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Artificial intelligence in financial services: a qualitative research to discover robo-advisory services

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Abstract

Purpose – The purpose of this study is to gauge the awareness and perception of Indian individual investors about a new fintech innovation known as robo-advisors in the wealth management scenario. Robo-advisors are comprehensive automated online advisory platforms that help investors in managing wealth by recommending portfolio allocations, which are based on certain algorithms.

Design/methodology/approach – This is a phenomenological qualitative study that used five focussed group discussions to gather the stipulated information. Purposive sampling was used and the sample comprised investors who actively invest in the Indian stock market. A semi-structured questionnaire and homogeneous discussions were used for this study. Discussion time for all the groups was 203 min. One of the authors moderated the discussions and translated the audio recordings verbatim. Subsequently, content analysis was carried out by using the NVIVO 12 software (QSR International) to derive different themes.

Findings – Factors such as cost-effectiveness, trust, data security, behavioural biases and sentiments of the investors were observed as crucial points which significantly impacted the perception of the investors. Furthermore, several suggestions on different ways to enhance the awareness levels of investors were brought up by the participants during the discussions. It was observed that some investors perceive robo-advisors as only an alternative for fund/wealth managers/brokers for quantitative analysis. Also, they strongly believe that human intervention is necessary to gauge the emotions of the investors. Hence, at present, robo-advisors for the Indian stock market, act only as a supplementary service rather than a substitute for financial advisors.

Research limitations/implications – Due to the explorative nature of the study and limited participants, the findings of the study cannot be generalised to the overall population. Future research is imperative to study the dynamic nature of artificial intelligence (AI) theories and investigate whether they are able to capture the sentiments of individual investors and human sentiments impacting the market.

Practical implications – This study gives an insight into the awareness, perception and opinion of the investors about robo-advisory services. From a managerial perspective, the findings suggest that additional attention needs to be devoted to the adoption and inculcation of AI and machine learning theories while

JEL classification – G20, G29

Authors duly acknowledge the time, knowledge and efforts of the participants of the present study. This would not have been possible without their active support. The names of the participants are not being disclosed as given in the ethics section, however, their contribution towards this research is immense and we are sure that this will help in building the knowledge in the area of robo advisors.

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building algorithms or logic to come up with effective models. Many investors expressed discontent with the current design of risk profiles of the investors. This helps to provide feedback for developers and designers of robo-advisors to include advanced and detailed programming to be able to do risk profiling in a more comprehensive and precise manner.

Social implications – In the future, robo-advisors will change the wealth management scenario. It is well-established that data is the new oil for all businesses in the present times. Technologies such as robo-advisor, need to evolve further in terms of predicting unstructured data, improvising qualitative analysis techniques to include the ability to gauge emotions of investors and markets in real-time. Additionally, the behavioural biases of both the programmers and the investors need to be taken care of simultaneously while designing these automated decision support systems.

Originality/value – This study fulfils an identified gap in the literature regarding the investors' perception of new fintech innovation, that is, robo-advisors. It also clarifies the confusion about the awareness level of robo-advisors amongst Indian individual investors by examining their attitudes and by suggesting innovations for future research. To the best of the authors' knowledge, this study is the first to investigate the awareness, perception and attitudes of individual investors towards robo-advisors.

Keywords Artificial intelligence, Qualitative research, Fintech, Wealth management, Focussed group discussion, Robo-advisory

Paper type Research paper

1. Introduction

Robo always reminds us of a wish we had during our childhood, of a robot or automated machine carrying our school bags, doing our homework and especially our artwork. "Years ago, our wish remained unfulfilled. But not anymore[. . .]!"

With the advent of robo-advisors, financial choices are no longer a confusing burden for investors. Robo-advisors are a class of financial advisors, which provide automated investment advice based on algorithms. They use contemporary and influential application of information technology in the wealth management sector. The calculations and analyses, based on set algorithms, are carried out through automated software. There are various synonyms for robo-advisors and they are commonly also known as a digital investment advisor, automated investment management, automated investment advisor, online investment advisor, digital investment advisor and so on and so forth.

Robo-advisory is at a nascent stage and is still emerging and evolving. Therefore, additional information is needed on the subject to better equip investors to understand its full capability of handling different financial technology issues. Moreover, it will be interesting to explore whether different robo-advisors are required to be designed to cater to different domestic segments of different countries (Abraham *et al.*, 2019).

There is notably considerable research, which suggests that robo-advisors have the potential to serve as an alternative for wealth management services. Robo-advisors can blend both judgemental and quantitative techniques of humans and machines, respectively (Phoon and Koh, 2017). Some researchers are of the opinion that the emergence of these online investment advice techniques has the capability to benefit both new and existing investors in a more cost-effective manner (C Lopez *et al.*, 2015). According to Woodyard and Grable (2018), financially literate young investors are frequent users of robo-advisors; however, they are not extremely confident about conventional financial advising techniques. Investors with trepidation of having a potential conflict of interest with human advisors are more likely to use robo-advisors (Brenner and Meyll, 2019).

Use of robo-advisors has shown tremendous growth in developed countries such as the US and Europe. As per Statista (2019) Market Report, the average Assets Under Management (AUM) under advice from robo-advisor's amounts to US$10,48,657m in 2020

and the number of users of robo-advisory services are approximated at 9.903 million users in the US. Germany and the UK are at the front seat and are key drivers of the robo-advisory market in Europe. AUM under advice from robo-advisors amounts to US$13,951m and $24,398m, respectively, with the number of robo-advisory service users approximated at 0.445 million users and 0.754 million users in Germany and the UK, respectively. In India, AUM under advice from robo-advisors amounts to US$65m with 0.108 million users of the service as per the report of Statista (2019). The data presents remarkable differences not only in AUM but also in terms of volume of robo-advisory service users in India, in comparison with developed nations such as the US, the UK and Germany.

Some researchers have found that enhanced transparency and abundant access to information are vital to adopt robo-advisory services. Cedrell and Issa (2018) have used a quantitative research approach on a sample of roughly 435 investors to conclude that lack of information and opaqueness are major concerns for the slow adoption of robo-advisors in the economy of Sweden.

The addition of two new parameters, personal risk and aspirational risk, in line with the foundations of modern portfolio theory, allows individual investors to personalise their risk-return preferences and diversify their portfolio. Better asset allocation is only possible when it is preceded by solid risk profiling (Chhabra, 2005).

Researchers have reported that low-income investors are more likely to use robo-advisory services and are often benefited from the service by generating a good return from portfolios (D Hond't, 2019). Time dimension is an imperative element in designing collaborative systems such as robo-advisory services to take care of behavioural factors, especially in nascent phases. Interactions and circumstances surrounding the interactions must be closely observed and the growth and increasing dominance of virtual advisors need to be monitored and, if necessary, scrutinised to evolve and develop better and more sophisticated models of advisory services (Dolata and Schwabe, 2017). Some researchers have recommended that automated online advice platforms help investors in gaining significant returns, higher savings rate and bias-free advice. In addition, robo-advisors have the potential to deviate the interest of individual investors towards passive management strategies (Edwards, 2018).

So far researchers have covered various aspects related to robo-advisory and have observed that robo-advisors can prove to be highly beneficial and effective. It is of great importance to learn about the antecedents of any behavioural bias before designing an algorithm to alienate the effect of previous repetitive choice both from the consumer's and designer's perspective (Jung *et al.*, 2018). Effective risk-profiling techniques can help investors in achieving goal-based investing. Strategies should be formed in line with changes in lifestyle, family and community to build effective solutions (Nevins, 2004). Robo-advisors can help in limiting the possible adverse effects of human emotions and idiosyncratic biases. To reduce complexities, building hybrid models by combining human and robo-advisory qualities may provide feasible and desirable solutions (Salampasis *et al.*, 2017).

Today, Gen X and Gen Y have 24×7 easy access to technology but seen to have traditionally maintained limited investment balances. To cater to such segment, hybrid models may be more effective by incorporating technical expertise into their existing financial planning process (Rourke Chase, 2019). Purchase behaviour and purchase intent are a few of the crucial factors which are influenced by the development of trust (Flavian *et al.* 2006). Another study by Inder *et al.* (2020) reported that financial literacy helps in improving the financial decision-making capabilities of B-school graduates. Some behavioural aspects such as ego, conservation, attention and emotion may adversely impact our investment decisions and it is necessary to identify these biases that impact our

financial decisions. Our success strategies such as risk aversion, which we have been using for a long time, play an important role when it comes to making financial choices (Peter, 2019).

Regulators and designers of robo-advisors must be highly proficient to utilise the potential of the advisory services to deliver quality advice to mass investors and also to build their capacity efficiently and in a constructive manner so as to give investors access to evolved and well-designed robo-advisors in future (Baker and Dellaerf, 2018).

According to Beltramini (2018), Coeckelberghs' thoughts of anthropology of vulnerability can give a deep insight of machine and human interface and is considered to be one of the important potentials of this. Post-behavioural analyses of users of robo-advisory services seem to be significant to be able to judge the satisfaction and progress of robo-advisory. A study conducted on Mechanical Turk (MTurk) from fall 2015 show a reduced exhibit of impulsivity bias (Fulk *et al.*, 2018). Robo-advisor 4.0 has almost taken over jobs performed by some of the human experts in the field and there is also a possibility that robo-bosses may take over a few high-level managerial jobs (Tokic, 2018). Implementation of private information security is needed with the evolution of big data owing to the ongoing threats of information security; in addition, protection of personal data is a big concern (Zhang, 2018). According to Elo *et al.* (2008), "An advantage of the method is that large volumes of textual data and different textual sources can be dealt with and used in corroborating evidence".

The data about AUM and the increasing volume of users for robo-advisory services across the world are trigger points for current research, raising questions related to the cause of limited AUM in the scope of the robo-advisory services in India, despite the fact that India is the world's second populous country and enjoys the demographic dividend of having a youngest population of the world. The current research aims to investigate the awareness of robo-advisors amongst individual investors and their perception about the robo-advisory services and AUM, the following questions have been framed:

RQ1. How aware are investors about the term and details related to robo-advisors?

RQ2. How do investors perceive the role of robo-advisory services in investment/wealth management?

RQ3. What is the general opinion of the investors about the increasing use of robo-advisors in India?

These insights, which would be provided by the investors, are crucial in understanding robo-advisory services in India and will help in scaling up these services in the wealth management sector in the Indian market. These insights will explain how trust and data security can be merged into robo-advisors to increase its acceptability and usage.

2. Methods

2.1 Design

In this study, researchers have used focussed group discussions (FGD) to gather data from Indian individual investors who are active investors in the stock market, mutual funds and similar investment avenues.

2.2 Setting

The study is carried out in the cities of Pune and Lucknow located in Maharashtra and the Uttar Pradesh States, respectively, in India. The former is the second-largest city in the Indian state of Maharashtra and has 62% of its population under 30 years of age, with a

literacy rate of 86%. Maharashtra has the highest population in India followed by Uttar Pradesh. On the other hand, the latter is the capital of Uttar Pradesh which is the second most populous state of India. Thus, the study took samples from the top two populous states of India.

2.3 Study participants

A total of 5 FGDs were conducted between December 2019 and February 2020. Overall, 27 participants took part in the FGDs. The purpose of conducting 5 FGD was aimed to reach the saturation point of obtaining further new information. Participants were purposely selected based on the availability of their profiles and also their interest in investing time and sharing knowledge with the researchers. The purposive sampling technique was the most effective way of discussing informant selection and an effective tool for qualitative research (Tongco, 2007).

2.4 Data Collection

Investors were approached and invited to participate in the study and the research objectives were explained to them. They were approached through text messages and phone calls initially and after their initial consent, they were invited to participate in group discussions based on their availability. FGDs were held in quiet and comfortable rooms. Researchers acted as moderators in all the discussions. At the starting of each discussion, the participants were asked to introduce themselves and they were assured that their identities will be kept confidential. All the FGDs were audio-recorded using the smartphone Redmi Note 7S. FGDs with investors were conducted in a mix of both Hindi and English languages. This was done to ensure the comfort level and confidence of the respondents. The authors ensured that the questions were clearly understood by each respondent; this was done by cross-validation with the respondents about the queries raised. Questions were open-ended in nature and were loosely structured. The unstructured questioning technique was used with the intent to gain deep insights and incite discussion not set in a prior direction, so as to minimise possible bias by researcher's and their opinions.

2.5 Ethics

The participants were assured that their identities and responses would be kept anonymous and confidential. Neither their names nor their organisation's names were mentioned anywhere in the research. The researchers also ensured that no questions were raised pertaining to the portfolio size of their investment, including any details related to asset allocation distribution or investment in a particular instrument or different instruments. Significant caution was exercised to not enquire about details of investments or individual investment preferences to ensure that respondents were comfortable to answer in a relaxed manner. The respondents were asked only about their investing experience in terms of a number of months or years.

2.6 Data analysis

FGD audio files were transcribed by the researchers in English. The transcribing of data has been the most time-consuming task wherein the researchers have transcribed the audio files. Time taken to transcribe files from each FGD was around 18–24 h. All the authors have read and verified the transcribed file to ensure that the dossier is not made redundant by cleaning the data and also to ensure that no significant opinion or result was missed out. Data analysis was performed using thematic analysis, as a result of which major themes were

derived from the data that are presented in Table 3. The participants' quote and opinion are presented in the Results section under the themes, which presented in Table 3. These are given in italics to ensure that this is the opinion of the respondent. There are two terms related to awareness in the present study. The first being awareness, where the awareness of the respondents is being judged while the second term of awareness is related to the increase of awareness of robo-advisors.

Table 1 showcases the details of the participants of the 5 FGDs which were conducted by the researchers. It is sheer coincidence that the two FGDs that were conducted in Pune city had only male investors while those which were conducted in Lucknow city had both male and female investors. The groups were identified and coded as FGD1, FGD2 and so on. The participants in each group were identified as FGD1-P1, FGD1-P2, FGD1-P3, FGD1-P4, FGD1-P5 for FGD 1. A similar coding scheme was used for all the other FGD and participants of each of the FGDs. There were two groups where the participants were six while in three groups the total number of participants were five in each, making the total number of participants as 27.

Table 2 presents the details of the questions that were asked during each FGDs. The questions were intentionally designed to be open-ended to enable respondents to express their opinion without being restricted to a particular closed framework. Simultaneously, it was ensured that the FGD does not go out of the scope of the study; the questions asked were pre-designed based on a literature study. The researchers have also identified the theme or the broad area to which each question addresses. These questions which were asked from the respondents included questions, which are expected for any IT application including robo-advisory services and the factors were data security, emotions, trust, etc.

- *Non-users*: "The person who does not make use of something" (Merriam-webster.com).
- *Naïve users*: A naive user is someone who has little or no expertise in operating computers. The study focusses on a specific group of casual, naive users, analyses their needs and proposes a solution (Burgess and Swigger, 1986).
- *Frequent users*: "The person who frequently uses it".
- *Prospective users*: "Prospective user means a person who seeks or who is reasonably likely to seek to enter into a contract for a service and includes a user who seeks or may seek to enter into a contract for an additional service" (Source: lawinsider.com).

2.6.1 Word frequency analysis using NVIVO. Word frequency analysis is the graphical representation of words. It emerges in such a manner that the word which appears king-size means it had been uttered numerous times. This comes out by running a query wherein criteria needs to be set by putting the desired figures in the below fields.

FGD No.	Location	Composition	No. of Participants	Duration (in minutes)
FGD1	Pune	Retail investors, male	5	60
FGD2	Pune	Retail investors, male	5	38
FGD3	Lucknow	Retail investors, male, female	6	28
FGD4	Lucknow	Retail investors, male, female	6	42
FGD5	Lucknow	Retail investors, male, female	5	35
Total			27	203

Table 1. Characteristics of FGD participants

Sl. No.	Questions	Factor
1	Are you aware of robo-advisory services (in a general and regulatory context)?	Awareness
2	Would you consider robo-advisors as a cost-effective alternative in the advisory domain?	Cost-effectiveness
3	Would you place higher trust on robo-advisors than that of the financial advisors?	Trust
4	How do you perceive robo-advisors (and their effectiveness) with respect to analysing your risk appetite?	Risk profiling
5	Do you believe that robo-advisors have the potential to address behavioural biases of investors?	Behavioural biases
6	How would you comment on the prediction and judgement capability of robo-advisors?	Prediction and judgement
7	Will robo-advisors be able to take care of the emotions of investors?	Emotions
8	How confident are you about the security of your financial data when it comes to machines?	Data security

Table 2.
Focus group discussion guide for investors

To validate it, researchers ran a word frequency query to get the more frequently used words in each FGD to establish a proposition of contextual relationships.

To maintain calibre, the following word frequency criteria was applied to get different word clutters as shown in Figures 1 and 2:

- Display words – 20.
- Minimum length – 4.
- Grouping – Grouping of selected words should be according to stemmed words (such as stock market and stock markets).

Each word in NVIVO that appears in word clutters is hyperlinked to coded files. Hence, researchers made a point to cross-check and validate different words that appeared in

Figure 1.
Trust issues on funds suggested by robo-advisors

clutters. After this step, the contextual clarity came in form of the most vocal words along with their backgrounds and their respective references.

Most of the participants had spoken in the context of creating awareness. From the word cloud, as shown in Figure 3, it can be seen that most of the participants have stressed more on conducting seminars, workshops by regulators, social awareness workshops by newspapers and so on.

2.6.2 Matrix coding theory using NVIVO. Figure 4. demonstrates the (6 × 5) or the 6 rows and 5 columns matrix. The rows here are 6 different codes and columns are files of all FGDs. The chart of the matrix-coding query reflects how different themes have been focussed on more in each FGD. For instance, it can be seen that more focus had been given to the theme *Advocates for Human advisors* by the participants of FGD1 followed by that of FGD 5. In a similar manner, participants from FGD 2 had discussed more on the *Perceptions and Challenges* of robo-advisors followed by that of participants of FGD 5.

2.6.3 Proportion of themes across focussed group discussions. Figure 5 demonstrates the graphical representation of different themes spoken across different FGDs; for instance, themes such as advocates to human advisors, awareness for robo-advisors and trust issues

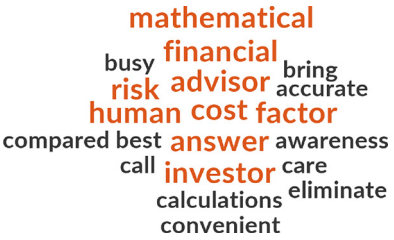

Figure 2.
Robo-advisors as an edge over financial advisors

Figure 3.
Different measures are taken to create awareness amongst Indian investors

	A: FGD 1	B: FGD 2	C: FGD 3	D: FGD 4	E: FGD 5
1: Advocates for Human advisors	10	0	0	1	2
2: Averse to Robo-advisors	11	4	0	0	2
3: Awareness Robo-advisors	1	0	2	1	1
4: Perception and Challenges	5	6	1	1	4
5: Security Concerns	2	0	0	0	1
6: Trust Issues	6	0	0	0	0

Figure 4.
Matrix of codes and files

have been concentrated on in FGD 1. However, for FGD 2, perception and challenges on robo-advisors had been concentrated on by the participants.

2.6.4 Project map using NVIVO. To get started with a project map, we need to frame questions that we would ask about the project data as shown in Figure 6, for example, how were these sources coded, which cases were assigned to this classification, what were the attributes defined for this classification amongst other questions. This was followed by adding the project items that are central to the questions to the canvas to build up a visual representation of the enquiry. Further, other associated items were added to the canvas to help illustrate the answer.

3. Results

Overall, five FGD were conducted and a total of 27 respondents participated in the discussions. The majority (70%) of the participants were men and the rest were women. Eight themes were identified across all the FGDs. Results and analysis from these discussions are detailed in each of the themes separately followed by transcribed sections.

3.1 Awareness

The robo-advisors are novel and at a nascent stage and this research is intended to ascertain the level of awareness amongst the investors.

From Table 3, it can be seen that more than 77% of participating investors, 21 participants out of 27 study participants, are not active users of robo-advisory services. It is important to note that even participating investors who are not active users of robo-advisory services have a basic level of awareness about the services. This is one of the key findings of the current research, indicating that all participants of the study were aware of robo-advisory services. As the sample size of the current study is restricted to investors who are technology savvy, it is observed and concluded that technologically savvy investors are at least aware of these services irrespective of their usage or beliefs about the product.

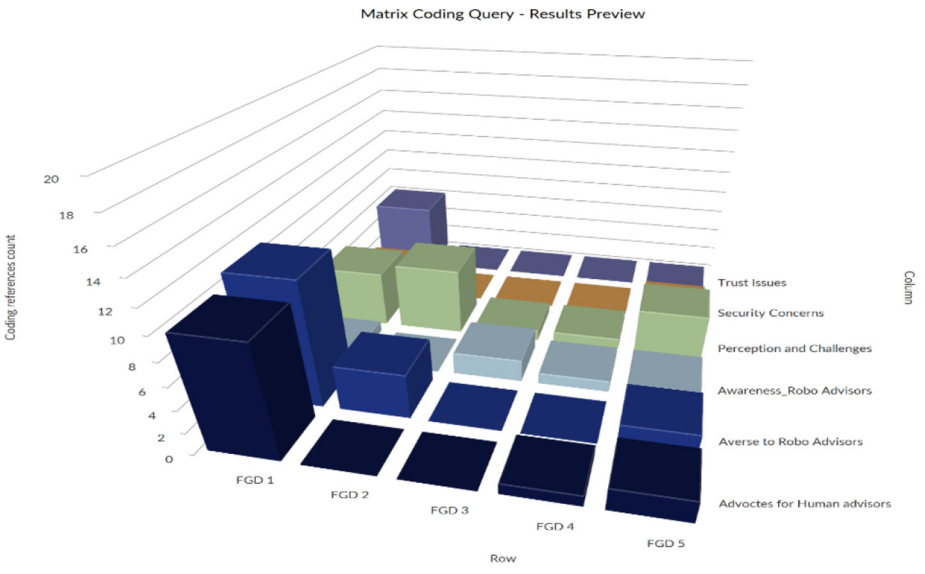

Figure 5.
Graphical representation different themes stressed on across different FGDs

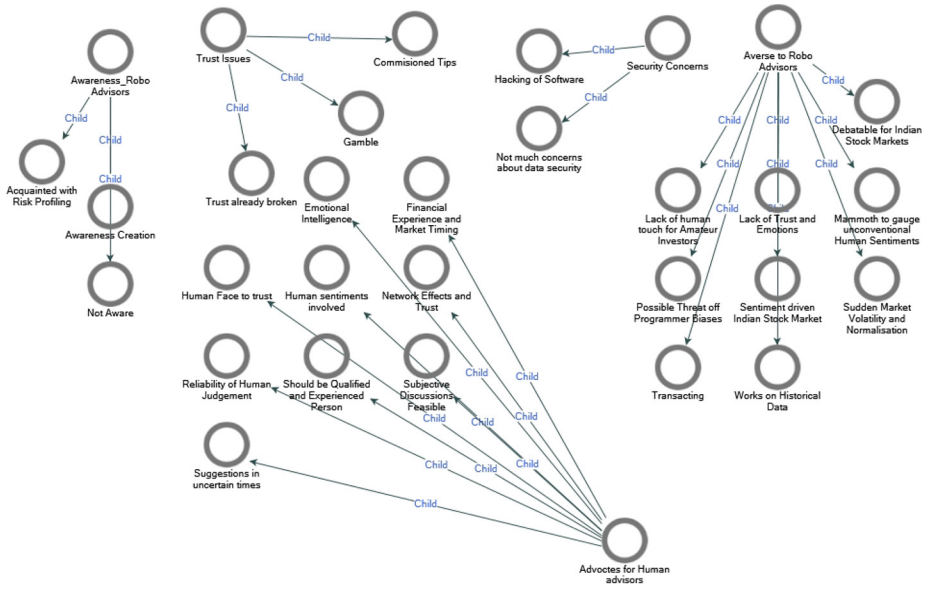

Figure 6.
Project map of different themes along with their indicators

Factors affecting user frequency	User frequency of robo-advisors Non-users	Naïve users	Prospective users	Frequent users	Sample
Awareness	21	3	0	0	27
Cost effectiveness	5	3	19	0	27
Trust	18	3	6	0	27
Risk profiling	0	3	24	0	27
Behavioural bias	5	2	20	0	27
Prediction and judgement	2	3	22	0	27
Emotions	15	2	10	0	27
Data security	21	2	4	0	27

Table 3.
Theme analysis for robo-advisor users

Yes, I have heard about these advisory services from social media and newspapers (FGD4-P1).

Yes, in fact just yesterday I was helping one of my friends to register on the "Upwardly" *robo-advisory platform* (FGD2- P4).

Yes, I am aware but have never used it (FGD5- P6).

3.2 Cost-effectiveness

According to Singh and Kaur (2017), robo-advisors can even cater to clients with minimal or no-account balance, which is not the case with human investment advisors. In addition, it is observed that the fees charged by robo-advisors are comparatively less than those charged by human advisors.

These are definitely cost-effective services for mass and affluent investors who are tech-savvy and who prefer to do investment as do-it-yourself. For them, robo-advisory offers a lower annual advisory service (FGD4-P4).

It would be more suitable for professionals who have money but less time to look after their portfolios. They especially lack the time to regularly meet and consult with financial advisors. This service may also be beneficial for those investors who may have time but less money to invest and hence maybe unable to attract and pay for experienced and qualified human advisors. Hence, automated solutions can cater to both classes of investors (FGD1-P2) (FGD4-P3).

As per the investor's opinion, robo-advisory is undeniably a cost-effective alternative for mass and affluent investors, as the advisory services offered by robo-advisory are available even to exist investors who are unable to afford experienced human advisors and to new investors who may have low income. These new investors may be wary of taking a risk and require some advice before investing is also provided by robo-advisors. Moreover, investors who may wish to refrain from a possible conflict of interest with their fund managers can also consider robo-advisory as an effective low-cost alternative to balance their portfolio.

3.3 Trust

Customised offers for particular segments, financial expertise as a hurdle, trust-building of target group users and hybrid models are some of the important aspects of virtual advisory (Cocca, 2016).

If my friends use or have used the service and have seen some benefit out of it, I will definitely be inclined to avail of these services. Still, as these services have not emerged prominently, an initial trust has to be built somewhere. I trust my own advisor more than automated services. These services can be considered trustworthy if they prove themselves by giving better returns and create a record of consistently providing better returns (FGD4-P5) (FGD5-P3).

As per my understanding from reading various books and papers, the Indian market is largely sentiment-driven, whereas the western market is largely logic-driven. While I will certainly agree that robo-advisory services are expected to expand, in my view, it is difficult for artificial intelligence (AI) and robo-advisors, right now, at this stage in 21st century India, to capture sentiments and prompt impact of sentiments. I believe the market and these solutions are still evolving, the AI and machine learning and deep learning (FGD2-P3) (FGD5-P1).

It is still unclear whether digital advisory services have disruptive potential or not in the Fintech industry; therefore, it is essential to inculcate trust-building mechanisms with the help of AI and machine learning mechanisms (Lee *et al.*, 2018).

We are still working towards it, we have not yet reached a pinnacle, the state of achieving perfection. At this point in time, when our markets are evolving and we are making such new programmes, we are not able to achieve optimum results from technology (FGD1-P4).

The technology is not able to capture a lot of human sentiment that is driven by qualitative data. Today, a key employee, say a CEO, leaving a top-notch company impacts the stock of the company – one can notice a sudden plunge in stock prices, primarily driven by the uncertainty of not knowing who is going to be the next CEO and if he or she is going to prove better or worse than the predecessor. I am not yet confident that automated platforms and AI would be able to accurately predict the impact of such subjective news or insights and be able to react and modify the advice based on similar sentiment-driven instances (FGD3- P3) (FGD5-P4).

Robo-advisors and AI cannot account for sentiment driven changes in the market and that is a key challenge with AI, that is a key reason why users in India cannot trust AIs. These are qualitative aspects that affect our market. In countries like the US, if a company is profitable and the profits are consistently rising, then it does not matter who is heading the

company in the public eye. The rational consumer only considers the fact that operations of the company are consistently profitable (FGD4- P5).

In India, if something changes, many investors just exit the market, without deep evaluation. Most investors do not extensively scrutinise each possible scenario and often make decisions based on the possible negative impact of change. The problem with robo-advisors is that they work on quantitative data and not qualitative data. In future, once robo-advisors are able to take stock and account for the impact of the qualitative data, then they may be able to better predict the market trends (FGD3-P2).

It is essential for robo-advisors to work in real-time. Investors believe that Indian markets are unique from global markets in the sense that the Indian stock market is largely sentiment-driven. Sentiment driven is defined as a market that may observe impact from any single news or incidence, whether local or global, irrespective of any logical change (in current or future profitability of a company) being brought about by the news. Investors believe robo-advisors may be an ideal substitute to human advisors only when it comes to huge quantitative data analysis. Nikiforova (2017) also posited after conducting research in the UK that robo-advisors can serve as a good substitute to human advisors. However, investors who are aware of robo-advisory services are still sceptical about the forecasting capability of robo-advisors when qualitative data is to be accounted for. As users believe that quantitative data can impact their portfolio balances, there is a lack of complete trust in the performance of robo-advisors, especially during tough market or distress times.

3.4 Risk profiling

Tertilt and Scholz (2018) recommended a more comprehensive and careful risk profiling by including a greater number of questions for assessment of a user's risk profile. They also suggested that the questions asked should have a significant impact on the risk categorisation.

I was helping one of my friends to open a trading account on an Edelweiss application, so we called Edelweiss and were guided by a chat-bot. However, eventually, I did observe various pitfalls with robo-advisory services. For instance, when the application conducted the risk profiling of my friend, the robo-advisor concluded him to be a risk conservative investor. However, as per my observation, based on past investments made by my friend – of his own accord – he is not risk-averse, but most likely a growth-driven investor. My friend has invested more than INR 26 lacs, over the course of the past 5 years and has been investing in intra-days and small caps. Observing this pattern, I would classify him as a growth investor (FGD4- P2),

I am unable to ascertain the analogy used by the robo-advisor for risk profiling of investors. Such observations lead me to question the efficiency of robo-advisory in India, at least in the current scenario and level of evolution (FGD3-P1).

I have read quite a bit about how robo-advisors are taking over an analyst's work. For instance, in Motilal Oswal, there is a separate AI division, users can mention their AISC security number, they automatically transact. However, in the present stage, I am wary of and do not agree with the technology that is being adopted. I believe there are many shortcomings and quite a lot of unknown areas. For instance, I still do not have an answer to why my fellow colleagues' friend's risk profile has turned up risk conservative. In my opinion, we should give some time for robo-advisors to evolve and prove themselves and then maybe we can take a call about its effectiveness and future (FGD4-P2).

Robo-advisors should include a wider variety of risk analysis questions as compared to that of their traditional counterparts. This will give clients an informed opportunity and choice between portfolio allocations of various investment products (Sebastiaan, 2017). Better asset allocation is only possible if it is preceded by a substantial risk profiling (Chhabra, 2005).

Robo-advisors may be biased but one benefit of such services is that they consider the answers given by investors. A broker making investment on behalf of his client may be biased towards the market, however, robo-advisors will not. Additionally, robo-advisors can be used to target one specific segment of the market, say, low-income group or middle-class income group. As the fees charged by robo-advisors are low across the world, these could be attractive segments. However, I do not believe these services can currently be used for high net-worth investors (HNIs) (FGD2- P5).

HNIs do trading in various additional segments and instruments, like derivatives and Portfolio Management Service (PMS) and there are several customised products exclusively being offered to HNIs. Additionally, there are some brokers such as ZERODHA and PayTM-Money which have surfaced and offer services based on the requirement of investors (FGD2-P4), (FGD5-P6).

A select segment of the investors has experimented with the usage of robo-advisors to find that even active users of robo-advisory services are not extremely content with the risk profiling performed by them. Few have experienced that the risk appetite has not been accurately judged by the robo-advisor. Others have argued that if robo-advisors are unable to accurately judge the risk appetite of investors, then how can these be expected to make optimum or even relevant, portfolio recommendations. Hence, an effective and efficient strategy should be used to build a meaningful and mindful questionnaire to judge the risk-taking capacity of investors.

3.5 Behavioural biases

According to Kahneman and Tversky (1979), investors weigh their losses more than their gains.

One of the biases people harbour is that they should hold on to stocks for eternity. It has been observed that shares of companies that are "considered trustworthy" such as ACC and TATA Steel. have been passed from generation to generation. As these stocks have not witnessed a surge of growth (or even a big downfall), there is that sense of clinging to the stock. The sentiment is "I have x shares of this well-established and trustworthy company, so I need to hold onto this stock because my grandfather had been holding on to this stock and passed it to us" (FGD2-P4), (FGD4-P2).

Robo-advisors work on fixed algorithms. What happens if the algorithm goes for a toss or how about the scenario where-in the programmer fed the wrong algorithm or fed the correct algorithm but in a wrong manner or if there was a bug or an update was erroneous [. . .] these pose a huge risk to the investor (FGD3- P5) (FGD5-P3).

It has been observed that some investors were sceptical about the programmers or developers who build the algorithm on which robo-advisory platforms are based. Besides being sure of the qualification, possible bias and intent, there was an apprehension that even the programmer is a human being, and thus there is a possibility of passing on their behavioural biases into programmes. In addition, there were apprehensions about possible human errors that may have been made by the programmer during initial coding or following updates. On the other hand, most investors also expressed the opinion that up to a certain extent, robo-advisors can definitely help to reduce anxiety and time delays, as the machine automatically executes a trade at a faster rate.

3.6 Emotions

In my opinion, the capability of robots is not advanced to the level that they may be able to gauge human sentiments. Thus, they cannot promptly react to human emotions because human emotions are often unconventional and unpredictable. While the market may

notably be in a growth phase, incidental news related to a traded company, say, for example, Infosys, can result in bringing down the growth streak to the opposite direction and show plunging share prices (FGD1-P1) (FGD2-P1).

It is essential to examine the temporal stability for the learning effect of stress levels in the mechanism of decision support systems (Glaser *et al.*, 2019).

So, if we opted for a robotic financial advisor, its inability to gauge human sentiments and emotion will be a shortcoming or shortfall of that robotic process because the market sentiments change in seconds and, in my opinion, robo-advisors will not be able to judge that sentiment. Thus, we will not be able to get the expected result from a robo-advisor (FGD5-P4).

Indian stock markets are sentiment-driven and the movement of the stock price is led by investors sentiment (Ghosh and Srinivasan, 2014).

In my judgement, there are two aspects to advisory, first is human advisors and second is automated advice. As an initial step, robo-advisors can record increasing financial data which would allow them to precisely analyse the data, maybe even better than human advisors (FGD3- P1).

Robo-advisors will be able to better predict the opinion and trends. The Indian stock markets are exceedingly driven by sentiments. While robo-advisors may be able to make better predictions, which are effective and efficient; however if there is bad news then it entirely changes the scenario of the market (FGD4-P1) (FGD1-P4).

As per the participating Indian investors, ones who are well versed with how the Indian stock market performs, the stock market in India is predominantly driven by sentiments and emotions in comparison to that of other markets in the western countries. In their view, as it is difficult for robo-advisors to understand human emotions and reactions, it will be difficult to fathom the impact of sentiments and reactions on the stock market. According to some participating investors, who also trade in international markets, Indian markets are more volatile, and thus, it is more challenging to predict the trend line and forecast stock prices.

3.7 Prediction and judgement capability of robo-advisors

Advice and recommendations of robo-advisors lack the ability to predict investor spending and stability status of investor's income; however, human financial advisors can account for the same. On the other hand, the advice and recommendations of robo-advisory are expected to be unbiased and exceedingly systematic in nature. Advanced risk profiling can help robo-advisors address the users' needs in an appropriate manner. New robo-advisors should not limit their principles to Markowitz analysis (Lam, 2016).

I believe that AI can be developed in such a robust manner that it may be able to predict uncertainty and the possible impact of events happening anywhere, in another part of the world. For example, if something is happening in Brazil, if Trump makes a new announcement or if Putin does something specific, then each of these instances has a definite impact on the Indian stock prices, in some way or the other. An AI-led machine may be able to instantly account for the impact of such global events and predict possible changes. At present though, I feel robots are taking care of some specific part of our work, but the technology will further evolve in the next couple of decades to be able to completely predict and advise on all financial matters (FGD1-P1).

Having robo-advisory for transacting or advising? During my earlier employment, we accepted algo trading as a secondary way of trading. This, for me, was a time of initial exposure to robo-advisory and robo trading. Now, I believe, that there are some trades, which are not possible for humans to make in real-time, say when there is a plunging market one would not be in a position to make that trade because of the human mind-set because the

market is moving so ferociously. In this situation, robo-advisors can make quicker decisions and execute trades instantly (FGD1-P2).

In such instances, robo-advisory transaction primarily comes into play because robots are able to instantly calculate, analyse and predict, and thus can take a position faster and effectively execute the same. In this sense, robo-advisory and robo-transacting are quite efficient and effective. If algo trading comes into the picture, then efficient markets come into play (FGD2-P2).

I believe that there is a lot of bias in the Indian market. The Indian investors have a lot of biases; these biases are, in turn, connected to every trade. One needs to study the plethora of biases and observe as these plays out in the Indian market. In the present state, robo-advisors may not be able to predict the Indian market, owing to these many biases which govern the Indian market. Once, these biases are well understood and accounted for, then maybe, robo-advisors can be trained to analyse the possible impact of these biases and incorporate their possible impact while crafting recommendations (FGD1-P3).

Only a handful of participants effectively commented on the prediction and judgement ability of robo-advisors. Few participants expressed that robo-advisors can only predict the future stock prices but the judgement of investing and taking decisions ultimately lies with the investors. Few participating investors commented that currently, robo-advisory may not be completely effective but there is high potential. Most participating investors believe that the technology would evolve in the next few years and eventually be able to account for qualitative data and biases. Once the evolution is completed, the technology may be able to make optimum predictions.

3.8 Data security

Security questions were in an open-ended manner, and hence it was observed that the responses received were also mixed in nature. While some users perceived security as a concern when trading online and availing digital investment advice, few others have answered the question in the context of data security, and thus responses varied accordingly.

Nowadays, the majority of banking-sector transactions happen online or digitally. One can notice reducing footfalls in bank branches. Online and digital transactions are believed to be trustworthy and to be honest indispensable. We have observed that the masses are ok with digital transactions and have faith in digital banking platforms (FGD2-P2).

There is always a risk while investing digitally, the apprehension of "what if the site or platform gets hacked, who will then be responsible and accountable for our funds"? (FGD1-P3), (FGD2-P2), (FGD3-P6).

Investors have mixed opinions about data security concerns. Security perception was multifaceted, ensuring high-security standards bagged by familiarity, relationship and customer experience as well (Kumar and Gupta, 2020). There were some participating investors who felt that it is not only acceptable but also unavoidable to trade online. On the other hand, there were some participating investors who were highly sceptical of trading online and had misgivings about the safety and trustworthiness of digital platforms.

4. Participant recommendations

Participants have made several suggestions for building awareness amongst Indian retail investors about robo-advisory services. The suggestions include varied tactics that may be useful to inform and educate masses from varied walks of life about robo-advisory technology and its possible uses and probable limitations.

4.1 Awareness through social media platforms

Awareness of robo-advisory services can be definitely encouraged through social media platforms such as Facebook. It would be ideal to conduct an awareness drive including webinars, through or in association with, various prestigious platforms and governing bodies such as CFA and SEBI. Such awareness programmes, especially webinars or web events, would be effective and helpful. Various financial channels such as CNBC and others can showcase results via useful graphs and charts to indicate how AUM of robo-advisors have performed well and are giving consistent returns (FGD2-P1).

4.2 Awareness by inculcating information in higher education curriculums

There should be some financial education right from classes at senior secondary school, where students must be taught about how to plan finances, how to invest in the market, how to do investment planning and how to effectively manage their funds. Currently, only commerce students seem to have some exposure to investing (from an educational perspective). However, I believe, everyone should be given basic exposure and education about it, similar to how we are taught about disaster management. Even while a student may be majoring in science or humanities, having one subject about investing is not a big deal but can definitely add big value (FGD2-P2).

Some people might not analyse stocks because technology is there. As we have so many tools and technology, like YouTube and probably 15 other financial channels, but people would not analyse stocks unless it is in front of them. The analysis is available on these platforms so investors would like to use the readily available information (FGD4-P5).

Information about investing and financial technology, including platforms such as robo-advisory, should be included in the college curriculum. Considering that there are so many online trading and advisory applications today, there should also be dummy platforms for trading. Some fintech firms, maybe in collaboration with educational institutes, should undertake an initiative to develop applications for mock trading. This can help users to better understand the how-to and usage of these platforms. On the other hand, banks are one of the prominent institutes which have interaction, either physical or digital, with investors and potential investors from all segments and walks of life, thus banks should be taken as a medium to disseminate information and increase awareness. This would greatly help, as educational institutes and banks are few institutions where-in the majority of Indians have faith (FGD4-P6).

4.3 Awareness through workshops

As everything boils down to money and at a certain point in time everyone has to manage their finances or maybe even someone else's finances, financial management and tools for financial management are relevant to all, be it a finance specialist or someone who specialises in the non-finance related domain. No one can claim to not have any monetary responsibility of managing finances, either in the present or future. I believe, to make everyone aware, specially Indians like us who prefer to put faith in practical things that happen in front of us, instead of just sharing the theory or informing people about the possible results and outcomes from the usage of technology, it will be way more useful to showcase the technology and the results of taking advice from robo-advisors, then I think people would lean towards investing via robo-advisors (FGD5-P2).

4.4 Need to change the perception about the stock market

Participants suggested that the Indian stock market is still evolving and a small percentage of the total population believe in investing in the stock market. One of the primary reasons being that many people do not consider the stock market as an investment avenue, rather they consider investments in stock to be a gamble. In addition, many people are not aware or

educated about investment options and instruments offered by the stock market, thus before expecting the masses to switch to an advanced technique, that is, automated advice, it is a prerequisite to create awareness about the stock market, available instruments and investment avenues and then about the possible tools that may aid in investment management.

Adding to the point of view shared by our colleague that there is a need to educate people right from senior secondary school, there is a need to add information and educational courses about investment management even at the graduate and postgraduate level. In our postgraduate business school itself, we have observed many of our peers are not well versed with investing. This is a bit concerning. My understanding is that the attitude of many of our peers about the stock market is very misleading. Many people, including our peers, are of the disposition that the stock-market is an avenue to gamble, many still cannot fathom even the possibility of algos which can help one make profits. Many people, our peers, still believe that investment and returns in the stock market are primarily reliant on luck and timing, they still do not believe in the technical and fundamentals of investing. There is still a prevalent disposition that if I am putting INR 5,000, then in the next two months it should become INR 50,000. People want to go to the stock market to double their capital, they take it not as an investment option but as an avenue to make "a quick buck" (FGD4-P4).

The concept of robo-advisory is quite recent, many investors believe that it has a lot of scopes but also believe that robo-advisory is currently at its nascent stage. They predict that it will take another 10 to 15 years for the technology to evolve to the extent that human intelligence may be completely integrated with the robo-advisors. For now, I believe that technology may provide basic knowledge and information about bank activities, but few AI functions would not be so easy with the robo-advisors. Also, many believe that everything cannot be done by writing algorithms or logic and that is one of the key reasons why algo trading itself has not been very successful (FGD3-P1).

The Indian stock market is still evolving and highly sentiment-driven, thus at this stage robo-advisor will not be beneficial to India. However, in future, definitely, robo-advisory is something that the masses will look upon. Nevertheless, it is important to educate the masses about investing in the stock market, once that is successful and people have a better understanding of the investment instruments, options and avenues, then we can think about the widespread usage of technology to advice and guide. In the former stages, the human touch is really important because you need someone to guide, the initial handholding is quite important, you can have chatbots working with him (FGD3-P4).

Investors feel that the western stock market is very different from the Indian stock market. Markets in western countries are more volatile than Indian stock markets. Indian stock markets continue to follow a trend for a very very long time, for example, when the market is plummeting and there is a downtrend then it may stay that way for a couple of years, similarly when markets are on an upward trend then it may continue rising for multiple years without a lot of volatility. There will be a lot of correction in the western market much more frequently, investors in the western market do not rely on the thought or a trend that the market may consistently move in one direction. In India, users will either hold onto their investments or will exist, one would not be able to churn out because there is not much volatility or movement, but in western markets, the corrections happen much more frequently and there is a lot of volatility, there is a lot of volume getting traded and from that perspective, there is a lot of continuous advisory feedback which can help because the time period for holding onto a stock fluctuates much faster, investors might get out of the position quicker, investors might want to obtain another position briskly. In that sense, I believe robo-advisory can help investors instantly get technical analysis. However, I am

unsure if fundamental analysis can actually help investors through robo-advisory, maybe that they will capture, but most of it will be technical analysis (FGD1-P1).

Participants suggested that there may be some alternative uses for robo-advisory and AI-led technology in the finance sector, which may be more suitable for the short term. The suggestion was to use robo-advisors to get a greater number of investors to spread awareness about investing in the market. Once we are able to do that, perhaps, then we can switch to robo-trading. This view can be inferred from the insights uncovered during the FGDs. Few excerpts are listed below:

I believe, the systematic investment plan, in the current time, is still not a powerful instrument. Many are still lump sum investors; thus, investment is not a habit or a regular instance but a one-time deposit. Once we are able to convince investors to invest on a regular basis rather than one time that may be the key, the market needs to be developed, evolved and equipped in such a manner to use such kind of technology (FGD5-P2).

I would like to highlight the fact that the market in India is still at a nascent stage, I am discussing both the equity market and mutual funds market. At the moment, it is challenging to even convince masses, i.e. non-investors or new investors, to invest in equity or mutual funds. Many still prefer to park surplus capital in gold, fixed deposits and real estate, i.e. physical property (FGD1-P5).

I believe that robo-advisory is very efficient, currently, there are just temporary answers assigned to them where you can have templates for each and every question. When the market is bearish and stocks plunge, investors need to be pacified, hand-holding is needed and someone will need to be reassured that this is a market cycle, there will be a turnaround and things will come full circle bullish markets again. On the other hand, during such a bearish market phase, algorithms will either suggest investors invest additional capital or hold on to the invested capital or sell there (FGD4-P3).

Big brokers and large trading houses are already using AI led algo trading systems. This is one of the key aspects that may have created a differentiator between retail investors and large traders. If insights from such algo trading, which is being used by large trading houses, is shared with retail investors, then the difference between these two could be reduced (FGD5-P3).

The above participants – factor (5×6) matrix, as shown in Table 4, demonstrates which participant has stressed more upon which factor or combination of factors. The first row is for FGD 1 and six columns represent six different participants, namely, P1, P2, P3, P4, P5 and P6. N/A in column P6 for the first and second row shows that only 5 participants have participated in FGD 1 and FGD2.

For instance, the interpretation of the first row and first column can be done as follows: Participant 1 from focus group discussion 1 *(FGD* 1 *-P* 1)has commented and stressed more on factors such as emotions, prediction and judgement and creation of awareness. Similarly, participant 3 from focus group discussion 4 *(FGD*4 *-P*3) has emphasised cost-effectiveness and the creation of awareness so on and so forth.

It has been observed that the *creation of awareness* is the key discussion focal point emphasised by 40% of the participating investors. This is closely followed by trust, emotion and risk-profiling, which are emphasised and prominently discussed by 30%, 26% and 22% participating investors, respectively.

5. Conclusion and findings

While all participating retail investors of this study were aware of robo-advisors, few of them had used their services and advice. Hence, the difference in opinions, sophistication in terms of awareness, perception and usage of robo-advisory services were observed between the

FGD/P	P1	P2	P3	P4	P5	P6
FGD1	Emotions, prediction and judgement and creation of awareness	Cost-effectiveness and prediction and judgement	Prediction and judgement	Trust and emotion	Participation and judgement and creation of awareness	NA
FGD2	Creation of awareness and emotion	Creation of awareness and data security	Trust	Awareness and behavioural biases	Risk profiling	NA
FGD3	Emotion and risk profiling	Trust and risk profiling	Trust	Creation of awareness	Behavioural biases	Data security
FGD4	Awareness and emotion	Risk profiling and behavioural biases	Creation of awareness and cost-effectiveness	Cost-effectiveness and creation of awareness	Trust and creation of awareness	Creation of awareness
FGD5	Risk profiling and trust	Creation of awareness	Behavioural biases and trust	Emotion and trust	Creation of awareness	Trust and risk profiling

Table 4.
Factor–participant matrix

participants. Most of the participants converged on the opinion that a hybrid model of robo-advisory can be effective as it is essential to have human interaction in the advisory realm today. Most participating investors also coincidentally opined that there is a high potential in future, once the technology is more evolved, for robo-advisors. The findings suggest that it is imperative to encourage investors for increased participation via online advisory platforms. Furthermore, the findings indicate an essential need to increase awareness about robo-advisory services at varying levels, including suggestions to include an introduction about robo-advisors as a part of the educational curriculum.

The participants of the study indicated a willingness to use robo-advisory services in specific scenarios and specific situation, but they were not willing to trust or substitute them for existing financial advisors or the traditional advisory models (that is, human advisors). Adding to this, they also raised concerns about emotional and cognitive biases which, if not addressed by robo-advisors, could prove detrimental. Behavioural biases such as herding, loss aversion, overconfidence bias have a strong influence on the investment decision-making of investors (Jain *et al.*, 2019). So, there is a strong need that robo-advisors should be evolved with the potential to address these behavioural biases.

From a managerial perspective, the findings suggest that additional attention needs to be devoted to the adoption and inculcation of AI and machine learning theories while building algorithms or logic to come up with effective models. Many investors expressed discontent with the current risk profiling of investors. This presents the insight for developers and designers of robo-advisors on the need to include advanced and detailed programming to be able to do risk profiling in a more comprehensive and precise manner.

Owing to the explorative nature of the study and limited participants, the findings of the study cannot be generalised to the population. Future research is imperative to study the dynamic nature of AI theories and investigate whether they would be able to capture the sentiments of individual investors and the human sentiments impacting the market.

In the future, robo-advisors will definitely change the wealth management scenario. It is well-established that data is oil for all business in the current time. Technologies, like robo-advisory,

need to evolve further in terms of predicting unstructured data, improvising the qualitative analysis technique to include the ability to gauge emotions of investors and the market in real-time. In addition, the behavioural biases of both the programmers and investors will need to be taken care of while designing these automated decision support systems.

6. Theoretical and practical implications

This study is poised to contribute to the fintech innovation landscape in multiple folds. The research findings demonstrate the awareness level of individual investors about the term "robo-advisors" along with their perception of the same. The study also gives a perspective on the investors' opinion of robo-advisor and about its functionality. The acceptance, intentions to use and perceptions of investors towards robo-advisors (Cedrell and Issa, 2018; Belanche *et al.*, 2019) have been widely researched empirically but qualitative inquiries have been neglected up until to explore insubstantial factors in this regard.

In view of that, we attempted to qualitatively investigate investor's attitude, perception and their opinions towards robo-advisory services by employing FGD technique It is exclusively meant for striking a dynamic discussion amongst participants and helps in learning the ground-level scenarios accurately (source: poppulo.com). Existing research studies on robo-advisory services are concentrated on regulation aspects, tangible components such as user design interface, their comparative analysis with human advisors and so on. Our study is the first of its kind to surface intangible expectations of prospective users (investors) such as trust factor, emotions and sentiments handling capacity, real-time predictions and sentiments-driven approach of robo-advisors.

From a practitioner's point of view, our study delivers several relevant factors such as imbibing trust-building mechanisms, embracing comprehensive risk profiling techniques, making sure to have unimpeachable data security platforms, orchestrating awareness campaigns to increase cognizance amongst investors which would certainly help fintech start-ups, robo-advisory service providers, banks and other players to mitigate apprehensions of prospective robo-advisor users. Moore and Benbasat (1991) documented that innovators are those categories of users in the technology adoption life cycle who make the first move to experience innovation. They are mostly youngsters with good financial well-being. Hence, this study presumably holds an important perspective to unravel innovators perception for the successful penetration of this product. This study is useful to the wealth management industry as a whole as it gives an insight into the qualitative factors of the investors towards robo-advisory services that can be used while designing the robo-advisors to be able to take care of risk profiling of the investors. There is a need for conscious efforts while building algorithms for AI and machine learning for risk assessment and risk profiling of the investors as there was discontent for the same in its present form of robo-advisory services.

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