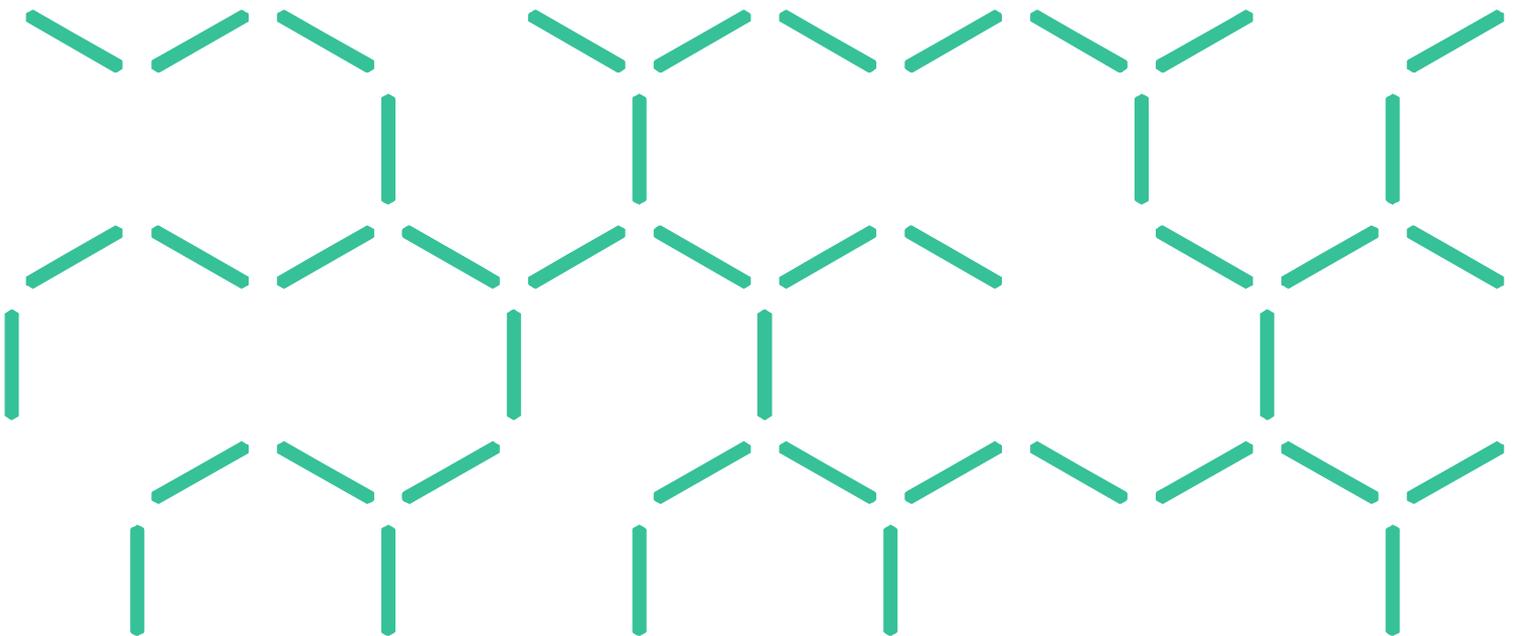# Automated Financial Advice for Superannuation

A Randomised Controlled Experimental Test of Engagement and Motivation Impacts

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Acknowledgments

Executive summary

An increasing range of financial services have been automated over the last couple of decades. Those who once visited their local bank branch regularly to cash cheques or deposit their earnings are now likely to hardly set foot in one now as all our transactions are done online. Financial advice is the new frontier for automation, with a number of 'robo-advisor' products under development or beginning to interact with customers. Such automated systems have great potential to cost-effectively extend financial advice beyond the minority who currently enjoy it. However, it faces barriers, both in the form of many people's low engagement with superannuation, as well as their wariness of trusting technology with their finances.

Previous work suggests that automated systems, if designed and implemented well, could improve engagement through enhancing people's underlying motivation. Such systems would seek to promote customers' experience of relatedness, competence and autonomy, overcoming the de-motivating default-based passive management which currently prevails for most superannuation fund members. This report describes two surveys: one survey to better understand people's perception of automated advice, and an experimental survey to better understand attitudes towards the automation of financial advice, and how experience with a simple automated financial advice system impacts users' attitudes and motivations.

The results indicate that many people are open to automated advice, with some even preferring it to interacting with a human advisor. Interest in robo-advice was higher among younger adults (who often tend to be least engaged with superannuation) and those with higher incomes. Experience of a simplified automated system was associated with a small but statistically significant increase in trust towards robo-advice. Breaking the sample down into clusters of people with initially similar attitudes showed that experience of the online calculator had the greatest impact on those who were initially least positive, increasing their perceived competence and autonomy.

1 Introduction

The ongoing digital revolution is resulting in a growing range of tasks that were once done by people becoming automated. This clearly has far-reaching implications for employment (see Hajkowicz et al. 2016), and is also disrupting business models and changing the face of service delivery. The finance sector is no exception. Within a generation, we have gone from most transactions being done in person in a bank branch to the vast majority of transactions now taking place online. Visiting a bank has become a rarity for most people. There has been a significant decline in the number of people employed as bank tellers, while roles with greater value-add such as financial brokers and advisors have grown (Hajkowicz et al. 2016).

Initial waves of automation targeted routine tasks. Artificial intelligence now means more complex tasks might be carried out by computers. The frontier for automation in the finance sector has now shifted to advice. As the technology becomes more advanced more complex tasks come into reach. As of this writing (May 2017), there are a number of prototype 'robo-advisors' under development, with the expectation that such services will be available to the public in the next year or so. Already, there are a number of options for consumers interested in automated financial information services, such as mortgage calculators and investment calculators. The next generation of these systems will impact parties on both sides of the investment economy – users, and the financial institutions themselves.

While automation is unsettling for existing workers and businesses who are at risk of being disrupted it also brings great opportunities. The marginal cost of delivering digital services is close to zero. This means that once a system has been built it can be used by additional customers at very little extra cost. This is in contrast to traditional face-to-face models in which costs are incurred incrementally with each customer. Digital technology has allowed companies to greatly reduce their costs of service delivery, but requires significant upfront investment. Increased economies of scale may mean that markets become 'winner-takes-all', as the best (and/or first) company to succeed may be able to expand without limit (as Amazon are showing in retail). Financial service providers therefore face interesting times, and critical decisions.

The stakes are also growing for individuals. As wealth increases and the economy opens up people face a greater range of financial decisions than ever before, but many are ill-prepared for this. The superannuation guarantee, which came into being in 1992, means that all workers have compulsory retirement savings, over which they have considerable choice about where and how to invest. However, most people are disengaged, and few seek advice until they are close to retirement, but which point their options have become more limited.

Automated advice systems present the opportunity to extend the reach of professional financial advice to the majority of Australians who currently get no formal advice. Digital advice can be delivered anywhere (with an internet connection) at any time, and at far lower cost than traditional advice. A key question is how far this can, and should, go. People are likely to be wary about trusting their finances to technology. Financial advice is also about more than just intelligence. While technology can easily handle the maths, many people may also need the human touch, for example with emotional support and motivation, to get them to confidently engage with these difficult and important decisions.

The purpose of the current work is to understand public attitudes and opinions surrounding the automation of financial advice, and further, to try and understand how experience with a simple automated financial advice system impacts users' perception of such systems. This builds on a literature review (Greenhilll et al. 2017) examining how digital technology might be applied in ways which enhance people's engagement with their superannuation. Drawing on psychological theory the review shows that digital services need to foster perceptions of autonomy, competence and relatedness among users in order to motivate people to engage. Existing approaches, based heavily on defaults, are largely failing to motivate people to engage.

Greenhill et al. (2017) suggest that there are complex relationships between engagement with superannuation and digital superannuation services, which is likely to vary between groups with different demographic and psycho-social characteristics. The current report takes an experimental approach to better understand this relationship. The following section describes an initial survey intended to assess people's existing attitudes to automated financial services, including advice. This was used to design a follow-up randomised controlled trial designed to test whether experience of a simple automated advisor impacted on people's sense of competence, autonomy and relatedness, willingness and intention, attitudes, and trust towards their superannuation.

2   Initial fact finding survey

To develop an initial understanding of how 'automated financial advice' is perceived in the Australian population, we conducted a survey of 138 adults in the 35+ age range. This survey was carried out on-line, and involved questions rated from 1 (disagree) to 7 (agree) which were aimed at clarifying general perspectives on automated financial advice. A sample question is reproduced in Figure 1 below, and the full survey is provided in the Appendix. The general aim of the survey can be understood as providing a baseline measure of people's willingness to engage with automated financial advice. Unpacking this, the survey aims to develop our understanding of which financial decisions are most amenable, in the public eye, to automation, and which are less so.

Figure 1 Example question and slider bar from initial fact finding survey.
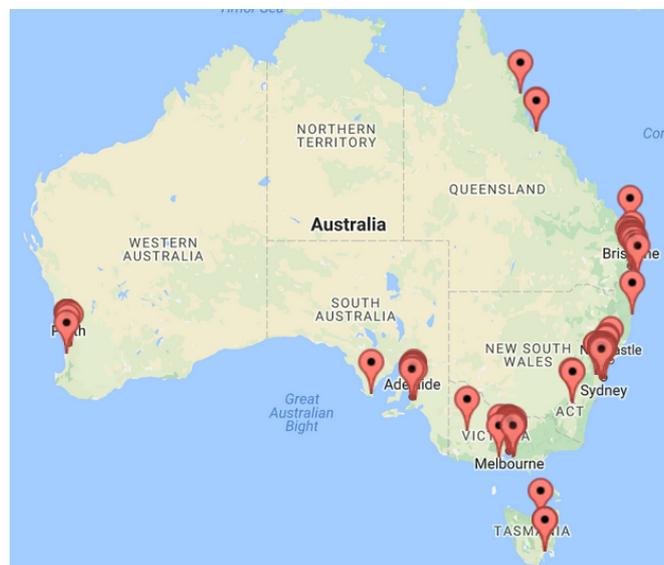
Figure 2 Locations of respondents from initial fact finding survey

This study was carried out using an on-line survey. Participants were queried on a number of relevant issues surrounding automation of financial advice.

2.1.1   Participants:

Participants consisted of 138 Australian residents (64 male, 74 female), with a mean age of 52.35 years (Range 35 to 82; standard deviation of 10.82 years). Participants' mean income was $77,185

(Range $0 to 250k; SD = $55,059), and they had an average of 0.9 dependants (Range 0 to 4; SD = 1.13).

2.1.2 Survey questions:

Five initial survey questions were asked, using the format shown in Figure 1 above. Responses were rated on 'Likert' type rating scale, with a minimum response of 1 and maximum response of 7, with 4 indicating a neutral response.

1. When choosing my investment strategy, I would prefer to receive: human advice (1) / automated advice (7).

2. When deciding on making voluntary contributions to my Superannuation policy, I would prefer to receive: human advice (1) / automated advice (7).

3. When purchasing insurance as part of my superannuation policy (e.g. life insurance, income protection, etc.), I would prefer to receive: human advice (1) / automated advice (7).

4. If transferring funds to another eligible superfund, I would prefer to receive: human advice (1) / automated advice (7).

5. If receiving advice on the self-management of your superannuation fund, I would prefer to receive: human advice (1) / automated advice (7).

Immediately following each of these initial questions, the survey queried respondents on a number of related issues, using a matrix-type format. These questions posed the topic in the header (e.g. "Regarding the transfer of funds to another eligible superfund, please answer the following:"), and the items to be rated appeared below. Please refer to the Appendix for an example of this format. For each of the initial questions above, respondents answered these follow up questions on a 5-point scale (low, somewhat low, moderate, somewhat high, high):

- What level of consideration would you give to making this decision?

- What is the likelihood that you would seek advice when making this decision?

- How would you rate your competence to make an informed decision on this matter?

- What level of trust would you have in the type of advice you have chosen?

- How useful do you believe this advice would be?

- How willing would you be to pay a fee for this service?

2.2 Results and discussion

The average responses for the initial survey questions are given in Table 1, below, and illustrated in Figure 3.

Table 1 Initial Survey Questions: preference for human (1) or automated (7) advice. Note that each main question is rated 1 – 7 (4 is neutral), while the follow up questions are rated 1 – 5 (3 is neutral).

| Question	Average Rating
When choosing my investment strategy	2.6
level of consideration	3.87
likelihood to seek advice	3.24
competence to make an informed decision	3.38
level of trust	3.41
usefulness of advice	3.50
willingness to pay	2.36
When deciding on making voluntary contributions to my Superannuation policy	2.8
level of consideration	3.5
likelihood to seek advice	2.85
competence to make an informed decision	3.47
level of trust	3.29
usefulness of advice	3.32
willingness to pay	2.12
When purchasing insurance as part of my superannuation policy	2.8
level of consideration	3.35
likelihood to seek advice	2.99
competence to make an informed decision	3.36
level of trust	3.23
usefulness of advice	3.30
willingness to pay	2.10
If transferring funds to another eligible superfund	2.8
level of consideration	3.49
likelihood to seek advice	3.18
competence to make an informed decision	3.21
level of trust	3.27
usefulness of advice	3.29
willingness to pay	2.15
If receiving advice on the self-management of my superannuation fund	2.7
level of consideration	3.59
likelihood to seek advice	3.04
competence to make an informed decision	3.34
level of trust	3.28
usefulness of advice	3.29
willingness to pay	2.01
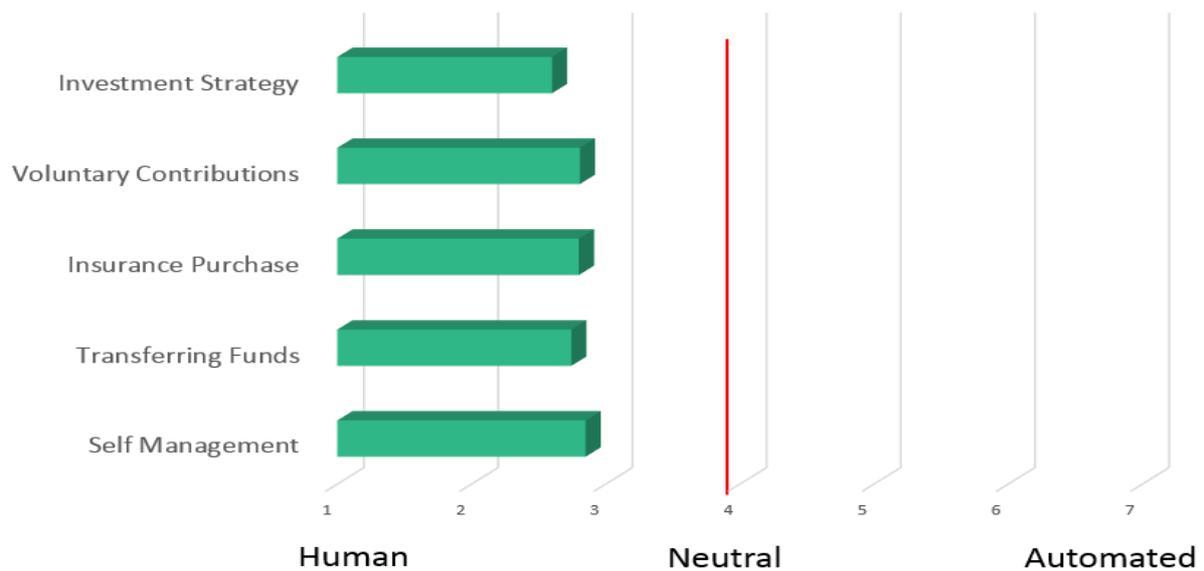
Figure 3 Preferences for Human vs. Automated Financial Advice. Note that overall, preferences in this participant base indicate negative (less than neutral) overall opinions of automated financial advice.

Some further insight can be gained by breaking down the data set by age, and by income level. These graphs are presented in Figure 4 and Figure 5, below. Note here that opinions regarding automated advice generally decline with the age of the respondent, there is an anomaly in the generation aged 60-69, where they rate automation considerably better than either those younger (50-59) or older (70-79). Looking at income level, there is a similar pattern. In this case, opinions regarding automation improve until the 100-150k range, and begin to drop off in the 150-200k range (there were 13 respondents in the 150-200k range – the smallest of the four income groups).
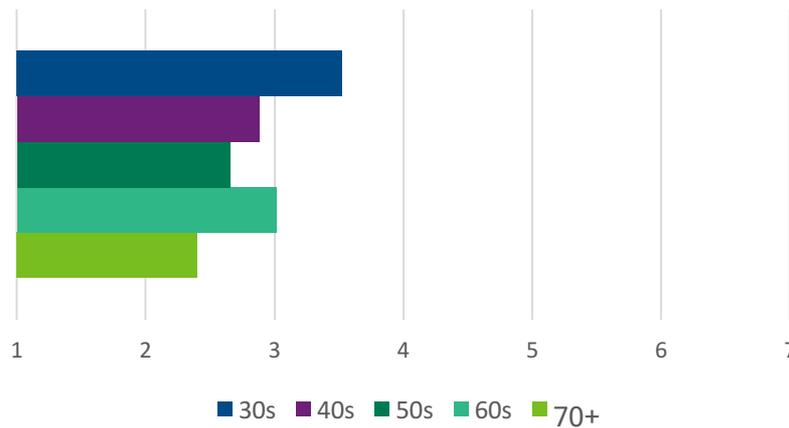
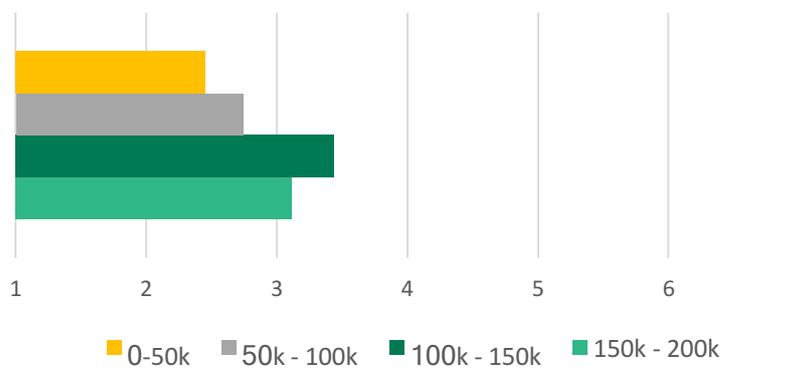**Figure 4 Average preference of automated advice by Age (years)**

Figure 5 Average Preference of automated advice by Income (AU$)

Finally, a number of derivative graphs are produced, which can provide further insight regarding the survey population's response to the above questions. First, we graph the percentage of respondents who rated automation positively (ratings above 4 on a 7-point scale), neutral (4 on a 7-point scale), and negatively (ratings below 4 on a 7-point scale). These are illustrated in Figure 6.

We can also consider the ages of the individuals in each of the 3 groups described above, (Prefer Human, Neutral, Prefer Automated). In this case, individuals who preferred Human Advice, and who were Neutral, were an average of 53 years of age, while those who preferred automated advice were on average 49 years of age. Please see Figure 7 below. Further, the same logic produces evidence that females are marginally pre-dominant in the Prefer Human group (Figure 8), and that those who rate Automation in the positive earn considerably more on average than those who rate automation negatively or neutral (Figure 9).
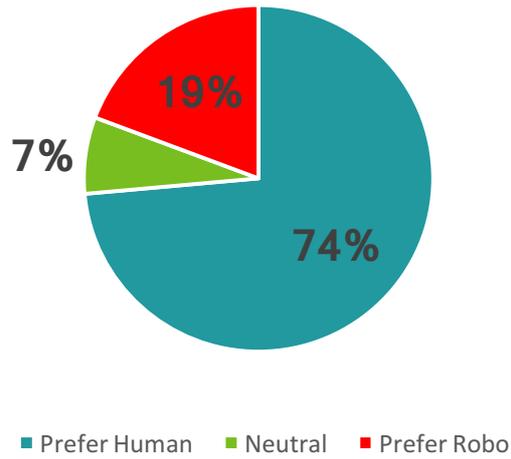
Prefer Human   Neutral   Prefer Robo

Figure 6 Proportion of respondents who prefer automated advice, human advice or with neutral preference
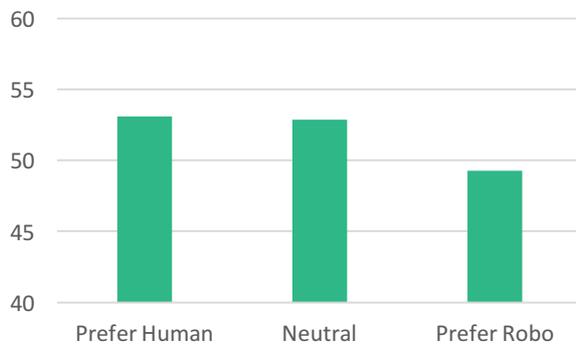

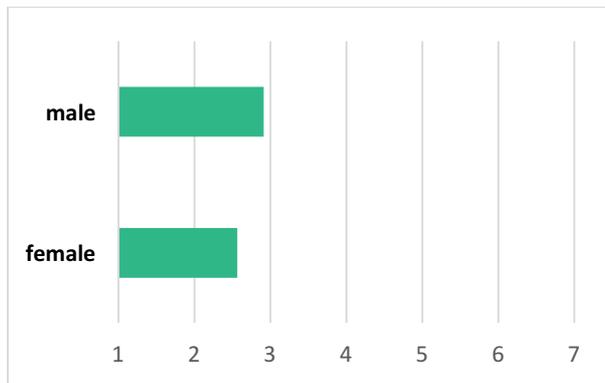**Figure 7 Respondent's mean ages by preference group**

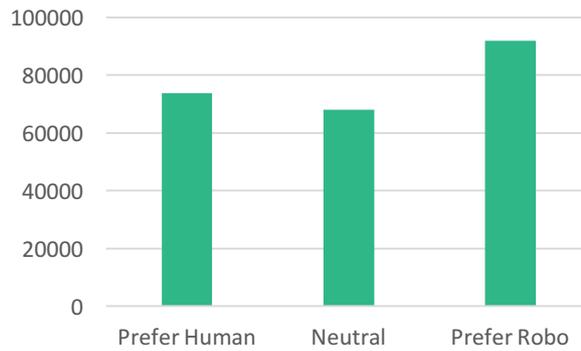**Figure 8 Respondent's gender by preference group**

Figure 9 Respondent's mean income by preference group

2.3 Summary

This initial data provides a basic understanding of where the Australian population stands in opinion surrounding automated financial advice. As can be readily seen from the main 5 questions, expectations are generally low (average rating of 2.7 out of 7, indicating a fairly strong preference for human advice, over automated advice). Importantly, the results generated at this point are based entirely on the respondents' hypothetical understanding of the automation. That is, they did not experience actual automated advice; rather, they were asked to provide ratings dependent upon their reading of the introductory information, and prior understanding of what 'automation' involves. To quote one of the respondents' comment, "if the automated advice is anything akin to automated telephone response, please don't go there". In the follow up study reported next, we address this issue by attempting to provide participants with a close approximation of what an automated superannuation advice system would look like.

3 Experimental survey

The second main component of the research carried out is an experimental survey study, in which the intervention is either 1) some reading that provides respondents with a descriptive explanation of retirement planning (ASIC retirement planning website), or 2) actual experience with the ASIC online retirement planning calculator. We employed a pre-test / intervention / post-test methodology, whereby the experimental group experienced the online planner, while the control group simply read the information provided by the ASIC site.

3.1 Research question

Considering key behavioural indicators surrounding superannuation engagement, trust in automation and motivation, including perceived competence, relatedness, and autonomy, how are these indicators influenced by exposure to an automated advice platform?

3.2 Background and rationale

Current motivational frameworks for the promotion of engagement focus mainly on extrinsic (e.g. financial) motivations. Application of Self Determination Theory (Ryan & Deci, 2000) in this context indicates that by improving individual's internal (*intrinsic*) motivation, superior engagement outcomes may be obtained. Given industry desire to understand superannuation engagement behaviour, this research seeks to demonstrate the effects of interacting with an automated advice platform, on various factors which are considered relevant to superannuation engagement.

In contrast to extrinsic motivation, intrinsic motivation is self-generated. In common terminology, the individual is pursuing the activity for his/her own "interest, enjoyment, and inherent satisfaction". Another important factor to consider in this context is trust in automation. Hence, by focusing on communication and system design factors that can improve an individual's intrinsic motivation and trust in automation, we potentially can increase customer engagement in making superannuation decisions.

If the key factors underpinning intrinsic motivation and trust in automation can be isolated, then this information can be used to support the design of automated advice systems that further support these characteristics, thereby increasing superannuation engagement, customer satisfaction and customer retention. Furthermore, such knowledge could be used to encourage customers who have not yet used automated advice services (by being able to refer to benefits experienced from engagement, validated by research).

Existing theory (Greenhill, Mason, Tapsuwan, Reeson, & Walker, 2017; Ryan & Deci, 2000; Venkatesh, Morris, Davis, & Davis, 2003) suggest that perceived competence, relatedness and autonomy influence motivation and engagement. In this study, we will investigate how experience of automated advice influences these variables. For this we compare a group that receives written information (control group; textual information on retirement planning) to a group that experiences simple automated financial advice.

We will also explore more generally people's attitudes to automated financial advice and if / how these change after having experienced simple advice scenarios. In the absence of an automated advice platform to use in our study we use the interactive online calculators provided by Australian Securities and Investments Commission (ASIC) at moneysmart.gov.au. These tools can provide an informative experience for users from a trusted source.

3.3 Methods

3.3.1 Survey questions:

- Demographics: gender, age, number of dependants, income

- General Use questions: amount of internet use and use of online financial services

Pre- and post-survey (participants answered these questions before and after the intervention):

- Willingness / Intention to use automated advice and online financial services: four questions including willingness or intent to used online services or getting advice, willingness to make voluntary contributions, preference for automated or human advice and willingness to pay for automated advice.

- Attitudes towards automated advice and online financial services: Both, attitudes towards "**getting automated online financial advice**" and **"using online services for managing my Super"** were measured using a semantic differential with 8 word pairs with opposite valance (e.g. Inconvenient – Convenient; Bad – Good; Stressful – Relaxing) and an 8-point scale between the word pairs.

- Intrinsic motivation in relation to making financial decisions: We have adapted the Basic Psychological Need Satisfaction Scale (Deci & Ryan, 2000; Gagné, 2003)[1]. We have changed the wording of questions with respect to making financial decision; furthermore, we have reduced the number of questions from 21 to a total of 9 (3 questions each for perceived competence, relatedness and autonomy).

- Trust in automation was measured with a modified version of System Trust Scale (Jian, Bisantz, & Drury, 2000); we changed the wording of the questions with respect to trust in automated advice and reduced the number of questions to at total of 4.

  - Q1_The automated advice system is straightforward.

  - Q4_I am wary of the automated advice system.

  - Q10_The automated advice system is reliable.

  - Q11_I can trust the automated advice system.

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[1] The BPNS is available at: http://selfdeterminationtheory.org/basic-psychological-needs-scale/

3.3.2 Experimental manipulation:

Following the pre-test, participants randomly assigned to one of two conditions:

- experimental condition: using the retirement planner provided by the ASIC[2],

- the control condition: reading retirement planning advice on the ASIC website[3].

In either case, the participants were required to spend at least two minutes on the respective web pages, and provide some specific piece of information from these pages to ensure that they were performing the task. After completing this section, participants returned to the survey and completed the post- survey questions.

To test whether or not the participant's responses have changed after using an interactive online calculator or reading about financial planning, we analysed the differences in question scores (willingness / intention) and scale mean scores (attitudes, basic needs, trust) before and after intervention using mixed model ANOVAs with one within subjects factor (before/after) and one between subjects factor (experimental/control).

3.3.3 Participants

202 Australian residents participated in this study (104 female, 98 male). Average age was 51 (range 31-83 years, SD = 10), and average income was approximately $76,000 (range $10,000 - $250,000, SD = $47,500), and they had an average of 0.79 dependants (range 0 to 5; SD = 1.12).

3.4 Results and discussion

3.4.1 General use questions

The results of the respondents' answers to the general question regarding their use of internet and of online financial services are illustrated in Figure 10 to Figure 12.

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[2] https://www.moneysmart.gov.au/tools-and-resources/calculators-and-apps/retirement-planner

[3] https://www.moneysmart.gov.au/superannuation-and-retirement/retirement-income-planning
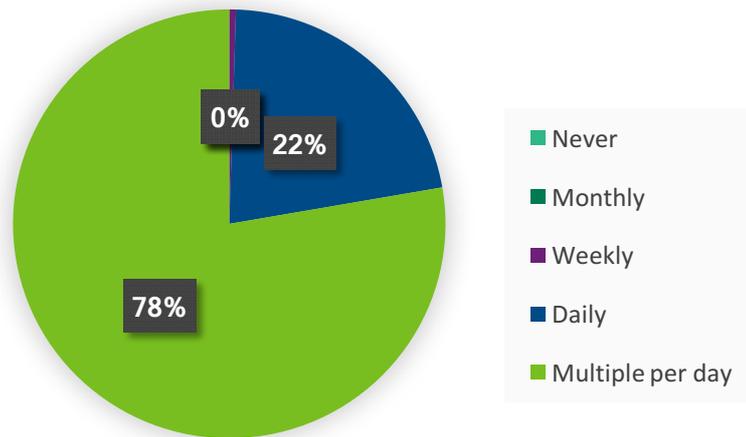
Figure 10 "How often do you go online / use the internet?"

Only one participant reported going online weekly. The rest of the respondents go online at least daily (22%) or several times a day (78%; please note, percentages in Figure 10 have been rounded to full numbers).
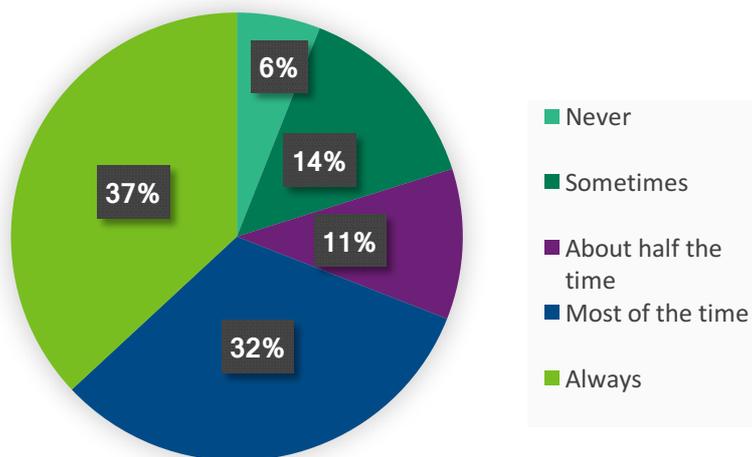

Figure 11 "Please indicate how often you use the Internet to access financial services (e.g. online banking, paying bills, etc.) compared to other ways (phone banking, going to the bank)."

Most respondents use online financial services as compared to more traditional access options either always (37%) or most of the time (32%). A quarter either uses online services half of the time (11%) or sometimes (14%), and only 6% never use online financial services (Figure 11).
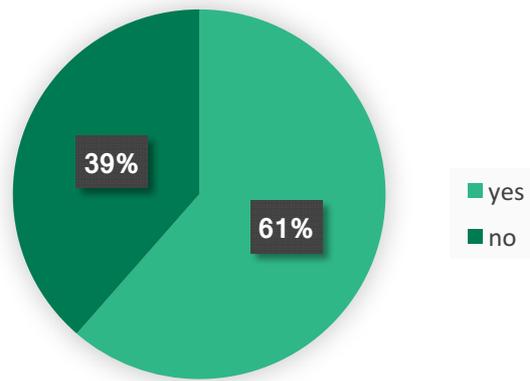
Figure 12 "Have you logged in to your online superannuation account?"

Almost two thirds of the respondents have logged in to their superannuation account, whereas 39% have not done so (Figure 12).

3.4.2 Willingness and Intention to use online services

We asked the participants a set of questions about their willingness and intention to use online financial services before and after the experimental or control intervention.

"I intend to use an online service for managing my Super account (e.g. changing investment or insurance options; checking balances) in the next six months." After the intervention, both groups were slightly but significantly less willing to use an online service ($F(1,200) = 8.748$, $p = .003$, $\eta_p^2 = .042$). There was no difference between the two groups (Figure 13).

"If I had access to an automated online financial advice system I would seek such automated advice for managing my Super in the next six months." Similarly, after the intervention, both groups were slightly but significantly less willing to access automated financial advice ($F(1,200) = 3.978$, $p = .047$, $\eta_p^2 = .019$), and again no difference between the groups (Figure 13).
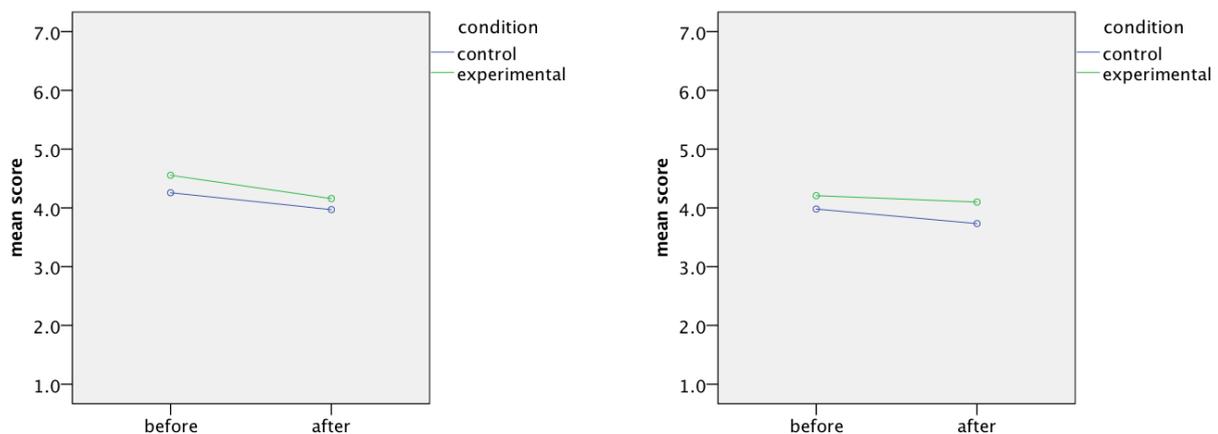

Figure 13 Left: Intention to use online services for managing one's super account before and after intervention; right: intention to access automated advice before and after intervention

We found no effect for the question "**If I had online access to my own superannuation account now, I would be willing to commit to making voluntary contributions**".

The data shows a significant difference between the groups for the question "**If I received accurate automated online financial advice, tailored to my individual circumstances, I would still prefer to talk to a (human) financial advisor**" with the experimental group not changing their preference, whereas the control group showing a stronger preference for human advice after having read about retirement planning ($F(1,200) = 4.161$, $p = .047$, $\eta_p^2 = .020$). The last question, **"I would be willing to pay for automated online financial advice"**, shows a (non-significant) trend with the experimental group being slightly less willing to pay for automated advice after the intervention and the control group not showing a change in willingness ($F(1,200) = 3.068$, $p = .081$, $\eta_p^2 = .015$).
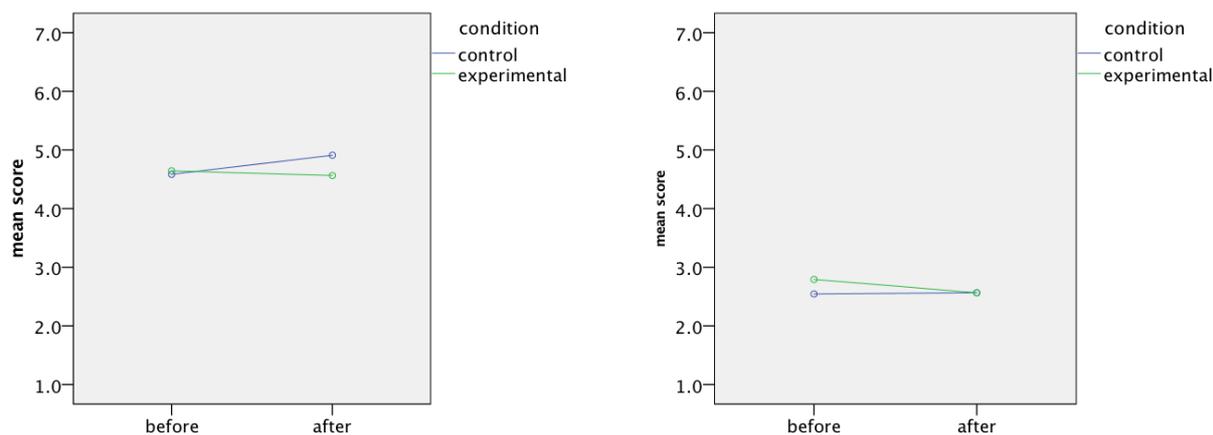

Figure 14 Left: preference to talk to human advisor before and after intervention; right: willingness to pay for automated advice before and after intervention

3.4.3   Attitudes towards automated advice and online financial services

This item employed a metric known as 'semantic differential', which requires participants to select a position between matched pairs of descriptive words (e.g. convenient – inconvenient). For each question, 8 of these semantic differential pairs were posed to the participant. To analyse these results, we first used exploratory factor analyses to check whether or not there were any latent subscales within these (i.e. whether some sets of the word pairs group together). This analysis showed that all word pairs loaded on one factor only (for both questions before and after intervention). Internal consistency analysis also suggested that all word pairs measure the same concept (i.e. attitude), with Chronbach's alpha ranging from .967 to .978. Therefore, we collapsed all into one attitude score.

An ANOVA showed a significant though small overall increase of positive attitude towards getting automated online financial advice for managing one's Super for both groups ($F(1,200) = 4.419$, $p = .037$, $\eta_p^2 = .022$; Figure 15). We found no significant effects for the attitude towards using online services for managing the super account (Figure 15).
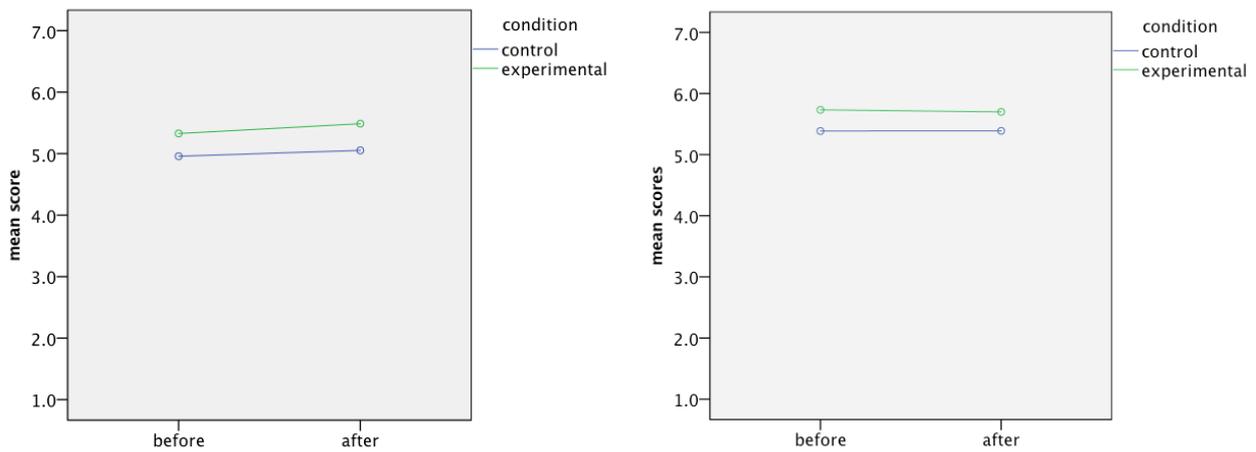
3.4.4 Intrinsic motivation in relation to making financial decisions

In terms of perceived competence, relatedness, and autonomy related to making financial decisions, we found no changes in perceived autonomy before and after the intervention in either of the groups. There was a significant increase in relatedness for both groups $F(1,200) = 5.106$, $p = .025$, $\eta_p^2 = .025$), however, there was no interaction effect (Figure 16).
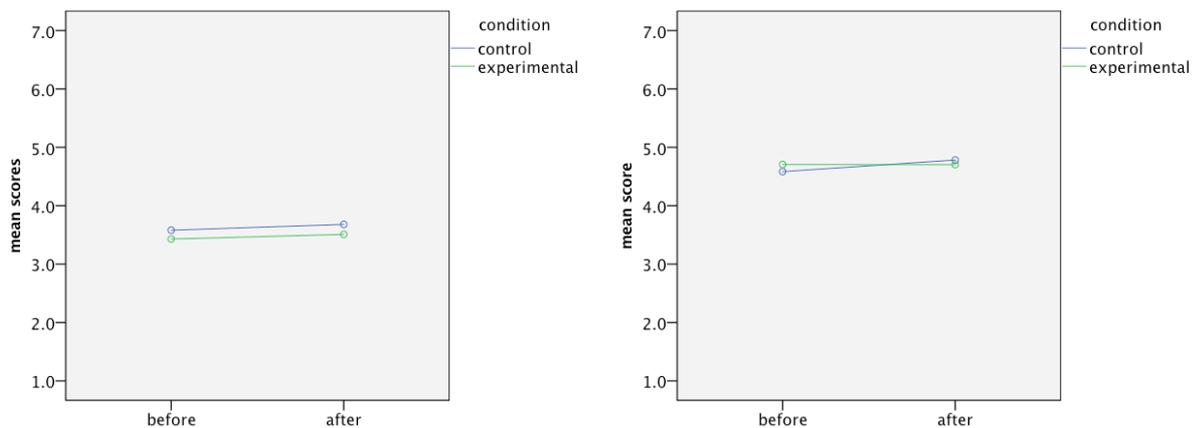
For perceived competence we found a trend towards slightly higher ratings after the intervention for the control group, whereas the experimental group more or less stayed on the same level ($F(1,200) = 3.228$, $p = .074$, $\eta_p^2 = .016$) (Figure 16).

3.4.5 Trust in Automation

After the intervention the experimental group showed significantly more trust in automated advice whereas the control group's trust scores did not show any change ($F(1,200) = 6.73$, $p = .01$, $\eta_p^2 = .03$)(Figure 17).

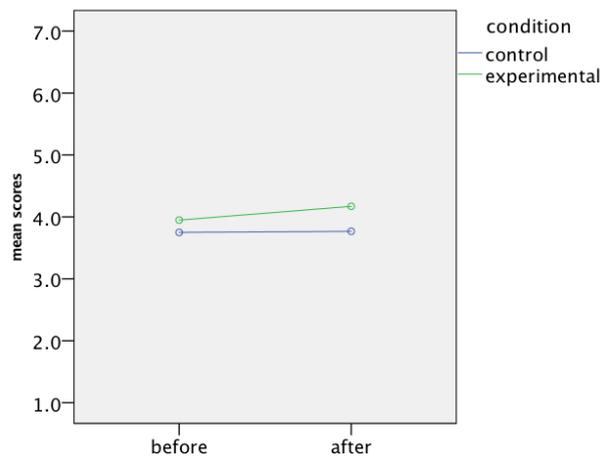**Figure 17 Trust in automated advice services before and after intervention**

3.5 Cluster analysis

In addition to testing the main hypotheses, we performed a follow-up exploratory analysis to gain better understanding of our sample population, and their opinions surrounding the subject of automated financial advice. The main goal here was to determine if there are specific sub-groups of participants, and if so, who they are, and how they engage with financial services and advice.

3.5.1 Clustering sub-groups

First, we performed a hierarchical cluster analysis to find groups within the participants with similar answering profiles. The analysis was done on the willingness, attitude, motivation and trust questions. This resulted in two sub-groups with distinct answering patterns as shown in Figure 18.
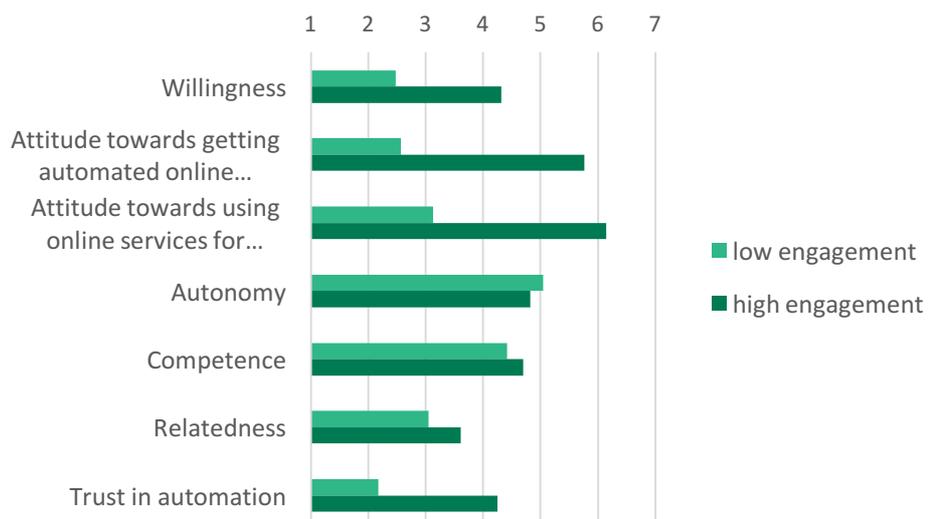

Figure 18 Score means for the two clustered groups

One group had low scores in willingness, attitude towards and trust in automated financial services and advice. We tentatively labelled this group the 'low engagement' group. Conversely

the other group shows relatively high scores in these scales and will be called 'high engagement' group. Differences between these groups in willingness, attitudes, and trust, questions are generally more pronounced than differences in the perceived autonomy, competence and relatedness scales.

A further look at the demographics of these two groups revealed no gender differences (χ^2 = 0.015, df = 1, p = 0.903). However, there was a significant difference in average income (t = -2.962, df = 191, p = 0.003), with the low engagement group earning on average AU\$55,961 (SD = \$36,836) per year and the high engagement group AU\$ 80,987 (SD = \$48,748). The low engagement group was significantly older (M = 56 years, SD = 11) than the high engagement group (M = 49 years, SD = 9; t = 4.212, df = 200, p < 0.001).

3.5.2   Use of online financial services

Next, we compare the use of financial services between these two groups. Figure 19 shows the groups' response to the question regarding whether or not they have logged into their superannuation account. Whereas only 26% of the low engagers had done so, 74% of the high engagers had logged into their accounts (χ^2= 20.985, df = 1, p < .001).
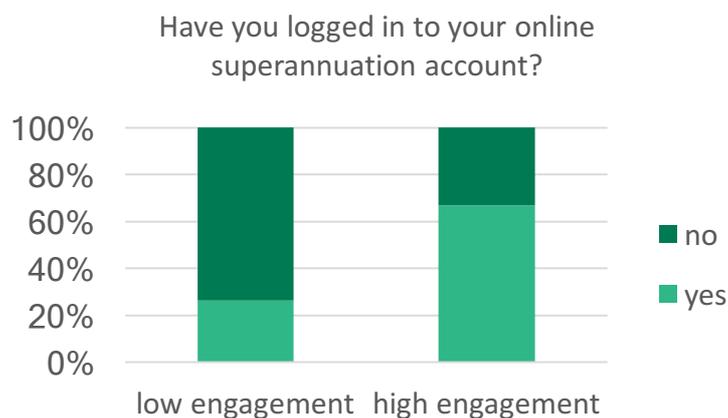

Figure 19 Use of online superannuation account for the two clustered groups

When asked about their use of online financial services, as compared to more traditional ways of accessing such services, the high engagers again had a significantly higher rate of using these as illustrated in Figure 20 (χ^2= 45.516, df = 4, p < 0.001).

How often you use the Internet to access financial services (e.g. online banking,…) compared to other ways (phone banking, going to the bank)
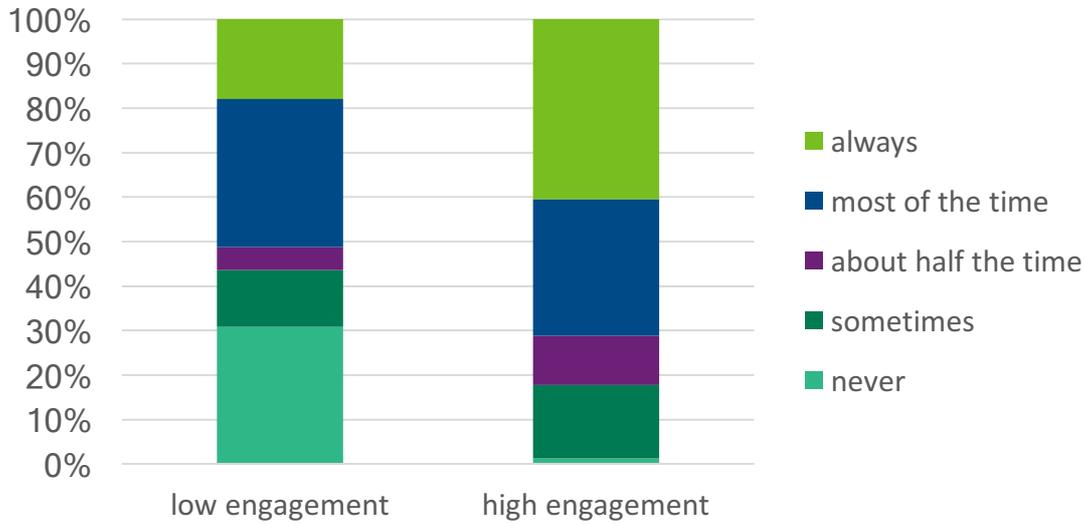
Figure 20 Use of online vs. traditional financial services of for the two clustered groups

3.5.3 Changes after intervention

Finally, we explored if and how these groups changed their initial responses and what impact the two interventions (online calculator, reading information) had. This analysis may help provide some clarity on how the lower engagement group (i.e. those customers that may be more negative towards online financial services and advice) could be better engaged. For each of the scales we performed ANOVAs with the respective score difference as dependent variable and group (low/high engagement) and intervention (experimental/control) as independent variables.

While there was no effect of *group* or *intervention* on 'willingness' and 'intention to use online services', there was a significant interaction between group and intervention with respect to 'Attitude towards getting automated online financial advice for managing my Super' ($F(1, 198)$ = 3.954, p = 0.048, η_p^2 = .020) as illustrated in Figure 21. While the high engagement group's attitudes changed very little in both intervention types, those low engagers who used the online calculator show a greater change in attitudes, when compared with the low engagers who simply read the information.
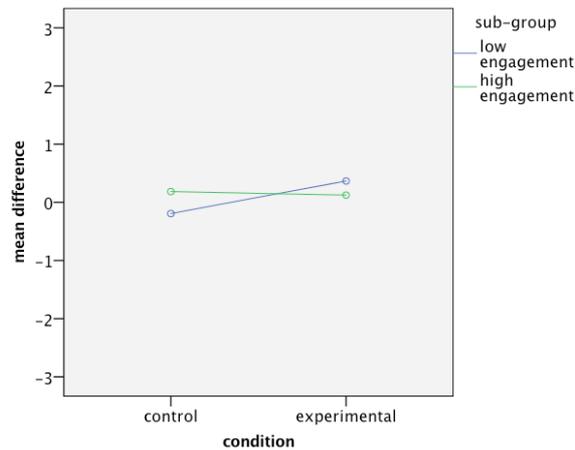
Figure 21 Score difference for 'Attitude towards getting automated online financial advice for managing my Super' before and after the two experimental conditions for both, low and high engagement groups

We found the same pattern for 'Attitude towards using online services for managing my Super', however, the interaction effect did not reach significance level ($F(1, 198) = 2.589$, $p = 0.109$, $\eta_p^2 = 0.013$). Also for perceived autonomy we found a significant interaction ($F(1, 198) = 4.657$, $p = 0.032$, $\eta_p^2 = 0.023$), indicating that use of the online calculator resulted in an increase in the low engagement group's perceived autonomy, while the high engagement group's scores remained unaffected (Figure 22).
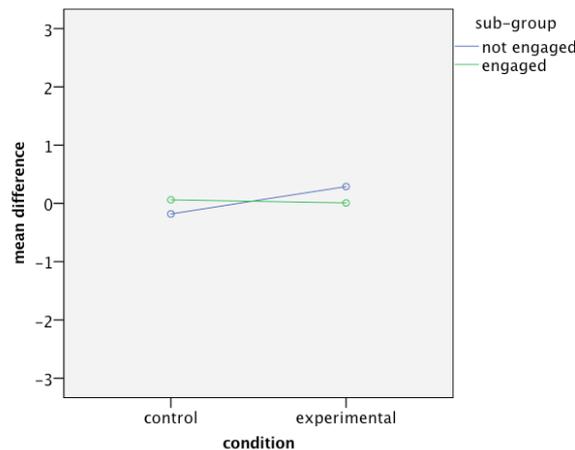

Figure 22 Score difference for perceived autonomy after the two experimental conditions for both, low and high engagement groups

For perceived competence we found a significant main effect indicating that the low engagement group's perceived competence slightly grew irrespective of reading or using the online calculator (no change in competence for the high engagement group; $F(1, 198) = 5.411$, $p = 0.021$)). There were no significant differences for the relatedness scores.

For trust in automation we found no interaction, but a significant main effect of condition ($F(1, 198) = 5.338$, $p = 0.022$), showing, as reported above in main results section, that respondents had significantly more trust in automation after having used the online retirement planner, whereas trust did not change when reading information on retirement planning. This effect was the same for both engagement groups.

3.6 Summary

The outcomes of Experiment 2 are multifaceted, with varying results for the experimental manipulation across the multiple dependent variables, which we will unpack below; and further, a number of non-significant findings. Furthermore, effect sizes were very small, and the results therefore have to be interpret rather cautiously.

Regarding the General Use questions, it is obvious from this survey that our sample consisted of mainly heavy computer users: 78% used the internet multiple times a day, 22% used it daily, with only one respondent in the Weekly, and none in the Monthly, or Never categories (0%). Regarding use of internet banking, respondents who used internet banking 'Always' or 'most of the time' accounted for a total of 69% of the sample, with only 6% answering 'never'. Regarding prior access to online superannuation material, 61% of the sample indicated that they had logged into their online superannuation account. This indicates that our sample is likely highly indicative of the opinions of computer literate individuals, while it may under-represent the opinions of individuals who are not comfortable with computer use. This can be traced to the origin of our sample (online survey takers); as this population likely overlaps with the intended market for automated financial advice, the results gained here should be considered relevant to the question of engagement with automated advice systems.

The first segment of the survey inquired regarding participants' willingness and intention to use automated advice systems. Interestingly, both our experimental and control group appeared to be less willing to engage with automated advice systems, after reading, or alternately, using a simple online service for retirement planning. This may indicate, generally, that the automated advice concept / experience is not overly appealing; or that alternately, our manipulation did not capture well enough the possible advantages and attractions of automated advice.

A further effect to be noted here is that the control group, who read about retirement planning, showed a stronger preference for human advice; whereas the experimental group, who used an automated financial planner, did not change their preference. Extrapolation from this finding is difficult, as it runs counter to our predictions for the experimental manipulation. Regarding willingness to pay for automated financial advice, individuals who experienced the automated financial planner were significantly less willing to pay for the service. This suggests that while the financial advice system used here (ASIC Moneysmart Planner) did not compel participants to pay for such a service (in fact, deterred them), reading about financial advice (thus, exposure to the concept) did not deter people from considering such financial contributions. It also could suggest that people may expect such services to be free of charge.

The 'semantic differential' questions, which gauged participants' attitudes towards financial advice using a series of semantic comparisons (e.g. convenient – inconvenient), generally indicated that people may be more positive towards automated financial advice, after receiving retirement planning information. However, there was no difference between the experimental and control conditions, so we can make limited conclusions outside of the basic finding that experience positively impacts attitudes towards automated financial advice. Further, while this pattern held true for the first semantic differential question ("Attitude towards getting automated online financial advice for managing my Super"), there was no difference when considering the more

general phrasing ("Attitude towards using online services for managing my Super"), suggesting that the concept of automation was a key contributor to this pattern of results.

Regarding the intrinsic motivation questions, the analysis is generally not compelling. Considering questions designed to get at an individual's feelings of competence, there was no difference between the control and experimental groups. However, one may note a marginal finding here, (trend at $p=.074$) where the control group demonstrated higher competence after the intervention, indicating difficulty with the actual automated advice condition. Likewise, ratings for questions designed to assess participants' perception of autonomy did not differ between the conditions. Finally, perception of relatedness improved post-intervention, but this occurred equally for both control and experimental conditions. While at first pass this section appears generally inconclusive, some interesting results present themselves when considering the behaviour of subgroups within the population, outlined in the following section.

Perhaps most compellingly for our initial hypotheses, we found that trust in automated financial advice systems improved in a clear-cut manner, after experience with the system. In this case, the experimental group (who experienced the ASIC money planner) demonstrated higher ratings of trust, as compared with the group that simply read about financial planning. This is an important finding, as trust is one of the major factors that acts in determining ongoing use of automated systems in general (e.g. Lee and See, 2004).

3.6.1 Sub-group analysis

Some further interesting outcomes of this study can be described by considering the exploratory analysis that we conducted on the data, following the initial analysis of our main hypotheses. Specifically, using a cluster analysis, we tested whether there were unique groups with similar patterns of response (i.e. subgroups of the sample who responded in similar ways to each-other). In this manner, the data was divided into two groups; one which clearly demonstrated high levels of willingness and intent, attitude towards, and trust in, online financial services and advice respectively; and a second subgroup who generally rated low on these measures. For convenience, we have characterised these as high and low engagement groups. Interestingly, and consistent with the results of our initial exploratory work in Experiment 1, those individuals who were more positive towards automation tend to have higher income, are younger, and reported using online financial services, including their online superannuation account, significantly more often.

Furthermore, within the 'low engagement' group, participants significantly changed their attitudes towards getting automated advice, becoming more positive, after having used a simple online retirement calculator. In contrast, they did not change when reading about retirement planning. This indicates that exposure to even simple advice scenarios can help in changing 'low engagement' individuals' negative attitudes towards automated advice, and may help in getting this group more engaged. After having used the online calculator the 'low engagement' group demonstrated higher 'perceived autonomy' in relation to making financial decisions. This occurred with the marked absence of similar effects for relatedness and competence. Finally, in a similar vein, perceived competence in this group increased irrespective of experimental condition. This indicates that providing less engaged people with different sorts of retirement planning information may help strengthen their perceived competence in making financial decisions.

4 General discussion

The current set of studies represents an early look at how Australian computer users may respond to the introduction of automated systems for advice on their superannuation investment. At the time of this writing, a number of sophisticated automated advice systems for superannuation are under development, and introduction of these systems to the general population can be anticipated in the coming year. In preparation for this, and to aid the superannuation research cluster in understanding the impact of these systems, we conducted a set of two surveys. First, a fact-finding investigation to determine demographics, opinions, and attitudes of the likely usage group for this technology, and second, a follow-up experimental survey designed to understand engagement patterns, and possible influences on customer engagement for this new technology.

This report has made clear a number of basic findings regarding automated superannuation and its likely acceptance within the population. First, we have a detailed categorization of the demographics for respondents who report positive ratings in regards to automated financial advice, as compared with those who report negative ratings. Specifically, it is evident that the demographics in the positive group (those who reported positive opinions towards automated advice) indicate a population that is on average younger and higher-earning than those who report negative opinions of automated financial advice.

It is encouraging that younger people were more interested in automated advice, since as a group they are among the least engaged with superannuation while also having the most to gain from well-informed decisions. While such positive opinions do exist in the sample collected, it is clear that when averaging all of the questions, overall expectations for the automated advice system are generally quite low (average rating of 2.7 out of 7, where neutral would be a rating of 4). This low rating indicates that the superannuation industry has a considerable hurdle to overcome in engaging users with automated financial advice systems for superannuation decisions.

As a follow-up to this initial survey, we conducted an experimental survey, using the pre-test / intervention / post-test design, where participants either experienced a simple automated advice system (ASIC Moneysmart Financial Planner), or simply read about retirement planning from the same source (ASIC). In addition to finding additional support for the previously reported proportion of people who have positive attitudes towards automated superannuation advice, we provided some further insight in this domain. Primarily, we note that trust in automated systems increases for all users, when experience with such a system is provided. Importantly, and perhaps more interestingly, we report that, for people who had low initial conceptions of automated financial advice, experience with the automated advice system differentially affects this population in that it increases positive attitudes towards the technology, and increases measures that are associated with perceived autonomy. Given that stronger feelings of autonomy are associated with stronger engagement with technologies (Greenhill et al., 2017), this is a strong indicator that one of the most successful strategies for improving engagement with automated superannuation systems would be to provide potential users with an opportunity to experience the service first hand.

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