Human Factors Cybersecurity Engineering: Inclusive Design through Social Science

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Assignment

Select a type of cybersecurity career and write a two-page paper describing how professionals in that career require and depend on social science research and social science principles in those careers. Pay specific attention to the key concepts learned in class and demonstrate how those concepts are applied in the career you selected. The focus should be on demonstrating how the material from class relates to cybersecurity professionals' daily routines. Specific attention should be given to how careers relate to marginalized groups and society in general. Students should use at least three reliable sources to write the paper.

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Human-enabled errors cause 95% of cybersecurity incidents (pp. 71, 82), revealing that human factors are underappreciated with society's overreliance on technology (Nobles, 2018). Human Factors Cybersecurity Engineers (HFCEs) design secure, accessible digital systems and assistive technologies (ATs) by integrating social science to understand user behavior. That ensures technology serves all people, including marginalized groups like older adults and people with disabilities. HFCEs use principles such as self-efficacy, risk perception, human-computer interaction (HCI), and human-centered design (HCD). Those principles help guide HFCEs' efforts to bridge the "Digital Divide" for vulnerable parties, making systems usable and equitable for specific groups of people without digitally excluding others. For example, HFCEs empower vulnerable users in a digital-first society by addressing older adults' fears of succumbing to cybercrime (i.e., phishing emails, phone scams, and ransomware campaigns) and accessibility barriers for people with disabilities (i.e., visual, hearing, and motoric impairments). This paper explores how HFCEs apply social science in daily routines to enhance security, fostering societal inclusion and trust (Wu et al., 2015; Ellefsen & Chen, 2022; Renaud & Coles-Kemp, 2022).

Social Principles & Application

HFCEs rely on social science to create inclusive networks and systems. Self-efficacy, the confidence to master technology, is vital for older adults who fear social isolation without digital skills. Wu et al. (2015) discovered that training boosts their curiosity and engagement, guiding HFCEs to design empowering interfaces, like simplified login protocols, navigation processes, and password management (p. 196). Risk perception also shapes security interactions; Ellefsen and Chen (2022) note that older adults distrust online services because of scam risks and require more

explicit privacy cues (pp. 203-205). HCI ensures accessibility using unique visual and auditorial cues: Renaud and Coles-Kemp (2022) highlight how complex website entry and account login CAPTCHAs exclude people with visual impairments, prompting HFCEs to reduce and simplify cognitive load (pp. 2, 5, 8, 10). Some other ATs for older adults and people with disabilities include screen readers, speech-to-text software, voice-activated assistants, wearable health and fall detection monitors (i.e., Lifeline), mobility aids with smart technology (i.e., canes and wheelchairs with sensors), hearing aids with Bluetooth connectivity, medication management devices, and smart home systems with mobile app connectivity, and cognitive training apps. It is straightforward for HFCEs to implement these practical, psychological, and sociological principles; however, they and technologies require continuous user research to address society's evolving technical needs, ensuring modern-day technology aligns with diverse cognitive and physical capacities.

Daily Routines

In daily routines, HFCEs apply these principles through targeted tasks. User testing, informed by Wu et al. (2015), reveals older adults' anxiety about technology, leading to tests of intuitive designs that combat loneliness, technical ineptitude, and lack of threat actor awareness (pp. 194, 196-197). HDI interface design addresses privacy concerns; Ellefsen and Chen (2022) show older adults struggle with cumbersome and complex passwords, prompting HFCEs to develop streamlined biometric authentication protocols, password management applications, and integrative web extensions for them to use (pp. 204-205). Prototyping also enhances accessibility: Renaud and Coles-Kemp (2022) recommend using text-to-speech login protocols for people with visual and motor impairments, refined through threat modeling and iterative trials (p. 3, 10). These tasks help reduce human errors tied to mistrust or inaccessibility. However, their success depends

on the tactical empathy and technical adaptability of HFCEs to ensure systems balance security with usability for diverse populations.

Societal Influence & Impact

HFCEs shape the digital world for older adults, people with disabilities, and society. They have a direct influence on and help shape how the public safely operates information and communication technologies (ICTs), including mobile devices, the internet and web browsers, email and messaging services, social media platforms, video conferencing tools, online service platforms, wearable devices, and search engines and digital assistants. Older adults seek digital inclusion and fear being left behind by society—particularly among their family, friends, and close peers—while recognizing they are more vulnerable to scams and cybercrime precipitation. Wu et al. (2015) emphasize their desire for connection, inspiring HFCEs to design phishing-resistant apps and supporting Gerontechnology for independent living (p. 196). Ellefsen and Chen (2022) highlight cybercrime fears, like identity theft, leading HFCEs to better secure banking interfaces using accessible biometrics and Multi-Factor Authentication (MFA) (p. 206). To combat digital exclusion, people with disabilities like visual or hearing impairments benefit from accessible authentication using unique visual and audio prompts (Renaud & Coles-Kemp, 2022, p. 205). HFCEs' efforts empower users to access healthcare and finance safely, foster technical knowledge, raise self-confidence, and broaden societal equity. Adopting inclusive designs can help reduce vulnerabilities, strengthen society's trust in digital systems, and reduce risks to threat actors.

Final Remarks

In conclusion, HFCEs harness social science to craft cybersecurity policies, protocols, and software that empower older adults and people with disabilities to remain confidently relevant in today's modern digital-first world. Self-efficacy, risk perception, HCI, and HDI enable designs to help bridge the digital divide, ensuring technology is secure and accessible. By focusing on and addressing accessibility gaps, HFCEs promote a productive and equitable digital society where all users can engage the digital world with confidence, safety, and independence.

References

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