

THE IMPACT OF ARTIFICIAL INTELLIGENCE ON CONSUMER BEHAVIOUR AND CHANGES IN BUSINESS ACTIVITY DUE TO PANDEMIC EFFECTS

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Abstract: *The COVID-19 pandemic has impacted the world economy, and the restrictions have shaken business models. E-commerce has skyrocketed as the only way to purchase products and AI has received closer consideration as social distancing has become imperative. This research aims to find whether the COVID-19 has translated into an opportunity for the use of AI by companies. A survey incorporating consumers and companies was conducted to analyse the positioning of consumers regarding the use of AI, as well as the perception of companies regarding their possible use of AI. It was concluded that due to COVID-19 there was an increase in the relevance that companies give to AI, the main drivers being the companies' views on AI and the benefits from its use. Regarding consumer behaviour, consumers are more receptive to AI use, favouring a fully automated experience, with half of the sample preferring to buy online.*

Keywords: *COVID-19, consumers, companies, e-commerce, intelligent systems, artificial intelligence.*

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INTRODUCTION

With the emergence of the COVID-19 virus, the global economy was significantly impacted by restricted movement, social distancing, and mandatory containment measures. This has cut across all sectors, not only economically but also socially. Today, the business environment faces new challenges, especially in the way business is conducted. Consumption habits develop over time, but while consumption is habitual, it is also contextual and, given the current landscape, it is undergoing significant changes, putting enormous pressure on businesses. Customers have been prevented from going to their usual places of consumption and have been forced to change their habits. In addition, consumer attitudes have been changing due to the danger of the contagion.

As the pandemic reached its peak, individuals were forced into confinement, and many businesses and services were similarly forced to close. The duration of the pandemic caused many businesses to experience serious difficulties. Numerous enterprises were unable to operate, either because of a lack of customers or because of legal requirements that restricted their operations. The changes resulting from the pandemic challenged consumer perceptions and behaviour. The use and acceptance of digital have given way to the new reality where it is the only alternative that can keep people connected, so digital has become a necessity rather than an option (Sheth, 2020).

On the other hand, the implementation of AI in companies has taken on a clear importance today. The digital transformation fostered by the increasing leverage of artificial intelligence has been a critical influencing factor unleashing the next wave of enterprise business disruption (Chintalapati & Pandey, 2022).

AI is seen as an important aid in the development of various tasks, but more importantly these days, it can automate tasks and processes, and inevitably come to reduce contact, representing a key element in the course of containing the COVID-19 pandemic.

Coombs (2020) concluded that before the COVID-19 pandemic, individuals preferred a human element rather than a fully automated experience. However, after the pandemic situation, these preferences may change as contact became compromising. The current moment may represent the turning point in the massive use of AI by businesses, supported by the possible renewed consumer preference for automated interactions and the need for organizations to react and adapt to survive and overcome the current difficulties.

Therefore, this study aims to contribute to the progress in scientific knowledge in the area of business in conjunction with the area of AI, through the following general objectives: Contribute to the development of literature in the areas of business and AI in the pandemic situation COVID-19; Try to answer the gap in the literature relating these two topics; To understand if the COVID-19 pandemic can promote the use of intelligent systems by companies in a generalized way; Understand the impact and importance that AI may represent in the business environment as the pandemic progresses. To strengthen and deepen the study, a specific objective was defined: To understand how Portuguese companies evaluate the possibility of using AI to respond to situations caused by the COVID-19 pandemic.

This article, to achieve the proposed objectives and answer the research questions raised, is organized as follows: 1) a brief introduction to the article, 2) the literature review is elaborated, trying to understand which works and studies have been done in these areas, through the study and observation of the work of other authors in the area of AI and the impacts

of the COVID-19 pandemic on the behavior of companies, 3) the methodology used and the characterization of the sample used for the development of the work, 4) presents and discusses the results obtained with the authors who contributed to the formulation of each of the research questions, 5) the conclusion, where the final considerations of the research are described, followed by the contributions to academia, the limitations that the study presents, and suggestions for future research.

LITERATURE REVIEW

Innovation has always been the main driver of improvement throughout history. Internet-of-things (IoT), big data, artificial intelligence (AI) and blockchain are rising technologies all over the world, and the strong technological growth is awakening the ability of a machine to perform cognitive functions such as perceiving, reasoning, learning, and interacting through different AI approaches. Large amounts of data are currently produced, and according to Henke and Kaka (2018), it is this data that allows AI to assist an increasing number of companies in a wide variety of areas.

Similarly, Haenlein and Kaplan (2019) argue that derived from big data and improved computing power, these approaches have been increasingly used by businesses and the general public. Almost 60% of large companies have already adopted AI in at least one function or business unit in 2019 (Perrault et al., 2019), in which, most reported gaining benefits where it was used.

It was in 1950 that AI moved from science fiction to reality, through the publication of Alan Turing's paper, entitled "Computing Machinery and Intelligence." The Turing test was introduced, where it aimed to assess a machine's ability to mimic the behaviour of a human to determine whether or not it was intelligent. The test was simple, if a judge, when involved in an interaction with a computer, could not tell the machine from a human being, the machine would pass the test, which it eventually did. This historic achievement was considered the catalyst in the interest and further development in the field of AI.

The term artificial intelligence, as a respectable scientific term, was established at the Dartmouth conference in 1956. AI came to be seen as a broad branch of computer science, focused on building intelligent machines capable of performing tasks that normally required human intelligence. This topic is discussed and addressed by numerous authors, to which several definitions are attributed.

Authors such as Shabbir and Anwer (2015) argue that AI can be viewed as the use of machines and computer programs, to perform intellectual and imaginative tasks of humans. Panch et al. (2018), meanwhile, argue that AI exhibits certain behaviours that resemble human intelligence, and highlights planning, learning, reasoning, problem-solving, and knowledge representation. In turn, Güngör (2020) argues that AI is a generic term for various methodologies designed to provide computers with human-like abilities to see, hear, reason, and learn.

However, there is one common element mentioned by Patrick (2020), AI must exhibit intelligent human behaviours or be able to perform tasks that previously required human intelligence. In addition to the aforementioned, Pettersen (2019) further explains that currently,

AI focuses on the use of algorithms, these being a set of rules and procedures that a computer must perform when performing a given task.

Different approaches and practical applications of AI

By now it is clear that AI corresponds to a broad branch of computer science, and as such, includes several approaches and tools that companies should take into consideration when supporting decisions, whether to increase efficiency, reduce costs, or even to automate processes. Within this vast field of AI, it is usual to identify three distinct general categories: Narrow AI, general AI, and super AI.

Narrow AI, which according to Burgess (2018), corresponds to current techniques, applications, and algorithms that seek to address what is happening. General AI, concerning systems that can learn and behave intelligently, similar to a human being (Finlay, 2018). And Super AI, capable of being used in any situation, and delivering superior results to a human being (Haenlein & Kaplan, 2019).

Of the numerous AI approaches, the main ones stand out: Natural language processing, corresponding to the approach that supports text analysis, facilitating the understanding of the structure and meaning of sentences, through statistical and machine learning methods. It allows machines to understand the meaning of human language in a useful and intelligent way; Natural language generation corresponds to the AI approach used to process and generate text from computer data; And regarding speech recognition, it aims to translate human language, and convert it into a useful format for computer applications (Lu et al., 2017).

Machine learning refers to the use of algorithms for analyzing specific, structured data to recognize useful patterns, relationships or correlations, between different data inputs and learn from them. Once patterns are identified, it can make inferences about similar situations (Finlay, 2018).

Machine learning is typified into three categories, supervised learning, unsupervised learning, and reinforcement learning. Supervised learning algorithms according to Panch et al. (2018), are programs that learn associations by analyzing data, defined by a supervisor. Unsupervised learning algorithms correspond to programs that can learn associations in data, without an external definition. However, reinforcement learning algorithms seek maximization and can automatically identify optimal behavior.

Moving on to a subset of machine learning, we have deep learning where algorithms designed to match human neural networks are used. This approach can learn and complete its tasks through unstructured data, looking for correlations between the data through evolutionary testing. The deep learning approach makes it possible for machines to perform many tasks with little or no human intervention.

Finally, one AI technology that is very much in vogue today is robotic automation. Robotics resorts to the use of software and algorithms, in an attempt to automate human action to obtain more efficient processes in companies. Nowadays, these processes are used when it becomes too costly or inefficient for a human being to perform a certain task (Willcocks & Lacity, 2016).

There is a great deal of discussion about the importance of AI in today's times. With the introduction and successful implementation of AI solutions, many are the businesses that benefit from increased output and show significant growth rates (Shabbir & Anwer, 2015). The

different AI approaches that have been developed are characterized by having high levels of efficiency. These approaches both facilitate cost reduction, through waste reduction and better optimization of resources and also enable the increase of results and consequently the improvement in organizational performance.

There is enough evidence available in the literature that different AI approaches offer new opportunities that can lead to a remarkable transformation in business. AI is characterized by being transversal to any industry and can be used in several areas, whether in the industrial sector through the prediction of manufacturing processes, in planning processes, in repair forecasting, in quality control, in logistics, and even in optimization processes. Regarding the health area, it can become an important ally as detection tools and medical diagnosis, in performing surgeries through robotics or even in the development of vaccines, in the latter case, using machine learning to facilitate the observation of large samples during the process.

Even in the financial sector, these approaches have a place, whether in fraud detection in financial institutions and auditing firms or as automated trading tools in investment funds. Even in the agricultural sector, AI can have an impact, as today, farmers can get assistance in irrigation to make production more efficient.

Impact of AI on the pandemic COVID-19

The pandemic crisis is challenging all domains and consequently, causing huge changes in societies, be it consumers or companies, and the way they do business. There has been an increase in the demand and use of AI in several areas described by Naudé (2020). Recent studies identify AI and machine learning as promising approaches in combating the COVID-19 pandemic. According to Davenport and Kalakota (2019), it increases processing speed, reliability and can outperform people in certain healthcare tasks. Lalmuanawma et al. (2020), on the other hand, explain the advantages of their use in screening COVID-19 patients. According to studies conducted, some of the uses have an average accuracy of 95%.

Throughout the literature review conducted on this topic, it is apparent that the vast majority of recent research and studies that have been prepared by various authors focus on and target the medical field. However, there is already some work that focuses on the use of AI by companies as a way to deal with the pandemic crisis.

According to Sreeharsha (2020), there are companies currently concerned with developing new AI systems to control the social distance between employees in the workplace. This represents a way to overcome the obstacles and restrictions imposed by governments and will allow many companies to resume their activities.

Adapted AI approaches can bring unpredictable, unexpected, or even misleading results since they were initially developed for another purpose. This concept, however, can be important in the current context where it demands quick solutions. With the need to accelerate the development of promising technologies to COVID-19, adapting existing technologies may be a solution.

As an example, consulting firm PwC developed an AI-based automatic contact control tool by reusing an existing system that was used to control assets within a building (Sreeharsha, 2020). It has now been used to control contact between employees. Similarly, Smartvid has developed a business system using AI to detect the distance between two individuals, and whether they are meeting with more than 10 individuals. This system analyzes the images to

help enforce social distancing in a given location and can serve as a preventive measure in the fight and control of the COVID-19 pandemic, allowing companies to return to work safely.

Businesses need to react and adapt, identify new products, new customers, and shift operations to new markets to survive and remain competitive in the new economic environment (Kim & Mauborgne, 2005).

Strategic agility and market-shaping oriented strategies

According to author Ehiorobo (2020), strategic agility is not limited to a specific definition. While Denning (2018) sees it as the concern with creating new products or services aimed at new markets, Judeh (2014) understands it to be the ability of organizations to remain competitive by adjusting and adapting to innovations. In turn, Morton et al. (2018) consider strategic agility as a continuous practice of adapting and adjusting to the strategic direction in the core business, depending on strategic objectives and changing circumstances.

Although several authors speak on the topic, it is clear that strategic agility implies fluidity and a quick response to unstable market conditions. This will be necessary for the survival and continuity of any business. With the changes brought about by the COVID-19 pandemic, small and large retailers have had to adapt to cope with the current situation. The restrictions have been severely affecting companies and forcing them to react. Thus, alcoholic beverage companies have had to reconfigure their production to produce hand sanitizers, textile industries have changed their production to masks to protect against the COVID-19 virus, while food delivery companies have had to introduce contactless payment methods.

While the actions taken by companies to adapt and survive are working, in recent years, researchers such as Priem et al. (2013) have increasingly emphasized that markets are not deterministic contexts exogenous to the company in which they must adapt. Instead, a change of perspective is proposed whereby markets are seen as malleable complex adaptive systems (Suvi Nenonen et al., 2014), which are essentially the result of agent-driven efforts (Dew & Sarasvathy, 2016; Gavetti et al., 2017; Kjellberg et al., 2015; Nenonen et al., 2019).

According to Johnes (1999), an agent can choose to be a market leader by developing that market in the directions that are most favourable to it. Thus, instead of firms being required to be flexible and ready to adapt to the external environment, Patvardhan and Ramachandran (2020) suggest the need for model-oriented strategies, giving primacy to artificial evolution processes, i.e., interventions where a firm's leaders challenge what leverages the organization's internal ecology to drive the business model in a preferred direction.

Consequently, in addition to adapting value chains and work practices to the COVID-19 pandemic, companies must think more actively about the future, as Nenonen and Storbacka (2018) state that pushing an already disrupted market in a specific direction that is favourable to us is easier than setting a static market in motion. Therefore, the occurrence of crises gives rise to a deliberate formation of agents (Luksha, 2008). These agents aiming to shape the market to their advantage must time their efforts to coincide with periods of instability or discontinuity (McGrath, 2019; Nenonen & Storbacka, 2018). In this way, the COVID-19 crisis that has set in may be an ideal time for companies to impose themselves on the market, according to their guidelines, with new ways of doing business in an attempt to gain an advantage.

Changes in consumer behaviour

The profound changes resulting from the pandemic crisis are challenging consumer perceptions and behaviours. The increase in the use and acceptance of technology and digital, as well as online services, are giving way to the new reality, this being the only alternative capable of keeping people connected. Knowledge about digital has become a necessity rather than an alternative, and e-commerce has shown a significant increase (Sheth, 2020).

Consumers in rethinking their shopping habits recognized benefits in services they had never used before. Aging consumers have begun to turn to online shopping, discovering the safety and benefits of home delivery. Pantano et al. (2020) state that the internet presents itself as the main way to purchase essential products and services, and in the current landscape, online shopping and home delivery are classified as essential services.

A major impact on the elected shopping channel has been observed, while online shopping has been stable, albeit, with a slight growth in the last decade (Harris et al., 2017), it skyrocketed during the COVID-19 crisis. In addition, older consumers with less digital experience have begun to turn to online shopping. As an example, one online retailer, Miss Fresh, witnessed a 237% increase in users over the age of 40 (Nielsen, 2020). Similarly, distribution options are beginning to emerge where no physical interaction is required, such as home deliveries via robots and Amazon's Walkout Shopping technology.

Coombs (2020) during his research sought to understand the pros and cons of the massification of smart technologies are. He concluded that before the COVID-19 pandemic, people preferred a human element in their interactions rather than a fully automated experience. However, after the COVID-19 pandemic, these preferences may change as interpersonal contact has become compromised.

A clear change in consumer behaviour is becoming apparent, and consequently, questions arise as to how long these new habits will last. Are the new trends here to stay? Will traditional consumer habits return after the pandemic? Author Sheth (2020) argues that most habits will return to normal. However, some of the habits will inevitably disappear as the consumer, when confined, has discovered a more convenient and affordable alternative.

The importance that AI can represent in the business environment

Containment has generated a sharp increase in dependence on digital technologies to ensure continuity of life and work. This has forced many companies to reinvent their business models through digital technologies. According to Maritz (2020), online has become critical to obtaining sales, before the COVID-19 pandemic, e-commerce came from factors such as convenience and price, now it is a necessity.

The pandemic has increased the need for intelligent services. In the current scenario, customers have developed a renewed preference for contactless services supported by digital and smart technologies. Coombs (2020), on the other hand, argues that in addition to renewed customer interest, the COVID-19 pandemic may become the catalyst for the mass use of AI. As such, several brands have accelerated digital transformation to sustain competitiveness in the post-pandemic world.

Several hotels have decided to implement smart contactless services, including automatic or remote check-in, facial recognition, voice control in-room service, and robotic room service.

These services seek to avoid interpersonal contact and minimize stays in public areas, helping to reduce the risk of infection and transmission of the COVID-19 virus. Shabbir and Anwer (2015) argue that AI will transform the way companies compete around the world, which will ultimately drive corporate performance and bottom lines. Similarly, Ehiorobo (2020) describes AI and strategic agility as solutions applicable to any business allowing them to survive, grow, and meet customer expectations.

Dickson (2020) mentions that AI, internet-of-things (IoT), and big data are increasingly present, and business leaders are paying attention to this transformation. Furthermore, Ehiorobo (2020) explains that AI algorithms will be an important aid in predicting actual demand, reducing expenses, interpreting data on business dynamics, and new narratives of change to increase the prospects of business survival.

According to Hao et al. (2020), in addition to the advantages already mentioned, digital and intelligent tools make it possible to eliminate human error, increase service efficiency, and consequently, increase customer satisfaction. Nevertheless, the implementation of these technologies can also improve operational efficiency in terms of significant cost reductions, culminating in improved organizational performance.

According to Butzmann et al. (2017) and Scor (2018), AI has become the game-changer, and organizations that ignore this fact may be unable to withstand the competitive pressures in the post-COVID-19 global economy. Ehiorobo (2020) explains that using AI to leverage other organizational resources to transform them into organizational capabilities is what enables performance improvement and sustainable competitive advantage. Thus, we can say that AI corresponds to a technological resource used synergistically with other organizational resources to improve factor productivity.

Machines and equipment can be fully automated by implementing AI. In customer relationship management where it is often thought that the machine has no place because it involves the relationship and the more personal side through communication, AI can be implemented, since it can predict customer requirements, meet their needs, and provide the necessary information to guide them in their purchasing decisions using chatbots. Today, marketing means using biometrics, voice, and conversational user interfaces, that offer distinct ways in adding value for brands and consumers alike (Wang & Wang, 2022). At the marketing action stage, mechanical AI can be used for standardization, thinking AI for personalization, and feeling AI for improving relationships (Huang & Rust, 2021).

These AI applications can be considered examples of a new form of automation that Coombs et al. (2020) describe as Intelligent Automation. This is defined as the use of AI in such a way that it can learn, adapt, and improve over time to automate tasks that were formally performed by a human being.

Alongside this, the use of these technologies is seeing a rampant increase. Walmart has used robots to clean its stores, and Amazon is using robots in its warehouses to sort and ship orders. In Rwanda, robots are being used in response to the pandemic to monitor patients' temperatures, identify people not wearing masks, and deliver medicine to infected patients. However, some disadvantages may arise, including the need for large data sets, or limitations concerning data quality if the data is not accurate, leading to decisions based on faulty insights (Günther et al., 2017). Also, AI cannot deliver its promises in many domains, like in Marketing, if the challenge of moving tacit knowledge between AI models and organizations functions cannot be solved (De Bruyn, et al., 2020).

METHODOLOGY

Research Model

According to Tarski (1977), research methodology is a science that arises from logic to study the scientific method. The scientific method, in turn, corresponds to the procedures used and approved by the scientific community, capable of presenting and validating a theory. According to Vergara (2006) and Vilelas (2009), the classification of the methodology used in the development of research documents can be done as to the ends and as to the means. In this context, the ends correspond to applied and exploratory research, while the means translate field study and bibliographic research.

The present study assumes a pragmatic or inductive character and was supported based on a non-probabilistic sample by convenience, according to the availability and accessibility of the elements addressed (Carmo & Ferreira, 1998), in this case by professionals with some experience as senior management or middle management with some degree of decision-making and consumers. Thus, the questionnaires were sent to Portuguese companies by email and through the LinkedIn platform, and to consumers from the general public through email and dissemination in social networks. A total of 154 questionnaires were answered by companies and 333 by consumers.

In this context, in as much as the purposes of the research are concerned, an applied and an exploratory nature was implicit. Regarding the applied character, this results from the attempt to investigate a contemporary phenomenon in the context of real-life (Yin, 1994), assisted with an exploratory strand given the poor knowledge about the phenomenon of evaluation of the possibility of AI adoption by Portuguese companies to respond to situations caused by the COVID-19 pandemic, to create new theoretical knowledge on the subject, to gain new inputs on the consideration of the use of AI in response to the COVID-19 pandemic, answers that are only possible to find through the search for causes for the effects found (internal validity).

In terms of means, this study is based on a set of primary sources, the application of questionnaires to two distinct audiences, one aimed at Portuguese companies and the other at consumers in general, and secondary sources, corresponding to the bibliographic research and treatment of information, comprised in the study developed in books, journals, and scientific articles.

As for the methodology used, of the three possibilities in terms of research approaches, namely qualitative, quantitative, or a combined approach (Williams, 2007), a quantitative approach was used, to collect and work data statistically to support or deny hypothetical conclusions based on academically focused hypotheses (Williams, 2007).

Two quantitative analysis techniques were used, descriptive statistics and analytical statistics. Descriptive statistics involves the processing and disclosure of the results obtained using charts and tables, using techniques and rules that summarize the information collected from the questionnaires in a data dispersion in the form of frequencies, percentages, means, modes, medians, variances, standard deviations, and counts (Vilelas, 2009). Regarding analytical statistics, a theoretical model was built and structural equation modeling (SEM) was used to test it. Partial least squares (PLS) was used, which is a variance-based structural equation modeling technique using the SmartPLS 3 software (Ringle et al., 2015).

Regarding data collection, according to Vilelas (2009), it is a logical research procedure, in charge of defining the means for collecting and processing information, as well as controlling its use. The questionnaire survey was chosen, one of the most widely used techniques in social sciences (Provdanov & Freitas, 2013). This method is less prone to mistakes because it is implicit in primary knowledge and because it allows the possibility of grouping data in the form of statistical tables, facilitating the measurement of the variables under study.

Regarding the classification of the scaling techniques presented, in the presentation of the data, the non-comparative scaling technique of Likert assessment was used, which allows assessing the degree of agreement of the respondent in each statement from 1 (strongly disagree) to 5 (strongly agree).

Therefore, the study unfolded in four stages. The first consisted of bibliographic research and information treatment; the second phase, through the transfer of theoretical ideas to the field of observation, to obtain greater confidence in the results, a theoretical model was built; the third stage, corresponds to the fieldwork through the collection of data and information by the questionnaires and, finally, the fourth stage, which consisted in the quantitative analysis of the data, comparing the ideas and knowledge from the bibliographic research with the results generated by the information from the questionnaires, establishing new theoretical approaches in the field of the use of AI in Portuguese companies to respond to situations caused by the COVID-19 pandemic.

When preparing the literature review, four research questions emerged that will serve as the basis for this study. This chapter aims to show how each of the previously raised questions will be addressed and worked on. Table 1 shows the relationship between the objective of the study, the research questions, and the inherent literature review, as well as the method used to work on each of the research questions raised.

Table 1: Relationship between the study objective, research questions, literature review, and methodology used

Objective	Research Questions	Methodology	Literature Review
Understand how Portuguese companies evaluate the possibility of using AI to respond to situations caused by the pandemic COVID-19	(Q1). Has there been a change in companies' perception of how they can use AI to achieve competitive advantage under the COVID-19 pandemic?	Descriptive analysis through quantitative analysis of the questionnaires	(Coombs, 2020); (Priem et al., 2013); (Patvardhan & Ramachandran, 2020); Ehiorobo (2020);
	(Q2). Did the COVID-19 pandemic foster a shift in consumer attitudes toward AI? Will it be lasting in the post-COVID-19 era?	Descriptive analysis through quantitative analysis of the questionnaires	(Coombs, 2020); (Pantano et al., 2020); (Sheth, 2020);
	(Q3). What is the true impact of using AI technologies on businesses during and after the COVID-19 pandemic?	Descriptive analysis through quantitative analysis of the questionnaires	(Maritz, 2020); (Hao et al., 2020); Sreeharsha (2020); Pantano et al. (2020);
	(Q4). Is the evaluation of the possibility of using AI by companies, impacted by their perception of the topic and its adjacent benefits?	PLS-SEM - Analysis of Path Strength and Significance (betas)	(Coombs, 2020); (Patvardhan & Ramachandran, 2020); Ehiorobo (2020); Sreeharsha (2020);

To continue the study and answer Q1, Q2 and Q3, descriptive statistics were used by processing and disclosing the results obtained through charts and tables, using techniques and

rules that summarize the information collected from the questionnaires in a data dispersion in the form of frequencies, percentages, means, modes, medians, variances, standard deviations and counts (Vilelas, 2009). The method selected for data collection was the questionnaire survey, constructed through the Google Forms application. They were developed based on the literature review, where the factors that were most relevant to the study in question were analysed, giving rise to the blocks of questions. Two distinct surveys were built, directed to different target audiences. A first survey, directed to consumers, associated with Q2, and a second survey is directed to companies, associated with Q1, Q3, and Q4. The questionnaires were then tested to validate the wording and design of the questionnaire. Once circulated, data collection took place during the month of February 2021. After data collection was completed, they were imported from Excel into the statistical analysis program IBM® SPSS® Statistics, and the results were analysed and prepared.

Concerning the last research question, Q4, this was worked out through analytical statistics, where a theoretical model was built and structural equation modelling (SEM) was used to test it. Partial least squares (PLS), a variance-based structural equation modelling technique, was used using SmartPLS 3 software (Ringle et al., 2015). The analysis and interpretation of the results were phased, first, the reliability and validity of the measurement model were assessed, followed by the assessment of the structural model.

Statistically, the model reflects a set of equations where the parameters are established from statistical observation, and structural equations refer to equations that use analysis parameters from observable variables (El-Sheikh et al., 2017). That is, structural equation modelling is a viable statistical technique for exploring multivariate relationships among variables, allowing a comprehensive approach to the research question for measuring and analysing theoretical models (Anderson & Gerbing, 1988). Therefore, the measurement of latent constructs is done indirectly, mainly through the use of observable variables, and through the observation of causal effects in structural equation modelling between latent variables (Tarka, 2018).

Knowing that model evaluation using factor analysis alone does not determine causality relationships and path analysis despite establishing causality does not assess the error of the variables, structural equation modelling measures the total effect, direct and indirect, of the explanatory variable on the dependent one (Haque et al., 2019). It is thanks to the ability to offer a comprehensive approach to quantifying and testing theories, and the fact that structural equation models take into account measurement error, that this analytical statistical technique is frequently used.

To construct the theoretical model, two independent variables were identified; the view towards AI and the benefits of using AI. In addition, the dependent variable corresponding to the evaluation of the possibility of AI use by companies was identified, which reflects Q4. The evaluation of each of the variables was based on the items presented in the model, which comes from the literature review.

After the variables were identified, they were evaluated based on the pre-defined items arising from the literature review. Thus, the variables were measured by asking respondents to indicate their degree of agreement with the statements presented in the questionnaire on a five-point Likert-type scale (1 is equivalent to strongly disagree and 5 to strongly agree). Next, the developed conceptual model to be tested is shown in figure 1, and the relationship of the variables in the model to the questionnaire is shown in table 2.

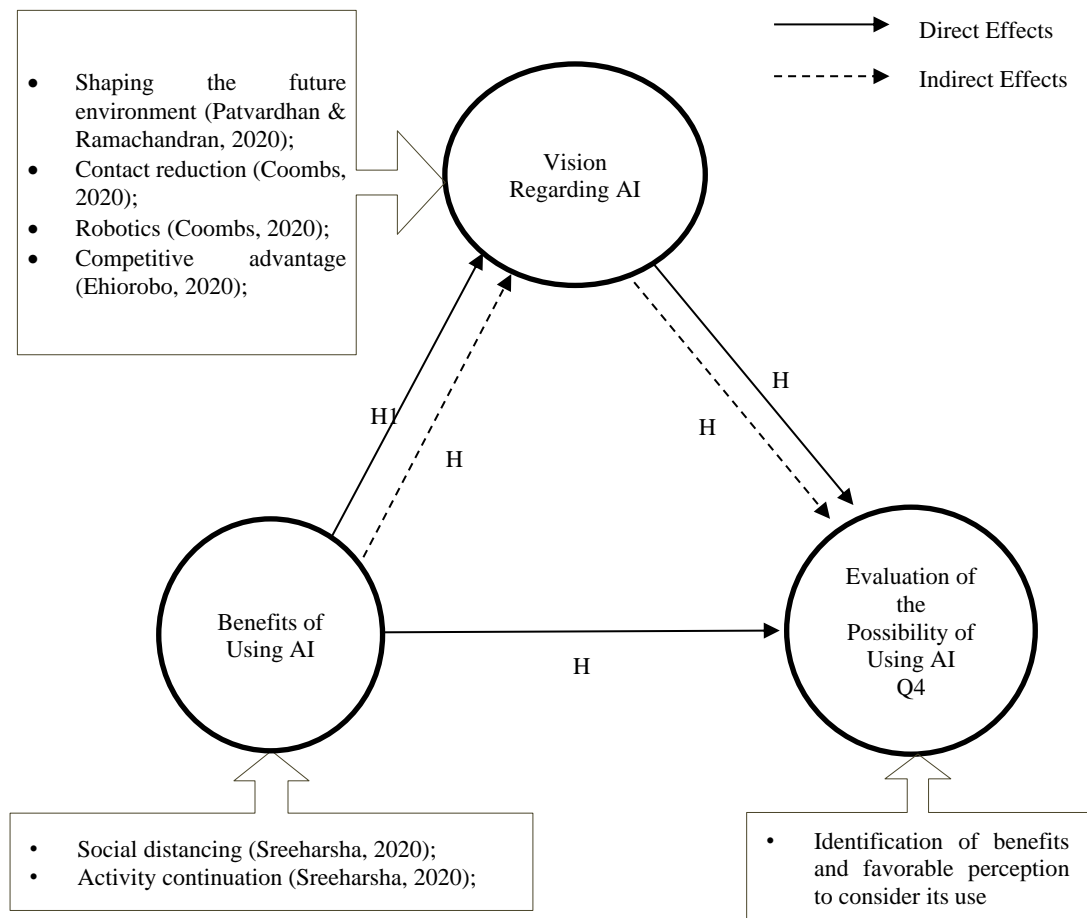


Figure 1: Conceptual model and hypotheses to be tested with SmartPLS 3.

Table 2: Relationship between the variables of the conceptual model and the questions in the questionnaire.

Independent Variable	Indicator	Questionnaire question (answers from 1 to 5)
Vision regarding AI	Shaping the future environment (Patvardhan & Ramachandran, 2020)	The different AI approaches represent the future, and the future will involve their massive use
	Contact reduction (Coombs, 2020);	The use of intelligent technologies enables the reduction of interpersonal contact
	Robotics (Coombs, 2020);	It may be relevant to use robots capable of performing tasks such as cleaning, destroying, and disinfecting any microorganisms within their reach, or delivering packages without human intervention All companies must have thermal security robots in their workspaces that can identify individuals within a radius of 30 meters with temperatures above 37.4 degrees It may be relevant to use intelligent systems that can monitor and detect the number of people gathered in a group, assess whether the safety distance is met, or check the wearing of the mask
	Competitive advantage (Ehiorobo, 2020)	With the culmination of the COVID-19 pandemic, my view on the use of smart technologies in business has changed By investing in AI technologies, I feel I am investing in the future and working in fields that could give me a competitive advantage given the COVID-19 pandemic
Benefits of using AI	Social Distancing (Sreeharsha, 2020)	The adoption of artificial intelligence systems capable of promoting social distancing, automatic temperature measurement of individuals, and controlling the wearing of masks to fight the

Activity Continuation (Sreeharsha, 2020)	COVID-19 pandemic may become essential and of utmost importance, impacting companies in a positive way The adoption of various measures using artificial intelligence is crucial for the continuity of various activities (security distance control systems, use of robots for disinfecting spaces, intelligent machines for contact reduction, etc.)
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The following hypotheses emerged from the presented model: H1- The benefits arising from the use of AI positively influence firms' views towards AI; H2- Firms' views towards AI positively influence the evaluation of the possibility of using AI; H3- The benefits of using AI positively influence the possibility of using AI in firms' activities and H4- The view of the benefits of using AI in the decision to use AI is mediated by the view that firms hold towards AI.

Finally, concerning external validity, the study reinforces some of the little existing theory regarding these themes, allowing for contextual analyses to be performed by comparing results between different countries in this field of research.

Sample description

For the study, two different surveys were applied to different audiences, a first survey directed to Portuguese companies, and a second survey directed to consumers. The sample size of the consumer survey was 333, where the age of the respondents ranged from 16 to 77 years old. Still, the average age of the sample is 33 years old. As for the questionnaire addressed to companies, it sought to survey professionals with experience as senior managers or middle managers with some degree of decision-making - 155 responses were gathered. Concerning turnover, this figure is for 2019, since 2020 was an atypical year. Approximately 35% of the companies surveyed had a turnover of less than 1,000,000€ in 2019. Table 3 shows the sample information.

Table 3: Sample description.

Consumer Questionnaire	Category Class	Description	Total Number	Percentage
	Gender	Male	145	43,54%
		Female	188	56,46%
	Academic Qualifications	Basic Education	18	5,41%
High School		136	40,84%	
Bachelor or Superior Degree		179	53,75%	
Company Questionnaire (Senior management or middle management professionals)	Geographic Location	Northern Region	38	24,52%
		Center	5	3,23%
		Lisboa e Vale do Tejo	99	63,87%
		Algarve	13	8,39%
Sector of Activity	Financial activities and insurance	65	41,94%	
	Wholesale and retail	25	16,13%	
	Accommodation, Restaurants and Similar Services	13	8,39%	
	Health activities	3	1,94%	
	Agriculture	2	1,29%	
	Construction	5	3,23%	
	Education	8	5,16%	
	Manufacturing Industries	6	3,87%	
	Transportation and Warehousing	9	5,81%	
	Other	19	12,26%	

ANALYSIS AND DISCUSSION OF THE RESULTS

Change in companies' perceptions regarding the use of AI and gaining competitive advantage in the pandemic COVID-19

Before ascertaining whether there was a change in the perception of companies concerning AI, we first tried to understand to what extent companies find the use of these technologies relevant through table 4.

Table 4: Table of descriptive statistics referring to the variables.

	AI represents the future, and this future will come through its massive use	The IS are important in predicting real demand and interpreting data in new business dynamics	Importance of using IS in several tasks without human intervention	The IS allows the reduction of interpersonal contact
N	155	155	155	155
Mean	4,45	4,24	3,88	4,29
Median	5,00	4,00	4,00	4,00
Mode	5	5	4	5
Srd. Deviation	,657	,850	,813	,837

Initially, the answers to questions such as the use of AI in the future, its importance in predicting and interpreting data concerning new business dynamics, and its ability to reduce human intervention and interpersonal contact were analysed. The answers of the surveyed companies show a mean and median value around 4 and a mode around 5, which reveals a high degree of agreement with the statements. Thus, we conclude that companies effectively attribute great relevance to the use of AI today.

Once it was perceived that companies value the use of AI, the possible change in their perception regarding AI and the achievement of competitive advantage in the context of a pandemic was analyzed. It was observed that more than 50% of the surveyed companies state that their idea about the use of AI has changed with the course of the pandemic, and about 80% of the sample agreed that the use of AI corresponds to the future and that it will bring them a competitive advantage in the context of the pandemic COVID-19.

To deepen the knowledge about the current change in the perception of the companies, we tried to understand if it presented differences according to the activity sector. By applying the ANOVA test, table 5, this analysis reveals whether there are discrepancies between averages by sector and allows us to investigate where these differences are found.

Table 5: ANOVA test on the change in firms' perceptions by sector.

	Sum of squares	df	Mean Square	Z	Sig.
Between Groups	7,617	9	,846	,805	,612
In the Groups	152,421	145	1,051		
Total	160,039	154			

When analyzing the ANOVA test, it shows a value of Sig. > 0.05, so it is possible to conclude that there were no differences in the means of the variable "change in perception" by

sector. This means that in the sample collected, the sector of activity had no influence on the change in perception of the companies, and this was transversal to all sectors.

Given that a good portion of the surveyed companies had changed their vision about the AI, a test was performed using Spearman's correlation coefficient to verify if the variables addressed were correlated with the change verified. As the COVID-19 pandemic progressed, social distancing and reduced contact became imperative. It was possible to verify that the fact that intelligent systems can reduce contact, predict actual demand, and interpret data in new business dynamics, show a moderate positive correlation with the change in companies' view on AI, and may explain this phenomenon.

Still, the fact that the correlation between the variables is moderate indicates that there may be other factors that contribute in the same way to this change. Some of the factors addressed in the literature are performance improvement, efficiency increase, cost reduction, human error reduction, and process optimization.

After analysing the data, we can conclude that, as Patvardhan and Ramachandran (2020) and Priem et al. (2013) state the need for companies to adopt strategies aimed at modelling the market through AI processes, a strong slice of the companies surveyed agree with this perspective, demonstrating their certainty in the potential of AI in the future and how it can be decisive in the context of the COVID-19 pandemic. Coombs (2020) argues that the COVID-19 pandemic can serve as a catalyst for the massive use of AI, which is corroborated with the companies' vision since they agree that the use of intelligent systems (e.g., robotics) allows for the reduction of human interactions, this being an essential factor as the pandemic progresses, which will drive the adoption of intelligent systems. Thus, with the use of these systems, it is possible to reduce contact and consequently obtain advantages in the course of the pandemic, since the distance has become imperative and that will inevitably improve performance and sustainable competitive advantage as described by Ehirobo (2020).

The change in consumer behaviour regarding AI use during the COVID-19 pandemic

Through the questionnaire, the respondents were asked about their position on the use of intelligent systems given the current pandemic. After analysing the data in table 6 we can conclude, that in fact, the consumers present in the sample saw their attitude towards AI change with the onset of the pandemic COVID-19. They became more supportive of the use of intelligent systems, just as they confess that their sense of well-being and confidence in a commercial establishment increases if there are intelligent systems in place to combat COVID-19. In addition, respondents have come to prefer a fully automated experience given current circumstances. The mean value of respondents' agreement on these issues is approximately 3.5, with a mode and median of 4, on a scale of agreement from 1 to 5.

Table 6: Table of descriptive statistics referring to the variables.

	With the pandemic, I began to support the use of IS	With the COVID-19 pandemic, I started to value the IS in the purchasing process	I began to prefer a fully automated experience	I felt more comfort when using IS by being able to reduce personal contact	I felt more confidence and well-being in knowing that the establishment has IS
N	333	333	333	333	333
Mean	3,45	3,16	3,38	3,50	3,60
Median	4,00	3,00	4,00	4,00	4,00
Mode	4	4	4	4	4
Srd. Deviation	1,109	1,256	1,261	1,201	1,172

Once it was realized that the consumers surveyed came to support the use of AI during the course of COVID-19 pandemic, we sought to understand if there were differences for each categorization class of the sample. By applying the ANOVA test, reveals whether there are discrepancies between means according to age, gender, and educational attainment.

When applying the ANOVA test to assess the differences in support for the use of AI according to the age and gender of the respondents, both tests had a Sig. > 0.05, so it is possible to conclude that there were no differences in support for the use of IS by age and gender. This means that in the sample collected, the gender and age of the respondents did not influence the support shown for the IS.

However, regarding educational attainment, it can be observed that there were differences since Sig.< 0.05. Thus, in the sample collected, the academic qualifications influenced the evaluation of respondents regarding the support shown for the use of I.S. Thus, a Scheffe multiple comparisons test was performed, table 7, to compare each group of academic qualifications and understand the origin of such differences. It is possible to conclude that the degree of support for the use of IS differs between respondents who attended high school and those who attended college. This illustrates that support for the use of IS changes depending on the educational background of the group in question.

Table 7: Scheffe's Multiple Comparisons Test

(I) Academic Qualifications	(J) Academic Qualifications	Mean Difference (I-J)	Standard Error	Sig.	95% Confidence Intervals	
					Lower Limit	Upper Limit
Basic Education	High School	,231	,274	,702	-,44	,91
	Bachelor or Superior Degree	-,181	,271	,799	-,85	,48
High School	Basic Education	-,231	,274	,702	-,91	,44
	Bachelor or Superior Degree	-,412*	,124	,005	-,72	-,11
Bachelor or Superior Degree	Basic Education	,181	,271	,799	-,48	,85
	High School	,412*	,124	,005	,11	,72

*. The mean difference is significant at the 0.05 level.

Since respondents have come to support the use of intelligent systems as the pandemic has progressed, we sought to understand how this phenomenon is occurring, and what its implications are. After analysing the data, it can be concluded that there has been a greater

demand for online, serving as a refuge from physical purchases. Roughly 48% of consumers surveyed say they choose to buy online when compared to buying in person, and only 27% of respondents still prefer to buy in person. Consumers regularly use chatbots during the online shopping process, as more than 54% of consumers recognize advantages in the support provided to them. The growing number of consumers choosing to use intelligent systems in the purchase process is supported by the fact that a good portion of respondents, corresponding to more than 54%, identify value in the recommendations made to them by these systems.

By verifying that a significant part of the respondents avoided the physical purchase by opting for online shopping, we tried to understand if this phenomenon was constant in all age groups. Through the application of the ANOVA test, this presented a Sig.> 0.05. Thus, the age of the respondents did not influence the preference for online shopping, and this renewed preference occurred in a generalized manner regardless of age.

Once concluded that due to the pandemic situation, consumers started to support the use of intelligent systems, we tried to understand to what extent this attitude will remain after the regularization of the pandemic. After analysing the consumer responses, it can be concluded that the change in consumer attitude will continue post-COVID-19, and consumers will continue to support the use of intelligent systems. In addition, consumers show intentions to continue shopping online. Nevertheless, they say that after the situation is regularized, they will again seek physical shopping experiences, as can be seen in table 8 below.

After analysing the data, it is verified, as mentioned in the literature, although consumption is usual, it is also contextual, and due to the current situation, it has been undergoing significant changes. The authors Pantano et al. (2020) and Sheth (2020) highlight the increase in the use and acceptance of technology and the digital, registering an impact on the elected purchasing channel, with an exponential increase in e-commerce. The authors' perspective is confirmed through this research, as consumers have begun to support the use of intelligent systems thanks to COVID-19. Furthermore, the change in the shopping channel is clear, as approximately half of the sample, regardless of age, now prefer online shopping compared to in-person shopping, highlighting the importance of the internet today.

Table 8: Table of descriptive statistics referring to the variables.

	I will be looking for new physical purchasing experiences	I will look for new online shopping experiences	The change in my attitude will remain
N	333	333	333
Mean	3,35	3,24	3,46
Median	4,00	3,00	4,00
Mode	4	4	4
Std Deviation	1,136	1,176	1,157

Coombs (2020) throughout his research concluded that consumers preferred a human element in their experiences. However, the author states with the pandemic, this preference could change, giving rise to a renewed preference for a fully automated experience. Therefore, after analysing the results, it is possible to state that, due to the COVID-19 pandemic, consumers began to prefer a fully automated experience to reduce interpersonal contact, confirming the author's idea.

To conclude, Sheth (2020) when confronted with the duration in changing consumer habits, argues that most habits will return to normal, however it is inevitable that some of the old habits will disappear. From this research, it can be concluded that the change in consumer attitudes will continue post-COVID-19, and consumers will continue to support the use of intelligent systems. Consumers intend to continue shopping online, yet say that after the pandemic, they will again seek out physical shopping experiences.

The impact of AI use in enterprises on the COVID-19 pandemic

To answer this question a questionnaire was developed to try to assess the benefits of using intelligent systems in companies. Several variables were analysed, such as the AI's help in obtaining sales in the context of the pandemic, the increase in efficiency and the reduction of human error, the ability to predict the consumer's individual preference and offer a more personalized service, or even the importance of these intelligent systems in the continuity of activities in times of pandemic. Through the variables analysed it is possible to identify two distinct domains, one outside the company more focused on the customer, and an internal domain more directed towards the company.

By analysing table 9 it is possible to conclude that regardless of the domain, the companies surveyed showed a high degree of agreement with the variables. The trend of responses was coherent and uniform, with no significant differences by sector of activity and company size, since the mean, median, and mode values are above 4, on a scale of agreement from 1 to 5.

Table 9: Table of descriptive statistics referring to the variables.

	E-commerce and the I.S. are fundamental in obtaining sales today	The adoption of I.S. is crucial for the continuity of several activities	S.I in the fight against the pandemic can be essential, impacting positively the companies	With online commerce and S.I., it is possible to predict consumer preference by providing the most personalized and appropriate service	The use of intelligent systems can increase efficiency and reduce human error
N	155	155	155	155	155
Mean	4,25	4,06	4,07	4,19	4,31
Median	4,00	4,00	4,00	4,00	4,00
Mode	5	4	4	4	5
Std. Deviation	,776	,824	,831	,804	,726

Although the importance given by companies is very similar in both areas, the consumer sphere has a relatively higher average showing, even if the difference is small, that the companies surveyed give more importance to customers. With the onset of the pandemic, many companies were forced to close down due to the impositions of mandatory containment. This may be one factor explaining why the overwhelming majority of the companies surveyed, around 83%, consider online commerce and the use of intelligent systems to reduce contact essential in obtaining sales today. With the evident difficulty in making sales, companies are even more dedicated to customers, and about 82% of the sample considers online commerce and intelligent systems essential in predicting consumer preference, providing more personalized and appropriate service.

Still, although companies value a little more the advantages that intelligent systems can bring concerning consumers and obtaining sales, they also value the positive impacts they can have within the company itself. Examples of this are the improvement in internal processes and the increase in efficiency, the reduction in human error, the ability of intelligent systems to promote social distancing, the automatic temperature measurement of employees, the intelligent control in the use of masks to combat COVID-19, the use of intelligent systems in the cleaning and disinfection of spaces, or even the importance that these aspects represent in the continuity of activities.

By analysing the data in table 9, it is possible to conclude that the companies surveyed attribute great relevance to the points addressed in the previous paragraph since approximately 78% of the sample states that the adoption of measures using AI is crucial for the continuity of several activities and that intelligent systems will positively impact companies.

Through this research it is possible to conclude, similarly to what the authors Maritz (2020) and Pantano et al. (2020) stated, the online medium became fundamental to obtain sales with the course of the pandemic, confirmed by 83% of the surveyed companies. In this way, the mandatory confinement imposed and consequently the closure of several activities made the main way for consumers to purchase products to be through the digital medium.

The authors Hao et al. (2020) highlighted the ability of intelligent systems to eliminate human error and increase service efficiency, which was verified during this research, in which about 86% of the companies surveyed agreed on the ability of intelligent systems in reducing human error and increasing efficiency. Along with this, several measures were addressed using intelligent systems that allow companies to continue their activities. Some of the measures discussed included safety distance control systems, the use of AI in the disinfection of spaces, and the control of masks used in the fight against COVID-19. A good portion of the surveyed companies, approximately 78%, show interest in these measures and believe that these systems are capable of having a positive impact, which is in line with the idea of the author Sreeharsha (2020).

The evaluation of the possibility of using AI by companies is impacted by their perception of the subject and its adjacent benefits

To answer the last research question, a theoretical model was built, and structural equation modelling (SEM) was used to test it. Partial least squares (PLS) were used, and data analysis and interpretation followed two steps. First, the reliability and validity of the model were tested, followed by the testing of the structural model. To analyse the model, individual indicators of reliability, convergent validity, internal consistency reliability, and discriminant validity were assessed (Hair et al., 2017).

Concerning the reliability of the individual indicators, this is verified since the factor loadings of all items were greater than 0.6 and significant at $p < 0.001$ (Figure 2).

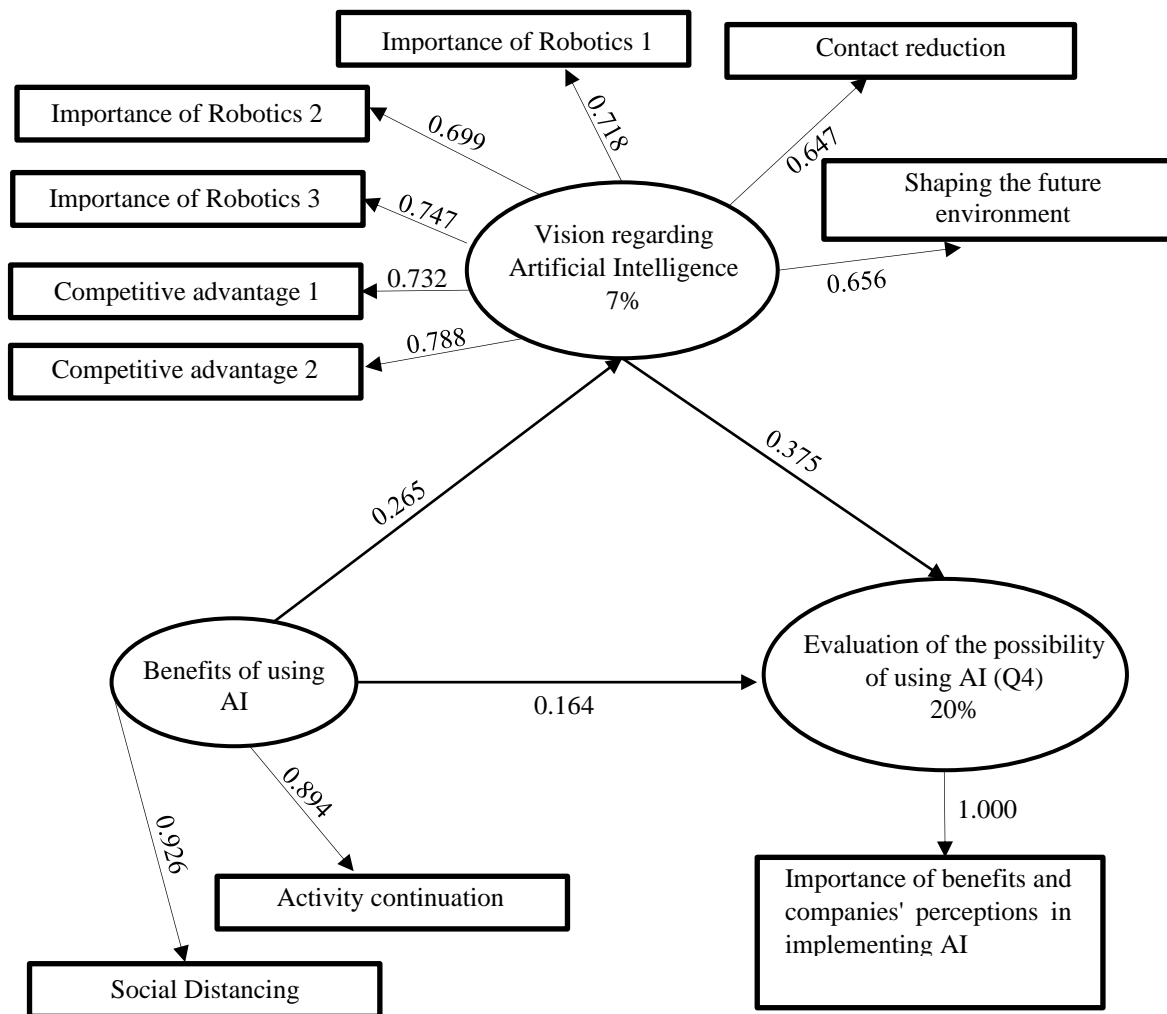


Figure 2: Tested model with the associated values from SmartPLS.

Regarding the reliability of the internal consistency, since Cronbach's Alpha and CR (composite reliability) values were always higher than 0.7 as shown in table 10, we can check its reliability.

Table 10: Checks for CR, AVE, correlations, and discriminant validity. Note: CR - composite reliability; AVE - average variance extracted. The numbers in bold are the square roots of the AVE. Below the diagonal elements are the correlations between the constructs. Above the diagonal elements are HTMT values.

	Cronbach's Alpha	CR	AVE	1	2	3
(1) Benefits of using AI	0.794	0.906	0.828	0.910	0.295	0.305
(2) Evaluation of the possibility of using AI	1.000	1.000	1.000	0.263	1	0.450
(3) Vision regarding Artificial Intelligence	0.840	0.879	0.510	0.265	0.419	0.714

Concerning convergent validity, as shown in table 10, since all items were positive and significant in the respective variables, and these presented CR values > 0.70 and AVE > 0.50 (Bagozzi & Yi, 1988), convergent validity was confirmed.

Discriminant validity was assessed based on two approaches. Initially, the Fornell and Larcker criterion was used, where the square root of the AVE (value on the diagonal of Table 10) must be greater than its highest correlation with any other variable (Fornell & Larcker, 1981). Looking at table 10 it can be seen that the criterion is satisfied for all variables. Next, the HTMT ratio criterion was used (Hair et al., 2017; Henseler et al., 2015), and as can be seen in the table above, all HTMT values are less than 0.85, providing evidence of discriminant validity.

To evaluate the structural model, we used the sign, magnitude, and significance of the structural path coefficients; the magnitude of the R^2 value for each endogenous variable as a form of predictive accuracy of the model, and Stone-Geisser's Q^2 values for the predictive relevance of the model (Hair et al., 2017). Before evaluating the structural model, collinearity was analysed. The VIF values ranged from 1 to 2.668, staying below 5 which shows that there is no collinearity. The coefficient of determination R^2 for the two endogenous variables of vision regarding AI, and the possibility of using AI, were 7% and 20%, respectively (Figure 2). The Q^2 values for the endogenous variables (0.028 and 0.167 respectively) are greater than zero, demonstrating the predictive relevance of the model (Hair et al., 2017). Table 11 shows the direct relationships present in the model.

Table 11: Direct model relationships.

	Path coefficient	Standard Errors	T Statistics	P Values
Benefits of using AI -> Evaluation of the possibility of using AI	0.164	0.082	1.993	0.046
Benefits of using AI -> Vision regarding AI	0.265	0.114	2.329	0.020
Vision regarding AI -> Evaluation of the possibility of using AI	0.375	0.075	4.990	0.000

Thus, through the results in table 11, we can verify that the benefits adjacent to AI and the use of intelligent systems have a positive relationship on the possibility of companies starting to use AI ($\beta = 0.164$, $p < 0.05$), as well as on the business vision regarding AI ($\beta = 0.265$, $p < 0.05$), and these results prove hypotheses H3 and H1, respectively. Nevertheless, the vision that companies have regarding AI has a significantly positive effect on the possibility that they started using AI ($\beta = 0.375$, $p < 0.001$), validating hypothesis H2.

Regarding hypothesis H4, a bootstrapping tool was used to assess indirect effects through a mediator variable (Preacher & Hayes, 2008). Table 12 demonstrates the result of the mediation effect.

Table 12: Specific indirect model relationships.

	Path coefficient	Standard Errors	T Statistics	P Values
Benefits of using AI -> Vision regarding AI -> Evaluation of the possibility of using	0.099	0.045	2.204	0.028

By analysing the results in table 12, it can be seen that the indirect effect of AI benefits on the possibility of using AI, through the mediator firms' vision towards AI, is significant with ($\beta = 0.099$, $p < 0.05$), validating the mediation hypothesis H4.

Thus, according to the model presented in the previous chapter, two main variables were identified, these being the vision regarding AI (Patvardhan & Ramachandran, 2020; Coombs, 2020; Ehiorobo, 2020), and the benefits of AI (Sreeharsha, 2020). Each of the variables presented a set of associated indicators, which were tested individually through a questionnaire, and all of these were confirmed to be relevant to the research, as they achieved scores above 0.6 and all were significant when $p < 0.001$, demonstrating their reliability (Hair et al., 2017).

Regarding the vision of companies regarding AI in the context of pandemic COVID-19, the results are aligned with the perspective of the authors studied, since the vision of companies is supported by the focus on the future environment (Patvardhan & Ramachandran, 2020), the reduction of contact (Coombs, 2020), the relevance of robotics (Coombs, 2020), and the competitive advantage they may gain (Ehiorobo, 2020).

Regarding the benefits of using AI as the COVID-19 pandemic progresses, we can conclude that these consist of the possibility of maintaining social detachment and inevitably, the continuity of various activities during the pandemic, as stated by the author Sreeharsha (2020).

After identifying the two main variables with potential impact on the possibility of AI implementation by companies during the COVID-19 pandemic, the hypotheses developed in the previous chapter were tested. According to the model developed, and regarding the direct effects, the results found that the benefits adjacent to AI and the use of intelligent systems, positively impact the possibility of companies starting to use AI, verifying hypothesis H3. In other words, as stated by the authors, given the current needs and the restrictions imposed, the greater the ability of intelligent systems to promote detachment, and in a way, allow activities to work, the greater the possibility of companies adopting this type of technology.

In addition, the benefits adjacent to AI and the use of intelligent systems positively impact companies' perceptions regarding these matters, confirming hypothesis H1. That is, the advantages that may result from the adoption of AI technologies and intelligent systems, cause the companies' view on these topics to be influenced, depending on the added value they may obtain from these technologies.

Interestingly, regarding the vision of companies regarding AI, this is the variable that has the most weight and significance in the possibility of using AI by companies in the context of pandemic COVID-19, significantly and positively impacting its implementation, confirming the hypothesis H2.

Regarding the indirect effects of the model, hypothesis H4 was formulated analysing the impact of the benefits of AI on the possibility of using AI, through the mediator vision regarding AI, where it was found to have a positive influence, confirming hypothesis H4.

CONCLUSION

The growing pressure on companies caused by the emergence of the COVID-19 pandemic has revealed a need for the business community to react. Many were the impositions and restrictions imposed that made life difficult for all citizens and, consequently, had a significant impact on companies. Therefore, this study sought to understand what changes occurred in the sphere of consumers and companies, seeking new alternatives using AI approaches and the use of intelligent systems to overcome the current difficulties. Following the literature review, and

after analysing the two questionnaires conducted with 489 responses, a set of conclusions about the proposed theme was obtained.

About the first research question concerning the perception of companies about AI and obtaining competitive advantage in the context of the COVID-19 pandemic, it was concluded that companies attribute great relevance to the use of AI nowadays and, more than half of the sample, regardless of activity sector, changed their perception derived from the current situation, assuming that by using AI they could obtain a competitive advantage.

About the second research question concerning the change in consumer behaviour, it was possible to conclude that consumers in the sample saw their attitude towards AI change with the onset of the pandemic, becoming more receptive to its use, preferring a fully automated experience, to prevent and mitigate COVID-19. This support by consumers was transversal to the age and gender of the sample. However, when analysed for educational attainment, there were differences between the high school and college education groups. In addition, it was possible to conclude that approximately half of the sample said they chose to buy online when compared to buying in person, and the age of the respondents did not influence the preference for online shopping. Attached, as to the duration of the change in the consumers' posture, it was concluded that this change will be maintained in the post-COVID-19 period.

As for the third research question, concerning the impact of the use of AI in companies during the pandemic, two distinct domains were identified, one outside the company more focused on the customer and related to obtaining and sales and concern with the customer, and another internal more directed to the company related to efficiency, error reduction, process optimization, AI's ability to promote detachment and control the use of masks, or be responsible for disinfection and cleaning of spaces. Although there are no significant differences, it was concluded that companies gave greater importance to customers, since with the pandemic, many companies felt serious difficulties in making sales, explaining the greater relevance given to the customer sphere when compared to internal benefits.

Regarding the fourth and last research question, we tried to understand how the companies' perceptions about AI and its benefits impacted their possibility of using it. It was concluded that the two main variables with potential impact on the possibility of AI use by companies are the companies' vision on these matters and the benefits of its use. It is concluded that the benefits positively impact the possibility of companies started using AI, in the same way, that they have a positive effect on the vision of companies regarding these topics. Interestingly enough, however, the companies' vision regarding AI was the variable with the most weight and significance on the possibility of use.

The present research allows us to conclude that the emergence of the COVID-19 pandemic has demanded new dynamics and strategies, which have to be adopted by the business fabric to overcome the current difficulties. Thus, the research intends to contribute to the development of management with the discussion of new AI approaches and implementation of intelligent systems, exploring the main ideas and applications, as well as the impacts that these can bring to companies.

Since the COVID-19 pandemic is a very recent topic and, to date, few studies have been conducted, and this being a pioneering study that aims to investigate the gap between the management of companies in the middle of the pandemic, with the implementation of intelligent systems and innovative AI approaches, this work represents a contribution to the scientific literature. More specifically, the research sought to understand what changes have

occurred in the sphere of consumers and companies in the face of AI, as well as the factors that lead companies to use AI and adopt intelligent systems in the context of the COVID-19 pandemic. However, the continuous development of studies and knowledge in this field is important, due to the rapid changes in the current reality, arising from the rapid evolution of the pandemic together with science, in an attempt to mitigate COVID-19.

As for the research limitations, it should be taken into account that the conclusions of the study should be read with due attention, given the sample size is considered small and reflects the context of the Portuguese reality, this being the main limitation of the study, given the impossibility of making generalizations.

Another limitation is that the coefficient of determination R^2 of the model developed corresponds to 20%, which means that the possibility of using AI by companies is only 20% explained by the benefits of AI and by the vision that companies have on this topic. However, assuming the exploratory and pioneering nature of the study, this factor is not a problem, being indicative of new avenues for future research, to identify new factors with potential impact on the evaluation of the possibility of AI use by companies, in the context of the COVID-19 pandemic. That said, these are the limitations that must be assumed, although they do not affect the importance and conclusions of the study.

Along with the limitation mentioned above, it is suggested that research be conducted to identify new variables and additional factors that can explain and impact the evaluation of companies in the implementation of AI in the context of the COVID-19 pandemic.

It would also be interesting to extend the study to other geographic regions, namely to other countries, to analyse and understand whether the attitude and behaviour of consumers and companies concerning these issues change depending on the countries and cultures in question.

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