

THE IMPORTANCE OF QUALITY ASSESSMENTS WITHIN THE IMPLEMENTATION OF AI TECHNOLOGIES

Cristina RALEA ^{a}, Octavian-Cosmin DOBRIN ^a, Andrei BURCEA ^a*

^a Bucharest University of Economic Studies, Romania

ABSTRACT

Implementation of AI Technology represents the most recent challenge that companies face, while trying to increase business performance. This study covers various aspects related to AI implementation challenges, together with the importance of performing quality assessments to ensure the reliability, fairness, and effectiveness of AI systems.

KEYWORDS: *assessment, Artificial Intelligence (AI), management, quality, risk, technology.*

DOI: 10.24818/IMC/2023/03.12

1. INTRODUCTION

Over decades, AI progressed from its theoretical roots, through rule-based systems and machine learning, to the deep learning revolution of the 2010s. Today, it grapples with ethical considerations, democratization, and a relentless pursuit of innovation.

These AI Systems are continuously evolving, self-adapting, even so, can be characterized as uncertain due to inherent non-determinism. Companies must understand that the implementation of AI technology is a complex and rigorous process that requires careful planning and consideration.

Until implementing an AI technology the following criteria must be considered: business objectives and strategy, data availability and quality, data privacy and security, infrastructure and technology, skills and talent needed for the implementation, cost and ROI (return of investment), regulatory and compliance considerations, ethical and bias concerns, user acceptance and change management, scalability and flexibility, testing and validation, integration with existing systems, vendor selection, training and education, monitoring and maintenance, risk assessment, pilot projects, feedback and continuous improvement, legal agreements with vendors, partners and stakeholders that outline responsibilities, data usage and liabilities, and documentation and knowledge sharing.

When all the criteria are achieved, the complementary process of an AI implementation is the performance of a quality assessment. Researchers and experts in the field of AI and machine learning have recognized the need for rigorous quality assessments to address the challenges associated with AI deployment.

2. AI TECHNOLOGIES IMPLEMENTED WITHIN SERVICE INDUSTRY

As well as other industries, the service industry has embraced the need of change by enhancing efficiency, improving customer experience, streamlining the operations, through AI technologies implementation.

* Corresponding author. E-mail address: cristina.ralea@man.ase.ro

The most frequent AI technologies implemented within the service industry are Chatbots and Virtual Assistants, AI tools used for predictive analytics, Natural language processing, Speech recognition, Computer Vision, Robotic Process Automation, Blockchain, AI tools used for Fraud Detection and Prevention, Healthcare services, HR and Talent Management, E-commerce and retail services, Travel and Hospitality and Energy and Utilities.

It's difficult to identify which were the first companies that implemented AI Technologies, since the adoption was a gradual process. However, we have noticed the following early adopters and pioneers in implementation of AI Technology which activate within the service industry:

- Amazon – improving product recommendations and inventory management,
- eBay – recommendation algorithms,
- IBM's Watson – customer support through chatbots,
- PayPal – fraud detection and risk management,
- Vanguard Group – algorithmic trading and portfolio management,
- Marriot International – chatbots and personalized guest experiences,
- Philips Healthcare – medical imaging analysis,
- T-Mobile – customer service and network management,
- Allstate – personalized insurance offerings,
- Adobe – marketing and advertising platforms,
- Coursera – course recommendations and learner assessments.

According to Thormundsson (2023b), the cost of investment in AI technology implementation has increased substantially (figure 1).

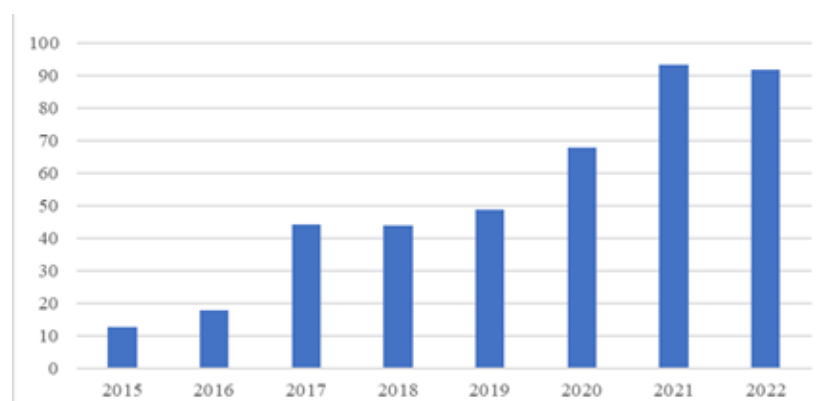


Figure 1. Cost of investment in AI Technology implementation from 2015 to 2022

Source: Thormundsson, (2023b, p.1)

We have noticed that compared to 2015, the cost of investment has increased by 621%, which is one of the main reasons that make us believe that the availability of AI technology has increased during the analyzed period. According to Chui et al. (2023), the reported usage of AI has increased during 2015-2022, as it follows in figure 2.

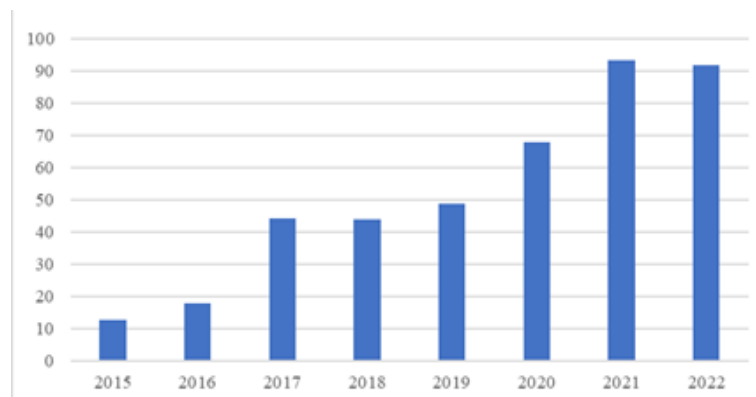


Figure 2. AI reported usage (% of total participants)
 Source: adapted from Chui et al. (2023, p.3)

According to Chui et al. (2023) the top objective for organizations planned generative AI activities are the following: Reducing costs in core business, creating new businesses and/or sources of revenue, increasing revenue from core business and increasing value of offerings by integrating AI based features or insights.

According to Thormundsson (2023a) the market for AI is expected to grow substantially until 2030 due to adoption of AI technologies within vast number of industries. Supply chains, Marketing, product making, research, analysis will be automated through implementation of Artificial Intelligence systems within business structures.

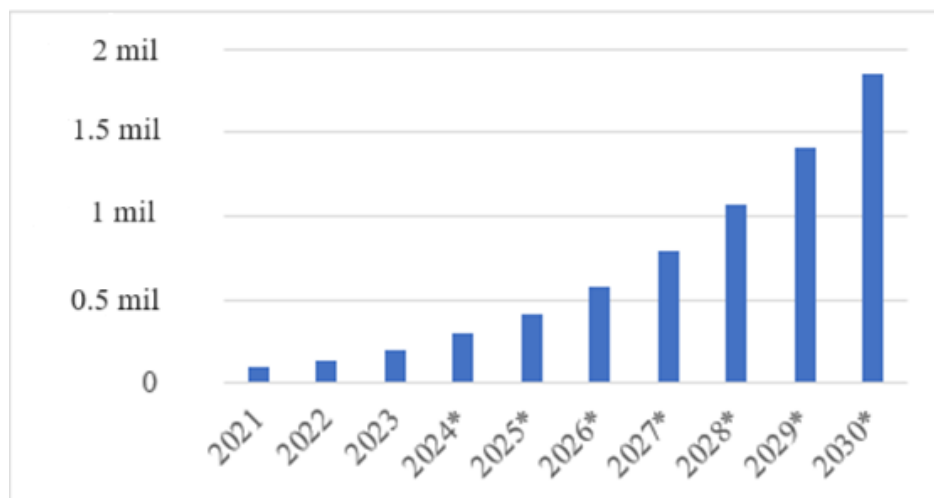


Figure 3. Global Artificial intelligence market size 2021-2030
 Source: adapted from Thormundsson (2023a, p.2)

3. QUALITY ASSESSMENT ON IMPLEMENTATION OF AI TECHNOLOGIES

Quality assessment (QA), according to Juran and Godfrey (1998), represents a systematic process of evaluation of the degree to which a service, product, system, or process is compliant with the predefined standards or criteria. Quality assessment, known also as quality evaluation or quality assurance, involves analysis, measurement and judgement of various characteristics and attributes of the compliance with established standards, customer expectations or specifications. The purposes of a quality assessment process are identifying ideas for improvement and ensuring that the quality of the subject under assessment is enhanced or maintained.

Moreover, the quality assessment process must be an ongoing process to sustain excellence and competitiveness within the market. As technologies constantly evolve, so do the market and customer expectations, thus, the role of an ongoing process of QA is vital. According to Juran and Godfrey (1998), quality represents a dynamic attribute which requires continuous monitoring and improvement. In order for the organizations to adapt to a dynamic environment it is mandatory to regularly assess the quality and to address potential deficiencies.

Quality assessment of AI implementations within the service sector is paramount for ensuring the delivery of efficient and reliable services. As AI technologies continue to play an increasingly integral role in customer support, data analysis, and personalization, it is vital to assess their performance and accuracy. Effective quality assessment helps in identifying and rectifying potential biases, errors, and inconsistencies in AI-driven processes, thereby enhancing customer satisfaction and trust. Additionally, it aids in compliance with regulatory requirements, data privacy, and ethical considerations. An AI implementation that undergoes rigorous quality assessment not only enhances service quality but also paves the way for ongoing improvements, fostering innovation and competitiveness in the service industry, according to Ras et al. (2019).

The quality assessment process has an indispensable role when we discuss AI implementation, since performing a QA is the only way to ensure successful integration of AI into business operations. According to Negnevitsky (2005), quality assessment in AI implementation becomes crucial due to AI systems data complexity, data sensitivity, and its impact on critical business processes.

While implementing an AI technology within a company, the performance of quality assessment becomes crucial for several reasons:

▪ **Reliability**

One of the main needs of a company when implementing AI technology is to ensure reliability of the related systems. AI technologies are often implemented within industries such as healthcare, autonomous vehicles, and finance, which conducts through the need of prevention of error, failures, and potentially harmful consequences.

▪ **Accuracy**

While AI algorithms and models are implemented as natural language processing and image recognition, quality assessment of the implementation becomes crucial for identifying errors that might have significant implications.

▪ **Ethical considerations**

Quality assessment helps identify and mitigate bias caused by the AI implementation to ensure fairness and justness of the related systems, as AI technologies can sometimes perpetuate biases or make unfair decisions.

▪ **Compliance and Regulation**

Quality assessment has a significant role in establishing the compliance of the implementation of AI technologies with applicable legal requirements/standards.

▪ **Cost efficiency**

Through quality assessment of an AI implementation the inefficiencies of the related systems can be identified, together with areas for improvement. The evaluation can provide saving organizations time and resources by optimizing the AI system.

▪ **User experience**

Quality assessment can be concluded through ideas of improvement of the implemented system, which can facilitate the user access and increase user satisfaction.

▪ **Continuous improvement**

AI technology evolves over time in a dynamic way. So does the need for regular quality assessments. Quality assessments enable organizations to monitor performance and make necessary adjustments to keep AI systems up to date and effective.

3.1 Quality Assessment Team

While performing a QA on AI implementation, it is vital to have a team structured on the project needs. Based on the complexity of the AI implementation, the team may comprise members with different skills and expertise. Usually, the team structure is composed by:

- a) Project Manager, which is responsible for establishing the strategy and objectives, coordinating the team, communication with stakeholders, ensuring delivery on term, and ensuring that the assessment stays within the budget.
- b) Data Scientists/Machine Learning Engineers, responsible for assessing the technical aspects of the AI model and its performance, evaluating the model's accuracy, robustness, and efficiency, and identifying and addressing any technical issues or improvements needed.
- c) Domain Experts, responsible for bringing industry-specific knowledge and expertise to the assessment process, understanding the business context and applicable requirements, and assessing if the AI system meets the needs of the organization and industry standards.
- d) Ethics and Bias Experts, which are responsible for focusing on evaluating ethical considerations of the AI system's decision-making, assessing the system for potential fairness issues and biases, and suggesting strategies to ensure ethical behavior and mitigate biases.
- e) User experience researchers, which are focusing on the assessment of the user interface, interactions, and satisfaction, gathering user feedback, and recommendation of improvements to increase user experience.
- f) Quality Assurance testers, which oversee designing and executing stress tests, validate the functionality of the system together with accuracy and reliability, and identify and report potential bugs or errors.
- g) Data Analysts, in charge of analyzing the quality and relevance of training and testing data, examining data for potential errors or biases, collaborating with data scientists to ensure quality of data.
- h) Legal and Compliance experts, which establish compliance with applicable legal requirements, address security and data guidance issues, and provide legal support on compliance topics.
- i) Documentation and Communication Specialist, which documents the entire quality assessment process and communicates the results to relevant stakeholders.
- j) Project coordinator or Administrator, which provides support on logistical tasks and helps by ensuring the assessment process runs efficiently.
- k) Stakeholders and Business owners, which help by establishing the objectives and priorities and make strategic decisions based on the recommendations received.

The structure presented above may also include additional specialists or experts, based on the needs occurred through AI implementation, business characteristics, or business goals.

4. CHALLENGES

While performing a quality assessment process of an AI technology implementation, several factors and situations may occur, that can lead to a negative impact or potential challenges. Companies must be aware of those potential issues, to mitigate them effectively.

We have identified the most common negative scenarios that are likely to happen while performing a quality assessment:

- a) Data Quality Issues, such as inaccurate or biased data which might lead to inaccurate AI models, poor model performance due to low-quality or insufficient data,

- b) Bias and Fairness Concerns, that can lead to, for example, discrimination against groups or individuals,
- c) Privacy and Security Risks, through system vulnerability which might be exploited by malicious factors,
- d) Inadequate Testing, through failure of considering real-world scenarios.
- e) User Experience Problems,
- f) Ethical Dilemmas,
- g) Misalignment with Business Objectives,
- h) Lack of Transparency,
- i) Compliance and Regulatory Issues,
- j) Resistance to Change,
- k) Cost Overruns.

In order to avoid the above mentioned potential negative scenarios, it's crucial to be mitigated through systematic evaluations, by involving different stakeholders, prioritize transparency, address ethical considerations. While performing a quality assessment of an AI system implementation it is necessary to be prepared to make adjustments based on the findings identified. The purpose of the quality assessment must be continuous improvement and risk mitigation.

4.1 Can the quality assessment be made by the AI technology itself?

When we are speaking about an AI technology which will be implemented, it's self-understood that the quality assessment cannot be performed by the AI Technology itself. Even so, there are other AI technologies which can perform a quality assessment, to some extent. AI can have a significant role in the process of quality assessment, but it often works in conjunction with human oversight. Usually, AI Technology is used for the following steps of a quality assessment: Automated Testing, Data Analysis, Performance Monitoring, User Feedback Analysis, Log Analysis, Compliance and Regulations and Automated Auditing.

It is important to highlight the limitations of AI Technology involvement in the process of quality assessment, as human oversight remains essential for the following reasons: Interpretation and Context Understanding, Ethical and Legal Considerations, Complex Issues, Strategic and Decision-Making.

5. SUMMARY AND CONCLUSIONS

This article delves into the critical role that quality assessments play in the deployment of AI solutions across various industries. It highlights how AI technologies are becoming integral components of business operations, from enhancing customer experiences to optimizing processes. The article emphasizes that, to maximize the benefits of AI and mitigate potential risks, rigorous quality assessments are imperative. Through a comprehensive exploration of best practices and case studies, the article underscores the importance of addressing issues such as bias, accuracy, and ethical considerations in AI implementation. It also emphasizes that quality assessments are not merely a one-time effort but an ongoing process that drives innovation and ensures long-term success.

In conclusion, "The Importance of Quality Assessments Within the Implementation of AI Technologies" sheds light on the undeniable significance of quality assessments in the AI landscape. As organizations increasingly harness AI for competitive advantage and customer satisfaction, the need for robust quality assessment processes becomes more apparent than ever. This article reinforces the idea that quality assessments are not obstacles but enablers of AI implementation, as they help

organizations identify and rectify issues, improve system performance, and align AI solutions with their business objectives. By embracing a holistic approach to quality assessment, businesses can harness the full potential of AI technologies while building trust, ensuring compliance, and achieving long-term success in an AI-driven world.

ACKNOWLEDGMENT

This study was conducted through the doctoral advanced research program, Management field.

REFERENCES

- Chui, M., Hall, B., Mayhew, H., Singla, A., & Sukharevsky, A. (2022). *Global Survey on AI, 1,684 participants at all levels of the organization, April 11–21, 2023*, Retrieved October 10, 2023, from <https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-in-2022-and-a-half-decade-in-review>
- Juran, J. M., & Godfrey, A. B. (1998). *Juran's quality handbook. Fifth Edition*, McGraw-Hill
- Negnevitsky, M. (2005), *Artificial Intelligence: A Guide to Intelligent Systems*, Retrieved October 10, 2023, from *Artificial_Intelligence-A_Guide_to_Intelligent_Systems.pdf* (academia.dk)
- Ras, Z. W., Guo, Y., Bos, J., & Zeng, D. (2019). Artificial Intelligence and Data Analytics in the Service Sector. *Service Science*, 11(1), 24-30. doi:10.1287/serv.2018.0209
- SO/IEC: ISO/IEC 25012:2008 *software engineering – software product quality requirements and evaluation (square) – data quality model*. Technical report, ISO (2008)
- Thormundsson, B. (2023a), *Global artificial intelligence market size 2021-2030*, Retrieved October 10, 2023, from [www.statista.com](https://www.statista.com/statistics/1365145/artificial-intelligence-market-size/), <https://www.statista.com/statistics/1365145/artificial-intelligence-market-size/>
- Thormundsson, B., (2023b), *Global total corporate artificial intelligence (AI) investment from 2015 to 2022*, Retrieved October 10, 2023, from [www.statista.com](https://www.statista.com/statistics/941137/ai-investment-and-funding-worldwide), <https://www.statista.com/statistics/941137/ai-investment-and-funding-worldwide>