Policing Vulnerability to Criminal *Persuasive Technology* Use on Futurist Moon Bases

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Abstract: There have been increasing demonstrations of criminal enterprises normalizing the adaptation of *persuasive technologies* to target and victimize people all over the world online and offline. Persuasive technologies include any software or hardware that we interact with that can influence our behaviors, including changing our behaviors or maintaining our behaviors, making people vulnerable to behavioral or technical exploitation of our information and communication. This vulnerability may be heightened in isolated environments like futurist Moon Bases, suggesting there may be a unique victimology for people living and working on a Moon Base. To counter this activity, in theory, policing criminal persuasive technology use on a Moon Base environment must consider the behavioral design of persuasive technologies and this unique victimology. This practitioner's paper will discuss the shifting research direction of persuasive technologies toward deception, since the introduction of this model focused on improving people's health almost two decades ago, suggesting that generative artificial intelligence and machine learning will accelerate adaptive, deceptive persuasive technologies. This paper will visualize theoretical scenarios describing how criminal enterprises could victimize people on Moon Bases with persuasive technology design specific to that environment. This paper provides a comparative example when considering Arctic contexts as similar isolated environments. These futurist theoretical scenarios provide some demonstrations of criminal behaviors using persuasive technologies to victimize people, highlighting the unique victimology of users in isolated environments of interest to criminals and nations alike.

Keywords: Persuasive technology, Crime, Moon bases, police, Deception, Artificial intelligence

1. Introduction

This theoretical practitioner's paper suggests that people living and working in isolated environments such as futurist Moon Bases may be more behaviorally vulnerable to exploitation than anywhere on Earth, complicating the potential extraordinary challenges of law enforcement to police crimes against people.

This paper particularly concentrates on the adaptive use of persuasive technologies to exploit people, especially in isolated environments where people would depend heavily on communication and online infrastructure. Persuasive technologies can be any software or hardware that we interact with online that influences our behaviors, including changing our behaviors and maintaining our behaviors (Oyibo, 2024; Idrees et al., 2024; Pintar and Erjavec, 2021; Ramachandran and Canny, 2008). Examples could include everything from social media to fitness applications like Fitbit to games like Candy Crush and language learning applications like Duolingo.

Hermida (2006) challenged the expectation at the time that isolated conditions in outer space would result in a high rate of "criminal and deviant conflicts". But other than an extraordinary incident where a Russian astronaut physically assaulted male astronauts and sexually assaulted and harassed a female astronaut, astronauts in the International Space Station are continuously monitored. Even prison inmates are monitored less. Hermida suggested this continuous monitoring established after the incident where there were multiple assaults could be considered an extraordinary deterrent. Hermida also highlights that generally the cohorts of astronauts selected for training and sent to space do not reflect the demographics and backgrounds of typical classes of criminals. There are sociological and psychological explanations for how this sample of astronauts is not expected to be as predisposed to criminal activity. The visualization in this paper explores the very likely environment at some point in the future where there is a larger population of people in outer space, where astronauts will be in the minority. A futurist Moon Base could plausibly include hundreds of people from civilian and military organizations.

The Arctic is a helpful example of how an isolated environment will continue to grow with people as infrastructure grows, especially when commercial and civilian organizations begin to establish their roles in those environments. The number of people deploying to or establishing an operating presence in the Arctic region is steadily growing, which has resulted in a growing need for infrastructure to support them. That infrastructure has included Starlink Wi-Fi access not just for facilitating military and scientific activities, but for the morale of personnel deployed to these isolated environments. Starlink provided similar internet infrastructure to personnel in Antarctica for personal use. There is arguably heightened use with this available infrastructure provided by commercial organizations because people are at times isolated or far from home in stressful and contest geopolitical locations. Outer space has already been characterized in a similar way when imagining

futurist Moon Bases. Persuasive technologies can drive our choices and interaction online, potentially making us vulnerable to collection or some other behavioral or technical exploitation of our accounts or information (Tariq, 2024).

An exploratory National Intelligence University study found among a sample of American military personnel who deployed in the past few years to similar "isolated intelligence domains" like the Arctic and Antarctica that younger personnel were more likely to use gaming applications on their smartphones than middle-aged personnel (Rudolph, 2024). While that finding may not be surprising, what was surprising was that middle-aged personnel tended to feel less lonely than younger personnel. There are several possible explanations for this preliminary finding, but this more recent research on the effects of isolation and loneliness on deployed military personnel and their use of persuasive technologies is crucial considering the growing population of military personnel deployed to the Arctic region will likely be younger. These kinds of studies are rare.

Some of the early anthropological and ethnographic research conducted in Arctic communities in the 1970s focused closely on the effects of the environment and other social factors on communities that were isolated and mobile in this region (Savishinsky, 1971). Many of those communities were indigenous. That starting point provided some context for exploring the effect of that same environment on people visiting that region for shorter or longer durations. Social psychologist Veronika Sharok (2020) conducted assessments of the psychological characteristics of the kinds of people who adapt best to the Arctic environment. Sharok found that generally the people who expressed the greatest interest in deploying to the Arctic adapted better to that environment and the people who stayed for a longer duration maintained a better relationship with their families. The people who tended to "fly-in fly-out" which may be the best approximation of military personnel on short-term deployments did not adapt well to the Arctic conditions and generally evaluated themselves to be less happy and less connected with their families at home. Sharok highlighted consistent findings in past research and in her research that found that interpersonal relationships seemed to have the greatest influence on coping behaviors and psychological well-being in such a harsh, isolated environment. Russian researchers more recently highlighted how the development of industries and infrastructure in the Arctic region has not thoroughly considered and measured the "psychophysiological" impact of working conditions and environment on people (Bashkireva et al., 2019). This environment makes "special demands" on people beyond their physical health, especially in terms of their mental health. The researchers noted as an example of an unexplored factor on people in this region the effect of magnetic and solar storms in this region on people living in this region. In some cases, someone's circadian rhythm can change.

Some of the same harsh working conditions and environment described above could be similar on futurist Moon Bases. The author recognizes that there is limited research into the effects of outer space environments on people and groups of people, but the references in the Arctic provide some perspective on how persuasive technologies could be used to criminally exploit people on futurist Moon Bases.

Although this theoretical paper explores how law enforcement may attempt to police the vulnerability of persuasive technology use on a futurist Moon Base, the author will only briefly discuss this context of criminology. There has been a growing subdiscipline of criminology in recent years that has mostly focused on the environmental harms people could create in outer space, such as mining companies in space trying to mine asteroids for minerals or space debris (Burns and Lampkin, 2024; Lampkin and Wyatt, 2023; Lampkin and McClanahan, 2023). This subdiscipline of "astro-green criminology" or space criminology has considered "predictive models of human space communities" based on our understanding of people and their behaviors in similar or artificial environments, such as the Arctic. The ongoing research into human factors in outer space environments has consistently highlighted the "mental processing of such extreme experiences" for people living in those physical and social environments (Pagnini et al., 2023). This theoretical practitioner's paper will introduce this unique vulnerability or perhaps victimology in this imagined outer space environment. The author has a background in law enforcement, researching and analyzing how people interact online and how people can be victimized online when using applications personalized for them.

This paper will be organized as follows. First, the author will discuss more background on the development of persuasive technology as a conceptual framework for understanding how people interact with technologies and how they can be influenced behaviorally. This literature review will explain some of the apparent shift in the design and research of persuasive technologies since this conceptual framework was developed more than two decades ago, to contexts of deception use. Second, the author will visualize two scenarios on a futurist Moon Base where persuasive technology design and application can be used by criminals to victimizers users living and working on a futurist Moon Base. Finally, this paper will discuss how these vulnerabilities could be policed,

including if military and intelligence services were also operationalizing persuasive technology design to target victims.

2. The Shift in Persuasive Technology Design and Research to Deceptive Contexts

Social scientist B.J. Fogg (1998, 2002) first named persuasive technology, which he defined as any interactive computing system designed to change or maintain someone's attitudes or behaviors. Fogg coined the phrase "captology" to characterize the limited space at the time in the early 2000s where technologies and persuasion overlapped in peoples' lives, anywhere there was human-computer interaction. Fogg emphasized that captology focuses on the *planned* persuasive effects of the technology, not on the 'side effects' of that technology.

While any technology is going to influence a user in some way, for a technology to be called "persuasive" that persuasion or influence must be intentional (Hamari, Koivisto, and Pakkanen, 2014). Technology is persuasive because it is designed to guide someone toward an attitude or behavior change or toward maintaining an attitude or behavior change.

Fogg (2009) recognized the social environment online and offline also shaped how responsive a user with complex behaviors might be to suggestions built into persuasive technology, but he wrote that he wanted to know how motivated someone was to perform a behavior or if they could perform that behavior made more of a difference than the persuasive technology. Ultimately, adversary nations and criminal groups might attempt to victimize deployed military personnel who may be more motivated than their peers to use some persuasive technology for some purpose, such as communicating back home to family or finding love on a dating platform. But beyond those kinds of psychological underpinnings, Fogg often emphasized that health-related persuasive technologies should not being used in a coercive or deceptive manner. Some researchers have tried to demonstrate how effective persuasive technologies can be in driving positive health choices (Parmar, Keyson, and de Bont, 2009).

However, the development and application of persuasive technologies for deception and influence have largely muted Fogg's caution. Oinas-Kukkonen and Harjumaa (2008) developed a systematic framework for designing persuasive systems, finding that whether a persuasive technology is characterized as coercive or deceptive makes little difference, as peoples' attitudes and behaviors can be shaped or changed or reinforced with persuasive technology, whether deception or coercion is designed into that technology or not. Machine reasoning researcher Timotheus Kampik (2018) argued that most researchers continue to find also that the concept of deception is the root of much persuasive technology and artificial intelligence research and application, so that deception in persuasive technology not only occurs on purpose, but also "occasionally and unintentionally". Deception is generally defined as creating erroneous sensemaking in someone so that they make a decision that is advantageous to the deceiver. Kampik expanded the range of persuasive technology applications, exploring knowledge sharing websites like Stack Exchange, video sharing platforms like YouTube, and enterprise instant messaging applications like Slack and source code sharing site GitHub. In another example, Kampik analyzed subscription news media sites, such as the Washington Post online. When potential users see headlines written to attract readers (i.e. clickbait), sometimes the written content that must be subscribed to for users to read does not reflect the headline entirely. Kampik suggested this is a form of deception in the persuasive technology of that online news content site and subscription service, even if this characterization is less recognized. These applications all reflect persuasive technology design, where the design of those applications is meant to drive engagement by anticipated users based on various motivations (Kaptein et al., 2015).

In a study referred to above, Hamari, Koivisto, and Pakkanen (2014) examined a large sample of nearly 100 empirical studies on persuasive technologies and gamification. Hamari, Koivisto, and Pakkanen characterized persuasive technologies as different than gamification because there is more focus on social and communicative persuasion and attitude change, while gamification seems to concentrate more on "invoking users' (intrinsic) motivations (through gameful experiences and affordances)". Their review of these studies found that while persuasive technologies are more concentrated on changing or maintaining attitudes, only a few of these papers included general attitude as an explicit variable. Their conclusion suggested that increasingly the goal of persuasive technology design was to influence a behavior that is "valuable only for the designer of the system". This may be another indication of a shift toward more deceptive uses and motivations of persuasive technologies. The author argues that this shift will likely continue, as criminal and nation state enterprises continue to discover the design and application of persuasive technologies on targeted human behaviors.

Every person appears to have a different susceptibility as a user of persuasive technologies to the influence of whatever that technology may be (Kaptein, M., Duplinsky, S. and Markopoulos, 2011). Their research argued that the "application of personalization" in persuasive technologies could "substantially boost their impact" on someone's behaviors, whether those behaviors are related to their health or continuing to play an online game. Kaptein, Duplinksy, and Markopoulos were exploring more manual, incremental changes in user experience, calling this modification adaptive persuasive systems. Any change or modification to a technology based on a user is going to enhance the effectiveness or influence of that technology. Chen (2021) found in a study of Chinese university smartphone users that persuasive technologies increase users' screen time and contribute to the "addictive behaviors" of younger smartphone users. There is a social and individual context to the infrastructure behind these persuasive technologies. The Chinese university students needed to use their phones for financial transactions, but also for chatting with friends and family, for example. In the example of a futurist Moon Base, the author suggests that dependence on persuasive technologies will also involve similar needs. Those needs and increased use or dependence on persuasive technologies can become vulnerabilities (Wang, 2017). Khaled et al. (2006) highlighted this social and individual context as well, finding that "social software" increasingly has made group dynamics "a powerful factor" in design as a persuasive technology platform. Social software is software that enables communication and connection online. Khaled et al. noted that people generally join online platforms voluntarily, but those platforms and the communities or groups of people in relationships of some sort in those communities have established some social norms related to how people communicate or behave with each other. The use of persuasive technologies extends into these interactions among people offline, making that influence or persuasion perhaps more effective or more intense (Waardenburg, Winkel, and Lamers, 2012; Midden et al., 2011).

Spitaletta, Matthaeus, and Guadian (2018) wrote that they imagined adaptation to a user input or considerable user data to machine learning or large language models could become engines of developing persuasive technologies, dramatically driving adaptation to the user to another level or scale. The development of persuasive technologies has accelerated over the past decade due to advances in software engineering and data technologies, "from bespoke solutions in healthcare and assistive technologies to malign influence ecosystems". Technology philosopher Floridi Luciano (2024) noted that artificial intelligence likely represents another "significant leap" in the field of persuasive technologies. Luciano suggested the online persuasion of persuasive technologies identifying and shaping a user's demand and supplying the content in response to that demand or desire could be characterized as *hyper-persuasion* or *hypersuasion*. Luciano referred to Burtell and Woodside (2023) who wrote:

The relentless nature of AI's *hypersuasion*, the magnitude of its scope, its availability, affordability, and degree of efficiency based on machine-generated content accurately tailored to individual users or consumers who spend increasing amounts of their lives *onlife* (both online and offline) in the infosphere overshadow its precursors, not only in terms of the depth of personalized influence but also for the potential scale of distribution and impact.

Luciano added that artificial intelligence can and will be used more commonly and effectively to manipulate someone's views, preferences, choices, likes and displaces, hopes and fears. The author agrees that there have been growing demonstrations of persuasive technologies personalizing a user experience and that adaptation to a user experience can be intensified when backed by LLMs and other artificial intelligence generation.

3. Visualizing Scenarios of Operationalizing Persuasive Technology Design on Futurist Moon Bases

The following two theoretical scenarios visualize possible applications of persuasive technology design targeting people living and working in an outer space environment on a futurist Moon Base. The author chose a futurist Moon Base because the conditions and isolation appear to resemble futurist infrastructure and personnel access to technologies currently available in locations such as the Arctic and Antarctica. There is currently limited case studies or examination of criminal behaviors in these kinds of isolated but geopolitically and economically important environments. The visualizations were developed based on the prior cited Arctic study and more recent persuasive technology research on gamification and persuasive technology application use.

Scenario 1: "*Women's Soccer Manager Soccer Fan*"

This iPhone or Android game was developed by a Danish gaming company in approximately 2018. This game can be logistically intensive, which might be ideal if living and working in an isolated region where there is more time than normal outside of daily mission tasks or functions. Users can create rosters for their team from real

players and real soccer leagues, negotiate contracts for their players, and manage their customized team through training camp and an entire season. This season is fictional, but considerable attention would be required for maintaining the team. This game can also be downloaded onto Steam, which is a gaming platform for regular gamers where users can chat as well. There could be several people that use this gaming application who know each other socially on this futurist Moon Base, which could influence continued use of this application and maintaining a team. There could be users who have family members back on Earth who use this application as well, such as a mother of a young girl who plays soccer and follows women's soccer.

There are plausible contexts where criminals or criminal enterprises could learn through human or technical collection that someone of interest for recruitment or exploitation because of their access or role on this futurist Moon Base is spending much of their time online playing this game. That information could be sufficient for a criminal to create a controlled account or sock puppet that also plays this game and shares common interests, demonstrated in their own fictional team. Because the user playing this game may be more likely to be a woman, the controlled account would also likely appear to be a woman who may be able to connect more easily with the targeted Moon Base worker, because there are limited numbers of women in most government and military communities and even fewer deployed to isolated environments like the Arctic or this futurist Moon Base. These isolated deployment locations are likely staffed mostly with men, which could present several social challenges to the targeted female user that may make them more vulnerable to communication with someone who appears to be like them online (Cialdini and Goldstein, 2004).

This relationship development based on persuasive technology design is comprehensive, facilitating several plausible approaches for future behavioral and technical exploitation. Communicating with someone on Steam about this game is less scrutinized because the platform is public and has no association with the military or government. There also may not be much association with a criminal, because it is a platform designed for gamers or users who enjoy games.

Scenario 2: *"Duolingo Japanese Language Peer"*

This iPhone or Android free or paid language learning account is widely accessible and has become increasingly popular with users around the world. Smartphone platforms and applications that are more familiar to users are generally scrutinized less, including the users on that platform or application that a user might interact with (Cheshire et al., 2010). Civilian or military personnel from member nations who are deployed to this futurist Moon Base or even commercial representatives may be interested in learning Japanese because some of their coworkers or other people of interest to them are from Japan.

While there could be several motivations for someone to want to learn Japanese in this scenario, the persuasive technology of this language learning program, which is gamified and encourages continued interaction, maintains that behavior or encourages that behavior. There are limited opportunities to message another user on this platform, such as when a user achieves a learning badge, but that limited opportunity for contact may be sufficient to make initial contact without the user scrutinizing that contact as much (Walther et al., 2015). Praising someone who also appears to be learning the same language as you is a form of Liking and could influence continued communication with that person (Cialdini, 2001).

The outcome the targeted user may be interested in accomplishing is to be able to communicate in Japanese with his or her peers and to develop relationships with those peers. This kind of persuasive technology can facilitate that outcome and maintain or encourage behavior to achieve it. But this is also a vulnerability, because a criminal can craft a behaviorally based approach or interaction based on this persuasive technology, to build a trusting relationship or exploit that targeted user of interest in some behavioral or technical manner.

In both theoretical scenarios, the initial contact and communication occur online, from people that appear to be like the user of interest and on platforms that rely on commercial infrastructure and commercial telecommunication networks instead of government platforms. This infrastructure is generally highly vulnerable to compromise and collection, because there may be less restriction or protection compared to sensitive government or military platforms. People familiar with these applications and social platforms based on personal use generally scrutinize those platforms and the people on them less.

4. Discussion

This practitioner's paper introduced some of the foundations of persuasive technology as a conceptual framework. The paper discussed how this method of behavioral design and application for influencing and changing or maintaining attitudes and behaviors has appeared to shift toward more deceptive design and

operational uses. This shift reflects some of the author's background in law enforcement as a profiler with a federal law enforcement agency, where he behaviorally analyzed cybercriminals of interest based on their online behaviors and on what platforms or applications, they may be most behaviorally responsive to or vulnerable to an approach by someone who they may be more comfortable with or may trust more. Criminals use this same approach to socially engineer victims, but the purposeful design and application of persuasive technology to influence a victim reflects a more sophisticated approach to behaviorally exploiting someone of interest. Generative artificial intelligence run by refined LLMs and machine learning will only accelerate this approach.

This paper only referred to criminals using persuasive technology to target victims on a futurist Moon Base, but arguably this same approach could be used by intelligence and military enterprises for the same operational needs. Intelligence and military enterprises are likely already intensifying their use of this behaviorally based operational design and application method not only against people and organizations of interest online but against other nations. The author suggested that a unique environment like the Arctic which is isolated but of great geopolitical importance and interest resembles the environment on a futurist Moon Base. There are similar characterizations of those geopolitical efforts in outer space among competing nations, including which nation will establish their own infrastructure and interests on the Moon first and how they might use that foothold as leverage in resource competition and in military and political advantage. This paper suggests the people living and working on a futurist Moon base will be like the growing numbers of people living and working in the Arctic today, isolated but relying heavily on increasingly available commercial infrastructure and perhaps working in increasingly stressful conditions. Those are conditions for increased use of social platforms and communication applications.

The author visualized two scenarios where criminals might target and victimize someone of interest on a futurist Moon Base, because of their access to people or information or other material. This approach does not require the criminal to be physically located on the Moon Base as well. These futurist theoretical scenarios provided some models of what this kind of behaviorally based criminal approach using persuasive technologies might look like, highlighting this unique victimology of users in isolated environments of interest to criminals and nations.

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