Technology Needs Assessment

Ultra Wideband

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1 Executive Summary

Based on the results of the questionnaire/interviews it has been determined that Ultra Wideband (UWB) is an up and coming technology that will be desirable to consumers. Its focus is to provide data transfer between PC's or other devices wirelessly. This would provide customers with a wireless personal area network (WPAN) between Consumer Electronic (CE) products such as your television, radio, surround sound and much more.

Our study found that most consumers are already utilizing wireless devices in their home. They are also utilizing a network of some sort in their homes, be it 802.11 or Bluetooth. These users would also benefit from the ability to transfer files wirelessly between devices. Most consumers are willing to purchase UWB ready devices that cost more than non-UWB devices, as long as the cost difference is reasonable.

2 Introduction

In view of the interest of UWB technology Panasonic would like to assess this technology in terms of its potential application to CE. Panasonic convened a panel of average customers that would be utilizing UWB CE in their homes. The panel's assignment was to provide feedback, in the form of a questionnaire and interviews, to determine the need for UWB in CE products that Panasonic would be producing. This report presents the results of these efforts and makes recommendations based on the findings.

3 Background

UWB is a wireless radio technology for transmitting data between CE, PC peripherals, and mobile devices within short range at very high speeds, while consuming little power. It is ideally suited for wireless transfer of high-quality multimedia content, such as wirelessly streaming family videos from the digital video recorder to a high-definition television in the living room or wirelessly connecting a mobile PC to a projector in a conference room to deliver a presentation.

UWB technology uses a wide band of the radio frequency spectrum to transmit data within a short range (such as in the home or small office), allowing for greater amounts of data to be wirelessly transmitted in a given period of time than more traditional wireless technologies.

"Specifically, UWB is defined as any radio technology having a spectrum that occupies a bandwidth greater than 20 percent of the center frequency, or a bandwidth of at least 500 MHz." [1] In February 2002 the FCC approved the use of bandwidth between 3.1 and 10.6 GHz for UWB useage. This ranges from mid S band through mid X band [2], as illustrated in Figure 1.

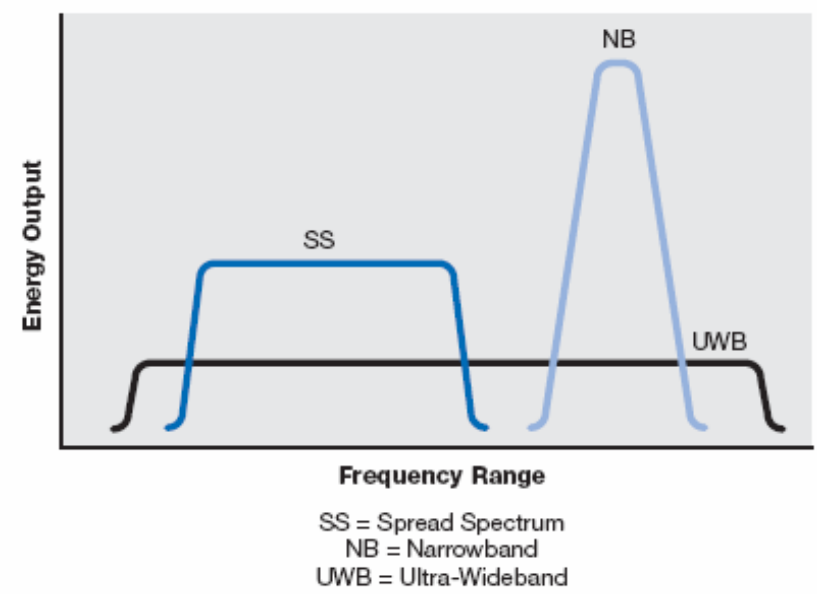


Figure 1. Radio frequency range of UWB [3].

"UWB is a unique and new usage of a recently legalized frequency spectrum. UWB radios can use frequencies from 3.1 GHz to10.6 GHz – a band more than 7 GHz wide. Each radio channel can have a bandwidth of more than 500 MHz, depending on its center frequency. To allow for such a large signal bandwidth, the FCC put in place severe broadcast power restrictions. By doing so, UWB devices can make use of an extremely wide frequency band while not emitting enough energy to be noticed by narrower band devices nearby, such as 802.11a/b/g radios. This sharing of spectrum allows devices to obtain very high data throughput, but they must be within close proximity." [3] Device range would be around a maximum of 30 feet.

Data rates can exceed 100 Mbit/s in wireless applications, and 1 gigabit per second in a wired application [2]. This capability, combined with low-power and pulsed data delivery provides increased speed when transferring data without additional interference from other wireless technologies already in use, such as Wi-Fi, WiMAX, and cellular wide-area communications. This technology will allow users to create a WPAN. Panasonic feels that the market will demand such technology in the near future and would like to prepare.

Figure 2 illustrates how UWB can be implemented. For the purposes of this assessment we are concentrating on the Blue Wireless PAN areas.

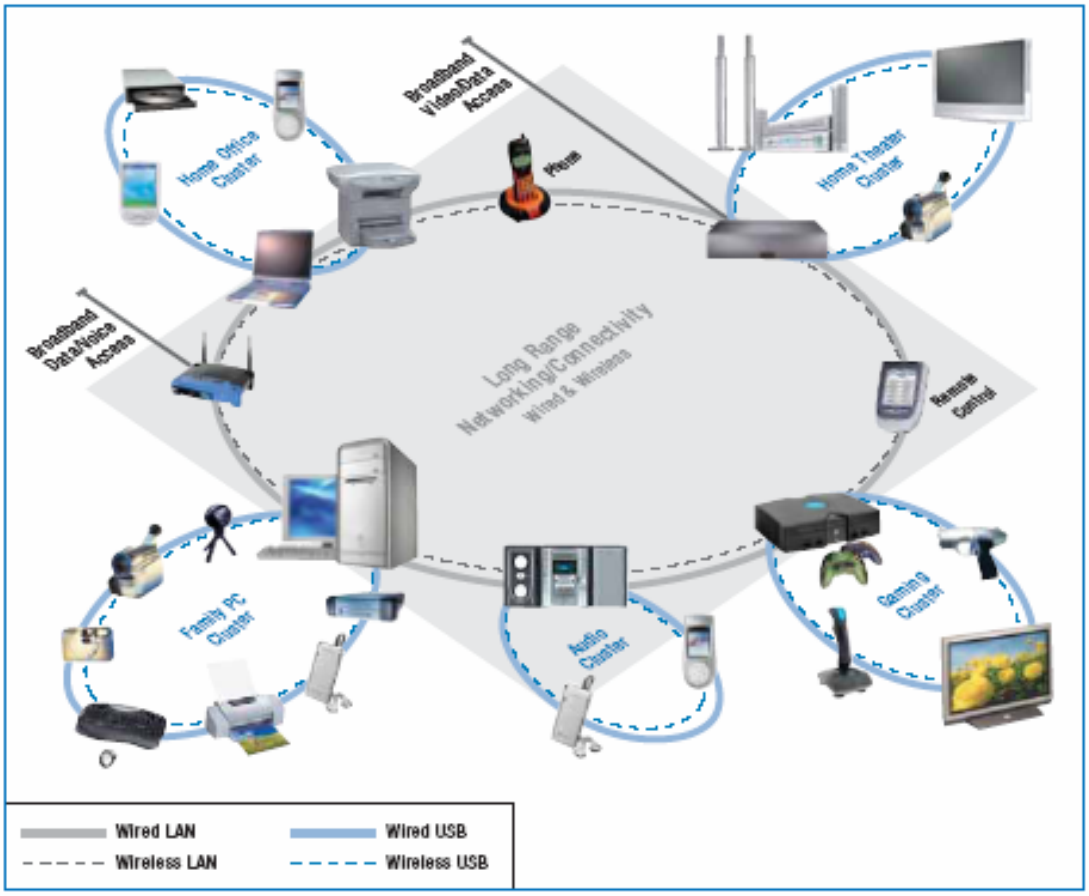


Figure 2.Implemented UWB [4]

4 Purposes

Panasonic's current set of products do not allow for the type of mobility that UWB can provide. This assessment will determine which products will fit the need for such technology. For example most homes have at least one PC and one TV, there maybe a strong need to have UWB installed in such CE products. This assessment may also determine which CE products do not have the need for UWB technology. It will also clarify any perceived notions of this technology in regard to their products.

5 Limitations

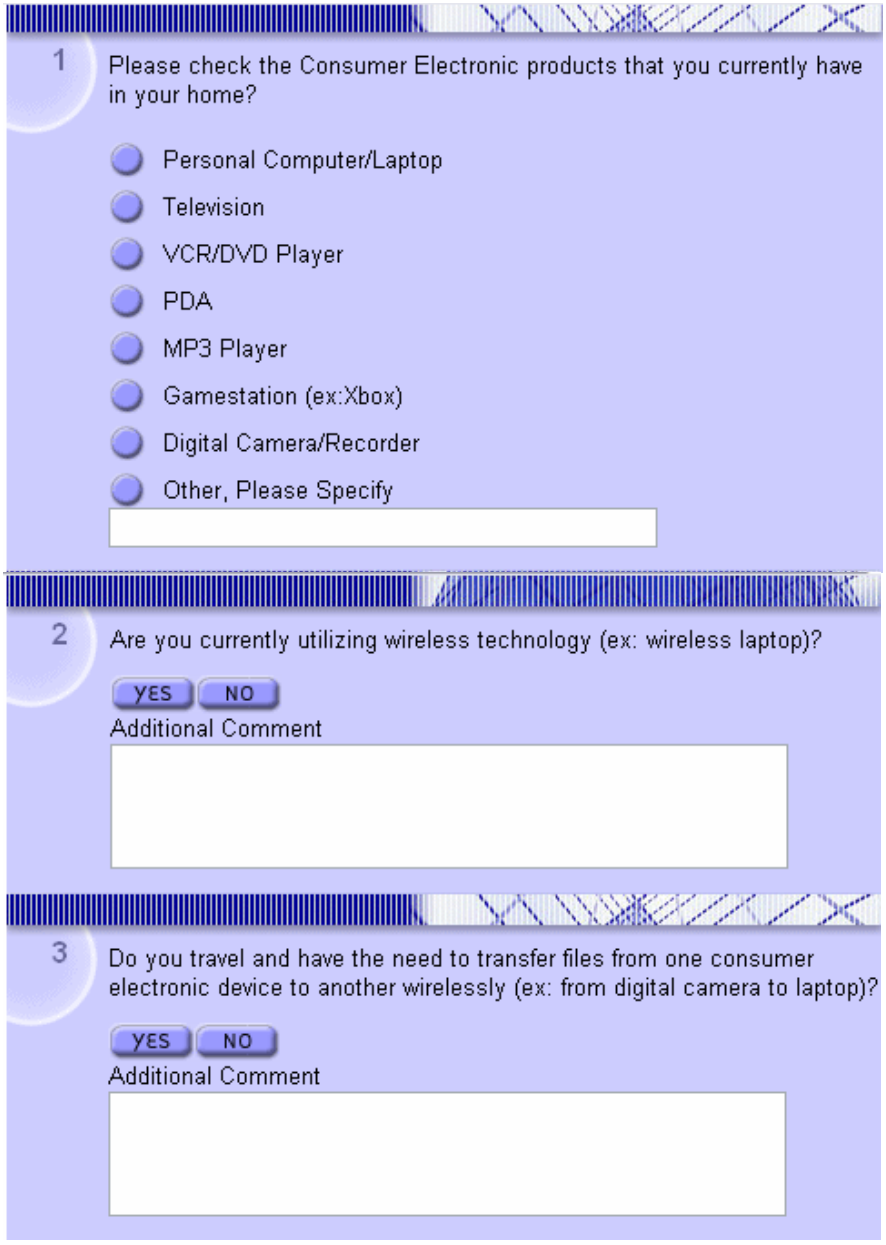
There are some limitations that face Panasonic due to the time allotment of this assessment. There isn't enough time to contact customers world wide, and there is a limited geographical area that can be reached. Another limitation is the small number of customers that can be reached in such a small amount of time.

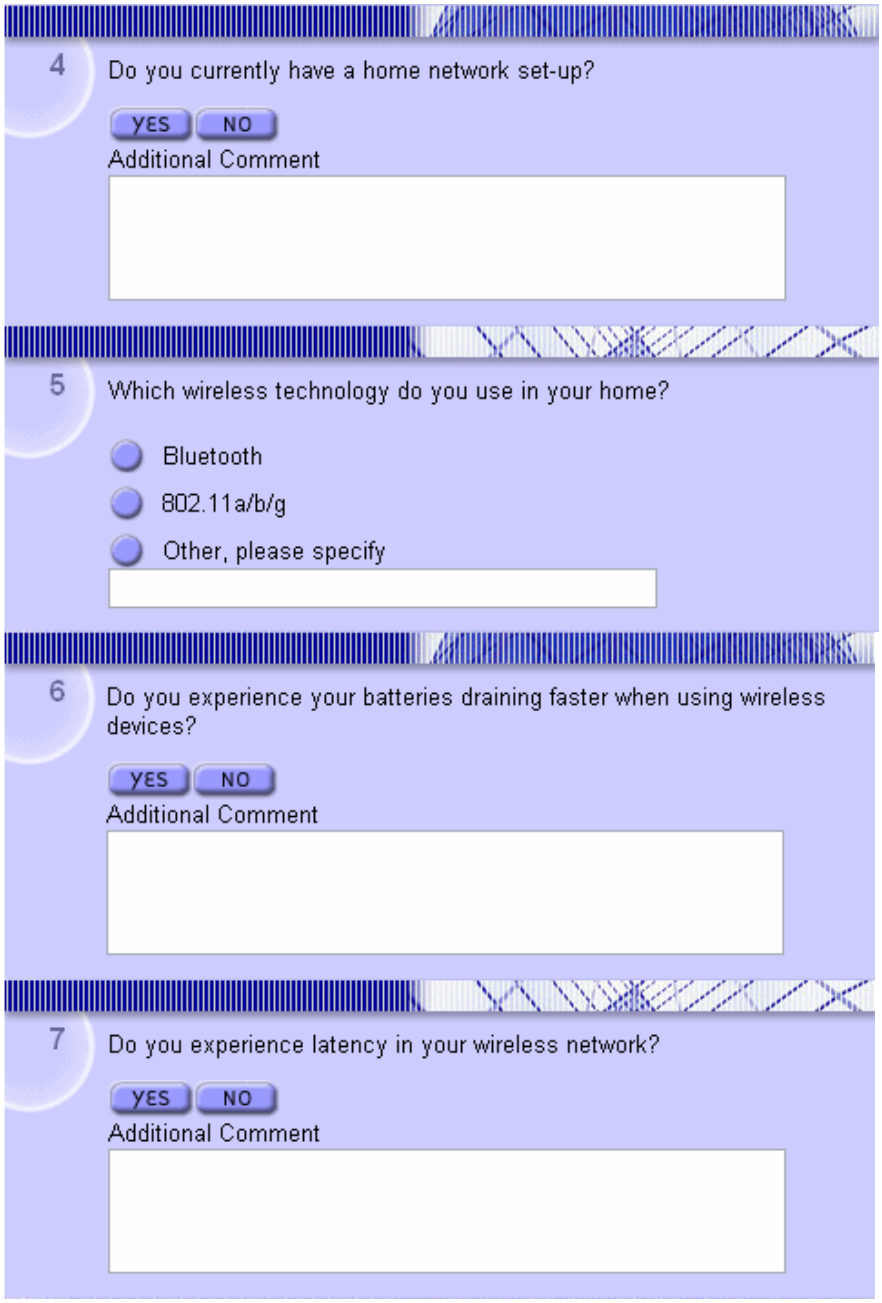
One final limitation was in the use of the surveys. On the Zoomerang web site (described in the tools section) we did not make the questions on the survey required. A survey taker could answer some questions and leave other questions blank. On some of the free answer questions we got very few responses because a response was not required. In the future on a survey of this type, all responses should be required before the person could submit the survey.

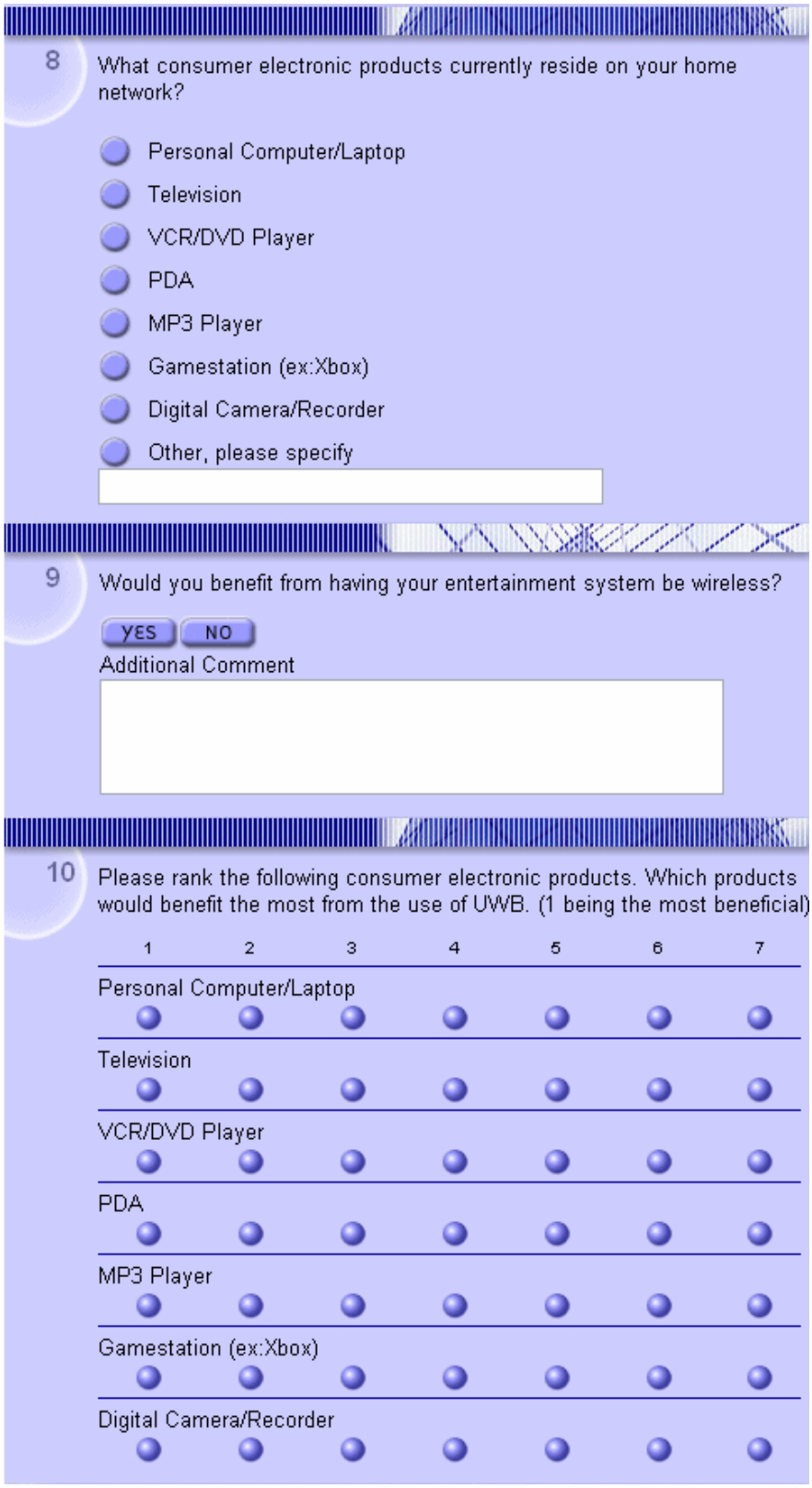
6 Questions

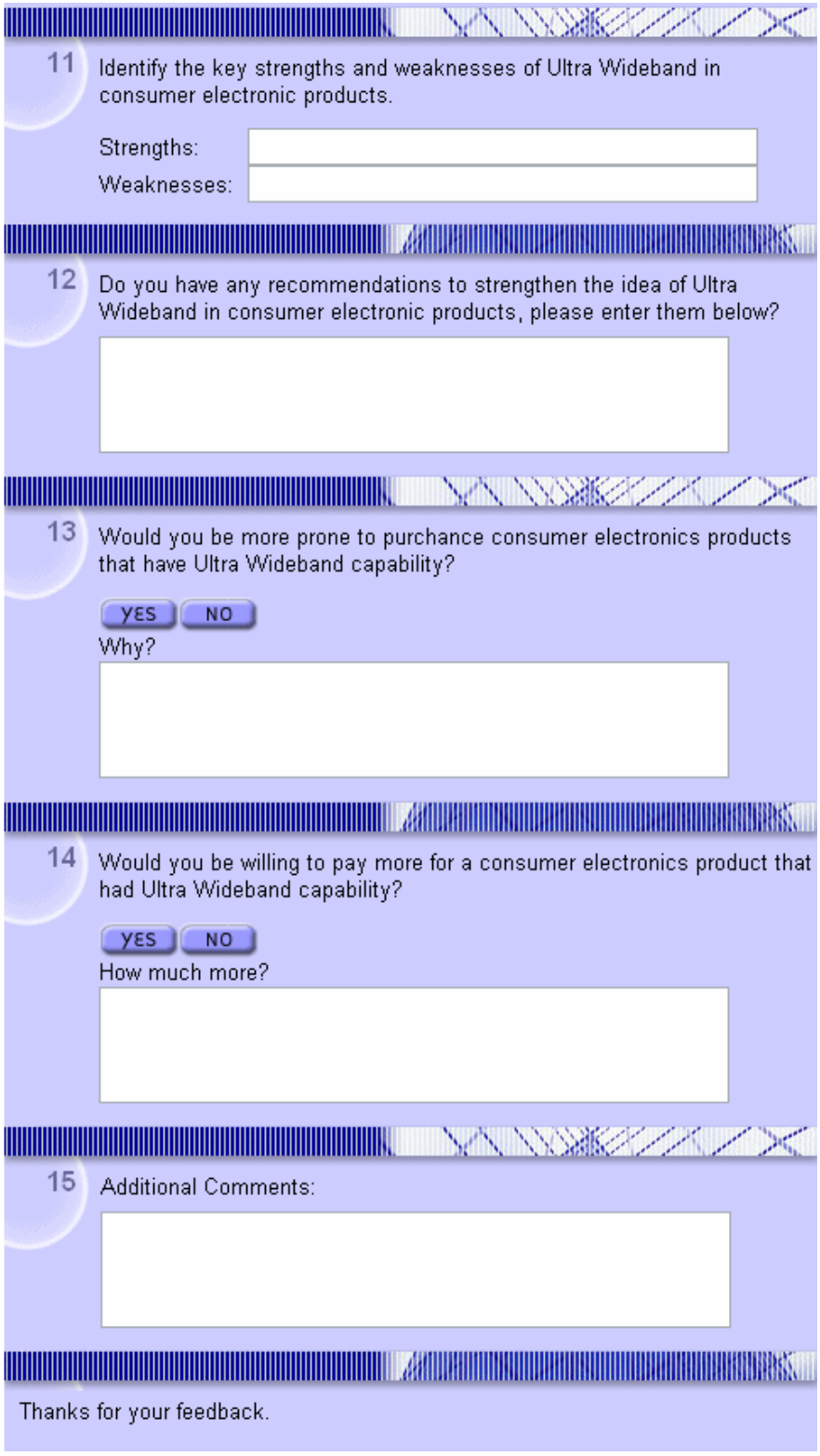
A key element of an effective analysis is careful specification of the questions to be addressed by the analysis methods. The clearer and more detailed these questions are, the more likely that you will be able to provide useful answers to them

Below are the questions that we used in the survey for Ultra Wideband. The screen shots below are taken from Zoomerang.com. Zoomerang is described in more detail in the "Tools" section of this document.


1
Please check the Consumer Electronic products that you currently have in your home?
Personal Computer/Laptop
Television
VCR/DVD Player
PDA
MP3 Player
Gamestation (ex:Xbox)
Digital Camera/Recorder
Other, Please Specify
2
Are you currently utilizing wireless technology (ex: wireless laptop)?
YES
NO
Additional Comment
3
Do you travel and have the need to transfer files from one consumer electronic device to another wirelessly (ex: from digital camera to laptop)?
YES
NO
Additional Comment


4
Do you currently have a home network set-up?
YES
NO
Additional Comment
5
Which wireless technology do you use in your home?
Bluetooth
802.11a/b/g
Other, please specify
6
Do you experience your batteries draining faster when using wireless devices?
YES
NO
Additional Comment
7
Do you experience latency in your wireless network?
YES
NO
Additional Comment


8
What consumer electronic products currently reside on your home network?
Personal Computer/Laptop
Television
VCR/DVD Player
PDA
MP3 Player
Gamestation (ex:Xbox)
Digital Camera/Recorder
Other, please specify
9
Would you benefit from having your entertainment system be wireless?
YES
NO
Additional Comment
10
Please rank the following consumer electronic products. Which products would benefit the most from the use of UWB. (1 being the most beneficial)
1 2 3 4 5 6 7
Personal Computer/Laptop
Television
VCR/DVD Player
PDA
MP3 Player
Gamestation (ex:Xbox)
Digital Camera/Recorder


11
Identify the key strengths and weaknesses of Ultra Wideband in consumer electronic products.
Strengths:
Weaknesses:
12
Do you have any recommendations to strengthen the idea of Ultra Wideband in consumer electronic products, please enter them below?
13
Would you be more prone to purchance consumer electronics products that have Ultra Wideband capability?
YES
NO
Why?
14
Would you be willing to pay more for a consumer electronics product that had Ultra Wideband capability?
YES
NO
How much more?
15
Additional Comments:
Thanks for your feedback.

7 Methods

It is usually a good idea to collect needs assessment data in several ways from several sources, especially in projects that are quite costly. Described below are the two methods in which we chose to collect data.

Two methods were used to gather data on Ultra Wideband: Surveys and Interviews. Surveys were done using the Zoomerang web site. This web site is described in more detail in the Instrumentation Section. The survey was created on the Zoomerang web site and sent to a sample of 25 people via a URL link in an email. This sample included people who had both technical computer backgrounds and people that do not. 20 of the 25 people filled out the survey.

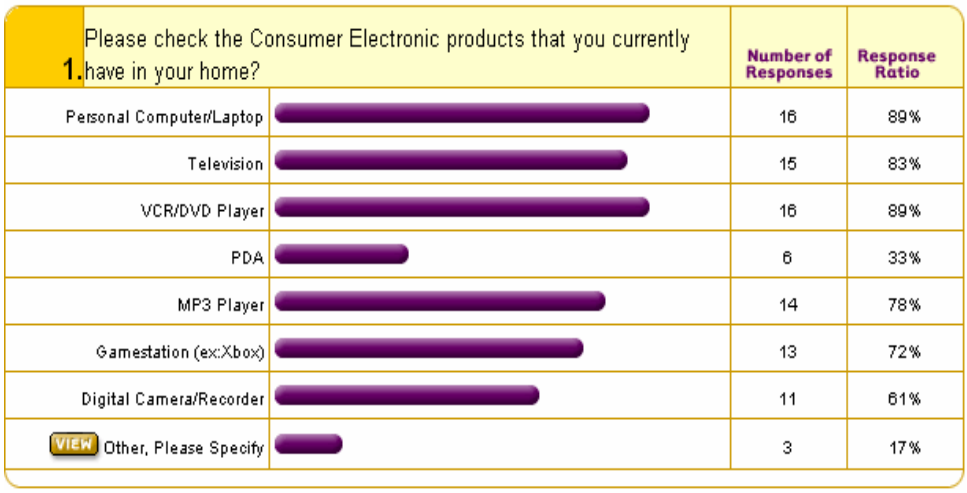
The interviews were conducted in person. Of the four interviews that were conducted, 2 interviewees were of technical computer backgrounds and 2 were from non-technical backgrounds. The interviews include a loose discussion based around the same questions that were included in the survey. The interview allowed for more feedback because of the personal nature and open discussion.

8 Instrumentation

The Zoomerang survey web site (www.Zoomerang.com) [5] was the only tool used for this assessment. Zoomerang allows for the easy creation of an online survey. Each survey has a unique URL that can be emailed to the target audience. Zoomerang has various levels of service. They offer a free account, and several higher-level accounts, which require a fee. The free account was used for this assessment. The free account allows us to create surveys with various types of questions. Types of questions include yes/no questions, multiple-choice questions, free answer questions, ranking questions, and many other types.

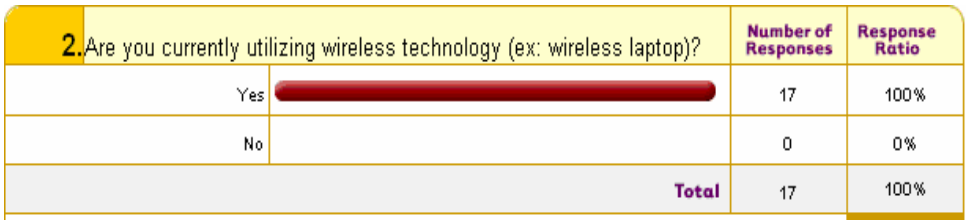
9 Results

The following figures represent the results of the survey. At each of the interviews, the interviewees were asked the survey questions. Results were incorporated into the survey results below.



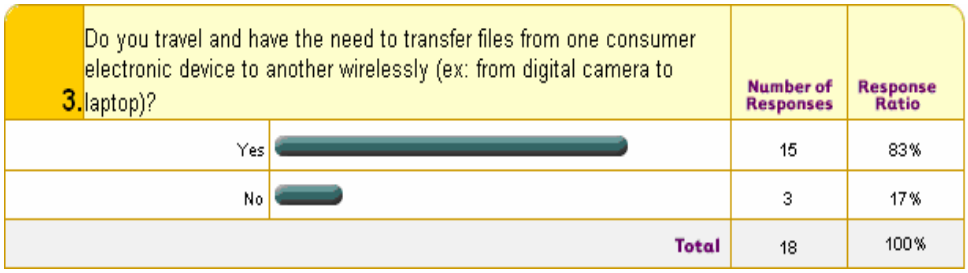
1. Please check the Consumer Electronic products that you currently have in your home?	Number of Responses	Response Ratio
Personal Computer/Laptop	16	89%
Television	15	83%
VCR/DVD Player	16	89%
PDA	6	33%
MP3 Player	14	78%
Gamestation (ex:Xbox)	13	72%
Digital Camera/Recorder	11	61%
VIEW Other, Please Specify	3	17%

Question 1 results show that the majority of consumers we surveyed have multiple CE devices.



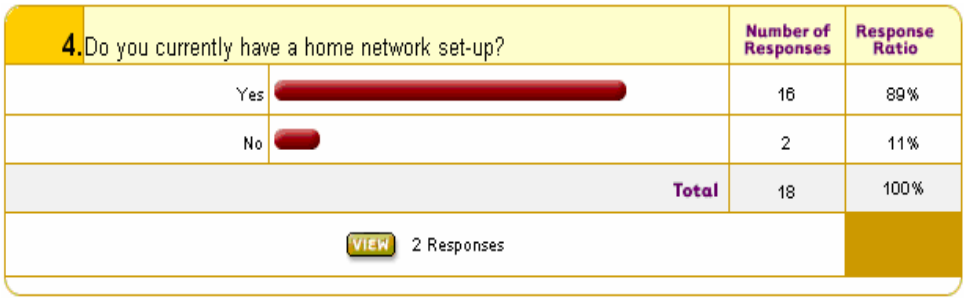
2. Are you currently utilizing wireless technology (ex: wireless laptop)?	Number of Responses	Response Ratio
Yes	17	100%
No	0	0%
Total	17	100%

Question 2 results show that 17 of the people asked use some form of wireless technology.



3. Do you travel and have the need to transfer files from one consumer electronic device to another wirelessly (ex: from digital camera to laptop)?	Number of Responses	Response Ratio
Yes	15	83%
No	3	17%
Total	18	100%

Question 3 shows that UWB would be a desirable feature to add to consumer electronics. 15 of 18 people have the need to transfer files wirelessly.



4. Do you currently have a home network set-up?	Number of Responses	Response Ratio
Yes	16	89%
No	2	11%
Total	18	100%
VIEW 2 Responses		

Question 4 shows that the majority of people surveyed have some form or network setup in their home. This network could be wired or wireless.

4. Do you currently have a home network set-up?	
#	Response
1	only LAN no WIFI

5. Which wireless technology do you use in your home?	Number of Responses	Response Ratio
Bluetooth	8	47%
802.11a/b/g	11	65%
VIEW Other, please specify	4	24%

Question 5 shows that 8 people surveyed use Bluetooth, 11 people use 802.11, and 4 use some other form of wireless technology. The hope is that if people are already using wireless, that they will be open to try UWB when the technology is put on the market.

6. Do you experience your batteries draining faster when using wireless devices?	Number of Responses	Response Ratio
Yes	11	61%
No	7	39%
Total	18	100%
VIEW 3 Responses		

Question 6 shows that more than half of the people surveyed notice their battery drain faster when using wireless technology. UWB has the potential to improve battery life of CE devices. This will be a feature that will help sell UWB devices.

6. Do you experience your batteries draining faster when using wireless devices?	
#	Response
1	not initially..but after 1-2 years batteries start losing charge faster
2	Don't know

7. Do you experience latency in your wireless network?	Number of Responses	Response Ratio
Yes	12	67%
No	6	33%
Total	18	100%
VIEW 3 Responses		

Question 7 asked about latency in wireless networks. UWB is a faster technology than most on the market today. The fact that users of wireless notice latency shows that faster speed will also be desired feature of UWB.

7. Do you experience latency in your wireless network?	
#	Response
1	Sometimes
2	no home network

8. What consumer electronic products currently reside on your home network?	Number of Responses	Response Ratio
Personal Computer/Laptop	15	94%
Television	0	0%
VCR/DVD Player	1	6%
PDA	2	13%
MP3 Player	4	25%
Gamestation (ex:Xbox)	8	50%
Digital Camera/Recorder	3	19%
VIEW Other, please specify	1	6%

Question 8 shows that laptops and game stations are the most prevelat devices that are include in a home networks. UWB will allow for expansion in to all the different devices list above.

9. Would you benefit from having your entertainment system be wireless?	Number of Responses	Response Ratio
Yes	14	78%
No	4	22%
Total	18	100%
VIEW 2 Responses		

Question 9 shows that consumers do have the desire to have a wireless home entertainment center.

9. Would you benefit from having your entertainment system be wireless?	
#	Response
1	less wires to clutter up.

10. Please rank the following consumer electronic products. Which products would benefit the most from the use of UWB. (1 being the most beneficial)

The top percentage indicates total respondent ratio; the bottom number represents actual number of respondents selecting the option	1	2	3	4	5	6	7
1. Personal Computer/Laptop	56% 9	25% 4	6% 1	0% 0	0% 0	13% 2	0% 0
2. Television	13% 2	27% 4	13% 2	13% 2	0% 0	7% 1	27% 4
3. VCR/DVD Player	7% 1	0% 0	14% 2	29% 4	21% 3	21% 3	7% 1
4. PDA	6% 1	13% 2	19% 3	31% 5	0% 0	6% 1	25% 4
5. MP3 Player	0% 0	7% 1	27% 4	20% 3	40% 6	0% 0	7% 1
6. Gamestation (ex:Xbox)	13% 2	19% 3	13% 2	6% 1	19% 3	31% 5	0% 0
7. Digital Camera/Recorder	12% 2	12% 2	12% 2	12% 2	12% 2	12% 2	29% 5

Question 10 was used to find out which devices comsumers would most like to see UWB technology. The highest ranking device was a Personal Computer/Laptop.

56% of people rated a Personal Computer/Laptop as their number one choice.

The second highest ranking was for Television. The majority of people ranked television as high on their list of devices that would benefit from UWB.

40% of people ranked MP3 players low on the list, meaning that they have a low desire to see UWB in MP3 players.

11. Identify the key strengths and weaknesses of Ultra Wideband in consumer electronic products.

#	Response
1	Strengths: Easy file sharing Weaknesses: Security
2	Strengths: wires suck Weaknesses: cancer
3	Strengths: high speed transfer for short range Weaknesses: not widely used/known
4	Strengths: fast, low power, good for media Weaknesses: short range, Is radio interference possible?
5	Strengths: No WIRES!! HELLO! Weaknesses: Might be difficult to setup.
6	Strengths: Less Wires!! Weaknesses: Security

In question 11, the main strength of UWB includes less wires and better power consumption. The weaknesses include possible security problems, and concern about ease of setup.

12.	Do you have any recommendations to strengthen the idea of Ultra Wideband in consumer electronic products, please enter them below?
#	Response
1	Products need to come equipped with Ultra Wideband capabilities by default. This should include hardware and to start a network as well.
2	no
3	battery life is important for any wireless item.
4	How vulnerable is it to disruptions in power, other radio signals, etc.?
5	no.

Question 12 got very few responses. The few people that did answer suggested that devices come pre-configured with UWB, and expressed concerns about the reliability fo UWB.

13.	Would you be more prone to purchance consumer electronics products that have Ultra Wideband capability?	Number of Responses	Response Ratio
Yes		14	82%
No		3	18%
	Total	17	100%

Question 13 shows that the majority of people would be more likely to purchase CE with UWB technology and CE without it.

14.	Would you be willing to pay more for a consumer electronics product that had Ultra Wideband capability?	Number of Responses	Response Ratio
Yes		10	59%
No		7	41%
	Total	17	100%

Question 14 shows that a little more than half of the people surveyed would be willing to pay more for UWB capable products. The price increase could be about 10-20%.

14.	Would you be willing to pay more for a consumer electronics product that had Ultra Wideband capability?
#	Response
1	Up to 10%, 5% without much thought.
2	$100
3	20/device
4	Depends on how much more money... This technology is an enhancement, so it's not an necessity.
5	do not want to pay more than whats currently out there.
6	0
7	about 20% more.

15. Additional Comments:	
#	Response

NONE.

10 Recommendations

Based on the results of our survey/interviews we feel there is evidence that supports Panasonic's decision to move forward in producing UWB ready products. The first product that should be produced is a UWB laptop, then a UWB ready PDA. It is also important to the consumer that the UWB products do not exceed 10%-20% more than their predecessors without UWB.

11 Conclusion

Respondents agree that UWB is indeed a desired technology. Moreover, it will continue to grow, as people require wireless devices to be networked together. The two major concerns that surfaced through our questionnaire/interviews had to do with Security and Set-up. It's important to the users that the CE's will be Secure since you will be sharing files wirelessly. In addition to security all the CE products that have UWB installed should require little or no set-up. Basically once you have all the products UWB ready they will recognize one another and start communicating.

13 Resources

[1] Ultra-WideBand (UWB) Technology, http://www.intel.com/technology/comms/uwb/

[2] Ultra Wideband, http://en.wikipedia.org/wiki/Ultra_wideband , modified: 16 February 2006

[3] Whitepaper: Wireless USB
http://www.intel.com/technology/comms/wusb/download/wirelessUSB.pdf

[4] Whitepaper: Ultra-Wideband (UWB) Technology
http://www.intel.com/technology/comms/uwb/download/Ultra-Wideband.pdf

[5] Zoomerang, www.Zoomerang.com

14 Acronyms

CE – Consumer Electronics

PC – Personal Computer

PAN – Personal Area Network

PDA – Personal Data Assistant

UWB – Ultra Wideband

WPAN – Wireless Personal Area Network