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CONSUMERS' PERCEPTION ON HUMAN-LIKE ARTIFICIAL INTELLIGENCE DEVICES

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Abstract

The presence of Artificial Intelligence in our everyday life has become one of the most debated topics nowadays. In opposition to the past, nowadays, in the age of broadband connectivity, it is difficult for individuals to imagine their everyday life, at work or in their spare time, without computers, internet, mobile applications or other devices. Most of these devices have had a contribution to the improvement of our everyday life by being more efficient and having a higher convenience. Few people are aware of the fact that, by continuously developing and improving these technologies, they might become more intelligent than we are and that they will have the potential to control us. In the attempt to make these devices friendlier to consumers, they have started to take human-like aspect and even having own identities. We have nowadays call center answering machines with names or robots with names and citizenships. The objective of this article is to determine the acceptance and preference of consumers for personalized or human-like robots or devices. For four different cases, the respondents had to choose between a classic device and a human-like robot. The results of the research show, with a high significance, that consumers still prefer the classic devices over anthropomorphic robots.

Keywords

Artificial intelligence, robots, consumer, anthropomorphism, perception.

JEL Classification

M10, M31

Introduction

The use of artificial intelligence for marketing purposes is already a must for all innovative and successful companies all over the world. From all kind of instruments used in Neuro-marketing all the way to the use of 'social robots' (Duffy, 2000), the expectations of the consumers are getting easier and easier to be reached and even exceeded. The growing investments in artificial intelligence support systems and their different automation functions have become one of the top priorities for most companies worldwide. Whether the implementation of automated processes and the use of artificial intelligence instead of human input make a business profitable on long term, or just on the short term, is still a popular debate with strong pros and cons.

Knowing your customers well is one of the most decisive factors that contribute to a firm's success (Popa & Pelau, 2016). Analyzing the consumer's readiness in terms of acceptance of initiatives and open-minded and embracing behavior towards a company's innovation

trends is one of the goals that are set up in the planning phase of the AI implementation processes. However, certain constraints appear and skepticism arises towards AI systems which are able to autonomously take decisions or react and the more advanced is the autonomy of a machine, the stronger is the restraint feeling of most humans (Lee & See, 2004). Interesting is that while some of the people directly link the autonomy and capability levels of a robot with a big sense of threat, resulting in low levels of trust towards the AI system, others are not influenced by these factors. The difference between these different types of perception is driven by the individual's characteristics like: personal beliefs, resistance to newness and change, cultural backgrounds, societal attitudes and experiences from the past (Lee & Moray, 1994).

This paper adopts the weak artificial intelligence stance, as not the fundamental intelligence of a system will be questioned, but the details or attributes that contribute to the system's appearance as intelligent or human-like (with anthropomorphic characteristics). The paper aims to establish a correlation between consumers rate of acceptance of different artificial intelligence systems, based on the level of the anthropomorphic design of the machines in question.

Literature review

The fast and dynamic evolution of different forms of artificial intelligence is creating both excitement and anxiety, as the fear exists that the created robots and artificial intelligence forms can become smarter and they might turn against their creator (Rinesi, 2015). The opinion regarding the ability of humans to design artificial consciousness differs. Some authors believe that it will take some time until robots will be able to have human-like motivation and social reasoning (Haladjian & Montemayor, 2016), while others consider it just a challenge for engineers (Graziano, 2015).

Another often debated topic and an important concern for companies, is the consumer's acceptance of these intelligent robots (Hengstler et al., 2016). Achieving customer's trust in artificial intelligence systems, defined as "willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that party" (Mayer et al., 1995). This is one of the challenging goals of any R&D department and there are several innovative ways to complete this task. One of these, is the use of anthropomorphic characteristics in the design of artificial intelligence systems.

Anthropomorphism is defined as the process of ascribing cognitive, emotional states and human characteristics to objects or other non-living things (from Greek: *anthropos*, "human being"; *morphe*, "shape"). In the topic of artificial intelligence systems, the anthropomorphic look refers to a couple of characteristics or standards: human-like face and gestures, natural motion, balanced function and human-like form, autonomy, artificial emotional mechanisms (Duffy, 2003). In addition to this, in Goleman's opinion, the key characteristic to anthropomorphic ability is the expressiveness driven by emotional intelligence, seen as the ability of an artificial intelligence system to understand and use the emotions of the others, as a guide to further thinking and acting (Goleman, 1997).

However, the role of the anthropomorphic characteristics in the design of artificial intelligence systems is widely debated. For instance, Shneiderman argues that the interface of a robot should be clear, predictable, comprehensive and support for direct manipulation, and not vague and compromised by anthropomorphic characteristics, as this will only lead to over-expectations and disappointment from the side of the consumers, when the systems will not be able to perform to their expectations (Shneiderman, 1989). Also against anthropomorphism are Nass and Moon, which state that the machines are not persons and should not be treated like these (Nass & Moon, 2000). Meanwhile, other studies conclude that people's tendency is to anthropomorphize, because this process is creating a sense of

familiarity, which is further easing social acceptance (Watt, 1995), as people ultimately accept and use the technology they trust, while rejecting the one they don't (Lee & See, 2004).

A differentiation of the two sides of artificial intelligence comes here in hand, in order to offer a better understanding of the topic. Following the social intelligence hypothesis, which states that the primate intelligence originally evolved in order to solve social problems and it was only later extended to problems outside the social domain and applying this logic to artificial intelligence systems, we are discovering two faces of artificial intelligence systems: strong AI and weak AI. Strong AI systems are in theory the ones which can actually duplicate the human brain, while weak AI systems are only able to simulate human intelligence.

There are previous studies which have analyzed this correlation. For example, an analysis conducted by Sproul et al. (1996) and Burgoon et al. (2000) concluded that an artificial system with a simple text interface is puzzling superior in comparison to synthesized faces and voices. Nowak's study found out similar results comparing a more human-like synthetic face with a less anthropomorphic one. The subjects rated the less anthropomorphic face higher than the other (Nowak, 2004). However, Gong is able to verify in 2008 his hypotheses according to which the higher the level of anthropomorphic computer representations, the more social responses, positive social judgment and greater social influence have been obtained (Gong, 2008).

This paper offers an empirical approach on consumer perception on human-like artificial systems, by attempting to verify the next. We have developed two hypotheses. Hypothesis 1 refers to the fact that for devices with similar intelligence level the consumers will prefer the human-like device. Hypothesis 2 refers to the case of a detailed personalization and humanization the consumers will prefer the classic device.

Methodology of research

The objective of this research is to determine the perception and the attention of the consumers towards human like robots in comparison to "classic" robots. In order to determine this perception we have selected four cases in which the consumer had to evaluate in two ways two situations involving robots or artificial intelligence. One of the mentioned situations contained a "classic" robot, while the second situation contained a human-like or personalized robot or device. In the first question, they had to evaluate the acceptance of the situation or the probability to choose the robot for solving an issue, on a Likert scale question, with answers from 1 to 7, where 7 means total agreement and 1 means total disagreement. For the second questions, we have chosen constant sum-questions, where the consumers had to choose from 100 points which is the probability to choose one or the other situation. The second question has been introduced in the questionnaire in order to make the consumers choose between one situation and the other.

In the first situation (case 1a and 1b) the respondents had to choose between two cash machines one having a classic look, while the other was designed as a postman. This situation has presented two machines which have the same function, but one of them has a human like look. In the second situation (case 2a and 2b) the consumers had to solve a contractual issue and they had to choose between Siri, a personalized call-center like system and a classic machine driven system. With this question, we have tested if the respondents accept better personalized intelligent system or a classic one. In the third situation (case 3a and 3b) the consumers had to choose a system to get information from (as for instance at an airport). For this they had to choose between two screens: one with a classic look and one picturing a virtual person who gives them information. The purpose of this question was to determine if the consumers prefer a human like robot to answer their questions or to give directions. In the fourth situation (case 4a and 4b), the respondents had to choose a type of

adviser in a store. In the first situation they had a classic robot, who gave them information about the products in the store, while in the second situation they had robots which looked like dolls that could assist them.

The survey has been carried out in December 2017 on the urban population of Romania and we have obtained a sample of 140 respondents. The discriminant analysis has been applied for the results, with the help of the SPSS program.

Results and discussions

The results of the research show that the respondents prefer the “classic” situations, in which they have to deal with robots or forms of artificial intelligence with an impersonalized look of a machine or device. This result has been obtained for both the Likert scale questions (a-cases) and the constant sum-questions (b-cases). As expected, the constant sum-questions showed more significant differences in comparison to the Likert-scale questions, as the consumers had to choose between one situation and the other.

The results for the perception of consumers regarding human-like devices or forms of artificial intelligence, measured with the help of Likert-scale questions can be observed in table no. 1. The most significant result has been obtained for the situation in which the consumers had to choose between a classic cash machine and postman-like one (case 1a). For case 1a we have obtained an $F_{1a}=13.42$ and $p_{1a}=0.000$. The mean for the acceptance of the non-human like situation ($M_{1aNH}=5.121$) has been higher than for the human like situation ($M_{1aH}=4.321$) showing that the consumers prefer the classic cash machines. The standard deviation for the human-like situation ($SD_{1aH}=1.986$) was higher than for the classic situation ($SD_{1aNH}=1.651$) showing a higher heterogeneity of opinions. Despite of this, the standard deviation was the lowest for both situations in comparison to the other cases (case 2-4).

Case 4 had also an average significance for the difference of acceptance of the two situations, having an $F_{4a}=2.93$ and $p_{4a}=0.088 < 0.10$. For this case, the consumers also prefer a classic robot to give them pieces of advice ($M_{4aNH}=4.200$) in opposition to dolls with incorporated artificial intelligence systems ($M_{4aH}=3.764$). It must be observed that for both situations, the mean-values for case 4 are the lowest among all cases.

For the other cases, we have obtained no significant difference between the two situations. For case 2, in which the consumers had to choose between the personalized Siri-robot and a classic robot answering machine or call center, we have obtained an $F_{2a}=1.54$ and $p_{2a}=0.215 > 0.10$. In this case they have preferred the classic robot ($M_{2aNH}=4.242$) over the personalized robot ($M_{2aH}=3.921$). For case 3, where the consumers had to choose between a classic information screen and one showing a hologram of a person, we have obtained an $F_{3a}=0.73$ and $p_{3a}=0.787 > 0.10$. This result shows no significant difference between the acceptances of the two situations. In spite of this, the mean for the non-human like situation is higher ($M_{3aNH}=4.821 > M_{3aH}=4.757$).

Table no. 1. Discriminant analysis results for scale questions

Variable	Mean in human-like situation	Mean in non-human-like situation	Standard deviation human-like situation	Standard deviation non-human-like situation	F value (df:1,278)
Case 1a	4.321	5.121	1.986	1.651	13.42***
Case 2a	3.921	4.242	2.169	2.162	1.54
Case 3a	4.757	4.821	2.097	1.874	0.73
Case 4a	3.764	4.200	2.184	2.071	2.93*

Significance: *** for $p < 0.01$; ** for $p < 0.05$; * for $p < 0.10$

Source: Own research results

The discriminant analysis results for the constant sum-questions have had higher significance in comparison to the Likert-scale question, as expected. For these questions, the respondents had to choose between the two conditions: human-like or not. Similar to the first analysis, the highest significance has been obtained for case 1b, in which the consumers had to choose between the classic and the postman like cash machine. For this case, the discriminant analysis result had an $F_{1b}=39.54$ and $p_{1b}=0.000 < 0.01$. In the case of the constant sum-questions, the first result is confirmed and the respondents prefer the classic cash machine ($M_{1bNH}=0.580$) in comparison to the human-like postman ($M_{1bH}=0.419$). The standard deviation for this case had the smallest value ($SD_{1bNH}=SD_{1bH}=0.213$) showing the highest homogeneity among the cases (cases 2b-4b).

The non-human like situation is also preferred by the respondents for case 2, in which they had to choose between an anonymous answering machine and a personalized one. For this case, there has been a significant difference between the situations by having $F_{2b}=11.34$ and $p_{2b}=0.001 < 0.01$. The mean for the anonymous answering machine ($M_{2bNH}=0.556$) is higher in comparison to the personalized one ($M_{2bH}=0.443$). Similar to this, in case 4, the respondents have had a preference for the robot-like sales assistant ($M_{3bNH}=0.512$) over the doll-robot with incorporated technology ($M_{4bH}=0.458$). For this case 4, we have had an $F_{4b}=7.70$ and $p_{4b}=0.006 < 0.01$.

Table no. 2. Discriminant analysis results for constant sum-questions

Variable	Mean in human-like situation	Mean in non-human-like situation	Standard deviation human-like situation	Standard deviation non-human-like situation	F value (df:1,278)
Case 1b	0.419	0.580	0.213	0.213	39.54***
Case 2b	0.443	0.556	0.279	0.279	11.34***
Case 3b	0.487	0.512	0.271	0.271	0.55
Case 4b	0.458	0.541	0.250	0.250	7.70***

Significance: *** for $p < 0.01$; ** for $p < 0.05$; * for $p < 0.10$

Source: Own research results

For the constant sum-questions, case 3 was the only one, which didn't show a significant difference. For this situation we have obtained an $F_{3b}=0.55$ and $p_{1b}=0.455 > 0.10$. In spite of this result, the mean for the non-human condition representing a classic screen ($M_{3bNH}=0.512$) was higher than that for the screen presenting a hologram of a human being ($M_{3bH}=0.487$).

Taking these in consideration, hypothesis 1 has been rejected. Consumers prefer the classic devices no matter of the degree of personalization or humanization. Hypothesis 2 has been confirmed. In the case of robots or artificial intelligence forms with detailed human characteristics, the consumers still prefer the classic devices.

Conclusions

The results of the research show the fact that consumers prefer the classic devices over different forms of human like robots. In our research, we have tried to simulate different situation of humanization, but none of them has shown a preference of the consumers toward the anthropomorphized devices. We have tested two situations in which the device took the form of a human with more (case 4) or less (case 1) human details, but contrary to our hypothesis that few human details will not be rejected by the consumers. So Hypothesis 1 had been hereby infirmed and Hypothesis 2 has been confirmed. We have also tested the effect of personalization (case 2), but this case has been also less preferred by the consumer. Not even the presence of a human being in the context of a digitalization (case 3) has not

had a better effect on the consumers. Therefore it is interesting to analyze if this perception will change in the future.

The limitation of our research refers to the selected situations endorsing artificial intelligence devices. For instance in case 1 and case 3, we have selected devices which are associated with a certain brand. Therefore the preference for one situation (human-like condition or non-human-like condition) might be affected by the preferences of the consumers towards a certain brand. As a result we will focus more on situations, which are not related a brand.

In order to be able to forecast the development of anthropomorphized robots, there is a need to understand the reasons behind the consumers' preference toward classic devices. On one hand consumers might associate these human-like robots with science fiction movies and not take them seriously. On the other hand, similar to some researchers (Rinesi, 2015) consumers might see a threat in the personification and humanization of artificial intelligence forms. In this situation, it is interesting to analyze if they do it instinctively or on a rational basis. However, robots and artificial devices have become part of our lives and it is interesting to see how they will evolve for the future.

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