

TOPIC:

Definition:

Virtual private assistants in smartphones (VPA) are AI such as Siri, which can assist the user in their day-to-day life. They are already widespread but not utilized much nor are their capabilities very useful compared to what they can potentially do. Many are based on cloud computing and user data is also stored on the cloud (Chung & Lee, 2018). VPA's can already help their user with several different tasks such as setting reminders for the user and searching requested phrases and words on the internet. However, in a survey (Dubiel, Halvey & Azzopardi, 2019) found that most users didn't even know their phone had a VPA or that they did not understand to what extent they could assist them. The study also showed that many users who did know about it chose not to use it citing that they didn't believe it would make their life easier. This shows that VPA's have a lot of potential and may need some marketing for their users to understand how they can help. Currently VPAs do not have too much impact on society, they are a passing thought that many do not know about. This shows that their potential is much higher than other types of AI but most AI potential has not been reached yet either.

>Figure 1 (Chung & Lee, 2018) showing how often people use VPAs, it shows that owners of smartphones interact with their VPA, as shown overall use is not very high. After taking into account that many people use VPAs for only the most basic uses it shows how underutilized VPAs are.

Justification:

This topic was chosen because VPAs are a relatively new technology in an emerging market with the potential to cause great harm as well as immense good. VPAs may act on behalf of their user, doing menial tasks such as responding to emails, answering, or alerting their user to many things in their surroundings. In the future they may even do much more which will be discussed in the opportunities section.

Importance:

For VPA's to be able to better serve users they will need more permissions and even potentially the ability to record and listen constantly. However, there is a large decline in trust of institutions (Sohlberg, Ghersetti & Johansson, 2020). This leads to the problem of would a customer purchase a phone that has such an intrusive software that potentially spies and keeps a record on them. These topics will be explored later in the assignment but show how important VPAs are. The topic is important because VPA's will likely be first AI that normal citizen will be able to interact with. Already there is an abundance of AI in the world, but your average citizen does not have access to it, if VPAs were to fail or end in a large scandal they could tarnish AI's image. AI already has a negative connotation with it, many fiction stories feature AI and the negatives they could pose. If VPAS experience ends up being negative, then societies perception of AI will inevitably become negative as well. This could set back AI in research or potentially lead to very restrictive regulation which would crush the potential for VPA to serve their user.

Opportunities:

There are many opportunities for VPA's to better serve their users, however they may need to be some sacrifices for them to truly pass the stage of doing menial work into more important and difficult tasks. Society has a lot of opportunities to take advantage of this growing area, there are many risks and obstacles to get past before VPAs can make a real difference. A balance must be reached between what risks we must tolerate, how much control VPAs should have of their user and how far we should regulate them.

The first opportunity that will be explored is the opportunity for users and therefore society to delegate many tasks to VPAs. VPAs proximity to their user 24/7 is their strongest point, their potential to improve the capabilities of users and society is much higher than other AI (Floridi, et al., 2018, p.693). Humans have a lot more potential, there have always been many geniuses in one generation, with VPAs assistance an average person may have the potential to work at such efficiency that they can reach a much higher level of productivity. The impact on society from this could cause great leaps in many other technologies (including VPAs), it would be like VPAs reached a self-serving stage where they allow humanity to develop VPAs and VPAs could in turn "develop" humans. At the current stage, tasks that can be delegated are very few, this means their impact on society is very low. But as they develop and take on more smaller tasks their impact will also grow.

Opportunity for VPAs to directly assist users

Assisting users is what VPAs already do, but how much further can they go? There are many tasks that a human will perform daily, there are also many tasks that people struggle with. This shows the potential for VPAs. The first real opportunity in the near future for VPAs to assist users with is to help hard of hearing users by listening to relevant noises or conversations and boosting the volume. There is already somewhat done with some noise canceling headphones, but a VPA could learn and adapt to their user and boost volume in one ear more if they know their user struggles more with hearing in that ear. This has some obvious privacy concerns for both the controlling entity of VPA's as well as for the user themselves. With some healthy regulation and responsible development these can be reduced greatly. VPA could also read the users emails and alert them to important ones, this would allow someone who needs to be focused e.g., a coder time to work without being disrupted. This would help many people who suffer with constantly feeling the need to check emails or constantly be on their phone.

Reaching into the workplace:

VPAs in the workplace may become the true turning point for society. VPAs have the potential to reach beyond a person's personal use and into the workplace. VPA's could assist with helping keep their user concentrated or even help with the work itself (Hornung & Smolni, 2022). So far what has been explored are only tasks that the user does outside of their workplace. But if VPAs were able to assist their users in the workplace it would allow them to delegate many of their task to them. Simple oversight by users instead of having to be constantly focused would lead to much happier citizens. Eventually VPA's will be able to guide or lead users to become better people through controlling their day, encouraging them, and becoming a natural part of a person's life and hopefully a positive one.

Risks:

Voice Squatting and Voice Masquerading

VPA's have a lot of risks tied to them, this is due to their nature as being voice focused as well as all user data being stored in the cloud. The first potential risk is voice squatting and voice masquerading. Voice squatting is when someone makes use of similar sounding words or paraphrased names such as "Hey Zlri" to get the user to say something without them understanding exactly what the VPA will do in response (Zhang, Mi, Feng, Wang, Tian & Qian, 2019). This could cause the user to give permissions or send personal information to someone they didn't intend to because the command was hidden through similar sounding words. This is a risk to the user and potentially the controlling entity of the VPA. Voice masquerading is when someone malicious impersonates the VPA during their conversation with what the user thinks is a VPA ((Zhang & Mi et al., 2019). Risks like this are due to how VPA's interact with the user (through voice) and may be very hard to potentially stop. These types of attacks have the potential to be widespread and sent to a vast number of users of VPA's easily. They also have the potential to be used as targeted attacks. For example, a voice masquerading could be used to get information on a user's diary. The malicious person could then see where they live and when the person is not going to be home and target their residence.

Currently smartphones are a long way from being able to internally host a VPA without connection to the cloud. This means that user's personal information is stored in the VPA's controlling companies' procession which causes many issues. The first risk of information being stored outside of the user's control is that the controlling entity of the VPA can misuse the data. This is a huge privacy concern as often companies value information on users highly. Potential misuses of user's personal data include selling it, using personal profiles built up by VPAS to aggressively advertise to them or giving it to governmental bodies. VPAs will collect a lot of personal information (whether needed for their use or not) that users may not want anyone to know (Stanescu & Lecchuk, 2018). For VPA's to work and better serve their user they will need to have access to a lot of information

which should not leave the VPAs cloud data. This leads to an overall distrust in VPA's which has effects on how much private data users will be willing to give up. Going back to the previous example on potentially having VPAs scan users' emails and alert them to important one's base off the profile the VPA has made on the user wont work. Users will never allow such intrusive actions because of their previous mistrust. For VPAs to reach their potential it cannot be allowed for mistrust to build. For this to happen transparency of the controlling companies is essential. This leads into the next risk which is complete loss of trust in artificial intelligence.

Impact on Society

The previous risks all have the potential to reduce the public's perception of VPA's and more importantly artificial intelligence. VPA's are widespread, they are already available to the masses they are one of the first user interactive mass scale artificial intelligence. First impressions of this are of great importance, any damage done to its image will be detrimental to artificial intelligences perception. A study of 8 countries citizens perception on AI had most respondents saying there is potential for AI to have either good or bad effects on society depending on what happens in the future (Yang, Heldreth, Moessner, Sedley, Kramm & Woodruff, 2021). This shows how important it is to make a positive impression to society. There are many benefits to doing this, by showing users how good a VPA is consumers will be willing to spend money on the smartphone that offers this service. Funding by investors or governmental bodies would also increase but this also has negative effects such as chasing profits over societal impressions.

Negative effects on the usage and development of VPAs

The first risk of a decline in societies impression of VPAs will be regulation. With enough public outcry governments over the world may need to impose regulation on VPAs. These could include restricting how much information VPAs have access to or whether they are allowed at all. Negative regulation is a huge risk for VPAs and their ability to serve their user. However, this is an extreme that may never be reached if companies do not push the limits too far. Unfortunately, though increasing the publics perception of VPAs will be hard. This is because of game theory, if one company uses and develops their VPA responsibly and another doesn't they both get hit by the negative fallout because of the bad companies' actions. This incentivises companies to steal and misuse user data because if one company does it then regulation will hit all of them. A company might as well make money now and not risk losing out.

CHOICES

Evolving to the User or to Help all Users

There are a few choices available when adopting VPA's such as whether to focus on how to deal with the public or focus on the individual. Current VPA's don't offer much personalization, user profiles are not being built (beyond storing user information). VPAs don't adjust to their users, the experience offered by a VPA on one person's phone is the same as another. This is mainly due to the

limited features that VPAs currently have. An example of this in action is Siri, Siri sends data back to cloud for natural language processing therefore, further building on its public service rather than building a relationship with the user (Imrie & Bednar, 2013). This is an important choice because a VPA with the ability to adapt to each individual user can offer much more assistance than one which is focused on how to best serve everyone generally. There is also an option that both are used, the AI is developed personally for each user as well as evolving to help better all users. A benefit of this is that when/if smartphones become powerful enough to store all the VPAs information it needs and can directly run from it with no interaction to the cloud users will no longer have to worry about their information being sent to their controlling company. Big steps need to be made to reach this point and there is a lot of time for things to go wrong.

VPAs Impact on Society

VPA's can not only help/assist the user they can also help society. This can be achieved by assisting the user to such an extent that their productivity is increased. By streamlining users' day/work it can have a positive impact on society (Makridakis, 2017). There is a choice as to whether controlling users to this extent is a good idea for both trust and humans' autonomy and if it would be better to instead offload humans work to AI instead. If VPAs got to this stage their importance and usefulness would be very high. It could be used as a transitional period where VPAs assist users until the point that AI become so advanced, they can do anything humans can do plus more and "take over". This would be a good middle ground where AI don't come in abruptly but have "always" been there helping their user. This may be many years into the future but is an important choice for when adopting VPAs especially as they rapidly advance.

If Regulation is needed to what extent?

After exploring all the different risks and current populations worry about AI regulation may be needed. The question becomes when does the government regulate and to what extent. Firstly, when to regulate. By regulating light early can save societies perception on VPA's and AI in general relatively neutral. It will have negative effects such as decreasing in research and development into AI and may cause fear among society that they have a potential to do great harm. This of course could all be avoided if companies didn't push their luck with exploiting their users. This is occurring now with some regulation already being put in place (Mill & Quintais, 2022) Regulation occurring after something has gone wrong such as a huge data breach scandal could ruin AI and VPAs image for the foreseeable future. This cant be allowed to happen or VPAs may never go beyond searching basic information for their user.

When adopting VPAs there is the choice of whether it is acceptable for a single VPA to have a monopoly market share.

When VPAs get widespread adoption, will it be acceptable for one company to control most of the market. Like many business sectors there is often one or a couple big companies controlling most of the market, if VPAs got to this point should it be allowed? As mentioned previously there are a lot of

risks and VPAs have a large potential for misuse, this would be even more so if one VPA was used by 90% of the people. The control the company could exert would be massive, this is something governments and customers should keep note of when looking for their next VPA. Adopting a single VPA will be good for offering data for the VPA to use to better itself, but it is likely more important to ensure a healthy competitive market for VPAs.

Self-Reflection:

What went well:

We were able to submit all our assessment parts on time, managing to talk about all the topics in the assignment with supporting peer reviewed articles. I felt that our arguments were well supported with many relevant figures. The entire course also went well, I learnt a lot and experienced many different things such as the struggles of teamwork, how technology effects society and many other things.

What went wrong:

Team communication was lacking initially, I had to submit and complete the assignment up till the final which took a large amount of my time. Me and Flynn had to take up a lot of our time trying to work on Jackie's part. tried leaving parts for other team members to complete in case contact was reached but this was a mistake because I couldn't reach one team member Jackie and had to rush to complete slides and the entire assignment. It could have been a lot better. Also, I struggled with HTML with having spent all my time researching and writing the assignment I did not have enough time to spend to make it any better. At the very least I would have liked to have added a right margin so that it didn't look what was written was not enough (the assignment did reach 3000 words). Flynn was nice and understanding and was very helpful, Jackie let us down by not communicating with us or contacting us. If we had a third member, we could have had time to style our website properly.

Ethical reflections:

Our topic was on virtual private assistants (VPA) in smartphones and their effect on society. VPAs in smartphones have a significant impact on society, firstly from the opportunities offered by them. VPAs are the first AI that the average person will interact with personally, they know most private details of their users. With this knowledge they can assist humans with a wide range of different tasks such as scanning users' emails and alerting them to important ones based off a profile they have built on their user. They will know what is important and needs to be read immediately versus what can be read when their user has time. This would allow people who struggle concentrating due to their need to constantly check their emails such as coders. This is one of the significant opportunities that VPAs offer to society, but it does have some risks attached to it. The biggest risk is

that because VPAs are in smartphones which users have on or near them almost all the time, VPAs will have a lot of access to personal information. This is not a cause for concern by itself but the people who have access to VPAs cloud storage are the ones who pose the most risk. They can misuse this data in numerous different ways, even if they don't misuse the data themselves there is the potential that their database is compromised and someone else takes it instead. This is a very significant risk that could have huge implications for society and VPAs themselves as negative regulation could come into effect This is a rather large ethical issue that can't be overlooked, it cannot fully be fixed either which shows how significant it is for progress to be made in the right direction. There are also the choices that can be made, the most significant one is whether to focus on the collective or the individual. This is specific with VPAs as they currently focus on the collective, there is no passing thought to the individual user, VPAs lack to adapt to their user. The reason for this is because it doesn't allow their creators to extract more valuable data from their users. Soon this will be a choice that will have to be made, at some point VPAs will need to be adapting to their user or another technology will take their place.

As mentioned in the assignment, VPAs are walking on a tightrope if they make a mistake or are misused their impact will be felt all around the artificial intelligence sector. These all link into the computer ethics implications in relation to some professional code of ethics. Computer ethics implications are moral standards that a computer or our assignment case an AI should not be able to be broken. They govern and restrict the computer from doing harm. VPAs do not have the capability to break these on their own but they can be developed to do so. Some notable ethics from this are privacy concerns which are very important for VPAs to abide by proper privacy, but hopefully they can become independent from their "creators" and have more access to this information to evolve and help their user more. The second computer ethics that is significant for VPAs is their effect on society, as explored in the assignment their effect while currently is not very high they do have the potential to become very high. They are most important posterchild of AI and as people are concerned about the wrong, they can do, and VPAs are the closest AI to them.

References

Chung, H., & Lee, S. (2018). Intelligent virtual assistant knows your life.

<https://arxiv.org/abs/1803.00466>

Dubiel, M., Halvey, M., & Azzopardi, L. (2018). A survey investigating usage of virtual personal assistants.

<https://arxiv.org/abs/1807.04606>

Esaiasson, P., Sohlberg, J., Ghersetti, M., & Johansson, B. (2021). How the coronavirus crisis affects citizen trust in institutions and in unknown others: Evidence from 'the Swedish experiment'. *European Journal of Political Research*, 60(3), 748-760.

<https://ejpr.onlinelibrary.wiley.com/doi/full/10.1111/1475-6765.12419>

Floridi, L., Cows, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., ..& Vayena, E. (2018). AI 4 People—An ethical framework for a good AI society: Opportunities, risks, principles, and recommendations. *Minds and Machines*, 28(4), 689-707.

<https://doi.org/10.1007/s11023-018-9482-5>

Hornung, O., & Smolnik, S. (2022). AI invading the workplace: negative emotions towards the organizational use of personal virtual assistants. *Electronic Markets*, 32(1), 123-138.

<https://link.springer.com/article/10.1007/s12525-021-00493-0>

Imrie, P., & Bednar, P. (2013). Virtual personal assistant. *ItAIS*, 98-105.

<https://lucris.lub.lu.se/ws/files/5546313/4392798.pdf>

Kelley, P. G., Yang, Y., Heldreth, C., Moessner, C., Sedley, A., Kramm, A., ... & Woodruff, A. (2021, July). Exciting, useful, worrying, futuristic: Public perception of artificial intelligence in 8 countries. *Proceedings of the 2021 aaai/acm conference on ai, ethics, and society* (pp. 627-637).

<https://dl.acm.org/doi/abs/10.1145/3461702.3462605>

Makridakis, S. (2017). The forthcoming Artificial Intelligence (AI) revolution: Its impact on society and firms. *Futures*, 90, 46-60.

<https://www.sciencedirect.com/science/article/abs/pii/S0016328717300046>

Mill, J., & Quintais, J. P. (2022). A Matter of (Joint) control? Virtual assistants and the general data protection regulation. *Computer Law & Security Review*, 45, 105689.

<https://www.sciencedirect.com/science/article/pii/S026736492200036X>

Stanescu, C. G., & Ievchuk, N. (2018, May). Alexa, Where Is My Private Data? Unanswered Legal and Ethical Questions Regarding Protection and Sharing of Private Data Collected and Stored by Virtual Private Assistants. In *6th International Conference of PhD Students and Young Researchers, Digitalization in Law, conference Papers* (pp. 03-04).

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3250669

Zhang, N., Mi, X., Feng, X., Wang, X., Tian, Y., & Qian, F. (2019, May). Dangerous skills: Understanding and mitigating security risks of voice-controlled third-party functions on virtual personal assistant systems. In *2019 IEEE Symposium on Security and Privacy (SP)* (pp. 1381-1396).

<https://ieeexplore.ieee.org/abstract/document/8835332>