

DARK KNOWLEDGE: A STUDY ON PUBLIC PERCEPTIONS OF THE DARK WEB

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Abstract

In this paper, I study how general technology users perceive the dark web. In this study, I conducted research on what these users know about dark web technologies, activities, content, and how their perceptions changed after a first-hand experience on dark web marketplaces and sites. I aimed to tackle myths and misconceptions that users had about the dark web and present new data in order to educate and bring awareness to the dark web to those who may never have the opportunity or reason to come upon this information on their own. It is my hope that the findings of this paper and the experiences of the participants will foster the spread of knowledge and awareness to both the threats and benefits that the dark web contributes to society.

Problem Statement

At this point in our society nearly everyone is connected to the internet in one way or another. Credit cards numbers, personally identifiable information, and health data are just a few examples of the various types of data that individuals are connected to in today's digital world. The technology industry and the public are aware of the growing security concerns we are facing in internet-connected devices. However, most common internet users are not aware of how to or aren't concerned with taking extra precautions into securing their data.

Furthermore, these users are unaware or don't see the full scope of the internet and how their data can be compromised on it. While most users have heard of the dark web in some context there are very few general users who have a full understanding of its scope. Rumors, myths, and misconceptions of the dark web run rampant in non-technical circles and people across the board are therefore left without the full picture of its purpose, activity, and content. Therefore, I would like to conduct a study that focuses on users with little to no technical background. The focus of this study is to collect data on how users perceive the dark web before and after being educated on various topics. The goal is to promote education, foster the spread of knowledge, and bring awareness to the purposes, activities, and content associated with the dark web in an effort to give the participants a better understanding of the scope of the dark web.

Solution Scope

The scope of this project is dependent on individuals who are willing and able to participate in two surveys and one technical demonstration. The first survey will be designed to gauge user knowledge and perceptions on dark web technologies, content, and activity. In

addition, the initial survey will be spread to a much wider audience in an effort to compile an adequate amount of data for this study. After a suitable number of users have completed the initial survey several will be asked if they are willing to participate in an interactive demonstration of dark web marketplaces, sites, and technology. The demonstration will take users through the process of securely accessing the dark web and on a guided, yet interactive, tour of several marketplaces and websites. After the demonstrations, participants will complete a short survey gaging their reactions to the demonstration, intent of acquired information, and any changes in perspective regarding the dark web.

Table 1: This table depicts the questions presented in the initial survey and an explanation as to why they were chosen.

Question	Explanation
What is your age?	General demographic question to determine participant characteristics.
What is your gender?	General demographic question to determine participant characteristics.
What is your highest level of education or level you are currently working towards?	General demographic question to determine participant characteristics.
How often do you use technology? (i.e. smartphone, tablet, computer, etc.)	Used to confirm that all participants interact with internet connected devices.
Have you ever heard of the Dark Web?	Used to determine how many participants are familiar with the study's focus area.
If so, how would you define your Dark Web knowledge?	Used to determine the study knowledge base of participants.
Have you ever heard of a TOR browser?	Used to determine how many participants are familiar with typical tools associated with dark web usage.
If so, do you currently or have you ever used a TOR browser?	Used to determine how many participants have used a Tor browser.
Do you know what a Virtual Private Network (VPN) is?	Used to determine how many participants are familiar with typical tools associated with dark web usage.
Do you use a Virtual Private Network while browsing the internet?	Used to determine how many participants are familiar with typical tools associated with dark web usage.

Do you know how to access the dark web?	It was important to see how many participants knew how to access the dark web pre-demonstrations.
Have you ever had access to the Dark Web? (i.e. A friend or colleague accessed it for you or you accessed it yourself)	Again, used to see how many participants have prior experience with using the dark web.
The Dark Web is illegal to access.	Used to determine what participants thought the legality of the dark web is.
The Dark Web's primary goal is to support illegal activity.	Used to determine what participants thought the legality of the dark web is.
I would be hesitant to browse Dark Web marketplaces if given access.	Used to determine how comfortable users would feel browsing the dark web alone.
The Dark Web can be used for perfectly legitimate and legal reasons.	Used to determine what participants thought the legality of the dark web is.
Activity on the Dark Web is completely and 100% anonymous.	Used to determine how participants felt their anonymity would be affected on the dark web.
I feel that I am more likely to be hacked while browsing the Dark Web than browsing the general internet.	Used to determine how safe participants would feel while browsing the dark web compared to the surface web.
I believe that my life cannot be affected by activity on the Dark Web.	Used to determine how participants felt the dark web could affect their day-to-day life.
It is possible to make money on the Dark Web.	Used to determine if participants believe the dark web has monetary benefits.
I know how financial transactions are completed on the dark web.	Used to determine participant knowledge on dark web transactions.
What I know or have heard about the Dark Web scares me.	Used to determine how participants felt the dark web could affect their day-to-day life.
Government entities use the dark web to communicate with operatives and other agencies.	Used to determine how much government involvement participants felt was present in the dark web.
Government operatives use the dark web to preform investigations or stings on potential offenders.	Used to determine how much government involvement participants felt was present in the dark web.
My knowledge of the dark web is primarily based on what I have heard regarding illegal activity.	Used to determine participant knowledge base of dark web.
I have not heard of any positive benefits of the dark web.	Used to determine participant knowledge base of dark web.
Do you think that the Dark Web should be shut down?	Used to determine how users felt about the dark web's existence.

Which of the following items do you think can be found for sale on Dark Web marketplaces and forums? Please choose all that apply. <i>Options listed under Results Item D.a.</i>	Used to determine what kind of items participants felt could be found for sale on dark web marketplaces and forums.
Which of the following groups of people do you think use the Dark Web? Please choose all that apply. <i>Options listed under Results D.b.</i>	Used to determine what kind of people participants felt would be likely to use the dark web.
Which of the following activities or services do you think are available through use of the Dark Web? Please choose all that apply. <i>Options listed under Results Item D.c.</i>	Used to determine what kind of activities or services participants felt could be found on the dark web.

Table 2: This table depicts the questions in the post-demonstration survey and an explanation as to why they were chosen.

Question	Explanation
I feel that I have a better understanding of the Dark Web after participating in this study.	Used to evaluate the effectiveness of the demonstration.
I learned something from participating in this study.	Used to evaluate the effectiveness of the demonstration.
My perception of the Dark Web has changed after participating in this study.	Used to evaluate the effectiveness of the demonstration.
I intend on sharing this newfound knowledge with friends and family.	Used to evaluate if the participant would share acquired information.
After participating in this study, I feel that the general-public does not know the true scope of the dark web.	Used to determine if the knowledge acquired has changed how the participant feels about public dark web perceptions.

Iteration Plan

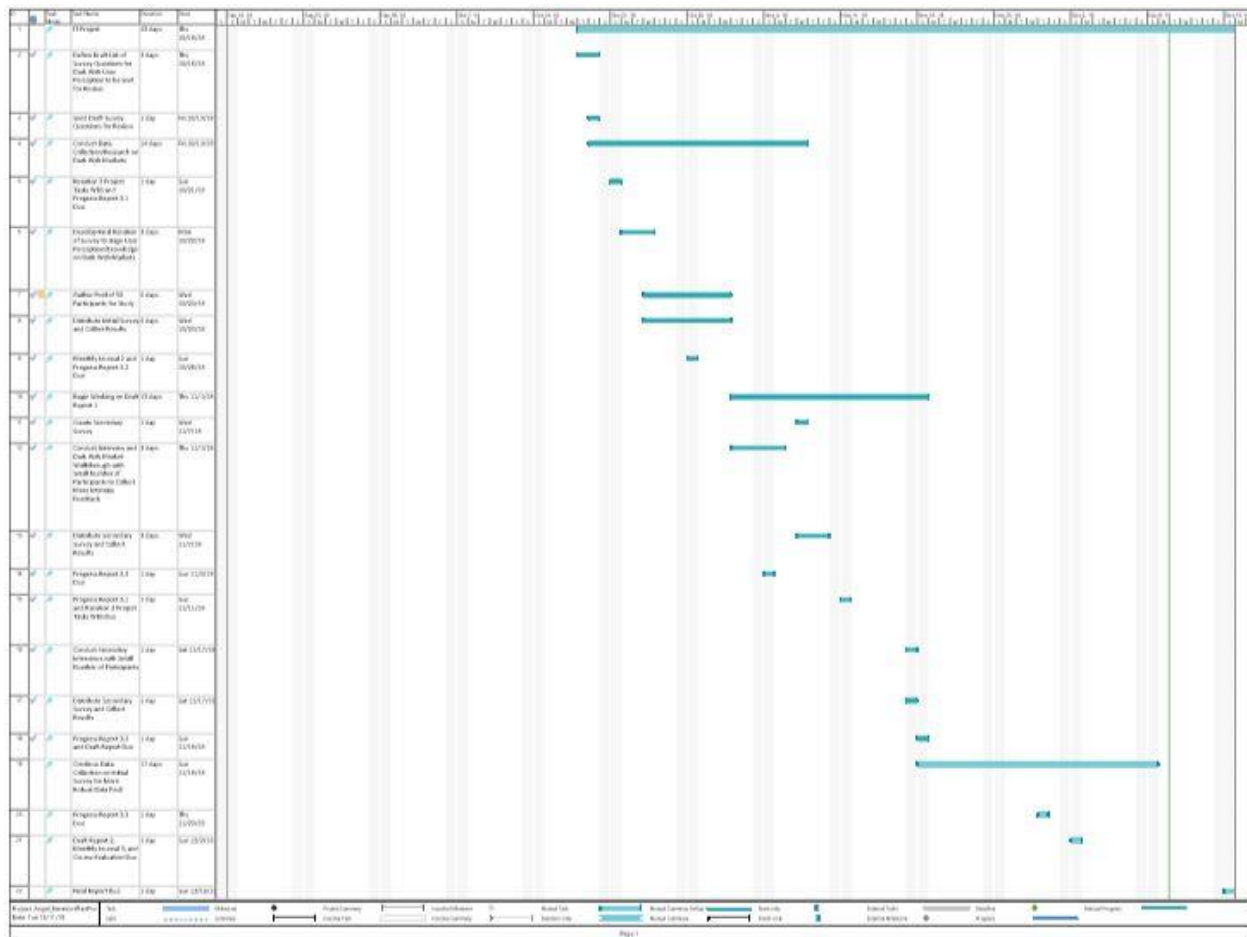
The following is an up-to-date iteration plan for the IT Project:

Table 3: This table depicts the final iteration plan for the project.

Task Name	Duration	Start	Finish
IT Project	43 days	Thu 10/18/18	Sun 12/16/18
Define Draft List of Survey Questions for Dark Web User Perception to be Sent for Review	2 days	Thu 10/18/18	Fri 10/19/18
Send Draft Survey Questions for Review	1 day	Fri 10/19/18	Fri 10/19/18
Conduct Data Collection/Research on Dark Web Markets	14 days	Fri 10/19/18	Wed 11/7/18
Iteration 2 Project Tasks WBS and Progress Report 2.1 Due	1 day	Sun 10/21/18	Sun 10/21/18

Develop Final Iteration of Survey to Gage User Perception/Knowledge on Dark Web Markets	3 days	Mon 10/22/18	Wed 10/24/18
Gather Pool of 50 Participants for Study	6 days	Wed 10/24/18	Wed 10/31/18
Distribute Initial Survey and Collect Results	6 days	Wed 10/24/18	Wed 10/31/18
Monthly Journal 2 and Progress Report 2.2 Due	1 day	Sun 10/28/18	Sun 10/28/18
Begin Working on Draft Report 1	13 days	Thu 11/1/18	Sun 11/18/18
Create Secondary Survey	1 day	Wed 11/7/18	Wed 11/7/18
Conduct Interview and Dark Web Market Walkthrough with Small Number of Participants to Collect More Intimate Feedback	3 days	Thu 11/1/18	Mon 11/5/18
Distribute Secondary Survey and Collect Results	3 days	Wed 11/7/18	Fri 11/9/18
Progress Report 2.3 Due	1 day	Sun 11/4/18	Sun 11/4/18
Progress Report 3.1 and Iteration 3 Project Tasks WBS Due	1 day	Sun 11/11/18	Sun 11/11/18
Conduct Secondary Interviews with Small Number of Participants	1 day	Sat 11/17/18	Sat 11/17/18
Distribute Secondary Survey and Collect Results	1 day	Sat 11/17/18	Sat 11/17/18
Progress Report 3.2 and Draft Report Due	1 day	Sun 11/18/18	Sun 11/18/18
Continue Data Collection on Initial Survey for More Robust Data Pool	17 days	Sun 11/18/18	Sun 12/9/18
Progress Report 3.3 Due	1 day	Thu 11/29/18	Thu 11/29/18
Draft Report 2, Monthly Journal 3, and Course Evaluation Due	1 day	Sun 12/2/18	Sun 12/2/18
Final Report Due	1 day	Sun 12/16/18	Sun 12/16/18

Image 1: This table depicts the final Gantt Chart for the project.



Solution Description

The solution presented in this project is the result of two distinct surveys gaging user perceptions and knowledge of dark web technologies, activity, and content. The first survey is comprised of 30 questions. The breakdown of the following questions is: 3 Demographic Questions, 9 Technology Questions, 15 Perception Questions, and 3 Content Questions.

The final participant pool for this study consisted of 75 individuals. These participants were collected from various age groups, educational backgrounds, and professional fields that are

classified as non-technical. The interactive demonstration consisted of 20 of the original 75 participants who also completed the secondary post-demonstration survey.

Initial Survey Results

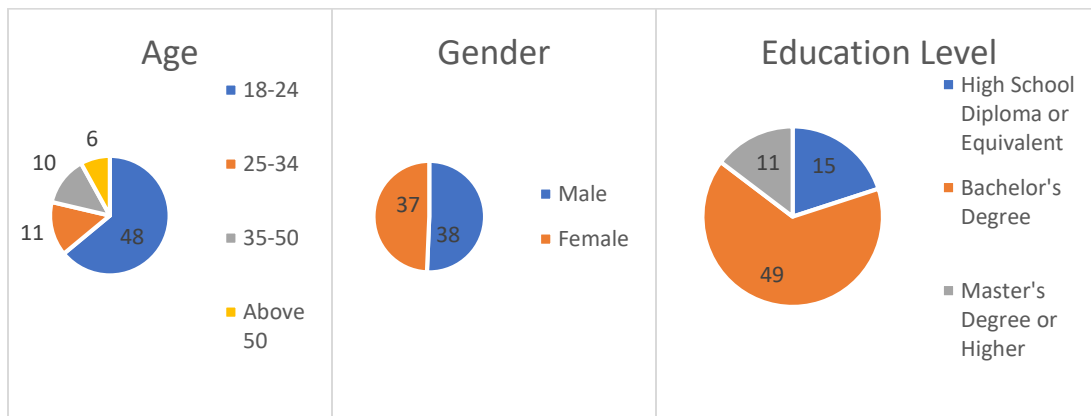
In this section I will be presenting the results of the initial and post-demonstration surveys.

Interpretation and comments will be given in conjunction with results.

A. Demographic Questions

The demographic section of this study presented a group of participants with a wide range of age designations and educational backgrounds. However, the genders of the participant pool were nearly equal. These results are not surprising based on the large number of participants and the wide range of survey dispersal techniques.

Chart 1: This chart depicts the results of the Initial Survey demographic questions.

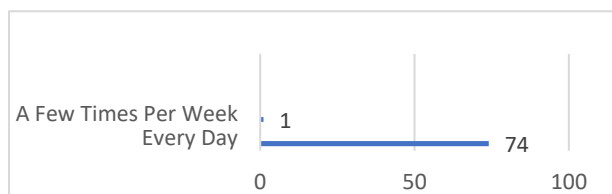


B. Dark Web Technology Questions

a. How often do you use technology?

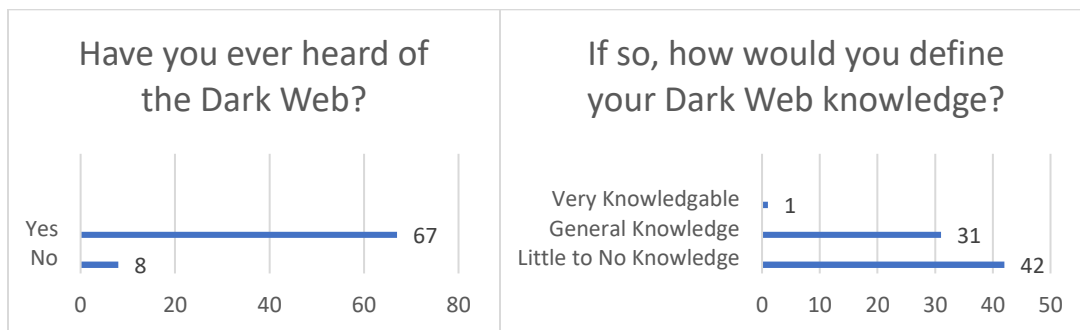
The results of this question met my expectations. In 2018, our lives are more interconnected with technology than ever before. This question was included to

confirm that the participants of this survey do indeed interact with internet connected devices regularly.



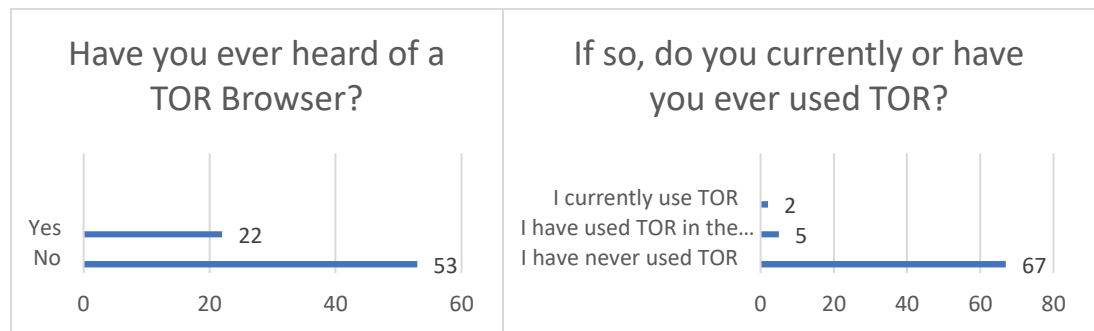
- b. Have you ever heard of the Dark Web?
- c. If so, how would you define your Dark Web knowledge?

The results of these two questions were not entirely surprising. However, I was quite pleased with what I discovered. Nearly, 90% of the participants have heard of the Dark Web and were aware of its existence which is a major step in the right direction. However, 99% of participants indicated having little to no or a general knowledge base of what it is. The problem with these results is that a clear majority of participants do not have a solid grasp on what the dark web is or what it is used for. As with any other concept, there is a vast difference between knowing about something and understanding it.



- d. Have you ever heard of a TOR Browser?
- e. If so, do you currently or have you ever used a TOR Browser?

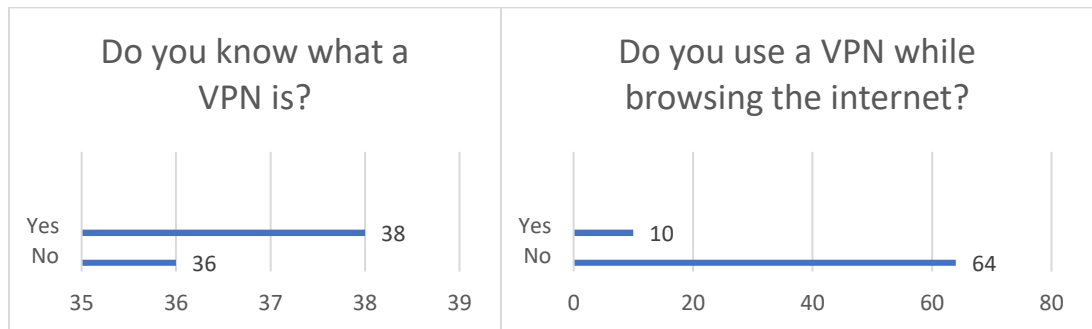
Only 22 participants in this study have ever heard of a Tor browser. Furthermore, only 7 of these participants have experience with the software. Honestly, it was surprising to me that this many participants have knowledge of the Tor browser. Most of these participants are used to using traditional browsers such as Chrome, Firefox, or Safari in their day to day lives. Therefore, I would infer that the 22 participants who have familiarity with Tor have heard of it through some relation to cybercrime news or extracurricular research into the dark web.



- f. Do you know what a Virtual Private Network (VPN) is?
- g. Do you use a Virtual Private Network while browsing the internet?

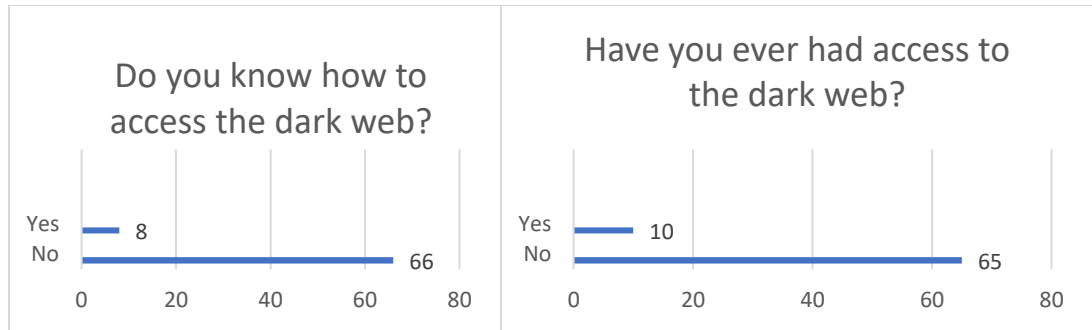
Virtual Private Networks are slowly becoming mainstream outside of technical circles. VPNs are being advertised and incorporated into workplaces more which raises awareness of their benefits and purpose to those who may otherwise not know. It comes to no surprise to me that the number of users who are familiar with this technology in this study is somewhat split down the middle. While this technology is becoming more accessible to all types of users there is a knowledge barrier that may prevent some individuals from adopting the service into their daily lives. Additionally, while there are free VPN services, most with a high number of features and extra services are available on a subscription or payment basis

(Vpnreviewer, 2013). The knowledge barriers, overwhelming number of options, and extra costs may deter non-technical users from adopting this technology which is evident in the result of this study.



- h. Do you know how to access the Dark Web?
- i. Have you ever had access to the Dark Web? (i.e. A friend or colleague accessed it for you or you accessed it yourself)

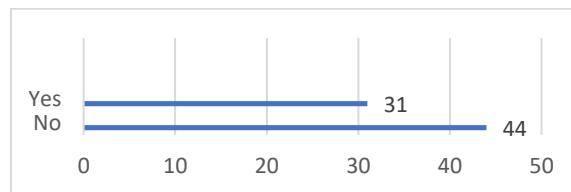
A majority of the participants had stated that they did not know what a Tor Browser was in a previous question. Additionally, 99% of participants noted that they had little to no or a general knowledge base of the dark web. Therefore, it is safe to presume that they wouldn't know what a Tor Browser is and therefore could not access the dark web. Tor is not nearly as popular as other internet browsers. In fact, Tor did not even break the top 5 web browsers in usage in the United States over a 4-year span (Statista, 2018). Furthermore, since so many participants stated they do not know how to access the dark web it comes as no surprise that 65 participants have never had access.



C. Dark Web Perception Questions

a. The dark web is illegal to access.

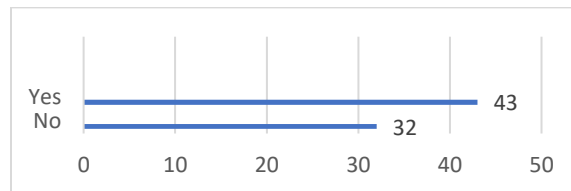
I was pleased with the results of this question. Inherently, the Tor Browser's primary use is to provide anonymity. Furthermore, it's just an internet browser. There is nothing illegal about the software itself. However, the activities and content you engage in could land you in legal trouble (Coble, 2015). In short, Tor is not illegal but what you use it for can be. I was happy to discover that most participants did not feel that the dark web itself was illegal. Rather the activities people choose to take part in.



b. The dark web's primary goal is to support illegal activity.

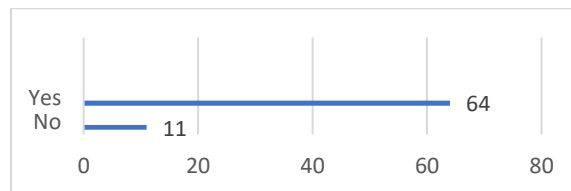
While the results of this question were relatively split there is still the majority that believe the dark web's primary goal is to support illegal activity. The news is so condensed with content that highlights the problems of the dark web that it comes to no surprise the public perceive is as a terrible crime ridden place. Forbes released an article highlighting the dark web's drug, child pornography, and private

information markets recently (Sparapani, 2016). Large media outlets such as this often portray the dark web for all of its pitfalls. As long as this continues, the more often people will associate the dark web with illicit activity.



- c. I would be hesitant to browse Dark Web marketplaces if given access.

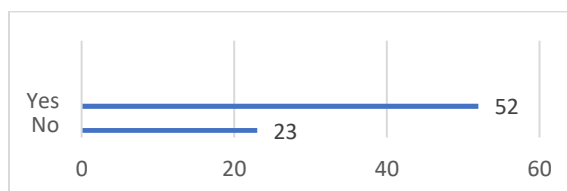
The results associated with this question relatively matched with my initial expectations. As most of these participants had little knowledge of the dark web it would be safe to presume that giving them access to independently browse the dark web would prove a daunting task. The same concept can be applied to any task or technology. If you give someone a completely new concept, especially one with potential legal consequences, the subject may be hesitant to preform given they have no prior experience.



- d. The dark web can be used for perfectly legitimate and legal reasons.

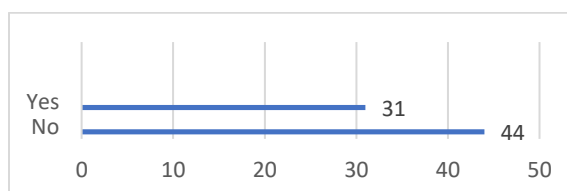
The results here were a pleasant surprise. Since the dark web is so often associated with illegal activity I expected more participants to respond “No” to this question. However, these results infer that the participants do indeed understand that that the scope of the dark web goes beyond illicit activity. In fact, You can even access a .onion link for Facebook, join book clubs, and enjoy free academic

publications provided by a plethora of institutions. Furthermore, a study by Terbium Labs has showed that nearly half of the activity on the dark web is legal (Help Net Security, 2016).



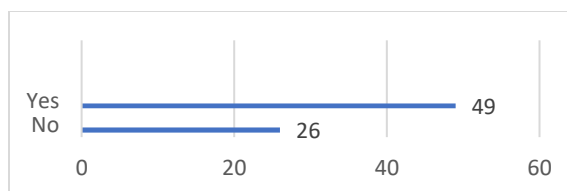
- e. Activity on the dark web is completely and 100% anonymous.

I was very surprised by the results of this question. While the dark web does provide layers of anonymity it is impossible to be completely and 100% anonymous on the internet whether you're on the surface, deep, or dark web.



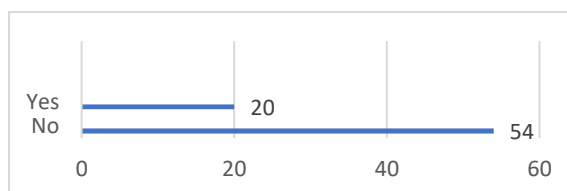
- f. I feel that I am more likely to be hacked while browsing the dark web than browsing the general internet.

49 participants felt that they were more likely to be hacked while on the dark web. It is certainly an interesting metric but statistically unlikely. The sheer amount of sensitive data that users have on surface web site such as financial, medical, or personal information far outweighs the amount on the dark web. Users are more likely to become victims of phishing attacks that lead to stolen information that will later be sold on the dark web than anything else.



- g. I believe that my life can't be affected by activity on the dark web.

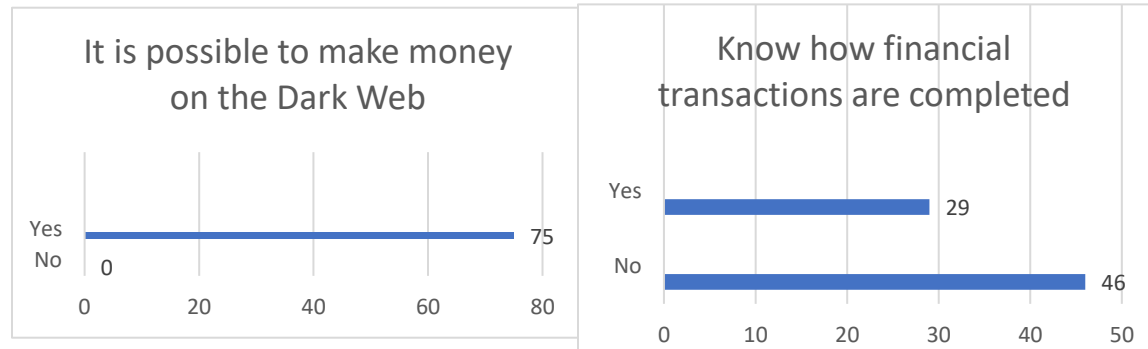
I used this question solely to discover how many participants feel that they are immune or set apart from activity on the dark web. I was surprised to see that 20 participants felt that they could not be affected by dark web activity. The truth is that no one is immune from activity on the internet. Regardless of what level of the internet you use, surface web or dark web, you are always at risk to be a victim. Anyone with personally identifiable information, financial information, medical records, or accounts of online services such as Netflix and Hulu are at risk of their information being compromised.



- h. It is possible to make money on the dark web.
i. I know how financial transactions are completed on the dark web. (i.e. what currencies are used).

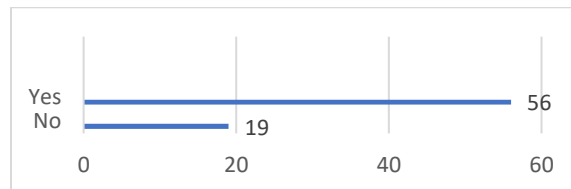
These were just two simple questions to gage participant knowledge on dark web financial activity. All users knew that it was possible to make money on the dark web due to the highly publicized marketplaces such as Silk Road and for-hire services available. It is no secret that there is opportunity for financial gain on the dark web. However, I wanted to see how many of these participants knew that bitcoin was the widely used currency on the dark web. 46 of these participants did not know. Not a

surprising result as many did not have much knowledge of the subject coming into the study. However, if it weren't for the dark web bitcoin would be all but a thing of the past (Malwa, 2018).



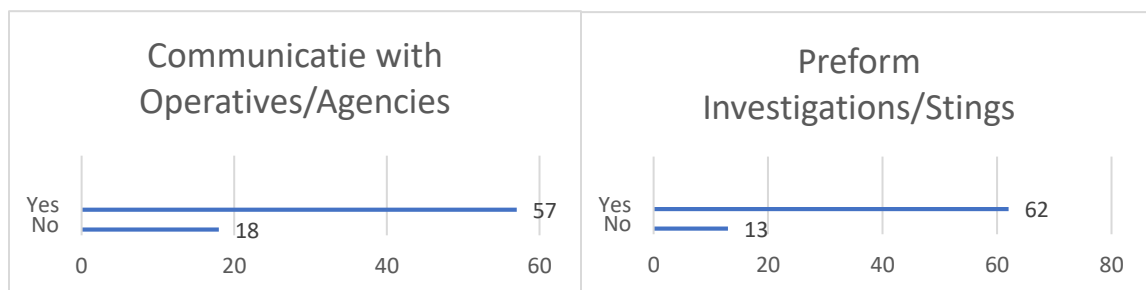
- j. What I know or have heard about the dark web scares me.

The results of this question are quite clear. The majority of respondents have knowledge of the dark web that can be difficult to digest. All of the sinister and illegal activity that the media and other outlets have portrayed of the dark web have certainly taken a toll on the public eye. However, the more interesting aspect of this question is the 19 people who don't seem to be affected by the dark web. Perhaps they do not feel that their lives could be affected by dark web activity or simply do not care.



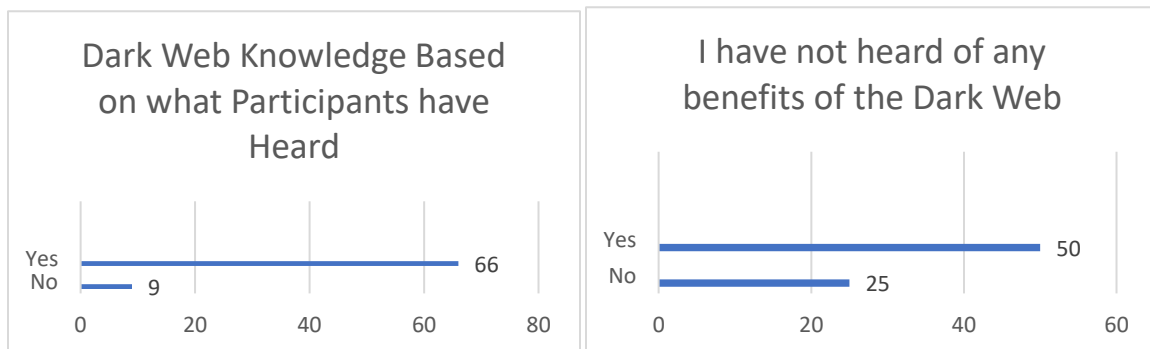
- k. Government entities use the dark web to communicate with operatives and other agencies.
- l. Government operatives use the dark web to preform investigations or stings on potential offenders.

Overall, participants seemed to agree that the United States government plays a part in dark web activities. After all, the Tor browser was developed by the US Naval Research Laboratory for open source intelligence gathering, communicating with deployed assets, bi-directional communication that can't be intercepted, etc (Mrs. Smith, 2011). It is true that governments of the world use the dark web to preform stings and carry out investigations as well. In fact, the dark web sites AlphaBay and Hansa were recently taken down by the United States and Dutch governments, respectively (Edwards, 2017). Therefore, I can presume that the majority of participants at least have some knowledge regarding the governments involvement in the dark web. To what extent remains to be seen.



- m. My knowledge of the dark web is primarily based on what I have heard regarding illegal activity.
- n. I have not heard of any possible benefits of the dark web.

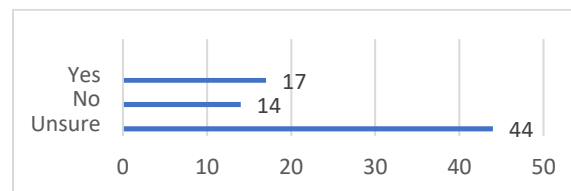
These results were not particularly surprising. Especially given the dark web's sinister portrayal by the media and news outlets. The media has continually given the dark web public scrutiny over red rooms, hit-men for hire, and many other acts of illegal nature (Ormsby, 2018). Media outlets such as CNN have even joined in to offer stories such as social security numbers belonging to infants being for sale on dark web marketplaces (Larson, 2018). It can be hard to justify the positive benefits of the dark web with stories such as these being run by media giants all the time. Therefore, the current public scrutiny of the dark web is understandable given its media portrayal.



o. Do you think the dark web should be shut down?

The results presented here are among the most interesting of the study. 44 participants stated that they are unsure if the dark web should be shut down or not. Additionally, 17 participants believe that it should be shut down and 14 do not. It was interesting to see such a divide amongst participants. Honestly, I did not expect the majority to be unsure of if the dark web should be shut down. There was a study consisting of 24,143 users in 24 countries conducted by the Centre for International

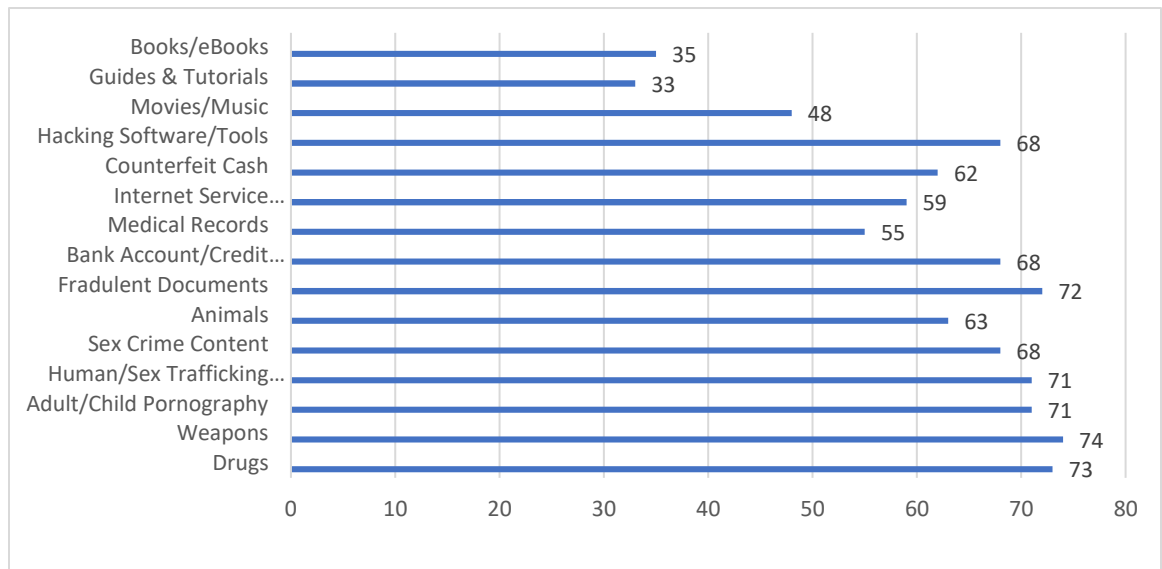
Governance Innovation (2016) that stated 71% of global citizens believe the dark web should be shut down. It was certainly interesting to compare the results of this question between the two studies. Clearly, there is a large portion of society with mixed feelings about the dark web. Hopefully studies like this and future ones may be able to provide a more vivid picture of the dark web and enhance society's understanding of it.



D. Dark Web Content Questions

- a. Which of the following items do you think can be found for sale on Dark Web marketplaces and forums? Please choose all that apply.

In one form or another each of these items listed for participants to choose from were found in research articles or practical sources as being present on the dark web. The top 5 were not surprising results (Weapons, Drugs, Fraudulent Documents, Pornography, Trafficking Victims). It was interesting to see how many participants felt that these illegal items were sure to be present on dark web marketplaces. One of the more interesting items was that 63 participants felt that animals could be found for sale on marketplaces. However, research suggests that animal traffickers haven't quite made the move to the dark web just yet (Matsakis, 2016). One of the more surprising results that this question yielded is that the majority of participants don't associate dark web items for sale with movies, music, books, or tutorials. In my own research, I found several marketplaces offering hacking guides, banned books, and bootleg movies and music.



- b. Which of the following groups of people do you think use the Dark Web? Please choose all that apply.

It comes as no surprise that most participants associate

Criminals/Cybercriminals, Government Agencies, and Terrorists with dark web

activity. These are some of the most publicized groups of people pertaining to the

dark web. However, it was nice to see that nearly 50 participants thought both

anonymity seeking users as well as privacy and security advocates use the dark web.

Especially since the dark web and Tor's main purpose is to provide individuals with

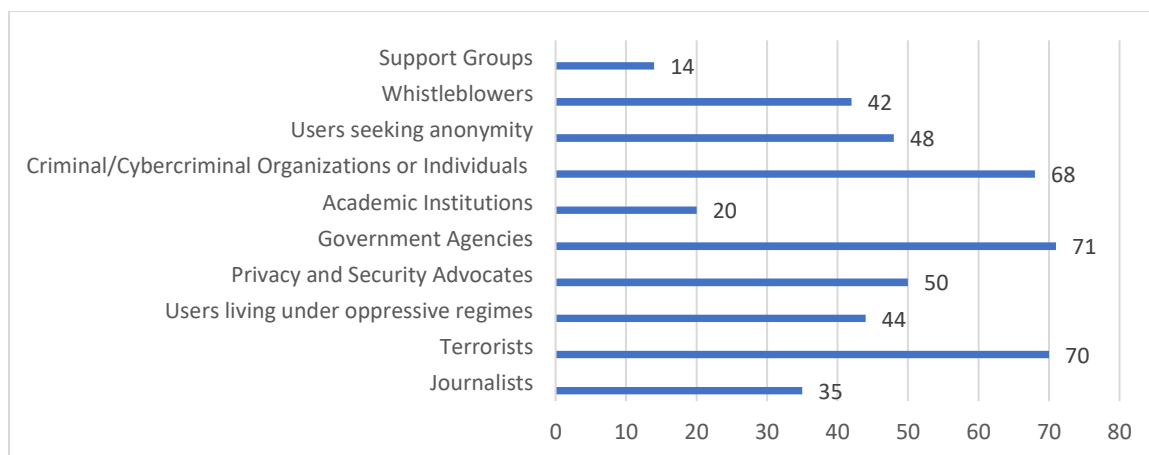
the opportunity to anonymize themselves. Additionally, an interesting metric was

that 35 participants felt that journalists use Tor. In fact, the Tor Project themselves

states that one of the primary uses of Tor is to give journalists the ability to reach

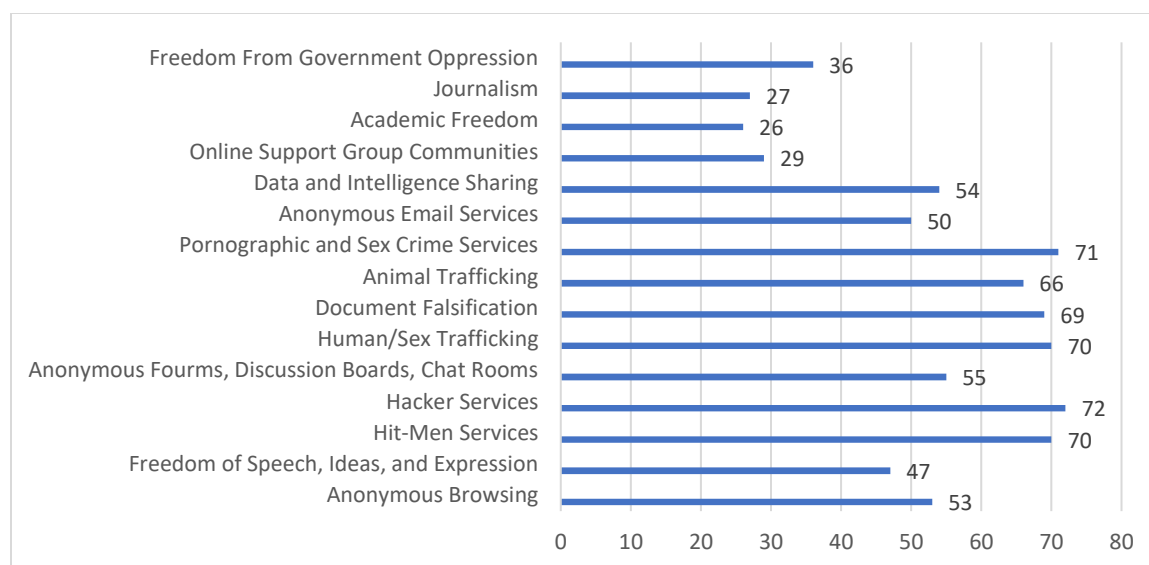
audiences they may not be able to and to protect themselves in countries who place

strict regulations on internet use.



- c. Which of the following activities or services do you think are available through use of the Dark Web? Please choose all that apply.

The results of this question are like that of the previous two. Most of the participants associated dark web services with Pornographic/Sex Crimes, Hacker for Hire, Hitmen for Hire, and Trafficking services. The results are quite straightforward. The participants of this study associate the dark web with illegal services more than anything else. Online support groups, academic freedoms, journalism, and government circumvention were all voted for by not even half of the participants. These results go to show that the dark web is primarily seen as an avenue for illegal activity instead of anonymity, censorship circumvention, and the protection of user privacy on the internet.



Demonstration Overview

The demonstration of this research study began by identifying 20 of the 75 participants of the initial survey. These 20 participants noted upon completion of the initial survey that they would be interested and willing to take part in an interactive demonstration of covering several dark web concepts. The interactive demonstration consisted of dark web marketplaces, sites, and technologies. The demonstration took users through the process, from start to finish, of securely accessing the dark web on a guided, yet interactive, tour of several marketplaces and websites.

On November 3rd and November 17th of 2018 a total of 20 participants convened at a neutral location to take part in an interactive demonstration covering several dark web concepts. As the moderator, the presentation equipment collected included a personal laptop, an HDMI cord, and a large flat screen television used as a projection medium.

To begin, I connected to the projection device and started a screencast for the participants to view. I then opened the Virtual Private Network (VPN) software, IP Vanish. After

logging into my account, I connected to a server in Sofia, Bulgaria. Furthermore, I took a moment to explain to the audience what a VPN is, how it works, and what its purpose is. Once I was securely connected to the VPN I could continue the demonstration by opening the Tor Browser installed on my computer.

The predefined list of websites that participants were brought to can be found in *Table 4*. Each visited website was thoroughly examined during the demonstration for its purpose, features, and content. Marketplaces and service websites were examined where products, services, and the process of purchasing or requesting service were inspected. Participants were given the opportunity to ask questions at any time during the demonstration and questions were answered as presented. As previously stated, this was an interactive process and users were highly engaged in conversation and discussion with the moderator throughout the demonstration. Users had the ability to steer the demonstration, with moderator discretion, into areas or topics that were interesting to the audience.

It should be noted that all websites visited both within the predefined list and those derived out of participant intervention aligned with the general categories listed in *Table 4*. All websites that contained or were suspected to contain pornographic, violent, or any legally questionable content were avoided. However, participants were made aware that these websites do exist and to consider the moral and legal implications of their nature.

Table 4: This table depicts the website names, their correlating .onion addresses, and site categories of the websites visited in the interactive demonstrations.

Website Name	Onion Link	Category
Silk Road 3.0	http://silkroad7rn2puhj.onion/	General Marketplace
Dream Market	http://t3e6ly3uoif4zcy2.onion/	General Marketplace

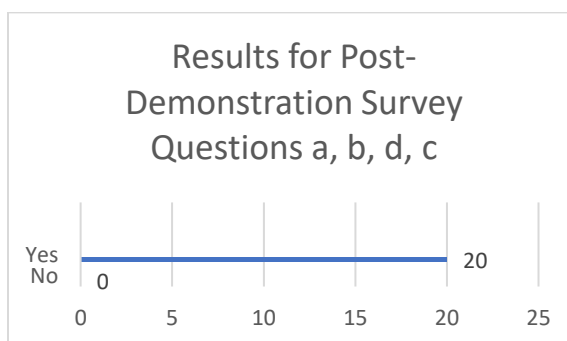
Hitman Connect	http://ygrqgcnoodnqdm1c.onion/	Hitman-For-Hire Service
Slayers	http://zy3dkytcaubkq2y3.onion/	Hitman-For-Hire Service
Hacker's Bay	http://zv2pk3rt7lspysus.onion/	Hacker-For-Hire Service
Deep Web Guns Store	http://armoryohajjhou5m.onion/	Weapons Marketplace
People's Drug Store	http://newpdsuslmzqazvr.onion/	Drug Marketplace
Auto Scan	http://scandgdp7ab2gaa.onion/	Document Falsification Service
Intelligence Buyer	http://rrydrab7aba7hilt.onion/	Data Dump Service
Hidden Answers	http://answerstedhctbek.onion/	Forum Service

Post-Demonstration Survey Results

- I feel that I have a better understanding of the Dark Web after participating in this study.
- I learned something from participating in this study.
- I intend on sharing this newfound knowledge with friends and family.
- After participating in this study, I feel that the general public does not understand the true scope of the dark web.

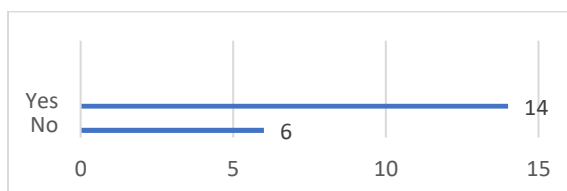
These results show that the original problem statement's goal has indeed been achieved. All users had felt that they came out of the surveys and demonstration with a better understanding of the dark web. Additionally, they all felt that they had learned something. As a researcher, it is my goal to bring a clear understanding and new knowledge to other through my work. Nothing is better than seeing your work reap beneficial results and create a more informed society. The participants also noted that they would be sharing some aspect of the study with friends and family. The act of sharing this information will go back to the spreading knowledge aspect of the problem statement. This study gave participants a unique view into the dark web that most users might not get by just reading an article or two on the internet. We were able to really dig deep into different topics and concepts of the dark web so it was wonderful to see that all participants in this study feel that the public doesn't have a grasp on the dark web's true scope. What I mean by this is that the participants are now more educated

on the dark web. Looking back on their previous perceptions, they are able to see that there is a much more to the dark web than what they previously thought and recognize most people may have no idea about these concepts.



- e. My perception of the Dark Web has changed after participating in this study.

The only question which participants were somewhat divided if their overall perceptions of the dark web had changed after the study. While 14 of 20 participants stated that their perceptions did change there were 6 who did not. These results don't necessarily diminish the effectiveness of the study. In fact, the 6 participants who did not have changed perceptions likely had very robust understandings of the dark web and the content available on it. I would say that these 6 participants provided a valuable contribution to this study by demonstrating a thorough understanding of the topics presented prior to the demonstration and initial survey.



Future Direction

The study allowed me to develop an in-depth understanding of how non-technical users perceive various dark web topics. I believe that this study could be used as a baseline or pilot

for future user awareness and education campaigns of the dark web. As technology becomes more intuitive and outreach methods become more widespread a study of this nature could be conducted to reach a much larger audience and have global impact.

Conclusion

Engaging in this project on user perceptions of dark web marketplaces and sites has been an incredible learning experience. I think that the results presented here have addressed the initial problem and goals of this project with smashing success. It has certainly been an educational and eye-opening experience for both the participants of this study as well as myself. The study allowed me to take my cyber hat off and look at this issue through the eyes of an individual not accustomed to dark web topics. Furthermore, I had the opportunity to engage friends and peers on this project. These interactions have allowed me to get a first-hand perspective on the impact this project has made on the participants. It was evident that some information presented was shocking and vastly informative to many these participants. The demonstrations allowed me to see the results of the study first-hand and the impact they made on the participants. I can successfully say that this study has indeed created a new knowledge base among many previously uninformed individuals that will surely foster the spread of dark web education and awareness.

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