[1]Alica Sailer

2Jürgen Seitz

AI Value Creation: Operational value creation potential of semantic AI assistants in corporate training

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Abstract: - This paper explores the potential value of semantic artificial intelligence (AI) in corporate training based on a study of semantic AI learning assistants in secondary schools and interviews with human resource professionals. The findings suggest that semantic AI can significantly improve learning outcomes and streamline corporate training processes through personalized, on-demand learning. However, successful implementation requires addressing privacy, security, and user acceptance challenges. While benefits such as efficiency, cost savings, and performance gains are achievable, value creation depends on the organizational context. Further research should explore the long-term impact of semantic AI in corporate learning.

Keywords: AI learning assistant, AI Education, Corporate Training, AI Value Creation

I. INTRODUCTION

Effective training is critical for organizations to build skills, improve performance, and remain competitive. However, traditional training methods face challenges adapting to different individual needs and delivering the proper knowledge when employees need it most. AI can help fill these gaps through data-driven, personalized, and on-demand learning.

Corporate training aims to develop employees' professional and general qualifications to meet current and future requirements (Nicolai, 2021). Due to digitalization, globalization, demographics, and new technologies, corporate training is becoming more self-organized, personalized, on-demand, informal, agile, collaborative, and integrated into work (Becker, 2023; Erpenbeck & Sauter, 2021; Garavan et al., 2019).

AI can analyze learning processes, automate content creation, and enable personalized, adaptable systems (Erpenbeck & Sauter, 2021; Münchhausen et al., 2021; Zawacki-Richter et al., 2019). However, few companies have used AI in training, often citing data privacy, IT infrastructure, costs, and change resistance as barriers (Coordes & Nörthemann, 2020). Research on implementation and effectiveness is limited, lacking pedagogical and ethical perspectives (Renz & Hilbig, 2020; Zawacki-Richter et al., 2019).

Potential AI benefits include efficiency, cost reduction, improved quality, and performance gains, but they depend on context (Enholm et al., 2021; Hildesheim & Michelsen, 2019). AI can facilitate personalized, on-demand learning aligned with work activities (Becker, 2023; Erpenbeck & Sauter, 2021). Semantic AI specifically interprets meaning in language, enabling natural interaction and effective information retrieval (RWS, n.d.). However, successful implementation requires addressing data privacy, security, user acceptance, and integration with corporate strategy and culture (Jäger & Tewes, 2023; Renz et al., 2020).

This paper explores the potential of semantic AI technologies, which focus on understanding meaning in language, to add value to corporate training and workforce development. We first review critical findings from an experiment using semantic AI in secondary schools, which showed significant learning gains. We then present insights from interviews with corporate training experts about the emerging role of AI in the workplace. Finally, we discuss the benefits and challenges of semantic AI in corporate learning and outline areas for further research.

[1]Stuttgart Media University,

[2]Stuttgart Media University

[1]sailer@hdm-stuttgart.de ,[2] seitz@hdm-stuttgart.de

II. THE AIEDN STUDY

The AIEDN research initiative explored the field of semantic artificial intelligence to identify its potential role in improving learning outcomes, specifically through autonomous learning with video content. The results shed light on the potential benefits and limitations of AI-based learning aids. The learning assistant developed for this project was designed to semantically interpret video search queries and match them with relevant sections of mathematics instructional videos created by a prominent German YouTuber.

This research focused on evaluating the effectiveness of a semantic AI learning assistant in supporting student learning. Participants included students from two different educational institutions in Baden-Württemberg, Germany - 137 ninth graders from secondary schools and 138 eleventh graders from grammar schools. The hypothesis was that the AI assistant would increase self-learning efficacy and educational achievement by helping students solve more problems and improve knowledge retention.

A 90-minute mathematics assessment was administered on a topic not previously studied by the students. Participants were divided into two groups: one with access to the AI-enhanced AIEDN prototype and the other with a standard keyword search interface. The test was administered once and then repeated after a week to a week and a half to measure long-term retention, this time without the help of the learning assistant.

The results showed a significant increase in the mean score of those using the AI learning assistant over the test interval, signaling increased task completion efficiency. This improvement was consistent across gender.

In contrast, the control group, which relied solely on keyword searches, showed negligible progress. Initial mathematical ability was a determining factor; students with higher baseline scores experienced significant gains from the AI assistant, while their lower-scoring peers did not. The implication is that the AI learning assistant can promote deeper learning for students who are already performing at a higher level, although its impact varies across different academic strata.

To further analyze the performance gains associated with using the AI learning assistant, a series of t-tests were conducted controlling for demographics such as gender, migration background, and type of educational institution. The gender analysis for high school students showed a significant improvement in learning for both genders when supported by the AI assistant.

Male students showed a moderate effect size, tending towards better results with the AI tool, while female students showed a similar trend. However, in the high school control group, scores were insignificant between the two test dates for either gender.

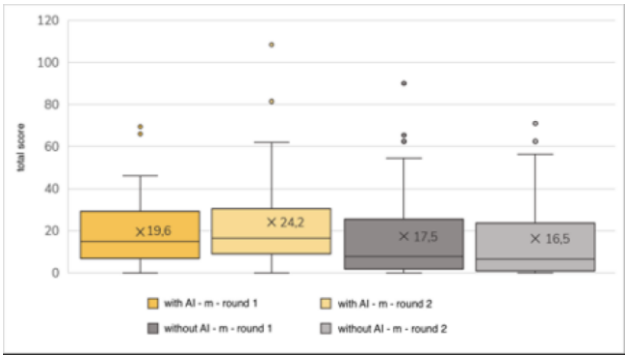

Figure 1Evaluation of male students at grammar schools with and without usage of the AI learning assistant

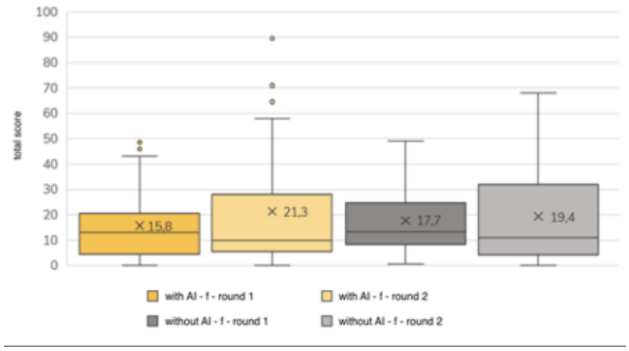

Figure 2 Evaluation of female students at grammar schools with and without usage of the AI learning assistant

At the secondary school level, the mean scores did not indicate a significant improvement for either gender. However, in the control groups of secondary schools that did not use the AI assistant, there was a slight increase in scores for female students and a decrease for male students. However, this change was not statistically significant for male students, as confirmed by a t-test. In contrast, female students improved their scores significantly, achieving a moderate effect size on overall learning performance.

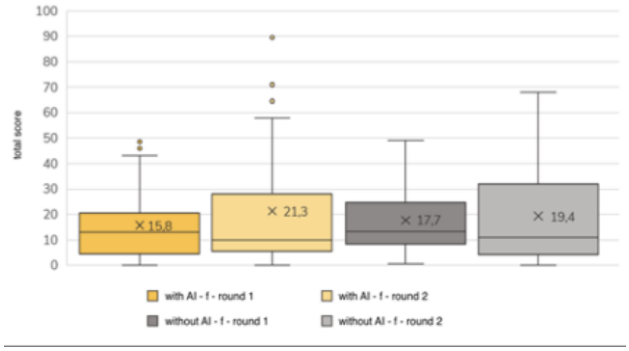

Figure 3 Evaluation of male students at secondary schools with and without usage of the AI learning assistant

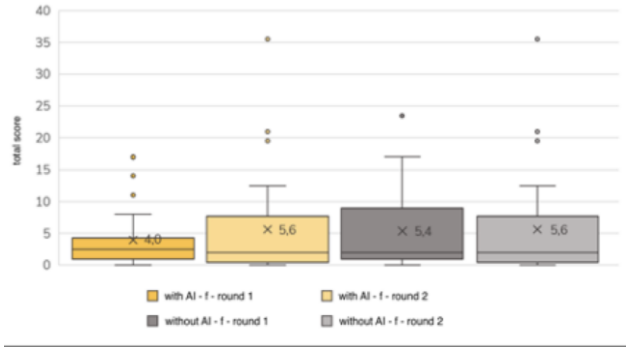

Figure 4 Evaluation of female students at secondary schools with and without usage of the AI learning assistant

In summary, the study found that using the AI assistant improved overall scores for both male and female participants, regardless of the type of school they attended. This suggests a comparable, modest impact of the AI tool across genders. In contrast, the control groups showed a gender difference in the overall scores recorded over the two days of the study. Specifically, male students performed less on average, while female students significantly improved their learning outcomes.

III. CORPORATE TRAINING STUDY

Building on these positive learning outcomes from the AIEDN research, we initiated a follow-up study for corporate training. The study presented in this paper was a qualitative research effort focused on uncovering the potential value of Semantic Artificial Intelligence in corporate training. A total of 12 semi-structured interviews

were conducted to gather insights from a diverse group of professionals. Participants included seven individuals working in HR and training roles within various organizations and five external experts, including consultants and tool providers. These interviewees brought a wealth of experience in training and development from a wide range of industries and organizational sizes.

The methodological approach of the study was carefully designed to meet its objectives. Semi-structured interviews were the chosen format, allowing for open and flexible discussions while ensuring that all critical issues were systematically covered. The questions asked during these interviews were structured within an interview guide that began with broader questions before narrowing down to the specific research questions.

A concrete example used in this study to illustrate the technology in question was the AIEDN semantic AI learning assistant. This example helped participants better understand and discuss the application of semantic AI in a corporate training context.

The collected interview data was transcribed and subjected to qualitative content analysis methods. This process involved the development of a codebook that facilitated categorizing statements into main categories and subcategories based on emerging themes.

The primary aim of the analysis was to identify patterns and extract insights into the potential applications and benefits of semantic AI in corporate training environments. Quotes from the interviews were used to provide evidential support for the study's conclusions and support the findings presented in the results section.

This research sought diverse practitioner perspectives on how artificial intelligence, specifically semantic AI, can add value to workplace training and development activities. This qualitative, exploratory, and inductive approach was considered particularly appropriate for a field that is still emerging and evolving.

IV. STUDY RESULTS

Based on these findings, semantic AI appears poised to transform corporate training, offering personalized and streamlined learning. However, realizing the total value depends on successfully overcoming key challenges. This section analyses the potential benefits of semantic AI and the requirements for its practical application in the workplace.

Time and cost savings

The interviews found AI can generate learning materials and summaries faster than humans. One expert explained AI can create more advanced content like puzzles or general materials in less time. This accelerates the learning process for content creators and learners. Experts expect AI to take over repetitive creation tasks, saving creators' time. Learners also save time searching for materials as AI recommends personalized content. Interviews revealed cost savings potentials through automating repetitive processes. Savings on travel and lodging costs were also noted when AI systems replaced in-person events.

Another efficiency benefit was avoiding mistakes that incur costs, like incorrect orders. One expert explained that AI assistants can provide information on rare processes, avoiding asking colleagues for help, thus saving human resources. Semantic AI can automate specific tasks to make the development and delivery of training more efficient. Experts have suggested that AI could speed up learning content creation and reduce costs. However, the perception of time savings may vary depending on the user's role.

Improve learning effectiveness

Multiple experts cited increased personalization as a critical potential. One explained AI adapts content and learning paths to individual needs and preferences. Several experts said personalized learning is more targeted, motivating, and relevant. One expert noted AI identifies and addresses learners' weaknesses. Overall, adequately designed AI optimizes competence gains through customized learning. Semantic AI can improve knowledge transfer and increase training effectiveness by enabling customized, on-demand learning. AI-powered personalization allows employees to learn at their own pace and in their preferred style and apply new skills directly to their work. However, organizations must have quality data and algorithms to deliver training tailored

to learners' needs.

Improved job performance

Interviewees indicated that learning effectiveness improvements translate into better job performance. One expert said AI provides access to needed information when solving real problems, boosting efficiency. Another explained AI helps keep skills updated through microlearning, enabling employees to perform at a higher level. Enhanced workplace learning was said to build competencies that strengthen productivity. Employees continuously strengthening their skills through AI-assisted learning can improve job performance. This, in turn, helps organizations innovate, improve quality, and increase competitiveness. Measuring the long-term performance gains from AI-driven knowledge will be valuable as adoption increases.

Natural interaction and enhanced understanding

Experts commented that semantic AI allows more natural communication as meaning is understood. One expert gave the example of conversational questioning with a chatbot providing a natural interface to learning. Another expert stated semantic AI facilitates flexible query phrasing. The interviews highlighted how semantic AI interprets meaning to improve information findability. One expert explained that learners can find content even when searching with terminology different from that of content creators. Another expert said that semantically understanding company information makes valuable knowledge more accessible. A key advantage of semantic AI is its ability to understand natural language, enabling more intuitive human-computer interaction. Semantic AI can retrieve more tailored information to the user's needs by interpreting meaning rather than just keywords. This can significantly improve the efficiency of enterprise search.

Overcoming implementation barriers

To realize these potential benefits, key challenges identified by experts need to be addressed. Ensuring that AI complies with privacy laws and cybersecurity protocols will be critical for enterprise applications. Organizations must also encourage employee adoption of AI through transparent implementation and intuitive user experiences.

AI training tools should easily integrate with existing learning systems. Ongoing input from various stakeholders can shape AI's ethical and responsible use in line with corporate values and culture. Change management techniques can increase user motivation to learn from AI technologies.

V. CONCLUSION

This study explores the potential of semantic artificial intelligence to add value in corporate training contexts. Drawing on insights from 12 qualitative interviews with HRD professionals and independent training consultants, the research explores the impact of AI on adult learning.

The findings suggest that AI can significantly improve the quality of educational resources, promote a more tailored learning experience, and streamline the educational process. Semantic AI offers opportunities for tailored, self-directed learning on demand. The synergistic integration of technological solutions with human oversight is emerging as a promising strategy, highlighting the growing importance of AI in corporate training. However, successfully implementing AI-based learning tools must overcome privacy concerns, IT security, and acceptance of AI technologies.

Semantic AI facilitates naturalistic interactions and a deeper understanding of concepts at a semantic level, increasing user engagement and streamlining information retrieval. These findings underscore the benefits of semantic AI in corporate training, including time efficiency, increased effectiveness, cost reduction, skill enhancement, and improved job performance. These benefits are critical to addressing today's business challenges and strengthening competitive advantage in an evolving marketplace, although the specific benefits will vary depending on the context.

Integrating semantic AI into corporate training offers significant opportunities to add value by refining learning methodologies. The optimal blend of AI, practical instructional design, and human input can make corporate training more effective, personalized, and accessible. However, careful implementation, considering user

acceptance, ethical considerations, and security, remains crucial. Future research should focus on specific applications and empirically evaluate the value-creation mechanisms. Semantic AI represents an innovative approach to augmenting training and enhancing strategic capabilities within organizations.

VI. AREAS OF FURTHER RESEARCH

The paper argues that the emerging field of artificial intelligence (AI) in corporate education requires extensive investigation. It highlights the lack of research on the application of AI in this domain and outlines several potential avenues for scholarly inquiry:

The scope of current research, which is primarily qualitative and limited to a small cohort, calls for expansion through large-scale quantitative studies to universalize better findings regarding the benefits of AI in corporate learning environments. A comparative analysis evaluating the experiences of learners and organizations using AI-enabled tools, with and without semantic capabilities, is essential to identify the distinctive contributions of semantic AI.

Research into the practical use of AI in business, including the challenges encountered, effective strategies adopted, and the quantifiable impact of using AI tools, is essential. Another critical research dimension is understanding the determinants influencing employees' willingness to adopt AI-based learning technologies.

In instructional design, there is a need to integrate pedagogical theories into the architecture of AI systems to improve learning outcomes. The ethical landscape, encompassing concerns about privacy, security, informed consent, potential biases, and the impact on the workforce, warrants thorough and continuous scrutiny.

A careful economic assessment, weighing the financial costs against AI's educational and operational benefits in learning, could strengthen the commercial case for its adoption. There is a need for advances in theoretical constructs within educational technology to incorporate and reflect the influence of AI.

While the paper provides a basic understanding, it recognizes the need for comprehensive, interdisciplinary research to unlock the full potential and optimize the use of AI in corporate training programs. The range of research opportunities in this innovative application of AI is considerable and deserves the attention of the academic community.

VII. MANAGERIAL IMPLICATIONS

Our research points to a strategic management approach that prioritizes using artificial intelligence (AI) to refine the creation of learning materials, thereby realizing efficiency gains. It advocates using AI's personalization capabilities to increase learner engagement and improve the relevance of the learning experience to individual needs.

The integration of semantic AI is highlighted for its ability to facilitate more natural conversational interactions, providing a more immersive and intuitive learning environment for participants. Our research recommends using AI to provide just-in-time learning support, delivering educational assistance to those in need. When combined with traditional human-led instruction, this immediate support is suggested to be most effective in achieving specific learning goals.

A critical aspect of our research is the evaluation of AI solutions, emphasizing the need to assess these tools beyond the quality of their content by examining their congruence with established instructional design principles. This will ensure that AI learning tools are informative and pedagogically sound.

Recognizing the challenges associated with introducing AI into learning systems, our research outlines the importance of change management activities. These are essential to promote AI acceptance and allay learners' concerns about employment and job security. In addition, it highlights the need to prioritize privacy and security to maintain trust in AI-powered learning tools.

Our research also supports starting AI integration with a limited pilot program. Such a measured start allows organizations to become familiar with the technology and adjust their strategies before expanding the use of AI more broadly. Tracking the impact on crucial training metrics, including learner satisfaction, knowledge

acquisition, and changes in job-related behaviors, will provide critical feedback on the effectiveness of AI in the learning context.

Ensuring that the learning pathways suggested by AI are aligned with the organization's strategic capability development needs is also seen as critical. This alignment ensures that the skills developed through AI-supported learning contribute constructively to the organization's overarching strategic goals.

Our research suggests that a deliberate and structured application of AI in corporate learning environments can significantly enhance learning agility and improve overall performance, provided management implications are carefully considered and implemented.

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