New and Emerging Technology: Ownership and Adoption

Leigh Ellen Potter
IDEA Lab
Griffith University
Nathan, Qld, Australia
L.Potter@griffith.edu.au

Alexandra Thompson
IDEA Lab
Griffith University
Nathan, Qld, Australia
A.Thompson@griffith.edu.au

ABSTRACT

While new and emerging technology is popularly represented in media and online, this popularity has not translated to broader adoption and purchase by individuals. This paper explores this situation through the lens of individual ownership of computer devices, entertainment devices, and emerging technology, and individual willingness to adopt new technology. We address four questions: What new technology do people choose to own, how willing are they to adopt new technology, what do people consider are barriers or motivators for their decision to adopt new technology, and what does this mean for people's readiness for a new technology workplace? Using a questionnaire instrument with both open and closed questions, we found that our respondents were most likely to own computer devices, less likely to own entertainment devices, and least likely to own emerging technology devices. They reported willingness to adopt new technology, however stated that this should fit well in their personal or work life and be useful to them in order to facilitate adoption. This suggests that the respondents are ready to adopt new technology within the workplace, however emerging technology needs to be easy to learn and cost-effective if it is to be more broadly adopted.

CCS CONCEPTS

Human-centered computing - Virtual reality; Human-centered computing-Mixed / augmented reality

KEYWORDS

Emerging technology; technology ownership; technology adoption; barriers.

ACM Reference format:

Leigh Ellen Potter and Alexandra Thompson. 2019. New and Emerging Technology: Ownership and Adoption. In *ACM SIGMIS Computers and People Research 2019 (SIGMIS-CPR '19)*, June 20-22 2019, Nashville, Tennessee, USA. ACM, New York, NY. 10 pages. <https://doi.org/10.1145/3322385.3322407>

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from Permissions@acm.org.
SIGMIS-CPR '19, June 20-22, 2019, Nashville, TN, USA

© 2019 Association for Computing Machinery.
ACM ISBN 978-1-4503-6088-3/19/06...\$15.00

<https://doi.org/10.1145/3322385.3322407>

1. Introduction

New and emerging technologies are riding a wave of media popularity, however that popularity is not translating to technology adoption and purchase by individuals (Gleasure & Feller, 2016; Laurell, Sandström, Berthold, & Larsson, 2019). This has not prevented technology businesses from embracing innovations such as augmented and virtual reality (AR and VR), including Microsoft, Amazon, and Google. Companies such as Meta are exploring the use of augmented reality as a substitute for desktop computers, with the aim of eliminating standard computing practices and devices in exchange for a phone and an augmented reality headset. There may be a mis-match between business enthusiasm for such new technology, and individual readiness to adopt the technology.

Existing research has explored the application of emerging technology within specific areas, such as health (for example Glegg et al. (2016)), education (such as Ott and Freina (2015)), and information provision (such as museums and in support of tourism (Jung, tom Dieck, Lee, & Chung, 2016)). The use of AR applications for retail businesses was predicted to 'go mainstream' (Dacko, 2017), however outside gaming the number of applications for VR and AR remains small.

This then raises the question of people's readiness for the next wave of technology. What hasn't the predicted adoption of new technology eventuated? In this paper, we will look at individual ownership of computer devices, entertainment devices, and emerging technology, and explore individual willingness to adopt new technology. We will revisit the barriers and motivators that influence this willingness to adopt new technology in order to respond to observations from Laurell et al. (2019) on the lack of research addressing the lag in consumer uptake of VR technology. In doing so, we will explore individual technology readiness. In such a changing environment, understanding people's decisions around technology adoption is critical if we are to design and develop technology that people both want and can use.

We will look at the theoretical background to technology adoption, innovation, and emerging technology, before introducing the research approach for this study: a preliminary exploration of the ownership and adoption habits of a group of people using a questionnaire implement. We will present the data gathered for the research, and discuss what this data means for the technology people choose to own, their willingness to

adopt new technology and the barriers and motivators for this decision, and finally review what this means for people's readiness for a new technology workplace.

2. Theoretical Background

2.1 Technology Adoption

Rogers (2003) defines technology adoption as "a decision to make full use of an innovation as the best course of action" (p473). The adoption process includes an individual's acceptance or rejection of the innovation, and its subsequent use (Haddon, 2003), and includes purchasing and acquisition decisions (Renaud & van Biljon, 2008). Rogers (2003) proposed a five stage process for technology adoption known as the innovation-decision process. Stage one, *knowledge*, occurs when an individual learns about an innovation. Stage two, *persuasion*, involves the individual forming an opinion about the innovation. Stage three, *decision*, occurs when the individual prepares to choose to adopt (or reject) an innovation. Stage four, *implementation*, is when the individual uses the innovation, and stage five, *confirmation*, is when the individual endeavours to reinforce the decision they have made to adopt or reject the innovation. The issue of ownership within adoption is important, as the decision stage may include purchasing and confirmation stage may seek to reinforce the purchase decision (Renaud and van Biljon, 2008). Device ownership may be an important technology adoption factor (Culén, Engen, Gasparini and Herstad, 2011), and can be used as a predictor for technology adoption (Brown, Venkatesh, & Hoehle, 2015; Li, 2014).

The terms adoption and acceptance are often used interchangeably, however refer to two distinct phenomena. In the context of this paper, acceptance is viewed as a component of adoption (Renaud & van Biljon, 2008). Dillon and Morris (1996) describe technology acceptance as a willingness to use technology for the tasks it was designed to support, and acknowledge that willingness and actual use are separate and different measures. The field of technology acceptance looks at a range of areas, including predicting the likelihood of a user group using a given technology. While a number of approaches for examining technology acceptance have been developed (such as including Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA), Ajzen's (1985) Theory Of Planned Behaviour, Davis' (1989) Technology Acceptance Model (TAM) and TAM2 (Venkatesh & Davis, 2000), and Venkatesh, Morris and Davis' (2003) Unified Theory Of Acceptance And Use Of Technology), these largely focus on predicting actual use of technology, rather than the more general issues that influence adoption decisions.

2.2 Innovation and Emerging Technology

The approach to innovation in this context refers to an individual's attitude towards either hardware or software applications of new technology and their tendency to explore and adopt such applications (Vishwanath, 2005). Rogers (2003) describes early adopters of technology as more likely to actively seek out innovations and have a higher degree of knowledge about innovations. Robinson et al (2005) found a positive

relationship between personal innovativeness and the perceived usefulness and ease of use of technology. Parasuraman (2000) identified innovativeness as a key indicator and driver of an individual's technology readiness, or propensity to accept and use technology.

Emerging technologies are "technologies that emerge from new technologies or incremental technologies that arise from the convergence of existing technologies" (Srinivasan, 2008). Context and application are key elements when considering whether a technology is 'emerging' (Halaweh, 2013), and an established technology may be considered as emerging in markets where development and application is new (Srinivasan, 2008). For the purposes of this research, a set of emerging technologies were chosen based on three core criteria:

1. Availability to commercial consumers – in order to be considered as a technology that an individual could adopt, that technology should be readily available for purchase.
2. Suitability for personal use - as the focus for this research was individual adoption, the technology should be fit for individual and personalised usage, rather than a business device.
3. Time to market - in order to fit the definition of 'emerging', the technology should be new, defined in this instance as release within the previous five years

The emerging technologies selected were Virtual Reality (VR), Augmented Reality (AR), intelligent personal assistant devices, and wearables.

VR can be defined as a computer-generated simulation delivered through the use of technology (Krueger, 1991) and may include audio, tactile and visual input delivered artificially (Boas, 2012). AR can be defined as the alteration of a real environment through the use of virtual, computer-generated objects (Milgram & Kishino, 1994). Research into AR and VR adoption has focused on adoption of specific applications, with few studies exploring the technology itself. VR and AR application adoption is influenced by perceived emotional and social benefits, social expectations, application enjoyment, physical activity, and the sensation of flow (Rauschnabel, Rossman, & tom Dieck, 2017). Flow in this instance is an intrinsically rewarding sensation of total involvement in an activity, to the point of experiencing a different sense of self and time (Csikszentmihalyi, 1975), and requires a deep understanding of the AR application itself to achieve (Schaffer, 2013). Laurell et al. (2019) describe headset performance and price, and the limited range of applications as barriers for VR adoption.

Intelligent personal assistants are a class of Internet of Things devices that support people in their day to day activities through the automated digital provision of administrative, technical, or social assistance (Saad, Afzal, El-Issawi, & Eid, 2016; Santos et al., 2016). This can be as simple as voice assistance such as Siri or Alexa, a smart home appliance such as Google Home or Amazon Echo, or it may extend to a complete home automation system (Han & Yang, 2018). For the purpose of this research, we will

focus on smart home appliances as a consumer ready device for personal use. A range of factors have been found to influence adoption decisions for intelligent personal assistants, including technical factors such as the accuracy and seamlessness of voice recognition and natural language processing, social factors such as the ‘friendliness’ of the interface, and risk factors such as security and privacy (Han & Yang, 2018).

Wearables are a broad category of mobile computing devices that provides information and activity tracking functionality designed to be worn on the body (Yung, Kim, & Choi, 2016). Wearables can be fashion devices, fitness trackers, mobile phone extensions, or health devices (Nieroda, Mrad, & Solomon, 2018). For the purpose of this research, we will focus on smart watches and fitness devices as consumer ready personal use technology. The functionality offered by these devices is progressively merging, with many wearable fitness devices now offering mobile phone connection and GPS tracking, and many smart watches now offering fitness support such as step and activity tracking. Research in this device category has explored technical and device challenges. Adoption attributes have been identified, including design and aesthetic appeal, data management and integration with day to day use, and data accuracy (Shih, Han, Poole, & Carroll, 2015), perceived usefulness, visibility, and fashionability (Chuah et al., 2016). Smart watches in particular are seen to be “not only utilitarian tools but also personalized, trendy items that reflect individual identities, emotions, and aesthetic values” (Kim & Shin, 2015, p. 535).

3. Research Approach

The research presented in this paper is part of a larger project exploring design and development of Augmented Reality. This paper seeks to explore ownership and adoption decisions in relation to technology in order to answer:

1. What new technology do people choose to own?
2. How willing are people to adopt new technology?
3. What do people consider are barriers or motivators for their decision to adopt new technology?
4. What does this mean for people’s readiness for a new technology workplace?

To answer these questions, a questionnaire was developed and approved through the university ethics process. The questionnaire was hosted through Limesurvey, and deployed online in July 2018. The questionnaire was open for six weeks

3.1 The Questionnaire

The questionnaire presented a mix of quantitative and open-ended qualitative questions, asking participants about their ownership and experience with phone technology, computing devices, gaming devices, AR and VR, intelligent personal assistant devices, and wearables. The questionnaire consisted of thirteen questions where respondents selected an option from a list, four sets of rating scale questions (totaling thirty-five questions), and five open-ended descriptive discussion questions. There was a final set of six demographic questions, and questionnaires were anonymous. 139 questionnaires were

started, and 104 were successfully completed. The median time for completing the questionnaire was 14 minutes 44 seconds.

The questionnaire was hosted online and open to all participants regardless of experience, and promoted through public and private avenues including the universities ‘Volunteer for Research’ portal and posts to social media. The questionnaire included a request to share with other potential participants in the closing page. The questionnaire reached an international audience, as indicated through specific answer elements such as references to different currencies and languages.

3.2 Participants

The questionnaire participants include a broad demographic population, with 59 women, 42 men, and 3 ‘prefer not to say’. Participants were aged between 16 and 74, with 65 participants aged between 18 and 34. Employment status varied, with 44 participants either retired, studying or unemployed, and 58 participants working in a part- or full-time capacity: two participants preferred not to answer. The majority of respondents were either students, or combining study and work. Diversity narrowed in one demographic respect: most participants were university educated, with 47 currently completing undergraduate or postgraduate study, 21 holding degree qualifications, and 26 holding postgraduate qualifications. Discipline areas for current students and graduates were varied, with business, law, education, medicine, science, creative disciplines, technology, and engineering areas represented.

3.3 Analysis

This initial questionnaire was exploratory in nature, looking at general technology ownership and adoption information. Questionnaires were examined for completeness, and unfinished questionnaires were removed from the pool. For this paper, quantitative questions were tallied and analysed using spreadsheets and summarised in tables, providing descriptive statistical information focused on frequencies and percentages. Data was sorted by frequency, and analysed for commonalities in the respondent pool for each frequency set. As an exploratory tool, this process aimed to identify high level trends and information, and not to infer correlation.

The content from the open-ended questions was coded with NVivo software using thematic analysis, allowing for the generation of emergent themes from the respondent’s words. These themes were mapped against the frequency sets generated by the quantitative analysis in order to explore relationships between identified themes and respondent pools.

4. THE DATA

Device ownership is detailed in Table 4 (at the end of this paper), and discussed below.

4.1 General Technology Ownership

Technology device ownership was generally common for these participants, as shown in Table 1. Mobile phones were owned by all but three people, and all respondents owned a computer device: a desktop computer, a laptop, or a tablet. 31

people owned a single device, however multiple devices were common: 40 people had two devices, 24 had three devices, 8 had four devices, and one person had 6 devices.

Table 1 Summary: Technology Device Ownership

	Age													
	16-17		18-24		25-34		35-44		45-54		55-64		65-74	
Overall	5	4.81%	32	30.77%	33	31.73%	14	13.46%	11	10.58%	4	3.85%	2	1.92%
Computer Device Ownership														
1 Device	2	6.45%	15	48.39%	9	29.03%	2	6.45%	2	6.45%	1	3.23%	0	0.00%
2 Devices	0	0.00%	11	28.21%	16	41.03%	5	12.82%	5	12.82%	1	2.56%	1	2.56%
3 Devices	2	8.69%	4	17.39%	6	26.08%	4	17.39%	4	17.39%	2	8.69%	1	4.33%
4 Devices	1	14.29%	2	28.57%	1	14.29%	3	42.86%	0	0.00%	0	0.00%	0	0.00%
6 Devices					1									

Respondents aged 18-24 years were most likely own a single computer device, with fifteen of the thirty-one responses in this device bracket. Respondents aged 25-34 were most likely to own two devices, with sixteen of the thirty-nine responses. Ownership of three devices was more evenly spread across the age brackets, however respondents in the 45-54 and 55-64 age brackets were more likely to own three devices than they were to own one or two. Only the first four age brackets reported owning more than four devices, and respondents aged 35-44 reporting the highest ownership.

Gender representation varied for computer device ownership. Nearly 57% of respondents answered that they were female, representing over 70% of single device owners, and less than 30% of four device owners. Ownership was therefore reversed for respondents stating they were male, with less than 30% of single device owners and more than 70% of four device owners.

Students were most likely to own a single computing device, whereas respondents who were combining study and work were most likely to own four devices. People who were working full time were more likely to own two or more devices.

4.2 Technology for Entertainment

Table 2 Summary: Entertainment Technology Ownership

	Age													
	16-17		18-24		25-34		35-44		45-54		55-64		65-74	
Overall	5	4.81%	32	30.77%	33	31.73%	14	13.46%	11	10.58%	4	3.85%	2	1.92%
Gaming Device Ownership														
0 Devices	2	4.65%	11	25.58%	14	32.56%	5	11.63%	6	13.95%	3	6.98%	2	4.65%
1 Device	1	3.23%	10	32.26%	11	35.48%	7	22.58%	2	6.45%	0	0.00%	0	0.00%
2 Devices	1	7.14%	5	35.71%	4	28.57%	2	14.29%	2	14.29%	0	0.00%	0	0.00%
3 Devices	0	0.00%	4	57.14%	2	28.57%	0	0.00%	1	14.29%	0	0.00%	0	0.00%
4 Devices	1	33.33%	0	0.00%	1	33.33%	0	0.00%	0	0.00%	1	33.33%	0	0.00%
5 Devices	0	0.00%	1	50.00%	1	50.00%	0	0.00%	0	0.00%	0	0.00%	0	0.00%
6 Devices			1											
Entertainment Device Ownership														
0 Devices	2	7.41%	11	40.74%	10	37.04%	3	11.11%	0	0.00%	0	0.00%	1	3.70%
1 Device	1	2.63%	11	28.95%	11	28.95%	7	18.42%	6	15.79%	1	2.63%	1	2.63%
2 Devices	1	4.00%	9	36.00%	9	36.00%	2	8.00%	3	12.00%	1	4.00%	0	0.00%
3 Devices	1	11.11%	0	0.00%	3	33.33%	1	11.11%	2	22.22%	2	22.22%	0	0.00%
4 Devices	0	0.00%	1	50.00%	0	0.00%	1	50.00%	0	0.00%	0	0.00%	0	0.00%

The specific entertainment technologies explored were gaming devices, audiovisual devices, and eReader technology, and ownership is summarised in Table 2. Fifteen respondents owned no devices in this category. Forty-four respondents did not own a gaming device, and a further thirty-three owned a single device. Device ownership was shared between major gaming platforms, with thirty-six respondents owning a Playstation platform, twenty-four owning an Xbox device, and thirty-eight owning a Nintendo device (console, Switch, or handheld). Twenty-seven respondents did not own audiovisual

devices or eReader technology, and a further forty owned a single entertainment device. Audiovisual devices were most prevalent in this group of people, with thirty-one respondents owning an MP3 player, and seventy-seven owning a smart TV, an Apple TV, or Google Chromecast. eReader technology was less widespread, with sixteen people owning a Kindle, and five owning a different eReader.

Nearly 65% of respondents over the age of 45 did not own a gaming device, and half of respondents aged 35-44 only owned a single game device. In contrast, nearly 60% of respondents who owned 3 gaming devices were aged 18-24, and the three respondents who owned five or more gaming devices were between 18 and 34. All but one of the respondents over the age of 45 owned at least one general entertainment device. 96% of respondents who did not own a general entertainment device were under the age of 44.

While representation for game device ownership was consistent with the general work status representation, some differences appeared for general entertainment devices. More than half the respondents who owned no general entertainment devices were full-time students. More than half the respondents who were working full time owned three or more general entertainment devices, and three or less gaming devices.

Gender representation for game device ownership was largely consistent with the respondent demographics with two exceptions: over 70% of respondents with two gaming devices were female, however this flipped to over 70% male ownership of three devices. Ownership of four or more devices was predominantly female, however the number of respondents in this category is too low to draw conclusions (4 female respondents and two male). Similar divergence was shown for general entertainment devices, with more than seventy percent of single entertainment device owners female, with a flip to 60% male ownership of two entertainment devices. A similar female ownership of three or more devices was also shown, again with small numbers (eight female and three male).

4.3 New and Emerging Technology

Table 3 Summary: Emerging Technology Ownership

	Age													
	16-17		18-24		25-34		35-44		45-54		55-64		65-74	
Overall	5	4.81%	32	30.77%	33	31.73%	14	13.46%	11	10.58%	4	3.85%	2	1.92%
AR VR Ownership														
1 Device	2	11.76%	4	23.53%	7	41.18%	2	11.76%	1	5.88%	1	5.88%	0	0.00%
2 Devices	0	0.00%	1	25.00%	2	50.00%	0	0.00%	0	0.00%	0	0.00%	1	25.00%
3 Devices					1									
4 Devices	0	0.00%	0	0.00%	0	0.00%	2	100%	0	0.00%	0	0.00%	0	0.00%
Home Assistance Device Ownership														
1 Device	0	0.00%	3	23.08%	4	30.77%	3	23.08%	3	23.08%	0	0.00%	0	0.00%
Wearable Device Ownership														
1 Device	0	0.00%	8	21.05%	16	42.11%	6	15.79%	5	13.16%	1	2.63%	2	5.26%
2 Devices	0	0.00%	0	0.00%	1	50.00%	1	50.00%	0	0.00%	0	0.00%	0	0.00%

The specific new and emerging technologies included in the questionnaire were Augmented and Virtual Reality, intelligent personal assistant devices, smart watches and fitness devices, and ownership is summarised in Table 3. Device ownership of emerging technology was lower than general computer devices, gaming devices, and entertainment devices. Forty-nine people owned no devices in this category. Forty-one respondents owned

a wearable, with fitness trackers more commonly represented (thirty-one devices) than smart watches (twelve devices). Twenty-five respondents owned a VR device, with a total of thirty-four devices owned. One person owned a Mixed Reality headset, and no one owned an AR headset. Thirteen owned an intelligent personal assistant device.

While respondents owned up to four VR devices, the majority owned a single device: only eight respondents owned more than one. Ownership was spread across all ages, however in terms of work status was largely the domain of either students or full time workers. Interestingly, while single device ownership was shared evenly on gender lines (nine female and eight male respondents), multiple device ownership was entirely male.

Intelligent personal assistant devices were owned evenly by respondents between 18 and 54, and predominantly by students and full time workers. Gender representation was even, with six female and seven male respondents.

Wearables were owned by all respondents above the age of eighteen, with the highest representation in the 25-34 age bracket. Both students and working respondents owned a wearable, with full time workers have the largest ownership. Gender ownership was consistent with the overall respondent profile, however female respondents owned nearly 60% of the fitness trackers reported in this questionnaire, and male respondents owned nearly 70% of the smart watches reported.

4.3.1 Experience using Augmented Reality. As part of the larger study respondents were specifically asked about their familiarity with AR and were provided with a list of ten different AR applications and the option to nominate an application that was not listed. Twelve respondents had not interacted with AR, and two of these were completely unfamiliar with the technology. Twenty had interacted with one application, twenty-four with two applications, twelve with three, thirteen with four applications, eleven with five applications, and eleven with six or more. Social media picture filters, Pokémon GO!, interactive projections, and 3D models generated by the use of QR codes were the most commonly used applications with 208 of the 281 reported interactions.

AR experience was present in all age brackets and for each work status. Of those who had not experienced AR at all, two were 18-24, five were 25-34, two were 35-44, two were 45-54, and one was 65-74. Gender representation was consistent with the respondent profile at the six AR experience levels, however was different at every other point with above profile representation for female respondents at most experience levels. Male respondents were higher at the four and five experience levels.

Respondents were also asked to describe their experiences using AR, and how they felt AR could best be used. A number of respondents described the technology positively as 'cool', 'fun', 'different and entertaining', and 'impressive'. Many respondents were either concerned or frustrated by the development maturity of AR technology, describing it as 'clunky', 'gimmicky', 'limited in their functional ability', 'lacking smoothness', with 'actions that aren't natural'. Some referred to physical

limitations of head mounted display technology such as the Hololens, describing the headset weight as "uncomfortable", and the field of view and image resolution as "limited". Use of these devices had caused negative side-effects for some respondents, including headaches, dizziness, eye strain, and nausea. One respondent commented specifically on the cost of the Hololens, and several remarked about the limited applications currently available.

Many respondents described the technology as useful and helpful, citing positive and enjoyable experiences. An AR application used by a large furniture store to help customers visualise new furniture in their own homes was cited specifically as a useful tool. An inter-active spider projection in a Sydney museum was also described, with the respondent mentioning that such an application of AR would "provide a safe way of overcoming fears." Another respondent stated that AR "would be really useful if it integrated seamlessly in day-to-day life."

Respondents provided a broad range of potential applications for AR, including within archaeology, museum, and art gallery exhibits, in support of architecture, construction, and manufacturing, within the health and education sectors, and for the games and entertainment industries. The most commonly suggested uses for AR centred around the provision of additional information to an object or environment, such as instructions for "working on the car or repairing taps around the house", and for "emergency situations where emergency services aren't available immediately - busy, remote locations etc, there could be someone giving guidance on what to do in a more clear visual manner until the proper help can make it to the location." AR applications that involved the manipulation of models and simulations were also common, such as virtual tours, terrain and building modelling, clothing and furniture simulations, and in all sectors that would benefit from practical training, "where you can simulate complex and expensive machinery in a safe and replicatable environment."

4.4 Technology Adoption

Respondents were asked to self-rate their willingness to try and to adopt new technology, and then were asked to describe their willingness. Ten people described themselves as unwilling to adopt new technology, with seven unwilling to either try or adopt new technology, and three people willing to experiment with new technology, however unwilling to adopt. Eighty-two rated themselves as willing to adopt new technology. Twelve described themselves as neutral. Many people rated themselves as willing to adopt new technology, however stated that their adoption decisions were heavily situation dependent: "The issue is whether the new technology is beneficial" and "I like what I use at the moment." These respondents were more likely to state that while they were willing to adopt new technology, they were hesitant to try new technologies or to experiment with them. Half the respondents rated themselves as very willing to adopt new technology, describing enthusiasm and enjoyment gained from this use: "I find new technology fascinating and exciting", and "I love gadgets". Innovation was a key motivator for

adoption decisions: “Innovation is what shapes the modern life. What used to work in the past may still work, but perhaps at a lower rate of efficiency” however many people linked innovation with utility: “if it doesn't work for me, I'll ditch it.”

Willingness to adopt technology was generally consistent for both age and work status, however in general female respondents tended to rate themselves slightly lower than male respondents, and all the neutral ratings were given by female respondents. Reasoning behind adoption choices given by female respondents frequently discussed cost, need, and novelty: “new technologies interest me, but I don't feel the need to have to test out every new technology”; “I am pretty content with my iPhone and my MacBook. I don't see a need for any other devices.”

While respondents rated themselves as willing to adopt new technology, their discussion of this choice revealed more reservations than the rating alone indicated. Respondents who rated themselves as very willing to adopt, also made statements such as “I'll only adopt a new technology if it seems relevant. I don't believe in new is always better”, “I can easily adapt to new technologies, however do not feel the need to” and that “it depends on how it benefits me and what I'm doing.” These respondents wanted to see improvements in work flow or ease of life in order to motivate adoption. People who were highly willing to adopt often cited more general life improvements as their adoption motivation: “New technologies can be fun and make life more exciting or easier.”

A range of reasons and influences were described by participants for their adoption decisions. Development maturity and reliability of technology was important, as “I like other people to work out the bugs with new technologies before I use them for real.” An individual's experience with technology will influence adoption decisions. One respondent stated that “exposure has increased my awareness and use of new technologies to the point where I feel quite comfortable to adopt a new technology myself.” Personal experience is a strong influence, however many respondents also described the experience of family and friends as an influence on their decisions.

A small number of respondents discussed the relationship between technology and their self-image as an influence for technology adoption. One user stated that “If I can afford it I'll buy it [but it] must be stylish”, and another described a smart phone purchase decision: “my friend had it and I got phone envy so I bought one.”

Many people discussed personal impact, life improvements, and social impact as influences on their adoption decisions. “It depends on what this new technology is going to affect in my life”, and “ways to improve quality of life” were influences for adoption: “I try to research all relevant information regarding new technologies, and adopt those which do not threaten my well-being.” Respondents stated that “I'd be less willing to adopt new technology if it means drastically changing my work flow.” Social impacts were also important, with respondents discussing issues with consumerism, safety, social interaction, and education: “I feel like we are losing touch of ourselves and our

own abilities”; “there is always the risk of hacking (leading to invasion of privacy or worse), large damage done to the environment and even causing health issues in the long term.”

The primary drivers given by this set of respondents were the practical issues of time and money: “I am very willing to adopt new technology if it has added benefits but my willingness is less when the financial and learning time costs outweigh the benefits of the new technology.” Many respondents discussed the expense associated with new technology, and the costs involved with new VR and AR technology specifically.

4.5 Barriers and Motivators to Adoption

Respondents described many of the barriers and motivating characteristics that influenced their adoption decisions. Just as cost was listed as a driver behind adoption, it was again specifically discussed by respondents as both a barrier and a motivator: “Whether the improvement in quality of life is worth the cost,” as while some technology can be expensive, in some cases “new technology can be cheaper, more reliable, or better performing” than existing technology.

Simple availability and access were listed as motivators to adoption, with “easy availability of products, consistent power source, easy, consistent and strong internet access” a strong influence. Physical access can be a barrier, with one respondent stating that “I live in a country where electronics are often in a different language from my native language, which I prefer to use for technology” and another describing issues as “the technology [is] unavailable in countries or regions due to prioritised distribution or manufacturing.” The availability of support for a product was also discussed in this way: “I would feel a lot more convinced if I was able to access customer support within the country instead of buying a prototype from [overseas] and then not being able to get support when it malfunctions.” In some cases, respondents preferred the more immediate support of friends or family as a motivator: “having smart or technology-literate friends who already own the technology and can demonstrate how to use it.”

Technology ecosystems were seen as both a barrier and a motivator, as “the ease of integration with other technology is significant.” Technology that is locked to a specific ecosystem could improve experiences for people already using that system, but was a barrier for people using a different platform: “it can be hard to justify some purchase if it does not integrate with my current setups.” This was not unique to operating systems specifically, with one person commenting that “there are so many different consoles that require different games, different methods of use.” This was linked to the perceived learnability of the new technology: “Time required to learn new technology inhibits my motivation and need for new technology.”

Some respondents were concerned about negative impacts from new technology, citing health issues, security issues, and potential environmental issues as barriers to adoption. Negative environmental impact would prevent some respondents from adopting technology. Health issues in terms of physical impact, psychological damage, and long-term health damage were all

cited as barriers to adoption. Security was seen as a major concern, with discussion of hacking, information security, and privacy raised. One respondent provided a specific example:

“We had a Google home assistant which was fun for a few days but ultimately we didn't really use it for anything. Anything it could do I already had plenty of ways to do and it would randomly respond without prompting. I don't like giving away more personal information (such as recordings of discussions) to companies than I absolutely have to.”

For several respondents, intrinsic motivation appears to be the primary motivator for adopting new technology: “An example is my desire for the technology to be widely adopted. For example, I purchased a VR system because I wanted to support the industry and encourage growth that would lead to it becoming a common house-hold technology.” People who rated themselves most highly willing to adopt new technology cited excitement and their ‘love’ of technology as their primary motivations: “I enjoy being on top of new technological advances and am excited by the possibilities they present”; “I find new technology fascinating and exciting”; “I love technology and think it is amazing, so I am 100% interested when a new product is released.”

5. Discussion

The respondents in this survey represented a broad spectrum of people who use technology, across age, gender, and work status and discipline areas. The population representation was biased by the online nature of the questionnaire, reflected in the fact that all respondents owned a computer device. This sets a baseline for the population as existing users of technology.

Starting with the more established of the devices explored, device ownership for entertainment was common, however not universal. Women were more likely not to own entertainment devices than men. Socio-economic factors may also influence entertainment device adoption, as most of this group were not working. The most commonly owned entertainment device was a smart TV, with gaming devices and MP3 players also popular. Younger respondents were more likely to own one or more gaming devices, and ownership of other entertainment devices increased for respondents over the age of thirty-five. Again, some gender differences emerged, with women slightly more likely than men to own no gaming devices, women more likely than men to own two gaming devices, and men more likely than women to own three gaming devices. Women were also more likely than men to own a single general entertainment device, whereas men were more likely than women to own two general entertainment devices.

Entertainment devices are the most established of the new technology categories explored in this paper, and are most broadly represented for existing applications. Gaming devices and televisions particularly are in wide domestic use (Brown et al., 2015), supporting the established nature of device ownership in this category for this population.

Emerging technology devices reflected the lowest ownership rates of the devices explored in this questionnaire, with nearly

half the respondents reporting no ownership in this category. The questionnaire asked specifically about experience using AR, and the majority of respondents reported experience with between one and eight different AR technologies. The most commonly used AR applications were those that were available through a mobile device, such as a phone or tablet. Despite experience with AR, positive feedback given on the experience, and a broad range of potential applications for the technology, no respondents owned an AR head-mounted display device such as the Hololens or smart glass technology. The most frequently given reason for this was cost, with many respondents commenting specifically on the price of these devices as a barrier to adoption. This reflects findings from other studies relating to price point as a barrier for AR and VR (Laurell et al., 2019). Mobile AR however can be experienced using devices these respondents currently own.

Those respondents who did own emerging technology were most likely to own a single device. The most commonly owned VR device was the Google Cardboard, which is the least expensive option in that market. The most commonly owned devices in this category were fitness wearables, the most established of the emerging technology devices included in the questionnaire. Early commercial fitness trackers emerged in the late 2000s with sophisticated clip on devices that were followed by wrist worn devices (such as the first wrist worn Fitbit in 2013). Women were far more likely to own a fitness wearable than men. This reflects findings by Macridis, Johnston, Johnson, and Vallance (2018).

The majority of respondents to this questionnaire described themselves as willing to adopt new technology, however this willingness varied from adoption ‘only when it's relevant’ to keen enthusiasm, such as the respondent who stated “I'd give anything a red hot shot.” Intrinsic motivation influences this willingness (as indicated by responses such as “Over marketing and oversaturation makes me suspicious and demotivates me”, and “Just not ‘getting’ the technology type of thing” for people who rated themselves as unwilling, in comparison to enthusiastic support from the highly willing). This is consistent with earlier studies linking intrinsic motivation and the adoption of a technology career (Potter, von Hellens, & Nielsen, 2009). Most respondents linked adoption decisions to their own experience with technology, the usefulness of the technology and its impact on their lives and work. The most commonly cited influence on personal adoption was cost, both positively in relation to saving money and time, and negatively in terms of expense. This was true for both respondents keen to adopt new technology, and for less enthusiastic adopters.

While cost and time were key influences, respondents cited a range of adoption barriers and motivators including availability of technology, access to technology, support for using the technology, influence from friends and family, and the inherent learnability of the technology. Potential negative outcomes from using new technology were also raised, including health issues, security problems, and environmental impacts.

6. Conclusion

This paper sought to explore ownership and adoption decisions in relation to technology in order to answer:

1. What new technology do people choose to own?
2. How willing are people to adopt new technology?
3. What do people consider are barriers or motivators for their decision to adopt new technology?
4. What does this mean for people's readiness for a new technology workplace?

The respondents in this questionnaire chose to own computing devices, however this ownership decision diminishes as we move through entertainment devices and to emerging technology. This may reflect the nature of innovation as defined by Rogers (2003), with computing devices at an established level of maturity owned by the majority, and smart televisions and gaming platforms delivering innovation to established devices potentially at the early majority stage. Ownership of emerging technology was lowest, reflecting its status as a new technology in a growth stage, currently the domain of innovators and early adopters.

In answer to the second question, the respondents in our questionnaire were largely willing to adopt new technology, however levels of enthusiasm varied. More information was gained from answers to the third question, where barriers and motivators were given that informed adoption decisions including the maturity of the technology and its associated software, the availability of support, the usefulness of the technology and its applications, and the cost and time involved in adoption.

The final question seeks to address people's readiness for expansion of this technology, and touches on the related issue of why the predicted adoption of new technology has not eventuated. Based on the information from the questionnaire respondents, work application is an adoption motivator, due to perceived improvements to productivity, and through necessity (as indicated by comments such as "My job requires me to experiment with emergent new technologies"). The respondents are willing to adopt new technology when they can see a clear benefit to them and to their work. They are willing to purchase emerging technology that is of lower cost. The current barriers to personal adoption, and the associated uptake of emerging technology, are practical: the time taken to learn new techniques and processes, and the costs associated with the technology itself, place many examples of emerging technology beyond the reach of the average consumer.

REFERENCES

- [1] Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action-control: From cognition to behaviour* (pp. 11-39). Heidelberg: Springer.
- [2] Boas, Y. A. G. V. (2012). *Overview of Virtual Reality Technologies*. Paper presented at the Interactive Multimedia Conference, Southampton.
- [3] Brown, S. A., Venkatesh, V., & Hoehle, H. (2015). Technology adoption decisions in the household: A seven-model comparison. *Journal of the Association for Information Systems*, 66(9).
- [4] Chuah, S. H.-W., Rauschnabel, P. A., Krey, N., Nguyen, B., Ramayah, T., & Lade, S. (2016). Wearable technologies: The role of usefulness and visibility in smartwatch adoption. *Computers in Human Behaviour*, 65, 276-284.
- [5] Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety: Experiencing flow in work and play*. San Francisco: Jossey-Bass.
- [6] Dacko, S. G. (2017). Enabling smart retail settings via mobile augmented reality shopping apps. *Technological Forecasting and Social Change*, 124, 243-256.
- [7] Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319-340.
- [8] Dillon, A., & Morris, M. (1996). User Acceptance of Information Technology: Theories and Models. In M. E. Williams (Ed.), *Annual Review of Information Science and Technology*. Medford NJ: ASIS.
- [9] Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention and Behaviour: An Introduction to Theory and Research*. Reading MA: Addison Wesley.
- [10] Gleasure, R., & Feller, J. (2016). A Rift in the Ground: Theorizing the evolution of anchor values in crowdfunding communities through the Oculus Rift case study. *Journal of the Association for Information Systems*, 17(19), 708-736.
- [11] Glegg, S. M. N., Holsti, L., Stanton, S., Hanna, S., Velikonja, D., & Ansley, B. (2016). Evaluating change in virtual reality adoption for brain injury rehabilitation following knowledge translation. *Disability and Rehabilitation: Assistive Technology*, 12(3), 217-226.
- [12] Haddon, L. (2003). Domestication and Mobile Telephony. In J. Katz (Ed.), *Machines that Become Us: The Social Context of Personal Communication Technology*. New Brunswick, New Jersey: Transaction Publishers.
- [13] Halaweh, M. (2013). Emerging Technology: What is it? *Journal of Technology, Management and Innovation*, 8(3), 108-115.
- [14] Han, S., & Yang, H. (2018). Understanding adoption of intelligent personal assistants. *Industrial Management & Data Systems*, 118(3), 618-636.
- [15] Jung, T., tom Dieck, M. C., Lee, H., & Chung, N. (2016). *Effects of Virtual Reality and Augmented Reality on Visitor Experiences in Museums*. Paper presented at the Information and Communication Technologies in Tourism, Bilbao, Spain.
- [16] Kim, K. J., & Shin, D.-H. (2015). An Acceptance Model for Smart Watches: Implications for the adoption of future wearable technology. *Internet Research*, 25(4), 527-541.
- [17] Krueger, M. W. (1991). Artificial Reality II. 318.
- [18] Laurell, C., Sandström, C., Berthold, A., & Larsson, A. (2019). Exploring barriers to adoption of Virtual Reality through Social Media Analytics and Machine Learning – An assessment of technology, network, price and trialability. *Journal of Business Research*. doi:<https://doi.org/10.1016/j.jbusres.2019.01.017>
- [19] Li, S.-C. S. (2014). Adoption of three new types of computers in Taiwan: Tablet PCs, netbooks, and smart phones. *Computers in Human Behavior*, 35, 243-251. doi:10.1016/j.chb.2014.03.001
- [20] Macridis, S., Johnston, N., Johnson, S., & Vallance, J. K. (2018). Consumer physical activity tracking device ownership and use among a population-based sample of adults. *PLoS ONE*, 13(1). doi:10.1371/journal.pone.0189298
- [21] Milgram, P., & Kishino, F. (1994). A Taxonomy of Mixed Reality Visual Displays. *IEICE Transactions on Information Systems*, E77-D(12).
- [22] Nieroda, M. E., Mrad, M., & Solomon, M. R. (2018). *Sporty, Posh or... What Type of Wearable Fits You? A Conceptual Framework for Consumer's Adoption of Wearable Devices: An Abstract*. Paper presented at the Back to the Future: Using Marketing Basics to Provide Customer Value. AMSAC, Cham.
- [23] Ott, M., & Freina, L. (2015). *A literature review of immersive virtual reality in education: State of the art and perspectives*. Paper presented at the eLearning and Software for Education.

- [24] Parasuraman, A. (2000). Technology Readiness Index (Tri): A Multiple-Item Scale to Measure Readiness to Embrace New Technologies. *Journal of Service Research*, 2(4), 307-320.
- [25] Potter, L. E., von Hellens, L., & Nielsen, S. (2009). *Childhood Interest in IT and the Choice of IT as a Career: The Experiences of a Group of IT Professionals*. Paper presented at the SIGMIS-CPR, Limerick, Ireland.
- [26] Rauschnabel, P. A., Rossman, A., & tom Dieck, M. C. (2017). An adoption framework for mobile augmented reality games: The case of Pokémon Go. *Computers in Human Behaviour*, 76, 276-286.
- [27] Renaud, K., & van Biljon, J. (2008). Predicting technology acceptance and adoption by the elderly. *Proceedings of the 2008 annual research conference of the South African Institute of Computer Scientists and Information Technologists on IT research in developing countries riding the wave of technology - SAICSIT '08*. New York, New York, USA: ACM Press.
- [28] Robinson, L., Marshall, G. W., & Stamps, M. B. (2005). Sales force use of technology: antecedents to technology acceptance. *Journal of Business Research*, 58(12), 1623-1631.
- [29] Rogers, E. (2003). *Diffusion of Innovation* (5th Edition ed.). New York: Free Press.
- [30] Saad, U., Afzal, U., El-Issawi, A., & Eid, M. (2016). A Model to Measure QoE for Virtual Personal Assistants. *Multimedia Tools and Applications*, 76(10), 1-21.
- [31] Santos, J., Rodrigues, J. J., Silva, B. M., Casal, J., Saleem, K., & Denisov, V. (2016). An IoT-based mobile gateway for intelligent personal assistants on mobile health environments. *Journal of Network and Computer Applications*, 71, 194-204.
- [32] Schaffer, O. (2013). *Crafting fun user experiences: A method to facilitate flow*. Retrieved from
- [33] Shih, P. C., Han, K., Poole, E. S., & Carroll, J. M. (2015). *Use and Adoption Challenges of Wearable Activity Trackers*. Paper presented at the iConference.
- [34] Srinivasan, R. (2008). Sources, Characteristics and Effects of Emerging Technologies: Research opportunities in innovation. *Industrial Marketing Management*, 37(6), 633-640.
- [35] Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186-204.
- [36] Venkatesh, V., Morris, M. G., Davis, G. B., & D., D. F. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27(3), 425-478.
- [37] Vishwanath, A. (2005). Impact of Personality on Technology Adoption: An Empirical Model. *Journal of the American Society for Information Science and Technology*, 56(8), 803-811.
- [38] Yung, Y., Kim, S., & Choi, B. (2016). Consumer valuation of the wearables: The case of smartwatches. *Computers in Human Behaviour*, 63, 899-905. doi:<https://doi.org/10.1016/j.chb.2016.06.040>

Table 4. Summary of Device Ownership

	Age					Gender		Work Status							
	16-17	18-24	25-34	35-44	45-54	55-64	65-74	Female	Male	Unemployed	Studying	Studying & Working PT	Working FT	Retired	
Overall	5 4.81%	32 30.77%	33 31.73%	14 13.46%	11 10.58%	4 3.85%	2 1.92%	59 56.73%	42 40.38%	4 3.85%	38 35.58%	21 21.15%	5 3.85%	32 30.77%	2 1.92%
Computer Device Ownership	1 Device	2 6.45%	15 48.39%	9 29.03%	2 6.45%	1 3.23%	0 0.00%	22 70.97%	9 29.03%	2 6.45%	16 67.74%	5 3.23%	1 3.23%	7 22.58%	0 0.00%
	2 Devices	0 0.00%	11 28.21%	16 41.03%	5 12.82%	1 2.56%	1 2.56%	21 53.85%	18 46.15%	1 2.63%	12 28.95%	6 18.42%	3 7.89%	15 39.47%	1 2.63%
	3 Devices	2 8.69%	4 17.39%	6 26.08%	4 17.39%	2 8.69%	1 4.35%	14 60.87%	9 39.13%	1 4.35%	6 26.08%	8 60.87%	0 0.00%	7 30.43%	1 4.35%
	4 Devices	1 14.29%	2 28.57%	1 14.29%	3 42.86%	0 0.00%	0 0.00%	2 28.57%	5 71.43%	0 0.00%	4 50.00%	1 12.50%	0 0.00%	3 37.50%	0 0.00%
	6 Devices			1					1						
	Gaming Device Ownership	0 Devices	2 4.65%	11 25.58%	14 32.56%	5 11.63%	6 13.95%	3 6.98%	2 4.65%	29 67.44%	14 32.56%	2 4.65%	15 34.88%	9 20.93%	3 6.98%
Entertainment Device Ownership	1 Device	1 3.23%	10 32.26%	11 35.48%	7 22.58%	2 6.45%	0 0.00%	0 0.00%	14 45.16%	17 54.84%	1 3.13%	12 37.50%	6 18.75%	1 3.13%	12 37.50%
	2 Devices	1 7.14%	5 35.71%	4 28.57%	2 14.29%	2 14.29%	0 0.00%	0 0.00%	10 71.43%	4 28.57%	0 0.00%	6 42.86%	3 21.43%	1 7.14%	4 28.57%
	3 Devices	0 0.00%	4 57.14%	2 28.57%	0 0.00%	1 14.29%	0 0.00%	0 0.00%	2 28.57%	5 71.43%	1 14.29%	2 28.57%	2 28.57%	0 0.00%	2 28.57%
	4 Devices	1 33.33%	0 0.00%	1 33.33%	0 0.00%	0 0.00%	1 33.33%	0 0.00%	2 66.67%	1 33.33%	0 0.00%	3 100%	0 0.00%	0 0.00%	0 0.00%
	5 Devices	0 0.00%	1 50.00%	1 50.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	1 50.00%	1 50.00%	0 0.00%	0 0.00%	1 50%	0 0.00%	1 50.00%
	6 Devices		1						1						1
AR VR Ownership	0 Devices	2 7.41%	11 40.74%	10 37.04%	3 11.11%	0 0.00%	0 0.00%	1 3.70%	14 51.85%	13 48.15%	1 3.70%	14 51.85%	5 18.52%	1 3.70%	5 18.52%
	1 Device	1 2.63%	11 28.95%	11 28.95%	7 18.42%	6 15.79%	1 2.63%	1 2.63%	27 71.05%	11 28.95%	1 2.63%	13 34.21%	9 23.68%	3 7.89%	11 28.95%
	2 Devices	1 4.00%	9 36.00%	9 36.00%	2 8.00%	3 12.00%	1 4.00%	0 0.00%	10 40.00%	15 60.00%	2 8.00%	7 28.00%	6 24.00%	1 4.00%	9 36.00%
	3 Devices	1 11.11%	0 0.00%	3 33.33%	1 11.11%	2 22.22%	2 22.22%	0 0.00%	6 66.67%	3 33.33%	0 0.00%	2 22.22%	1 11.11%	0 0.00%	6 66.67%
	4 Devices	0 0.00%	1 50.00%	0 0.00%	1 50.00%	0 0.00%	0 0.00%	0 0.00%	2 100%	0 0.00%	0 0.00%	2 66.67%	0 0.00%	0 0.00%	1 33.33%
	Home Assistance Device Ownership	1 Device	0 0.00%	3 23.08%	4 30.77%	3 23.08%	0 0.00%	0 0.00%	6 46.15%	7 53.85%	1 7.69%	2 15.38%	5 38.46%	0 0.00%	5 38.46%
Wearable Device Ownership	1 Device	0 0.00%	8 21.05%	16 42.11%	6 15.79%	5 13.16%	1 2.63%	2 5.26%	22 57.89%	16 42.11%	0 0.00%	8 21.05%	9 23.68%	2 5.26%	17 44.74%
	2 Devices	0 0.00%	0 0.00%	1 50.00%	1 50.00%	0 0.00%	0 0.00%	0 0.00%	2 100%	0 0.00%	0 0.00%	1 50.00%	0 0.00%	1 50.00%	0 0.00%
	AR # Experiences:														
	0	0 0.00%	2 16.67%	5 41.67%	2 16.67%	2 16.67%	0 0.00%	1 8.33%	10 83.33%	2 16.67%	0 0.00%	6 50.00%	1 8.33%	0 0.00%	4 33.33%
	1	1 5.00%	9 45.00%	4 20.00%	3 15.00%	2 10.00%	1 5.00%	0 0.00%	13 65.00%	7 35.00%	1 5.00%	9 45.00%	5 25.00%	1 5.00%	4 20.00%
	2	2 8.33%	7 29.17%	8 33.33%	3 12.50%	2 8.33%	1 4.17%	1 4.17%	16 66.67%	8 33.33%	2 8.33%	5 20.83%	5 20.83%	3 12.50%	8 33.33%
3	1 8.33%	4 33.33%	2 16.67%	1 8.33%	3 25.00%	1 8.33%	0 0.00%	8 66.67%	4 33.33%	0 0.00%	6 50.00%	1 8.33%	1 8.33%	4 33.33%	
4	1 8.33%	3 25.00%	5 41.67%	3 25.00%	0 0.00%	0 0.00%	0 0.00%	4 33.33%	8 66.67%	0 0.00%	5 38.46%	5 38.46%	0 0.00%	3 23.08%	
5	0 0.00%	6 54.55%	3 27.27%	1 9.09%	1 9.09%	0 0.00%	0 0.00%	4 36.36%	7 63.64%	1 9.09%	4 36.36%	1 9.09%	0 0.00%	5 45.45%	
6	0 0.00%	1 14.29%	4 57.14%	1 14.29%	1 14.29%	0 0.00%	0 0.00%	4 57.14%	3 42.86%	0 0.00%	1 14.29%	3 42.86%	0 0.00%	3 42.86%	
7>	0 0.00%	0 0.00%	2 66.67%	0 0.00%	0 0.00%	1 33.33%	0 0.00%	0 0.00%	3 100%	0 0.00%	2 66.67%	0 0.00%	0 0.00%	1 33.33%	