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## CONSUMER PERCEPTION REGARDING THE ROLE OF AI: A DISCRIMINANT ANALYSIS BASED ON AGE

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### Abstract

Artificial intelligence systems are nowadays a must for both companies and individuals. On one hand, individuals easily succumb the pressure and temptation of being constantly connected to their friends and families, by being actively present in the online environment. Moreover, the increased number of disruptive technologies is leading to a world, where certain activities are no longer or very hard accessible for individuals who do not embrace the ongoing shift to smart devices. On the other hand, the companies recognize the opportunities provided by disruptive digitalization and channel most of their efforts into growing their businesses efficiently, by implementing automations where possible. The constant use of technology raises a series of issues that are being addressed in both academic and business communities. The most recent topics which were widely and intensively discussed relate for example to the amount of personal data which is being accessed and shared online. Other topics include trust in artificial intelligence systems or the consumer's preference towards virtual assistants or actual humans for various types of services. This study brings a contribution to the topic of consumer's ability and willingness to adapt to the new redefined ways of living, marked by an aggressive intrusion of artificial intelligence systems in most parts of the everyday life. The study analyses a sample of 252 responses, out of which 161 respondents with ages younger than 40 years and 91 respondents with ages older than 40 years. The results show clear differences between the two groups.

### Keywords

Artificial intelligence, consumers, trust, technology, virtual assistants, robots.

### JEL Classification

M10, M31

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### Introduction

Technology has completely changed the business environment and the ways that companies operate. From commerce to e-commerce, from invoicing to e-invoicing, from meetings to video conferences and so on, the relationships with business partners as well as the internal processes have suffered major changes. For instance, the implementation of business intelligence and analytics has become the cornerstone to efficient reporting of critical business data. Companies view business intelligence and business analytics as two different approaches, consisting in technologies, systems, techniques, tools and applications which contribute to an improved decision making process (Chen et al., 2012). Business intelligence refers to databases, architectures, methodologies, applications and analytical tools which

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offer support to various decisional tasks (Turban et al., 2011), while business analytics is an umbrella term that includes data mining and quantitative statistical analysis which contribute to a better understanding of key business performance indicators (Chen et al., 2012; Davenport, 2010).

Innovations are also being implemented in the accounting department (for eg. e-invoicing, e-payments), in the marketing department with the increasing use of neuromarketing techniques, in sales or even production departments. Companies are completely redefining their value proposition and are creating competitive advantages through well thought market launch strategies, which gradually introduce the consumers to new types of services or products.

The commercial success of an innovative product or service is strongly impacted by the market launch strategy (Chiesa and Frattini, 2011) which needs to clearly emphasize the benefits of the new solution (Lee and O'Connor, 2003). The aim is to allow gradual social learning of the artificial intelligence system (Debruyne et al., 2002; MacVaugh and Schiavone, 2010). However, issues arise when the consumers mistrust towards disruptive innovations is being neglected. Even when the technology behind the product or service is highly complex, the consumer's experience must be intuitive and the interface must be user friendly. Studies show that consumer's tendency to accept or refuse using smart solutions based on artificial intelligence is strongly related to their first interaction with them. If a system is not initially understood, then the context of use and its purpose will remain unclear, hence the possibility to be used in the future will consistently drop (Hornbaek, 2005). This kind of failure creates big challenges for the companies which are connecting their products, creating a complex ecosystem out of them.

### **Literature review**

Digitization, machine learning, artificial intelligence, robotics, as well as information and communications technology are completely transforming our times. The time people spend connected to technology is almost surreal. The fact that certain activities have begun to not only require, but impose the use of applications or online networks brings a big contribution to the situation nowadays (eg. ordering an uber), as technology and internet are slowly becoming indispensable.

The customer experience while using technology is merely impacted by the company's ability to provide services which fit the individual needs. From theory to praxis, there are currently discussions in regards to the ways in which the companies are allowed to store and use personal information of their customers for the sole purpose of offering appropriate service packs.

While sharing private data has become a mainstream act on social media platforms, the question is "how much is too much". The latest debates focus on the role of each party in assuring a fair trade between companies and consumers. On one side, there are measures taken which regulate the processing of the collected private data. The General Data Protection Regulation (GDPR) is leading to changes for companies, which need to offer their consumers an insight into the use of their private information. The regulation states that the consumers should be empowered with the right to find out which personal data is stored by the companies, in which way is it being processed and who can gain access to it. Overcoming this barrier is the new challenge companies are dealing with, as they need to make sure that consumers can benefit from the same services and access the same data in a satisfactory manner (Presthus, 2012). However, the constant tracking of the customer's every move online is one of the disadvantages which led to the adoption of this regulation, which is looking to prevent the subjections of consumers to stigmatization (Mateosian, 2013).

On the other side, the sole necessity of this regulation is a sign that the individuals should also contribute to their own data privacy, by being more careful with the personal information that they make public or trade in exchange for various offers. Accepting terms and conditions without actually reading or acknowledging them is another example in this case. The fact that this intrusion is made possible by applying artificial intelligence systems and algorithms is affecting consumer's trust in the idea of artificial intelligence. A study showed that the consumers reject the idea of using AI systems for automate decision-making activities such as taking loans or giving grades. Furthermore, they do not fancy the storage of personal sensitive data by artificial intelligence systems either, as this can be shared with third parties or can be fed into algorithms which enable product recommendations. The study was conducted in Norway and concluded, that consumers perceive the storage of personal information in different ways, depending on the type of data collected (Presthus and Sorum, 2018).

Another study conducted by Pelau & Ene (2018) showed that the more independent an AI system looks like, the less chances of being accepted it has. The results showed that consumers are reluctant when it comes to anthropomorphized robots, as they give the impression that they have too much autonomy. However, according to Jamson (2013), an artificial intelligence system becomes truly effective, only if the user can give it some degree of control. For this to happen, a certain level of automation should be defined, which can assure an efficient collaboration between people and machines, as the human behavior is carefully shaped through incentives and communication with the consumers (Jamson, 2013). The matter of trust in automation is currently one of the most debated subjects in the research environment, as in this context of innovation the perceived risk is a central factor which can determine the resistance or adoption of a new technology or system based on artificial intelligence. As every new product brings with it uncertainty and risks, consumers' reluctance towards it, is likely to arise (Nienaber and Schewe, 2014). One of the main factors which influence the perception of risk is the novelty characteristic (Kleijnen et al., 2009).

In the context of innovation, the perceived risk is seen as the uncertainty regarding a possible failure of a new product, which can be due to malfunction (Nienaber and Schewe, 2014). For the artificial intelligence field of study, perceived risk is attributed to a lack of control over a machine or automated process (Castelfranchi and Falcone, 2000). This lack of control can have a serious impact on the consumer's level of trust towards artificial intelligence systems (Pelau et al. 2018). Moreover, consumer's decision to adopt a certain technology is not only taking place on an individual level (Rogers, 2003). Studies show that the main factor which influence the adoption of a new technology is utility, as both acceptance or rejection are mainly influenced by the interaction between the social context and the new technology (MacVaugh and Schiavone, 2010). Besides, the use of new automated processes can influence the energy costs for the consumers (Pelau & Acatrinei, 2019).

According to McKnight et al., trust in automation is mainly influenced by its predictability. He emphasizes the fact that if individuals can anticipate the future behavior of a technology, then this technology will be more easily trusted (McKnight et al., 2002). Especially important is the initial trust, which plays a crucial role in the acceptance process of a new technology. If a system is not initially trusted, then it will not be used to begin with. Therefore, the initial trust is a critical condition which can afterwards evolve into dependability, meaning that the artificial intelligence system has a consistent behavior which enforces constant utilization. As a finality, trust and dependability can shift to faith, described as the moment in which the consumer actually relies on the technology (McKnight et al., 2002).

### Research methodology

The objective of this study is to analysis the demographic factors that influence the customer's behavior related to artificial intelligence systems. The 24 items have been included in survey with multiple topics, which has been carried out in December 2018-January 2019. The sample consists of 252 respondents from urban areas. The reliability of the data is given by the Cronbach's Alpha=0.933 for the dataset related to artificial intelligence.

This article focuses on the differences of perception depending on age. Two groups were created out of the sample, based on the respondent's age: the first group (defined as G1) consists of people younger than 40 years and the second group (defined as G2) includes people older than 40 years. The study is based on 252 valid responses. These responses belong to 161 respondents younger than 40 years (G1) and 91 respondents older than 40 years (G2). For the interpretation of the results a discriminant analysis was applied with the help of the SPSS 20. The significant differences between the two groups will be discussed.

### Results and discussion

The results of the analysis show that there are relevant differences between the two age groups. From the 24 items which were analyzed, 22 show significant differences, having  $p < 0.10$  and only 2 items show similarities for the two groups. The results are presented in Table 1.

**Table no. 1 Discriminant analysis values based on grouping variable age**

Item	Mean G1	Mean G2	SD G1	SD G2	F (1,250)	p
I prefer applications I use to be customized for my personal needs, which is why I create my own user.	5.24	3.14	1.72	2.10	73.743	0.00
I often personalize my phone and laptop as I please. Example: themes, wallpaper, password protection.	5.25	3.05	1.78	2.23	73.092	0.00
I constantly use various forms of AI such as smartphones or smart banking.	6.01	4.26	1.39	2.08	63.526	0.00
I'm curious about the new technologies and I want to try them out	5.40	3.82	1.46	1.85	55.374	0.00
I think I'm spending more than half a day connected to technology: laptop, PC, smartphone.	5.55	3.77	1.60	2.29	52.292	0.00
I'm comfortable solving various administrative tasks with the help of technology: bank transfers, data updates, initiation or termination of contracts.	5.25	3.55	1.59	2.14	51.505	0.00
I'm open to change and I'm adapting relatively quickly to new technologies	5.63	4.21	1.38	1.92	46.36	0.00
I feel comfortable creating an account for each application, using my personal data: name, email and phone number.	4.47	2.78	1.88	1.94	45.599	0.00
I believe that the automation process contributes to making processes more efficient	5.68	4.43	1.30	1.98	36.451	0.00
Smartphones are indispensable to various professional activities.	5.24	3.81	1.71	2.28	31.341	0.00
I prefer using virtual assistants to solve minor problems than waiting on the phone until I'm being connected with a call center employee	4.27	2.96	1.75	2.05	28.671	0.00
I consider that technology makes many processes	5.78	4.87	1.23	1.65	24.816	0.00

more efficient and helps us save much time						
I think robots and artificial intelligence systems will ease my professional activity	4.48	3.38	1.68	1.99	21.576	0.00
I think robots will ease my home activities	4.60	3.55	1.76	1.94	19.3	0.00
I think that the smart solutions adopted by the companies are quite user friendly and can perform the same tasks as the employees, only more efficiently. Examples: Andreea-Vodafone robot, George-BCR robot.	3.95	3.04	1.64	1.81	16.505	0.00
I have more confidence in systems that use robots	3.50	2.67	1.60	1.56	15.753	0.00
I like searching for packages of services directly from my laptop / phone and having programmed assistants to consult with, rather than actually going to the company headquarters or contacting the responsible persons by phone. Example: going to the bank, to the lawyer, to the tourist agencies.	4.09	3.15	1.78	2.10	14.195	0.00
I think it is good that some simple work tasks can be replaced with artificial intelligence systems	4.79	3.99	1.70	1.66	13.062	0.00
I think that in 50 years a lot of the usual activities will be done by robots	5.68	4.93	1.54	1.71	12.442	0.00
I like receiving recommendations based on my search history. For example: songs, movies, pictures or videos on specific themes	4.53	3.95	1.79	2.07	5.637	0.02
I like receiving personalized emails from various applications, even if I know it's a general email.	3.69	3.19	1.85	1.97	4.106	0.04
I am reluctant to delegating tasks to robots	4.00	3.58	1.82	1.98	2.86	0.09
I think robots and artificial intelligence systems have a lower error rate than people	4.52	4.20	1.67	1.82	2.054	0.15
I think a robot can be a human's good friend	2.75	2.65	1.70	1.69	0.19	0.66

Observation: G1 are people younger than 40 years; G2 are people older than 40 years

Source: Own research results

The behavior which shows the highest differences is the preference for customized applications ( $F=48.816$ ,  $p=0.000$ ). People younger than 40 years prefer customizing their apps for their personal need, including creating their own user on certain apps ( $M_{G2}=5.24$ ), while older people prefer the opposite ( $M_{G1}=3.14$ ). This is also confirmed by the item with the second highest difference, which describes the preference of consumers to personalize their phones or laptops, matching them with their own styles ( $F= 73.092$ ,  $p=0.000$ ), where the mean of perception is higher for the young people ( $M_{G1}=5.25$ ) in comparison to people older than 40 years ( $M_{G2}=3.05$ ). The same preference for customization is also different in the case of the item related to believing that the automation process contributes to making processes more efficient ( $F= 45.599$ ,  $p=0.000$ ), which shows that younger people are feeling more comfortable sharing personal data while creating user accounts on different platforms ( $M_{G2}=4.47$ ), whereas older people would rather avoid sharing personal data like their name, email or phone number ( $M_{G2}=2.78$ ). Receiving online recommendations personalized emails based on the search history were two topics where the difference between the two age groups was still relevant, but on a lower rate ( $F_{20}= 5.637$ ,  $p_{20}=0.020$ ;  $F_{21}= 4.106$ ,  $p_{21}=0.040$ ).

A second behavior that shows significant differences is the general degree of tolerance towards artificial intelligence systems. People younger than 40 years have constant interaction with various forms of AI such as smartphones and smart banking ( $F= 63.526$ ,  $p=0.000$ ,  $M_{G1}= 6.01$ ) in comparison to older people ( $M_{G2}=4.26$ ). They tend to spend more than half a day connected to technology ( $F= 52.292$ ,  $p=0.000$ ,  $M_{G1}= 5.55$ ) and believe that

automations are making processes more efficient ( $F= 36.451$ ,  $p=0.000$ ,  $M_{G1}= 5.68$ ), in opposition to people older than 40, which spend less time online ( $M_{G2}=3.77$ ) and do not consider that automations are strongly related to efficiency ( $M_{G2}=4.43$ ). This is also confirmed by the  $F_4= 55.374$ , which shows that the G1 group is more curious about new technologies and wants to try them out ( $M_{G1}=5.40$ ), while the G2 group, representing people over 40, had a smaller mean for this item of  $M_{G2}=3.82$ .

When asked about the third behavior, mainly if technology and robots offer more efficient, time-saving solutions to work or home activities, the younger group agreed ( $F_{12}= 24.816$ ,  $F_{13}= 21.576$ ,  $F_{14}= 19.300$ ,  $p_{12,13,14}=0.000$ ) having higher means  $M_{12;G1}=5.78$ ,  $M_{13;G1}=4.48$ ,  $M_{14;G1}=4.60$ ), while the older group showed a lower tolerance towards artificial intelligence usage ( $M_{12;G2}=4.87$ ,  $M_{13;G2}=3.38$ ,  $M_{14;G2}=3.55$ ). However, there are few points about this topic regarding the tolerance towards AI where the two groups showed similarities in their opinions. Both groups have stated that they are reluctant in delegating tasks to robots ( $F= 2.860$ ,  $p=0.09$  very close to 0.10,  $M_{G1}= 4.00$ ,  $M_{G2}=3.58$ ) and do not agree with the idea that a robot can become a good friend to a human being ( $F= 0.190$ ,  $p=0.66>0.10$ ,  $M_{G1}= 2.75$ ,  $M_{G2}=2.65$ ).

The fourth and last behavior that was checked through this study was the preference towards artificial intelligence forms instead of human interaction for solving daily activities. While younger persons state that they are feeling comfortable solving various administrative tasks like bank transfers, data updates, termination of contracts with the help of technology ( $F= 51.505$ ,  $p=0.00$ ,  $M_{G1}= 5.25$ ), this does not apply to older people ( $M_{G2}= 3.55$ ). The same difference can be noticed as the subjects were asked if they prefer using virtual assistants to solve minor problems than waiting for the phone until they are being connected with an actual call center employee ( $F_{11}= 28.671$ ,  $p=0.00$ ). The mean for the G1 group was also in this case higher ( $M_{G1}= 4.27$ ) than the mean for the G2 group ( $M_{G2}= 2.96$ ), which means that younger people prefer talking with a robot than having to wait for a conversation with a human being.

The results also show that younger people think that simple work tasks should be replaced with artificial intelligence systems ( $F=13.062$ ,  $p=0.00$ ,  $M_{G1}= 4.79$ ) and have more confidence in robot-based systems ( $F=13.753$ ,  $p=0.00$ ,  $M_{G1}= 3.50$ ), while people older than 40 do not fancy the idea of involving artificial intelligence systems in their daily routine ( $M_{G2}=3.99$ ) and do not experience the same level of trust towards robots ( $M_{G2}=2.67$ ).

Also an important difference is the extent to which people allow artificial intelligence to come between themselves, as buyers, and companies, as sellers. People younger as 40 tend to believe that the smart solutions adopted by the companies are quite user friendly and can perform the same tasks as the employees, only more efficiently ( $F=16.505$ ,  $p=0.00$ ,  $M_{G1}= 3.95$ ), while people older than 40 had a different lower mean ( $M_{G2}=3.04$ ) when asked about this preference. Almost the same difference ( $F=15.753$ ,  $p=0.00$ ) appeared when the two groups were asked if they prefer searching packages of services directly from their smart devices and have programmed assistants to consult with, rather than actually going to the company headquarters or contacting the responsible persons by phone. The G1 group agreed more with this idea ( $M_{G1}=4.09$ ), while the G2 group showed more reluctance towards this course of action ( $M_{G2}=3.15$ ).

Similar behavior and perceptions for the two age groups can be observed for the item in which consumers think robots and artificial intelligence systems have a lower error rate than people. In this case, both groups agree with the fact that robots and AI systems have a lower error rate than people. ( $F=2.054$ ,  $p=0.15>0.10$ ,  $M_{G1}=4.52$ ,  $M_{G2}=4.20$ ).

## Conclusions

The study analyzed four main subjects: the preference for artificial intelligence systems customized for consumer's own needs, the overall tolerance towards technology and innovations, the level of acceptance and trust in artificial intelligence and the preference for artificial intelligence forms instead of human interaction for solving daily activities.

The results showed that in almost all cases people younger than 40 are more open-minded and more prepared for change and adaptation to new technologies, while people older than 40 are more reluctant to artificial intelligence and do not trust the efficiency that it may bring with it. One of the reasons why older people do not recognize the benefits of AI could be related to the fact that they do not experience the same curiosity and do not want to try out new technologies, in order to understand the opportunities that they may offer. This idea can be related to the theory of Lee and See (2004), which states that if a system is not used, then the initial trust can never grow. The same theory was mentioned by McKnight, which states that trust can only shift to dependability and then to faith, if the consumer's initial trust is high enough to determine him to make use out of the artificial intelligence system and allow himself to rely on it (McKnight et al., 2002).

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