Assisting Seniors with Technology Challenges:

Video Tutorials for Password Development and Management

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Abstract

Seniors often have difficulties using evolving technology while keeping their valuable personal data safe. This research effort began with assessing how and why seniors use technology and determining the best educational techniques to help them connect with instructional information. Additional research determined how design principles including layering and progressive disclosure could be applied to enhance these techniques. In an effort to maintain a manageable scope, password development and management was selected as an example technology challenge. The current state of training resources related to these topics on Facebook and YouTube was surveyed and analysis performed to determine if the design principles and instructional techniques discovered through the aforementioned research were evident. Good tips and tricks for strong password development were incorporated into the instructional design/development plan. A Facebook group and training videos were developed to facilitate assisting seniors with password creation and management.

Keywords: Seniors, Technology, Information Security, Passwords, Facebook, Videos, Progressive Disclosure, Instructional Design, Layering, Nudging, Training

Links to Developed Content:

Password Importance - https://youtu.be/i-YwiUeop0I
Password Do and Don't - https://youtu.be/C0ObTIOjFGk
Generating a Password - https://youtu.be/M1GKjsFdKHM
Introduction to Password Managers - https://youtu.be/qKkqfB1C72w
Diceware Applications - https://youtu.be/5OC90CnxGw0
Password Manager Overview – https://youtu.be/0beuukPOtRk
Tech Tips for Seniors Facebook Group - https://www.facebook.com/groups/1448870968778001

Assisting Seniors with Technology Challenges

Introduction

As technology has evolved and expanded over time, most if not all, of our social, transactional, informational, educational and entertainment interactions are conducted online. The digital environment has replaced the real environment for many of us; this having been expanded by stay at home orders imposed during a global pandemic. Businesses and services that once could safely remain brick and mortar adapted to remain relevant. As business models shift to respond to consumer and government driven safety concerns, less tech savvy consumers run the risk of being left behind.

Often these users are older and did not have the benefit of growing up with technology and its affordances. The use of computers, tablets and cell phones has become part of the fabric of daily life. Interacting with different websites and applications requires security and password use for identification and authentication. This has been expanded upon recently with the proliferation of multi-factor authentication and biometric protection.

Older adults already struggling with multiple log-in credentials find additional frustration with new security protocols. Developing a collection of step-by-step, visual instructions for commonly encountered technology tasks and safety measures is the first step toward educating seniors, or adults over 65 years of age, to facilitate internet safety. It is also necessary to provide seniors with access to these resources without adding to frustration with technology.

Designing an instructional flow that will be accessible, iterative and layered will help cement information security concepts with learners. Implementing a strategy that includes progressive disclosure and nudging in the context of a mental model may lead to positive outcomes in an older population. Using password development and management as an example,

this project will incorporate recognition over recall and chunking techniques to develop good safety strategies.

Project Objectives and Questions

The objectives of the research and literature review for this effort include answering the following:

- How do seniors interact with technology?

- How can we limit seniors are frustration with technology?

- What are the best educational methods to use to assist seniors?

Areas of Literature for Review

It is necessary to explore how seniors are using technology while considering how seniors access the internet, as well as what kinds of tasks they perform and why. Determining these data points will help to establish a foundation of knowledge of senior use of technology in general and the internet specifically.

The challenges we all face as technology evolves can be more difficult for some than for others. Determining which challenges create the most stress and potentially put seniors most at risk must be understood. Additionally, researching how seniors learn and retain knowledge will help to create a plan for the best methods of delivery to ensure positive learning outcomes.

Conducting research on these topic areas will create a foundation from which solutions can be built to solve problems some seniors, and others, face.

Anticipated Results and Obstacles

Seniors face challenges and frustration while following internet safety protocols like password strength requirements and multi-factor authentication. It is further anticipated that an effective way to address the information problem is to create visual, video-based media, which

will include a method to stop and playback with ease. Video learning tools should be accessible through a means that seniors are comfortable with to avoid adding additional frustration and stress.

Literature Review

Seniors often become frustrated with safety and internet security requirements. Determining how and why seniors use technology, which aspects of its use frustrate them and how best to teach seniors without adding additional stress could benefit this user group. This literature review will focus on the current knowledge base related to these topics in the hope of leveraging this information to create a video-based collection of tailored trainings for seniors.

Scope of the Effort

This review will explore how and why seniors use the internet, as well as some of the problems they face. The review will determine the best learning/teaching techniques to employ when designing and delivering training for seniors in technology security. This literature review will discuss the risk associated with weak or duplicate password use, and the challenges that strong password creation pose as an example of how improvements can be made to promote internet safety. The purpose of this literature review is to provide context for the hurdles seniors face while safely using technology to determine the best way to assist seniors with protection of their personal information.

Summary of Literature Review Findings

The summary of findings is organized by how seniors use technology, why they use it, and the challenges this demographic faces. Password strategies and managers are also discussed as an example of one challenge and its potential resolutions.

Use of Technology

The use of technology become part of the fabric of life, not just for user populations from younger generations who have effectively grown up with computers and smartphones. Seniors have had to adapt to the changing landscape through technology adoption. Jacobson et al. (2017) built upon Robert Taylor's work from the early 1990's as framework for understanding information use environments as applied to seniors. In 2017, they reported that only 27 percent of US seniors owned smartphones. According to AARP in January of 2020, "smartphone adoption is 86 percent among Americans age 50 to 59 and 81 percent for those 60 to 69. Meanwhile, 62 percent of those 70 and older use smartphones" (Kakulla, 2020).

While many studies have been conducted, these studies seem to focus on an often-narrow field of study. Researchers focus on a specific country or region and a small sample of individuals. Jacobson et al. (2017) explored mobile technology use in a single Canadian community over the period of several years. The research of Pikna et al. (2018) centered on 5 participants in Slovakia. Their qualitative study drew information from questions and discussion and concluded that adaption is more complicated for seniors (Pikna et al., 2018).

Jung and Sundar (2016) explored the use of social media sites, specifically Facebook, by seniors. They determined that seniors are motivated to use Facebook for social bonding, social bridging, curiosity and in response to family member requests (Jung & Sundar, 2016).

The study explored each of these uses and mapped the activities associated with each motivation. Social Bonding was associated with the most activities. It was also noted that the use of smart phones showed a positive association, implying that seniors that are more comfortable with technology may be more comfortable with social media. This comfort may be driven by a need to connect, particularly with family members from younger generations.

In addition, this study provides useful insights for the improvement of current social networking sites for use by older adults, by considering their needs and preferences. Importantly, we revealed the potential advantages of Facebook's current affordances in attracting the older adult population. This suggests that senior citizens' use of social network sites (SNSs) shows promise as an intervention for breeding greater connections with younger generations, given that the latter have spent more time with SNSs. (Jung & Sundar, 2016, pp. 32-33)

According to Statista, in January of 2021 only about 5 % of Facebook users are 65 years of age or older, with only a slightly higher use rate of women in this age group over men (Chen, 2021). These users, motivated by connection and other benefits, find their way using technology despite challenges and potential frustrations.

Social media applications lead seniors to the internet to connect and share with family and friends, often using mobile technology. The level of comfort they enjoy in these spaces makes the use of technology for other tasks, like banking, bill payment and shopping more likely.

Motivation

There is limited recent research discussing challenges and issues seniors face in regard to technology. Dominguez-Rue and Nierling (2016) provide insight on a variety of topic areas related to seniors and technology use. The E Book has a number of contributors and includes the following topic areas:

- Ageing, Technology and (Inter) Personal Development: Old Agers and Technology Users
- Ageing, Technology and Elderly Care: Assistive Technologies
- Policy Making and Discourses of Ageing

The articles attempt to review some technology uses by older people; explore how technology can benefit in elder care and discuss policy, decision making and how technology can level the playing field for individual abilities.

Articles with focused consideration of specific topic areas, address ageing and the use of technology from varying perspectives. In the introduction, Dominguez-Rue and Nierling provide insight, "In this context, it seems crucial to continue emphasizing that the decision to whether a technical solution in 'good or bad' can not be judged from the given technology as such: it rather concerns the question of how a technology is integrated in the social surroundings" (Dominguez-Rue & Nierling, 2016, p. 10).

This contextual reminder includes a discussion of how design and development can bridge gaps in usability rather than creating chasms.

Despite the undeniable reality that our lives are surrounded and supported by an ever-increasing amount of technological developments and that the ageing population represents an important niche in the technological market, many complexities arise when observing the development of everyday technologies addressed to the elderly and their end users, which are – at least partly – addressed in the first part of the volume, 'Ageing, Technology and (Inter-)Personal Development: Old agers as Technology Users'. (Dominguez-Rue & Nierling, 2016, p. 14)

This work explores interpretations of technology by older people, while considering behavior patterns and influencing conditions (Pelizaus-Hoffmeister, 2016, p. 27). The article describes Horning's four general models of orientation: Control Orientation, Aesthetic-Expressive Orientation, Cognitive Orientation and Communicative Orientation. The article continues to discuss the research methods employed and the questions asked to interpret how

respondents fit into types associated with models based partially on these orientations. The study found that older adults are motivated by many of these technology orientation models at the same time and to varying degrees.

> Another finding of the study is that with the use of technology, elderly are usually influenced by several motives simultaneously. For example, some elderly with high technical expertise use technology – in addition to supporting their daily work – as a means of increasing self-confidence, feelings of social affiliation, and social recognition. Avoiding the use of technology leads other elderly to an avoidance of technology-induced loss of control and the visibility of their lack of technical expertise, which contributes to their desire for 'invisible' technology. (Dominguez-Rue & Nierling, 2016, p. 43)

The article concludes that developing technology with the objective of providing seniors with the tools they need to be more independent should take motivation into account.

Challenges and Learning

Information and Communication Technologies (ICT) have been leveraged to assist ageing individuals with independence. In their 2015 article, ICT Learning by Older Adults and Their Attitudes toward Computer Use, Gonzalez et al. (2015) studied computer use and attitudes in seniors before and after a 20-hour basic skills course.

> This program was designed as a 20-hour course to learn basic computer skills, with 30 subsequent hours of tutorials to consolidate these skills, for a total of 50 hours. The program was specifically structured to be suitable for teaching older people and to address the basic knowledge of computers, files, the Internet, e-mail, chatting, and word processing. (Gonzalez et al., 2015, p. 2)

According to the article, the training program was broken up into 2-hour sessions and training manuals were provided. Surveys were conducted before the training to determine Background information and computer/internet use variables, as well as senior citizens' attitudes toward computers. Interviews were conducted after the course to determine why participants were interested in the course, what some of their challenges were and to capture any course improvement suggestions.

Based on the contributions of the older people who participated in the interviews, we can verify that learning how to use the computer and the difficulties it involves were an issue that manifested itself as significant in this context. Some of their contributions are identified as highlighting memory and mental agility, initiative or practice, and dedication. Moreover, participants felt that the difficulty using the mouse and keyboard or fear of breaking the computer is aspects related with the learning of how to use the computer. (Gonzalez et al., 2015, p. 4)

The study concluded that exposure to computers and technology positively impacted seniors' attitudes about their use. This appeared universally despite gender, socio-economic status or previous exposure.

A 2019 study on older adults and learning focused on instructor approach to assisting seniors in learning internet technology. "How to Help Older Adults Learn New Technology? Results from a Multiple Case Research Interviewing the Internet Technology Instructors at the Senior Learning Center" by Chiu et al. (2019) provides a summary of the results. The study explored topics including:

- Employment, adjustment, and revision of teaching strategies

- Course preparation, course design orientation, and the teaching behavior of the instructors in the entire teaching process

- Teaching strategies by instructors during the teaching process

- Documentation analysis of supplementary materials and multiple research data to map a real situation in the field at a senior learning center for internet technology

Observations, interviews and material review was used the determine the results of the study. The six participants agreed to be recorded for the purpose of the study.

It was found that when teaching internet technology classes, instructors face challenges due to the different levels of ability with internet technology and challenges in teaching older learners related to age. Instructors use their own methods to convert these challenges into opportunities by developing different teaching strategies as coping methods when teaching older learners, which include: 1) reserved teaching, 2) unscripted performance, and 3) assistance from peers. (Chiu et al., 2019, p. 68)

Maintaining a learning environment that is familiar yet flexible was key to older learner's success. It was also found to be beneficial to include teacher aids/peers to assist learners and lighten the teachers load.

It is clear that different challenges and in turn different solutions are required for seniors as they learn how to interact with technology. Routine exposure, repetitive direction and flexibility and patience in teaching style are all methods that should be employed for success.

Users in general have to adapt to the changing landscape of technology and seniors are often faced with unfamiliar tasks meant to protect their personal data, but instead can reduce use of internet technology or increase unsafe practices. The use of strong passwords and multi-factor authentication are examples of new requirements that may seem daunting to seniors.

Password Strategies

In their article, Yildirim and Mackie (2019) study how password guidelines and suggestions may increase security in password creation over traditional password policy rules. The study states that authentication is an important aspect of security, offers the premise that passwords should be easy to remember but hard to guess, and acknowledges the risk associated with weak passwords.

Policies often drive password creation and dictated by administrators responsible for system security. "Password restriction policies are a series of rules which determine the content and format of the passwords accepted by an authentication system. These policies are used by system administrators to enhance computer security by guiding users to create more secure passwords" (Yildirim & Mackie, 2019, p. 744).

Users must comply with these rules and requirements before they are granted access. Yildirim and Mackie (2019) discuss the password advice provided by these systems and report that at times this advice conflicts with the requirements or is ambiguous or unhelpful. The advice explored included:

- mnemonic passwords

- password chunking

- password strength meters

Yildirim and Mackie (2019) further discussed memorability and system assigned vs. user chosen passwords. The trade-off of higher security found in system assigned passwords and the ability for a user to remember without assistance was acknowledged.

During the study two websites were created to collect data. The control group was provided password creation rules while the experimental group was provided with a message

attempting to persuade users to create a strong password and providing password composition methods.

> The password guideline of the experimental group was framed using logical reasoning by providing explanations such as the fact that if users create weak passwords for ordinary websites, a crafty hacker can obtain that password easily. If using the same or similar password is the user's habit, it would not be difficult for the hacker to guess the other passwords created for important accounts such as bank account. (Yildirim & Mackie, 2019, p. 747)

Ultimately the study concluded that users who were persuaded and given guidance on strong password creation created stronger passwords. This method could be applied to seniors to assist them in creating passwords that will protect their information. Understanding why passwords are important and how to create strong passwords may facilitate a positive attitude about this topic and a willingness to learn.

In "Nudging with Construal Level Theory to Improve Online Password Use and Intended Password Choice," Kaleta et al. (2019) test a new nudging technique to determine if it will help induce people to create stronger passwords.

> We theorize that a high construal level of creating a strong password induces online users to focus more on the desirability features, or the prolonged utility of creating a strong password (why aspects) than the feasibility of creating a strong password (how aspects) which is concerned with a low construal level, considering the instantaneous utility of creating a simple password for the here and now. (Kaleta et al., 2019, p. 997)

Three experiments were conducted to determine the effects of construal level on password development. In the first experiment, participants were asked to write down the

reasons they use strong passwords and how they develop those passwords before creating a password for an online purchase. The second experiment expanded the study to include the use of password management software. Each of these experiments reinforced the belief that higher construal level results in stronger passwords. Experiment 3 focused on construal level and perspective. The perspective they selected was that of an IT security manager. Participants were provided with instructions and information as well as being asked to complete a questionnaire after reading the material. It was determined that perspective augments the high construal level and further influences password strength. "Stemming from these results this research offers the implications that a person's level of construal influences their password creation behavior, which can be augmented through perspective taking, when individuals act of those desiring more secure passwords" (Kaleta et al., 2019, p. 1009).

This manipulation of construal level has the potential to help seniors develop passwords that are strong. Providing an understanding of why and how passwords should be leveraged will help seniors connect with internet security tasks.

Another way to help seniors create strong and memorable passwords is to provide them with Mnemonic password strategies. Research conducted by Ye et al. (2019) discussed the balance between password strength and memorability is explored. Types of mnemonic passwords include:

- sentence substitution

- keyboard change

- using a formula

- special character insertion

Table 1 was provided to describe password generation using these methods.

Table 1. Mnemonic Password Creation Tips (Ye et al, 2019, p. 44)

Table 1 – Mnemonic password creation tips		
Tip	Short Description	Exact instruction given to users in the study
SenSub	Sentence substitution	1.Select a memorable random sentence that is meaningful to you, for example, the sentence you choose is "*I went to Hong Kong four and half years ago.*" 2.Replace each word of the sentence with a letter, digit, special character, or a word. A common way is to use the first letter of the work instead of the word. If we take the following way to replace each word in the sentence, I=>I, went=>went, four=>4,and=>&,half=>h, then concatenate them to forms a password: IwentHK4&hya.
KbCg	Keyboard change	1.Select a basic password that you think is easy to remember, such as, "*helloworld*". 2. Move the finger on the keyboard to the upper left when inputting the password to get a final password: y3oo9294oe.
UsForm	Using a formula	1.Select a formula that you are familiar with, such as, addition formula. 2. Choose a few digits to calculate your password. For example, we choose the additional formula of 2,5,3,two+five+3=10, then the password is two+five+3=10 or two+five+3=ten.
Spins	Special character insertion	1.Select a basic password which is memorable, such as "Helloworld". 2.Use a memorable method to divide it and insert several special characters to form a password, such as, a password is: He,llo&&world!.

The study compared the strength of passwords generated under these techniques. Under unknown attacks, we compared the security of passwords created by the 4 tips with the passwords in the 178 dataset and phpBB dataset, and found that the 4 tips passwords have a higher strength than the control groups passwords. Among the 4 tips, the strongest password distribution is generated by using UsForm. Under known attacks, we found that using SenSub properly can create a more secure password, which are stronger than the other three tips. (Ye et al., 2019, p. 49)

Leveraging these style of mnemonic passwords to assist seniors with password generation may help to create more memorable and more secure passwords in this population of

users. Designing a teaching tool that informs users about these strategies would help seniors

generate secure passwords.

Password Managers

One strategy being used to maintain strong passwords without having to memorize them

is to use a password manager. A password manager is an application that stores login credentials

in one place, protected by one strong password. In "Password Managers – It's all About Trust

and Transparency," Alodhyani et al. (2020) investigate why password management applications

do not enjoy a higher rate of adoption and use. They compared three password managers and on

the basis of interface, usability and user experience.

Three password manager applications were evaluated in the study based on Neilson's 10

principles, developed in the 1990s as guidelines for interface design. Table 2 provides an

overview of these principles.

Table 2. Overview of Neilson's Principles (Alodhyani, 2020, p. 5)

Visibility of System Status	The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
Match Between System and the Real World	The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
User Control and Freedom	Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.
Consistency and Standards	Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.
Error Prevention	Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.
Recognition rather than recall	Minimize the users's memory load by making objects, actions, and options visible. The user should not have to remember information form one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
Flexibility and Efficiency of use	Accelerators---unseen by the novice user---may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.
Aesthetic and minimalist design	Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.
Help Users Recognize, Diagnose, and Recover from Errors	Error messages should be expressed in plain language (no codes), precisely indicate the problem and constructively suggest a solution.
Help and Documentation	Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

A sample of users were given tasks and surveyed on the basis of those tasks to determine

the usability of the LastPass password management application. Additionally, an online

questionnaire was distributed to a wider user base to expand demographic coverage of surveyed

users. This also expanded password manager review to include Dashlane and Keeper. The study

reports on the positive application of Neilson's principles as well as violations of them. Overall the study determined that usability could be improved.

> However, based on the findings of heuristic evaluation study (Section 4.1.2), cloud-based password managers should reduce the complexity of their design because the more features they have, the more complex they become; thus users, particularly non-experts (novices), will find it hard to use and adopt them. (Alodhyani et al., 2020, p. 36)

Usability issues were minor and not the only issue presented by this study. Interview questions provided an open-ended opportunity for users to discuss password manager concerns.

> Additionally, we asked the participants if they would trust the browser extension to fill in passwords on their behalf, nine non-users and two users did not trust the browser extension to fill in passwords, so we can see that more non-users do not trust the extension to fill in passwords. A few participants who answered "No" said they would not trust the browser extension with financial accounts and would not use it for all websites. Likewise, other participants stated that they would not trust it because somebody else might use the browser and they would not trust the computer. (Alodhyani et al., 2020, p. 19)

Respondents went on to report that they would not trust password managers with all their passwords, citing banking information as an example. Additionally, concerns were raised that the password manager would delete their passwords and they would be lost. "The majority of users and all non-users do not trust password managers to store all their passwords or to delete passwords permanently from their databases, which means that both groups have a lack of trust in password managers" (Alodhyani et al., 2020, p. 20).

While the study concludes and advises that enhanced transparency in the functionality and security of password managers is necessary to expand their use by individuals, it offers no path forward for how this should be done. Educating users in how password managers work, and their benefits and risks could help increase adoption and in turn increase user password strength and security of data.

Methods

Seniors must be motivated and engaged with technology to have a positive attitude from which to learn good techniques for safety and security. Explaining the why and how of password generation, for example, will help individuals create stronger protections. Understanding what password managers do, and how they do it, might increase user trust in those applications. Education is a key to understanding. For seniors that education should embody that understanding and incorporate design principles like nudging, iteration, progressive disclosure and layering to help facilitate success. Training videos should be accessible to seniors in an internet environment with which they are comfortable and should focus on recognition over recall through the visual platform.

Requirements are a cornerstone for success in any project's execution. If there is no solid basis from which to develop a plan that will ultimately meet the needs of its target audience success is unlikely. This project is not based on user feedback or request. The literature review conducted did not provide a concrete list of the things related to technology that seniors most want to learn. Without this foundation, it is necessary to infer requirements based on anecdotal experience, qualitative results from the literature review and a general knowledge of the changing scape of technology.

During the literature review, password development and management was used as an example of one topic that seniors found frustrating and could use assistance with navigating. This topic area can be broken down into several requirements sets to show an example of how topics can be organized into requirements and incorporated into design and training video development.

Functional requirements are the necessary aspects of a design that facilitate usability and positive user interaction. Meeting these requirements ensures that system behavior is intuitive and easily achieves results. The following provides a list of the functional requirements of training videos to assist seniors in learning how to perform tasks using technology:

- Training videos should be slow paced and conversational.

- Large topics should be broken up into overlapping chunks of information.

- Visual recognition should be highlighted.

- Training videos should build upon previous sessions and repeat relevant information.

- Videos must use common pause and play interfaces that are standard and recognizable.

- A method for feedback must be included.

Non-functional requirements contrast functional requirements and specify the criteria against which a design is judged. These requirements make the user's experience pleasant, help to make the information palatable, and in the case of educational videos, help the user to retain critical information without distraction. The following provides a list on non-functional requirements:

- Videos must be accessible.

- Training resources must be easy to find more than once.

- Training videos should be viewable on a computer or on a handheld device.

The design of these training is based on meeting the functional and non-functional requirements. Design decisions consider these aspects while developing the design plan.

Research and Planning

After determining to requirements that the videos should meet, it is necessary to research the current offerings available on the internet. Searching Facebook and YouTube will result in an understanding of the current video libraries. An analysis of these offerings helped to develop a list of positive and negative characteristics, as well as any gaps that may exist.

Upon completing this review, a series of videos were created that focused on the best ways to provide information to seniors and incorporated accepted instructional design principles. The initial effort focused on password development and management.

Instructional Design

Reinventing a design to meet non-functional requirements is not necessary if existing and accepted tools and interfaces are leveraged. Seniors occupy the same online spaces that many of us inhabit. While a smaller percentage of users on Facebook are older, there is a presence, primarily due to the desire to connect with family and friends. The integration of YouTube videos with Facebook platform, makes delivering videos in an accessible manner seamless. A Facebook group for technology tips will be created to make training videos readily and routinely accessible to seniors. The YouTube video playback interface is standard and recognizable; making it easy for anyone to use. Creating a visual model of the YouTube video playback interface as an infographic will also reinforce recognition and provide an easy reference if needed.

Figure 1. YouTube Button Controls

According to Lidwell et al. (2003), "Recognition memory is attained through exposure, and does not necessarily involve memory about origin, context of relevance. It is simply memory that something (sight, sound, smell, touch) has been experienced before" (p. 200). Using familiar interfaces that call back to universally accepted buttonography, will limit distraction from the learning process.

The use of an accessible interface that needs no modification for a specific user group if discussed as a design principle. "The principle of accessibility asserts that designs should be useable by people of diverse abilities, without special adaptation or modification" (Lidwell et al., 2003, p. 16). Applying this design principle, as well as recognition over recall, through the use of established resources will meet the nonfunctional requirements of this project.

It is necessary to break up topic information into smaller more digestible concepts. Incorporating design principles like progressive disclosure, iteration and layering will help viewers learn and retain technology tips and internet security practices.

Progressive disclosure is defined as involving the separation of information into multiple layers and only presenting that are necessary or relevant (Lidwell et al., 2003, p. 188). Implementing this design principle will allow viewers to process only the information specifically relevant to the topic at hand. This layering of information has its roots in another design principle. Layer is defined by Lidwell et al. (2003) as, "Organizing information into related groupings and then presenting or making available only certain groupings at one time."

(p. 146). These principles can further be applied in an iterative approach. Iteration is the process of taking complex topics and breaking them down to build sequentially upon each other. "In design, iteration allows for complex structures to be created by progressively exploring, testing and tuning the design." (Lidwell et al., 2003, p. 142).

Additional principles related specifically to educational design focus on the cognitive theory of multimedia learning (CTML) and explore effective learning from digital materials (Edyburn, 2015, p. 111). The multimedia principle is described as coupling words and graphics to create a more effective message; the contiguity principle expands upon the multimedia principle to stress proximity of words to their corresponding images. The coherence principle warns against too many distractions drawing attention away from the learner. The modularity principle suggests that the combination of graphics and audio is more effective even that images with accompanying text. The redundancy principle warns the designer to avoid text and audio simultaneously (Edyburn, 2015, pp. 111 – 112).

The design of this project's set of training videos will build upon content, as well as implement user/viewer feedback and validation to continue developing and improving material delivery. The videos will contain a combination of text and visual or audio/visual without overloading the viewer and creating distractions.

Training Video Development Plan

The training videos will be housed within YouTube and accessible through a Facebook Group. This delivery method seeks to provide information in an environment that is already used and accessible to seniors. The recognizable interface will keep the focus on the material rather than trying to figure out how to find or view the content.

The topic area for the initial video offerings is password development and management. These two broad topics will be broken up into smaller chunks of data resulting in short concise training videos. The following provides the breakdown of topic areas into specific video titles and topics.

Password Development

- Password Importance - Discuss data protection, identity theft and that strong passwords are the best way to prevent these occurrences.

- Password Do's and Don'ts - Re-emphasize importance of strong passwords; do not use the same password for multiple sites, don't use name/age/address/pet information, do make it easy to remember but hard to guess; provide an example.

- Generating a Strong Password - Start with the example from previous session; discuss what mnemonic passwords are, show examples (whiteboard); reinforce difference between weak and strong passwords.

- Using a diceware application to generate a random pass phrase – This builds upon the password creation video by walking the viewer through using a diceware application available online.

Password Management

- What is a Password Manager? - Application, usually a browser plug-in (explain this) that stores your passwords for use on the sites for which you have log in credentials.

- How can Password Managers Keep You Safe? - Encryption at rest, encryption in transit, explain these concepts.

- Password Manager Demonstration - Walk through adding a site with username and password, launching from the manager interface, browser plugin and discuss encryption.

Overlapping the concepts and developing short videos that cover topics that build upon each other will make the content resonate with viewers. Each video will open with an introduction. Visual images from or in support of the videos will be provided on the Facebook group page for reference.

Project Outcomes

The first step in creating videos meant to help seniors tackle technology challenges is to survey the current offerings available. In conducting Google and Facebook searches it was discovered that this broad topic resulted in different styles and delivery of videos. Some focused on how to teach others; some leveraged screen share capabilities, and some simply featured conversational discussion.

Considering the studies conducted on learning and seniors, the best way to deliver information technology to this group is by using a slow-paced, conversational style that focuses on why things are important and relies on recognition over recall. Covering one topic at a time and building upon concepts through layering and progressive disclosure will increase the chances of success and information retention. The current videos available were evaluated through the lens of these design principles and the knowledge presented through literature review.

Current Video Resources

A series of searches were conducted to establish the current state of training videos available on YouTube, specifically. This search was also conducted using Google with modifications made to the search scope. Finally, a search of Facebook groups was performed to see what groups were available for seniors interested in learning technology tips and tricks.

YouTube Search of Seniors and Technology

The first video encountered through a YouTube search was Costa's 2018 video titled, "Technology Senior Citizens Should Learn to Use," Costa does not seem to be talking to seniors but rather about them. The video is over twelve minutes long and covers a wide variety of topics. The video does not feature any examples or visuals, just Mr. Costa speaking directly to the camera.

A not-for-profit group called Cyber-Seniors Corner offers a wide range of subject matter targeted directly to seniors. The Cyber-Seniors Corner has an expansive YouTube environment with a variety of different topic areas covering everything from meditation to record disposal. This particular video focused on passwords including covering password managers and what they do. The video had a good slow pace but was really long at 28 minutes. The video included a LastPass Demo around the seventeen-minute mark.

These noteworthy examples had aspects that embodied the design principles and senior learning needs discussed previously. Several other videos were reviewed, and many were focused on teaching others to teach seniors to use technology, employing a train the trainer model.

Google Search How to Create a Strong Password

Migrating to a Google search resulted in more results. In a 2017 video presented by ESET, strong password development was the focus. The video presented password strategies on a whiteboard and moved through the material quickly. The fast pace of the delivery may not suit older adults. Additionally, upon reviewing some of the feedback in the comments, several people indicated that implementing techniques like replacing letters with numbers is not the best way to prevent hacking, as hackers are very aware of this strategy (ESET, 2017).

Reviewing the more recent, "How to make a Strong Password" by CyberNews (2020) added the strategy to include emoticons in a password. The provider spoke at a rapid pace spent a considerable amount of time on what makes a password bad or insecure. She also covered password managers, so while the topics were all related and video was relatively short at 4 minutes, a lot of information was discussed at a fast pace (CyberNews, 2020).

DPC Technology (2020) also covered password development and highlighted the use of use of diceware to create a strong master password and then discussed using a password manager. Several topics were covered sequentially within a 6-minute time frame (DPC Technology, 2020).

"How to Choose a Password" by Computerphile (2016) had a different tone. The presenter might turn off some viewers as his perspective seems to be from an information technology professional who is very knowledgeable about his topic areas. Viewers were reprimanded for using bad passwords, one example provided was substituting numbers for letters as a negative strategy. The presenter contends that using four words that are unrelated with spaces is pretty good but still may be suspectable to a dictionary attack. He urges novices to be careful about picking common words. He further recommends that adding an underscore or ampersand in the middle of one of the words is even more secure (Computerphile, 2016).

Facebook Groups

A search of Facebook groups was conducted to determine what resources are available in the Facebook communities to assist seniors with technology challenges. There were several sites geared toward the senior demographic and also several sites that were focused on technology help for users. Additional sites might exist but might not be available to the Facebook search engine if they are set to private and hidden.

One site, Seniors and Technology is open to the public and has a membership of about twenty-nine people. Allison (2018) posts videos about a wide range of topics, including internet security. He also has videos about computer dusting and using Twitter. His topic offerings are varied, but his videos are consistent. His pace is slow, and he is conversational. He also shares other images and videos on topic and of interest (Allison, 2018).

After these search results were concluded, a Facebook group was created called Tech Tips for Seniors. The group is private, and membership will be managed through the Facebook member approval process. Videos and images are added directly to the group, rather than linking out to YouTube or another platform. This is intended to keep users in one place for trusted content.

Video Offerings

Development of the videos primarily followed the video development plan with some minor variation. An additional video was added to display the use of a dice roll application to develop a passphrase for modification and use in password development. All videos stayed with a two-minute time frame and covered specific topics meant to build upon each other.

- 01 Password Importance – This video discussed the importance of having a strong password and provided high level advice about what makes a password strong. Following the findings of Yildirim and Mackle, this video explains why passwords are important, rather than just talking about password rules (Yildirim & Mackie, 2019, p. 747).

- 02 Password Do's and Don'ts – This video incorporated a whiteboard to add a visual element to the video. In addition to the password advice displayed on the whiteboard, an image was also created for easy reference on the Facebook page, as seen in Figure 1.

Figure 2. Password Do's and Don'ts

Good Passwords (Do's)	Not so Good Passwords (Don'ts)
Easy to remember but hard to guess	Don't use personal information like your name or date of birth
Meaningful to you	Don't just use something random that you won't remember
Only used once	Don't use the same password on multiple sites
Upper- and lower-case letters	Don't use words everyone knows you like – for example, a pet's name or nickname
Add numbers and special characters ($#@&*!)	Don't use "password" or "qwerty12345"
Should be at least 12 characters long	Don't write your passwords down or store them in a place that can be accessed by others

- 03 Generating a Password – This video reinforced the password advice from the previous video and built upon it by creating an example password. The steps used to generate the password were displayed on the whiteboard and the process was described in detail. An image was taken to add to the Facebook group page as well so that viewers do not have to watch the video to reference the information, as depicted in Figure 2. The use of passphrases (DPC Technology, 2020) and adding special characters (Computerphile, 2016) were incorporated into this password generation methodology.

Figure 3. Password Generation
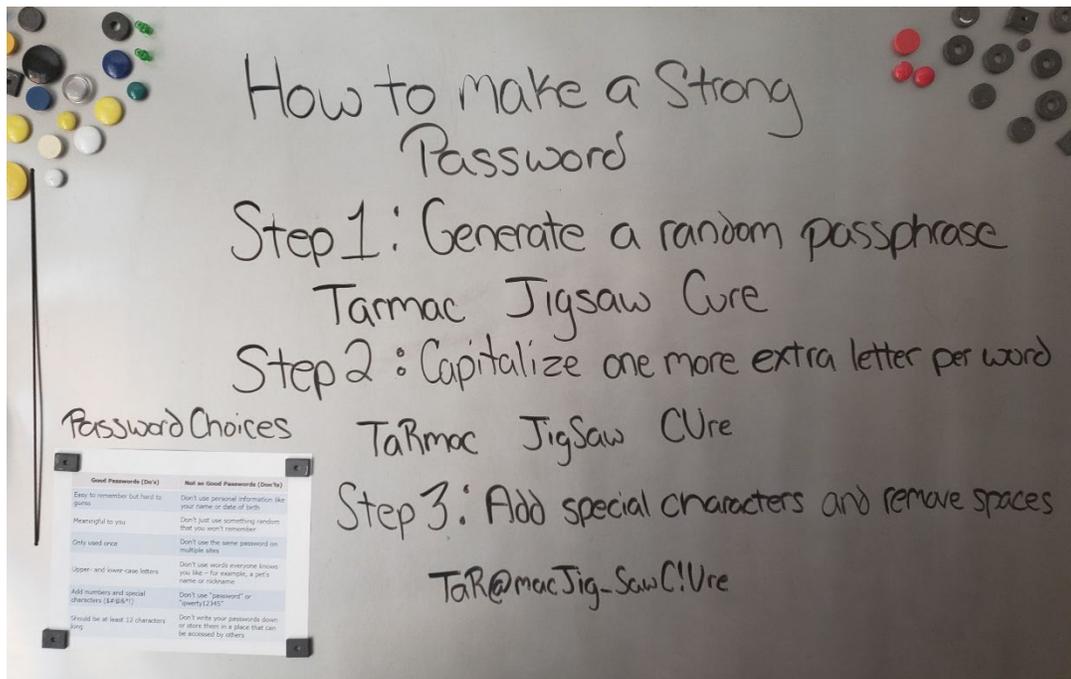
- [04 Introduction to Password Managers](#) – This video focused on introducing seniors to password manager applications. One aspect that was discussed was encryption and how that protects data both at rest and in transit. This was discussed in response to findings that seniors do not trust password managers (Alodhyani et al., 2020, p. 20).

- [05 Diceware Applications](#) – This video uses screen recordings rather than a whiteboard or just a person talking to the camera. Since Diceware applications were discussed in the Generating a Password video, this short video was added to show a user how to find examples on the web and use them for passphrase development.

- [06 Password Manager Overview](#) – This video provides an overview of the LastPass password management application. It covers the general interface, how the plugin to the web browser behaves and shows a user how to add a site.

Conclusions and Future Outlook

The literature review leverages research in how and why seniors use internet technology, as well as how best they learn about technology topics and uses against challenges we all face in the context of internet security. These resources provide a launch point for the generation of training videos to assist seniors, and in fact any user, with technology challenges.

The training videos developed for this project are one example of how progressive disclosure, layering and recognition over recall can be leveraged to create learning resources for seniors. Additional topics can be explored, and this premise can be built upon for other technology challenged that seniors face. Providing consistency, predictability and an explanation-base teaching style, delivered in a slow-paced tempo, will help to foster success.

Leveraging Facebook groups to deliver technology tips to seniors is an interactive way to assist individuals with internet security and other skills. The interactive nature of Facebook is anticipated to help create a bi-directional environment where members can ask for help and videos or images can be created to meet their needs. Building on the example of password development and management will serve as a launch point for additional resources. Password security is fundamental in prompting internet safety, but there is no shortage of topics that can be explored. Seniors know best what they need and will find useful. The next step in this research and implementation project is to launch the site, develop a member-base and illicit feedback.

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Vita

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