Artificial Intelligence an enabler in Robo-Advisory services to enhance Investment returns – Empirical study.

[1].Ramesh. K P , [2]. Nelson Mathew, [3]. Dr. R. Amudha, [4.] Dr. Jayaseelan Clement Sudhahar, [5.] Dr. Easwaramoorthy Rangaswamy

[1.]Ramesh. KP *
Karunya Institute of Technology& Sciences
Department of Management, Karunya Nagar, Coimbatore 641114, India.
Email id: rameshkurunamkattil@gmail.com

[2.]Nelson Mathew
Karunya Institute of Technology& Sciences
Department of Management, Karunya Nagar, Coimbatore 641114, India.
Email: nelsonmathew06@gmail.com

[3.]Dr.R. Amudha (Corresponding Author)
Karunya Institute of Technology& Sciences
Department of Management, Karunya Nagar, Coimbatore 641114, India.
Email: amudha8@gmail.com

[4.] Dr. Jayaseelan Clement Sudhahar
Karunya Institute of Technology& Sciences
Department of Management, Karunya Nagar, Coimbatore 641114, India.
Email: clement@karunya.edu

[5.]Dr. Easwaramoorthy Rangaswamy
Principal & Provost, Amity Global Institute, Singapore
Email: erangaswamy@singapore.amity.edu

Abstract

The vitality of Robo-advisors is grounded with Artificial Intelligence (AI) to facilitate, synthesize and to infer required information, as an enabler in the process of upscaling and providing financial advice, to the millennials and the xennials, on their Investment returns. Most of the times, investors behave irrationally while making decisions on their investments, called behavioral biases. Millennials being the prime target for Robo platforms due to its affordability, 24/7 access and transparency with zero investment biases, a hybrid model (Robo plus Human) can help to address their investment goals. Hence the study pertains to analyse,, using the Technology Acceptance Model(TAM) on the factors such as perceived usefulness, perceived trust, perceived security, age, gender of the investors, using Structural Equation Model, which confirms, better user interface and the AI capabilities have a significant role in building the ease of use and trust in investors over the Robo-advisory services.

1. Introduction

The dynamic element of Robo-advisory services is Artificial Intelligence (AI), without any doubt. AI demonstrated by machines, perceives, synthesize and infers information similar or better than human intelligence. This intelligence factor of AI enables higher investment returns through upscaling and integrating financial advice in Robo-advisory services, playing a powerful role in providing financial insights with a potential and positive outcomes. "Robo-advisors working on complex algorithms that has the capability to address complex investment needs of an investor says Jill E. Fisch (2019)[1]"There are two types of Robo Advisors , pure play Robo advisors , as well as hybrid models operates with or without an extra fee. As they are working on algorithms, Robo platforms can avoid conflicts of interest and investment biases that could occur with a human investment advisor, who might push for investment instruments that pays higher incentives for him" Fisch. Robos came to existence a decade ago, and the first two brands that introduced Robo-advisory platforms were - Wealthfront and Betterment.

Today, Robos are a fast growing investment advisory platform across the globe, but still they command a very small share of invest in advisory market. In 2016, Robo-advisory platforms had an AUM of $126 billion out of $ 69 trillion in US. The surprising factor is that most of recent studies showed that 55% of investors still have limited or no knowledge about Robo-advisory platforms. In 2017, the Securities and Exchange Commission included Robo Advisor in its "examination purview" as per the PwC report (2017)[2]. Robo advisors are regulated ie., Robos should register as investment advisor, and as a stock broker if required. Today most of the Robo-advisory platforms use improved algorithms that can accurately deliver investment solutions tailored according to the needs of people as required and can manage complex investment needs. It helps an investor to design his portfolio, invest as per his investment goals and retire better with the assistance of Robo platforms. Advanced Robos use complex algorithms that use the data provided by clients to create and manage their portfolio based on the investment goals of the clients.

Robo advisors take the information from clients through an online questionnaire and use AI based algorithms to recommend asset allocation that best fits the customer's investment goals, risk appetite and investment horizon. "Post creating the portfolio, Robo advisors manages the portfolio by doing the periodic rebalancing, executing trades, performing tax-loss harvesting and other services that can help its clients" Lilly et al(2022)[3].

2. Conniving with Nudges

Robo advisors are suitable for investors who are comfortable in using digital platforms with very minimal or no human interference. "The grey area is, does Robo advisor improve outcomes?". Indeed, investment advice does pay off says Hammond 3 Studies shows that investors who seek professional investment help by putting their money in target-date funds have seen their median CAGR moves up by 3-percentage.

The fundamental drawback of Robo advisor is that there is no human touch and emotional angle, which is very important to some investors, and in Robo you are just conversing to a computer and "computers output is solely depended on the information that you input," Sironi,P (2016)[4] said. Even if the algorithm is super intelligent, it may not necessarily understand and draw out all information that are relevant to an investor's

investment goals and financial situation, most of the studies that has been done on the efficiency of the platforms. The performance of Robos are still in grey area when the market is highly volatile and the investor' s needs are highly complex.

3. Literature Review

The SWFI describe the Robo-advisory as the kind of financial advices for providing a AI based management of the portfolio with the nearly zero human interaction and that has been characteristically using algorithms and formulas (SWFI 2015)[5]. Accordingly, Investopedia [2017][6] defined Robo-advisory as the digital platforms for providing algorithm driven and automated financial planning services with no supervision of humans. The Wall Street journal in its research stated that with minimum balance and low management fees, Robo-advisory is a boon to middle class investors that enables them in accessing wealth management services.

The RA market of Asian Pacific has been expected to depict a promising growth among various regions and forms continuous attempt to developer innovative and cost effective automated economic advisory services. The RA market in this region is expected to predominantly driven by India, Japan and China through the forecasting period. This is due to the huge customer base associated with increased disposable way of income. As per Tokic (2018)[7] Robo Advisor can handle complex investment needs of an evolved investor due to the complex algorithms on which Robo Advisors are working. Fein (2015)[8] clearly narrates in this study about the success rate of the investment decisions the Robo platforms can offer to an investor as all new Robo platforms are working on the complex algorithms. Belanche (2019)[9] says with the advanced algorithms now Robo advisor can play a critical role in the investment success and it can revolutionalise the investment market. According to Demo.C(2020)[10] The success of Robo advisor will solely depend on two things the AI capabilities that can address complex investment needs and user friendliness of the platforms .

4. Structural Framework of the study:

The structural framework of the study revolves around the provision of Investment advice to the seeking Investors, both millennial and retired, for the purpose of enhancing their returns, which is both cost effective and reliable, facilitated through Robo-advisors which are articulated with Artificial Intelligence.

4.1 Framework of Robo-Advisory on TAM

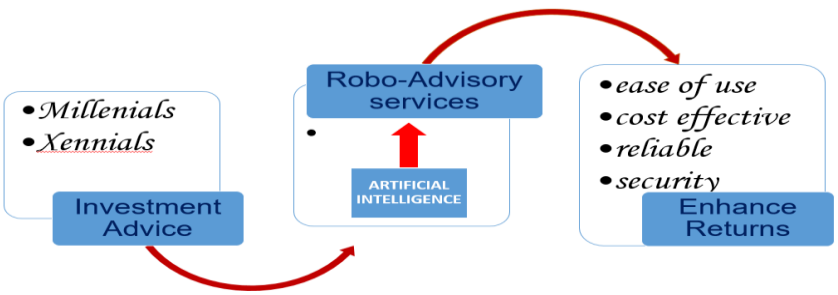

Fig 1 – Structural Framework of Robo-Advisory on TAM

4.2 Investment Advice

According to the Research papers millennials are going to be the prime target for Robo-advisory platforms, due to the low fund management fees and transparency of platforms.Abraham.et.al (2019)[11] presented that the predominant reason for the Robo-advisory 's popularity among the millennial is because of that the individual investors has to take sole responsibility of their own investments and millennials feel advices are free from biases. Furthermore, as the millennials are starting their investment journey the low level of investible income does not meet the minimum investment criteria set by Wealth Management firms hence millennials can't access a wealth manager most of the time (Cedrell et.al 2018)[12].

4.3 AI and TAM in usage of Robo-advisors

According to Francesco D'Acunto et.al (2018)[13] the Robo-advisory is transparent as they work on AI. Meanwhile the interaction between the clients and human advisors can be influenced by the interests of the advisor, whereas Robo Advisor purely works on the inputs that an investor has given to the platforms and on the inbuilt algorithms. Hakla.k (2019)[14] says the Robo Advisor has the AI ability to do active investment decisions and there by replacing the human involvement in active decision making, which makes this platform free from investment biases.

4.4 Process of Outcome

Rising awareness among the customers for adopting the automated financial advices for the purpose of investing and saving is the main and key concept for the demand of RA services in the upcoming years as per the reports of Asian market witnesses. Robo-advisory market in India is still at a very nascent stage and we need to create a lot of positive perception about the platform and build trust for mass adoption (Ankita et.al 2020)[15]. According to Fein (2016)[16] RA provide investment advise and discrete management service without the involvement of humans but with the help of algorithms followed by the allocation of asset models.

5. Research Design

A causal research design is applied to explore the effect of selected variables on influencing the Investment returns. The respondents were the customers seeking investment advice, mostly millennials and retired. The data collected from Ernakulum district of Kerala state. The convenience sampling method is used to find out the client's behavior towards its technological acceptance (TAM).

The TAM had nine variables and the data collected was tested to prove its validity and reliability of the tool used. Cronbach alpha of all the variables were above 0.8 followed by the Structural equation modelling(SEM) using partial least squares were used to predict the effect of independent variables on behaviour intention.

The hypothesis framed for the study were:

H1a. Perceived usefulness has a positive effect on consumer attitudes toward the intention to use Robo-advisory

H1b. Attitude has a positive effect on the intention to use Robo-advisory

H1c. Perceived ease of use has a positive effect on consumer attitudes toward the intention to use of Robo-advisory

H1d. Perceived ease of use has a positive effect on consumer perceived usefulness of the intention use of Robo-advisory

H1e. Perceived usefulness of financial Robo-advisors has a positive effect on the intention to use them.

H2: Personal innovativeness in information technology has a direct relationship with the intention to use Robo-advisory among investors.

H3: Perceived trust has a positive relation on the intention to use Robo-advisory among millennials

$H_0$4 : there is no significant difference in the age on the perceived uncertainty of investor's intention to use RA - based on the extension of TAM

$H_0$5 : there is no significant difference in the gender on the perceived uncertainty of investor's intention to use RA - based on the extension of TAM

6.Analytical Observations

The primary data collected from the Investors on their utilization of Robo-advisory services for Investment advice instead of relying upon the human suggestions and information about the selection of stocks and other capital market related queries in the process of investors' wealth creation. Relevant statistical tools applied to test the relationship and impact of the variables chosen under the study.

6.1 Relationship of perceived ease of use of RA towards gender:

The Levene's test for equality of variances used to test the relationship between gender and the perceived ease of use of RA based on TAM

Ho : There is no significant difference in the gender on perceived ease of use of investor's intention to use RA - based on the extension of TAM

Table 1 - Investor's intention to use RA based on TAM

Investor's intention to use RA based on TAM										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	Std. Error Diff	95% Confidence Interval of the Difference	
									Lower	Upper
PEU	Equal variances assumed	1.574	.210	2.053	502	.041	-.12008	.05848	-.23497	-.00518
	Equal variances not assumed			2.054	501.953	.040	-.12008	.05846	-.23493	-.00522

From the analysis as given in the above table 1, it is clear that the gender of the respondents has a significant effect on the perceived ease of use (t value=2.053, p=0.041< 0.05). There is a significant difference in the gender-wise perception of the Robo-advisory scheme.

6.2 Influence of the age on the perceived security:

Evaluation of the influence of the age on the perceived security of investor's intention to use RA - based on the extension of TAM

Ho: there is no significant difference in the age on the perceived security of investor's intention to use RA - based on the extension of TAM

Table 2 – Age on the perceived security

Association between Age and Perceived security					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.034	2	.017	.069	.933
Within Groups	121.798	501	.243		
Total	121.832	503			

The influence of the age category of the respondents on the perceived security is evaluated using the ANOVA, and the results depict that the age of the respondents does not play any significant role in the perceived security and its effect on the intention to use Robo-advisory schemes as the p value=0.933>0.05.

6.3 Structural Equation Model Analytical Views

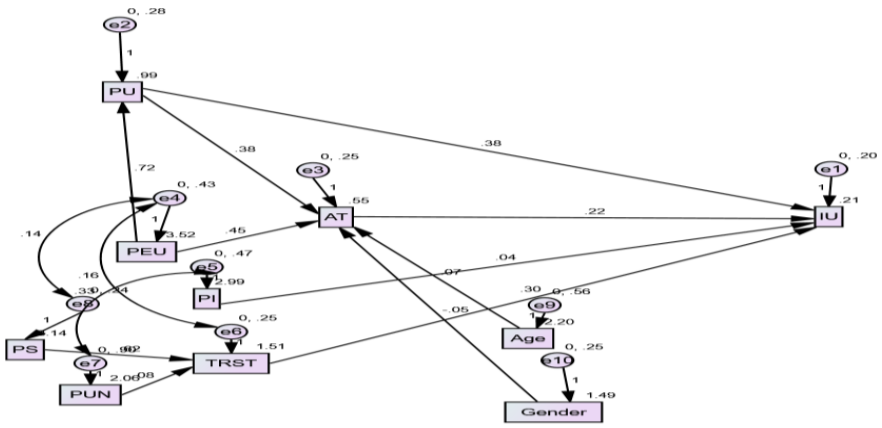

Fig 2 – Structural Equation Model of the study

6.3.1 Model Fit Indices for The Factors Influencing the Intention to use Robo – Advisory services

Table 3 - Model Fit Assessment of Factors influencing Robo-Advisory

Factors	Actual Value	Recommended Value
RMS	0.072	<0.08

GFI	0.901	>0.90
AGFA	0.822	>0.80
NFI	0.924	>0.90
TLI	0.934	>0.90
CFI	0.912	>0.90
RMR	0.035	<1
IF	0.935	>0.90

The fit indices shown in the above table 3, for the proposed conceptual model indicate that the model is a good fit for the given data with GFI=0.901, AGFI=0.822, NFI=0.924, TLI=0.934, CFI=.912, RMR=0.035, IFI=.0.935 and the measures conclude that all the factors analysed are influencing the Robo-advisory services.

7. Findings and Conclusion

A characteristic Robo Advisor gains information from the clients regarding the financial situation, investment horizon, risk appetite and their expected returns, through online and the data is processed further with the help of complex inbuilt algorithms to arrive at the best investment instruments curated based on their investment goals. Many studies on the investor biases have been observed that at times investors behave irrationally more often while making decisions on investments, they show certain biases based on their past experiences and these behavioral biases need to be avoided. Such errors are proved very pricey in most of the situations, hence we need a dependable Robo platforms that is evolved from a technological standpoint and can handle complex investment needs even in volatile market conditions.

The findings of the study confirm that the Robo-advisors along with TAM, exhibit a positive outcome prominently. With advance AI capabilities Robo-advisors can play a predominant role in future and it can really help the investors to manage their investment with a minimal advisory cost. AI enabled Robo advisors will be beneficial for the customers especially for those who are starting their investment journey and specifically to the millennials. Better user interface and AI capabilities have a significant role in building the ease of use and trust among the investors play a critical role in the adoption of Robo advisors. Gender wise perception of Robo advisory platforms are totally different from our study that could be difference in the awareness level and the Robo platforms can be targeted to across investors as age has a least significance in the perception and adoption of Robo advisory platforms.

Millennials are going to be the prime Target for Robo Platforms due to its affordability, 24/7 access and transparency with zero investment biases and as an investor moves up in their investment journey a hybrid model (Robo plus Human) can help to address their investment needs.

References:

[1] Fisch, Jill & Laboure, Marion & Turner, John, The Emergence of the Robo-Advisor, *The Disruptive Impact of FinTech on Retirement Systems*, pp 13-37, (2019)

[2]The role of risk and trust in the adoption of robo-advisory in Italy, An extension of the unified Theory of Acceptance and use of Technology, www.pwc.com/it , (2017).

[3] A.Lilly, R. Rajkumar & R.Amudha, Aggrandizing the human resource development with underpinning artificial intelligence, *Journal of Statistics and Management Systems*, 25(5), pp 1083-1094, (2022).

[4] Sironi, P. FinTech innovation: From robo-advisors to goal based investing and gamification. Wiley, DOI: https://doi.org/10.1002/9781119227205 (2016).

[5] Sovereign Wealth Fund Institute : https://www.swfinstitute.org/news/34448/everyone-wants-a-robo-advisor-right-8461344)

[6]Investopedia- https://www.investopedia.com/terms/r/roboadvisor-roboadviser.asp

[7] Tokic D., BlackRock Robo Advisor 4.0: When are artificial intelligence replaces human discretion, *Strategic Change*, 27(4), pp 285–290. https://doi.org/10.1002/ jsc.2201, (2018).

[8] Fein M.L.**Robo-advisors: A closer look** (2015) Available at SSRN 2658701?

[9] Belanche, D., Casaló, L.V. and Flavián, C. (2019), "Artificial Intelligence in FinTech: understanding robo-advisors adoption among customers", *Industrial Management & Data Systems*, Vol. 119 No. 7, pp. 1411-1430. https://doi.org/10.1108/IMDS-08-2018-0368

[10] Clarke, Demo, Robo-Advisors - Market Impact and Fiduciary Duty of Care to Retail Investors (February13,2020).SSRN: https://ssrn.com/abstract=3539122 or http://dx.doi.org/10.2139/ssrn.3539122

[11] Abraham, Facundo and Schmukler, Sergio and Tessada, Jose, Financial Innovation and Additionality: The Power of Economic Analysis and Data Analytics (June 1, 2019) World Bank Research and Policy Briefs No. 138280, Available at SSRN: https://ssrn.com/abstract=3586630

[12] Cedrell L., Issa N.The adoption of robo-advisory in the Swedish financial technology market: Analyzing the consumer perspective (2018)

[13] Francesco D'Acunto, Nagpurnanand Prabhala, Alberto G Rossi, The Promises and Pitfalls of Robo-Advising, *The Review of Financial Studies*, Volume 32, Issue 5, pp 1983–2020, https://doi.org/10.1093/rfs/hhz014, (2019)

[14] Hakla.Krista Robo-advisors as a form of artificial intelligence in

private customers' investment advisory services, https://aaltodoc.aalto.fi/handle/123456789/39329 , (2019)

[15] AnkitaBhatiaa, ArtiChandania, JagritiChhatejab, Robo advisory and its potential in addressing the behavioral biases of investors A qualitative study in Indian context, *Journal of Behavioral and Experimental Finance* , Vol 25, sciencedirect, online issue, pp. 237–261, (2020).

[16] Fein, Melanie L., Robo-Advisors: A Closer Look,SSRN: 10.2139/ssrn.2658701 , *Researchgate* online journal, (2016).