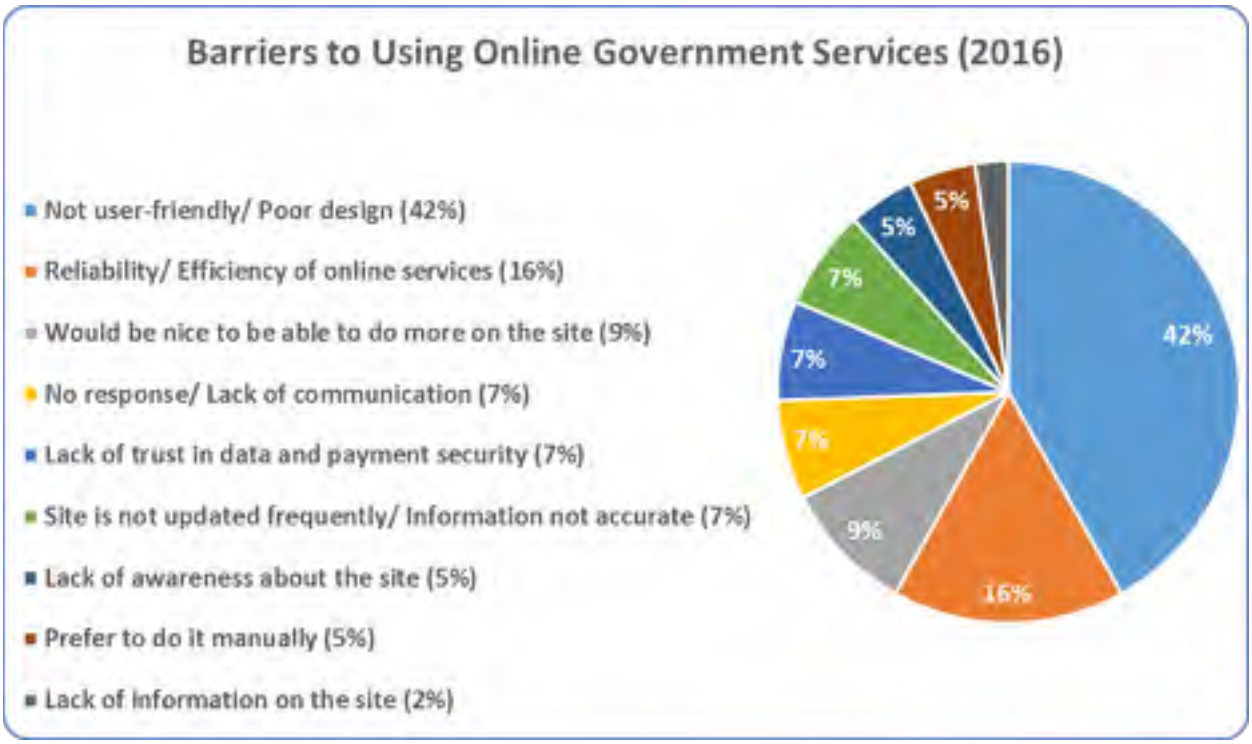


85% of businesses use on-line Government services the top three of which are Payroll Tax (46%), Social Insurance (21%), and Immigration (10%).

The majority of businesses use said government online services quarterly (34%) or monthly (21%).



For those who do not use Government services online, the most commonly-mentioned reason was that the Government portal was perceived as not being user-friendly and as being poorly designed.


Barriers to Using Online Government Services (2016)
Not user-friendly/ Poor design (42%)
Reliability/ Efficiency of online services (16%)
Would be nice to be able to do more on the site (9%)
No response/ Lack of communication (7%)
Lack of trust in data and payment security (7%)
Site is not updated frequently/ Information not accurate (7%)
Lack of awareness about the site (5%)
Prefer to do it manually (5%)
Lack of information on the site (2%)
42%
16%
9%
7%
7%
7%
5%
5%

8 AREAS OF NOTE

Continuing Obsession with Mobile

Mobile devices are a major part of our everyday lives. This study has shown that the ownership of laptops, tablets and smartphones continues to rise. The pervasiveness and variety of mobile devices give access not just to information, but to an entirely new way to live and communicate: even using the calculator, checking the weather, and setting an alarm clock is done quickly, with one swipe of the screen, on smartphones and other mobile devices.

While we may not intend to do so, we also use our mobile devices while doing other things, for example while watching TV, walking and having a meal. Some believe that this is changing our home life and work life in such a way that it will ultimately impact how society as a whole evolves in the coming years. On-the-go Internet use is becoming more widespread, and the divide between online and offline functions is becoming blurred.

Our attachment to mobile devices also encourages us to demand additional services in our jurisdiction. For instance, more people are shopping using mobile devices. There is also an increased expectation of mobile payment possibilities because they are widely available in other jurisdictions

Internet of Things, Data Analytics and Cybersecurity

The Internet of Things describes the multitude of devices that are connected via the Internet to cloud servers and each other, and that can control our fridges, heating controls, wearables, and much of our modern lives. As more of these devices are connected to the Internet in order to serve us better, they generate increasing volumes of data about us, what we do and how we live grows. Organisations see this often raw and unindexed data as opportunities for new product and service development. In turn, tools are being developed to access and process this data that will provide the desired insights. Theoretically, with enough data points, an organisation might get to know us as well as we know ourselves, even better.

This, of course, creates a cause for concern in the areas of privacy and security: as smart homes, smart cars, smart TVs and smart wearables enter our lives, security and privacy have become major concerns for users. While the Internet of Things can enhance our lives, it could also cause harm.

For example, the Internet of Things-based distributed denial-of-service attack in October 2016 cut internet access to millions of people, many of whom did not even realise that their devices were compromised by the Mirai malware. As a result of that attack, many websites that seemed impervious went down, including Twitter, Airbnb, and Spotify.

The massive distributed denial-of-service attack (DDoS), many believe, was only possible thanks to (or because of) the IoT (ISACA): Mirai was designed to "run scans across IoT-connected devices looking for known security vulnerabilities." Using said vulnerabilities, the malware gains access, and the infection begins.

Communication and information-sharing is critical to help organisations and residents to combat cyber threats and protect their organisations and homes.

Cybersecurity

According to www.paloaltonetworks.com, "Cybersecurity involves protecting information and systems from major cyber threats, such as cyber terrorism, cyber warfare, and cyber espionage."

In Bermuda and globally, Cybersecurity is undergoing dynamic and turbulent formative years. Regular news headlines indicate that cyberattacks, far from being a seasonal threat or from depending on specific industries or environments, are a constant threat and should remain at the forefront of every enterprise executive's thought process (ISACA).

It widely accepted that an organisation's main asset is the data that it owns. Two threat groups may put that data at risk, which would cause the organisation's cybersecurity to shift: insider threat and outsider threat (ISACA). As enterprises become more dependent on technology and data, it becomes increasingly important to protect the information that they hold and to ensure the security of the systems that they operate.

While cloud-based operations are widely acknowledged to offer significant benefits including lower costs and easy deployment, the increasingly popular cloud computing is emerging as an area of concern locally and overseas.

To enhance cybersecurity, the world is taking action. Most recently, the UN Security Council called on member states to address threats against critical infrastructure, unanimously adopting resolution 2341 (2017) (Cybercrime Digest).

Locally, the 2016 Speech from the Throne honed in on cybersecurity, noting that strengthening cybersecurity and protecting Bermuda's digital infrastructure against cyber-threats is vital to Bermuda's economic resilience. Referring to recent attacks overseas on the infrastructure of the Internet, and recognising that the Island's infrastructure and ICT sector complement each other in supporting our jurisdiction, the document highlighted the need to protect Government, businesses, organizations and the people they serve.

In the summer of 2016, the E-Commerce Advisory Board's Cybersecurity Sub-Committee's performed a thorough survey of the country's Critical National Infrastructure (CNI). The Survey has been instrumental in examining Bermuda's cybersecurity landscape and its maturity.

Privacy

While the Internet of Things is bringing about issues of information security and privacy, these issues have been brought to the fore even more visibly within Bermuda itself as a jurisdiction, since the passing of the Personal Information Protection Act in the summer of 2016.

As we count down to the PIPA coming fully into force, an awareness programme and guidance will be issued regarding the privacy of one's personal information and what organisations should do to

ensure that any personal information that they hold is both useful for their operations and secure for the peace of mind of their customers .

This survey will keep this in mind and benchmark residential and organisational awareness and sensitivities of privacy as it pertains to Bermuda.

Universal Service Obligation

In Part 6, the Electronic Communications Act 2011 (the 'ECA') provides for universal service provision and funding. "Universal service obligation" refers to the minimum set of electronic communications services that designated communications providers must make available to all citizens at an affordable rate. This notion has moved on from its initial application to conventional voice telephony services and now encompasses broadband services in an effort to enable all citizens to have affordable access to a basic level of Internet service.

In February 2017, the Minister of Economic Development Dr. the Honorable Grant Gibbons requested that the Regulatory Authority perform a study that would assist him in formulating a broadband universal service policy and any necessary regulations, which the Authority, in turn, will implement. Said study will result from a public consultation exercise that is to include service providers, commercial users and consumers and to answer the question: "How would the public benefit from a universal broadband service provision?" It will be interesting to see what the market expectations shall be in such a technology savvy jurisdiction.

Fibre-to-the-Office/ Fibre-to-the-Home

This survey has found that the most popular Internet connection for homes is the 8Mb broadband speed, and 10Mb for businesses. 78% of households and 60% of companies confirmed that they would upgrade to fibre if it were available.

A mere three months after the survey questions were asked, One Communications announced that it had rolled out almost sixty miles of super-fast fibre optic cabling reaching nearly 1,400 homes, with the company saying that "installing its FibreWire network is part of a $20m investment in its infrastructure that will dramatically improve both internet speed and 4G LTE coverage." (Bernews 8-feb)

As a result, Internet speeds of up to 200Mbps will be available to Bermuda by the end of the year 2017 (Bernews 14-mar). With the provision of faster speeds, we shall see how Bermuda's Internet Activities evolve in future surveys.

Fintech

Blockchain is outgrowing its adolescent cryptocurrency identity, with distributed consensus ledgers becoming smart contracts facilitators. Beyond creating efficiencies by removing the legal and financial intermediary in a contractual agreement, blockchain is assuming the role of trusted gatekeeper and purveyor of transparency. In the emerging "trust economy" in which a company's assets or an individual's online identity and reputation are becoming both increasingly valuable and vulnerable, this latest use case may be blockchain's most potentially valuable to date.

(Deloitte's Tech Trends 2017) On the other hand, in an environment where 'Know Your Customer' is critical, it will be interesting to see how blockchain will allay the concerns of regulators and auditors.

Technology Education and Computer Science

As technology is so pervasive in our jurisdiction, there is the expectation that individuals be able to use technology in their daily lives. Responses gathered through this survey indicate a strong expectation that the education system would teach computer science as a matter of common practice. Also, and increasingly, there is evidence that eskills training currently takes place at many levels - in the workplace and in schools, to name but a few sources.

Locally, the adoption of global initiatives such Hour of Code is seen across Bermuda's schools. It exposes primary and middle school students to coding using fun and engaging activities which are used to show students that computer science can be enjoyable and a career option (Hour of Code).

While important, eskills training supports technology literacy in the community but it does not ensure that we are developing the next generation of technology professionals to enter into industry. This gap indeed is an issue worldwide, and several jurisdictions are tackling it through a number of initiatives that aim to encourage computer science and more technically-based information technology adoption by students at earlier phases in their school careers, in the hope to encourage them to pursue Computer Science at the university level and technology careers upon graduation.

CONCLUSION/ GENERAL OUTLOOK

This State of ICT in Bermuda 2016 describes the results of the biennial survey conducted by the Department of ICT Policy and Innovation in December 2016. The survey results bolster the belief that the field of Information and Communication technologies continues to be significantly dynamic.

Technology continues to be seen as an important tool for individuals and organisations alike. Looking at the most common uses of technology, whether for work or recreation, one can quickly note that it is as omnipresent as ever, acting as a means of simplifying life, work, and providing increasing efficiencies. Bermuda is therefore navigating the ever-shifting waters of an ever-increasingly prevalent and complex presence of ICT in all aspects of life. The demographics and competencies uncovered in this survey show that Bermuda-based businesses and residents continue to embrace technology, entering more fully into the era of the Internet of Things.

Bermuda residents are often early adopters of new technologies. As the State of ICT in Bermuda survey is performed in December, many of the answers received regarding planned purchases are given with Holiday shopping in mind. Bermuda-based purchases support worldwide trends that the Internet of Things is here to stay as households are increasingly comfortable with smart TVs, wearable technologies, and artificial intelligence in such items as Amazon's Alexa service and Echo intelligent speakers.

Companies find technology to be essential for competitiveness as it facilitates communication, allows for greater efficiency, and provides tools for specific organizational needs. Technology permeates training, education and research, as well as customer service, communication, and marketing/advertising. The Bermuda market and business environments require that most industry sectors embrace technology to remain competitive.

Fiscal responsibility and strategic planning have industry leaders carefully considering technology options. While prices have dropped in recent years for equipment and connectivity as market forces act upon the Bermuda landscape, respondents are still clamoring for lower rates, better broadband speeds, and better cellular and data service overall. Technology adoption remains brisk; however, a shrinking workforce, companies engaging in cost-saving activities and other factors do have a tangible impact on technology spending.

Cybersecurity is often at the forefront of organizational conversations. Respondents expressed the need for more information regarding security alerts and privacy. At the same time, most believe that their servers are secure and they have a disaster recovery or business continuity plan in place. Security and privacy considerations may be an area for future focus, particularly given the increasing use of cloud solutions.

Looking into the future, employers see an increased need for IT specialists with specific skills in Bermuda. Certifications in Microsoft Office, CCNA, and MCSE/MCSA are currently considered beneficial, and students should keep an eye on such feedback. We do note that companies may turn to outsourcing, as they may feel that the size of their organization, cost-effectiveness, and the shortage of qualified Bermudians may push them in such a direction. While outsourcing to local service providers is indeed beneficial, encouraging the highly-skilled labour force to remain on the Island is critical.

This year has seen the addition of two issues which often go together: privacy and cybersecurity. What's more, the rapid changes in technology worldwide are indicating movements beyond what the results of this survey indicate.

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