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Employing Artificial Intelligence Applications to Evaluate Faculty Development Programs by Kirkpatrick's Model (Case Study: University of Tabuk)

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ABSTRACT

Objectives: This study aims to explore the level employing artificial intelligence (AI) applications to evaluate faculty's reaction, learning process, behavior change process and the impact of the faculty development programs at University of Tabuk by Kirkpatrick's Model.

Methodology: The researcher used the descriptive method and developed a questionnaire which was distributed to a study sample of (492) faculty members working at University of Tabuk in Saudi Arabia in 2024.

Results: The results showed that the effectiveness of faculty development programs based on Kirkpatrick's Model, with varying outcomes across its evaluation levels. The Impact of the Training Program on the Organization ranks highest (Mean = 2.4501, SD = 0.59333) with a "High Possibility" rating, suggesting strong perceived organizational benefits. Reactions (Mean = 2.3963, SD = 0.59170) and Learning Process (Mean = 2.3670, SD = 0.62103) also fall into the "High Possibility" category, reflecting positive participant feedback and effective knowledge acquisition. However, Behavior Change (Mean = 2.2894, SD = 0.66252) is rated as "Medium Possibility," indicating challenges in translating learning into sustained workplace behavior.

Conclusions: The findings suggest that AI provides a powerful tool for overcoming the limitations of traditional evaluation methods, offering more precise, detailed, and dynamic insights into the effectiveness of professional development initiatives. By addressing the challenges associated with data quality, algorithmic bias, and ethical considerations, University of Tabuk can harness the full potential of AI to enhance their faculty development programs, ultimately contributing to the broader objectives of educational excellence and national development outlined in Vision 2030.

Keywords: Artificial Intelligence Applications, Faculty Development Program, Kirkpatrick's Model.

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Introduction & Purpose:

The professional development of faculty members in higher education institutions is critical for maintaining the quality of education and ensuring that educators are equipped with the necessary skills and knowledge to meet evolving academic and industry standards. In Saudi Arabia, public universities have increasingly focused on faculty development programs to enhance faculty capabilities as part of the broader educational reforms outlined in Vision 2030 (Ministry of Education, 2019). Despite these efforts, a significant challenge remains accurately measuring the training return on investment (ROI) of these faculty development programs. This challenge is particularly pronounced in the context of rapidly changing educational landscapes and the need for data-driven decision-making.

Traditional methods of evaluating professional development, such as self-reported surveys, feedback forms, and performance reviews, often lack the depth and reliability needed to provide a comprehensive assessment of training effectiveness (Guskey, 2002). These methods are typically subjective, relying heavily on the perceptions of the participants, which can be influenced by numerous factors unrelated to the actual efficacy of the training program. Moreover, these approaches frequently fail to capture long-term impacts on teaching practices and student outcomes, limiting the ability of university administrators to make informed decisions about future investments in faculty development (Desimone, 2009).

The University of Tabuk continually assesses the effectiveness of its faculty development programs using a variety of methods. These include pre- and post-training assessments, participant surveys, peer evaluations, and analysis of student performance data. By regularly evaluating these programs, the university ensures that they are meeting their objectives and contributing to the overall mission of fostering excellence in teaching and learning.

The University of Tabuk's commitment to faculty development and the use of innovative technologies is evident in its comprehensive approach to training and support. Through a range of targeted programs and a focus on continuous improvement, the university ensures that its faculty are well-prepared to meet the challenges of modern higher education and to contribute to the advancement of knowledge and learning in their fields.

However, these studies (Suleiman, 2023; Khan and Baig, 2023; Al-Ghamdi and Al-Faifi, 2022; Alenezi, 2021; Alharbi, 2021; and Alqahtani and Rajab, 2020) also highlight several challenges and considerations for future research. Issues such as data privacy, the need for robust AI algorithms, and the importance of human oversight in AI-driven evaluations are critical areas for further exploration. As institutions continue to adopt AI technologies, ongoing research is necessary to ensure that these tools are used ethically and effectively, with a focus on enhancing educational outcomes for both faculty and students.

Hence, the purpose of this study was to understand the level Employing Artificial Intelligence Applications to evaluate faculty development programs at University of Tabuk by Kirkpatrick's Model. To accomplish this purpose, the following four questions have been developed:

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1. To what extent do the artificial intelligence applications evaluate faculty's reaction in faculty development programs?
2. To what extent do the artificial intelligence applications evaluate learning in faculty development programs?
3. To what extent do the artificial intelligence applications evaluate Behavior change process because of the faculty developemnt program?
4. To what extent do the artificial intelligence applications measure the impact of the faculty development program at university level?

Importance of the Study

1. The study directly supports the broader national agenda of Vision 2030 by promoting educational excellence through innovative evaluation mechanisms. The findings contribute to developing faculty capacities, which are essential for advancing the quality of higher education and fostering a knowledge-based society in Saudi Arabia.
2. This study highlights the potential of artificial intelligence (AI) applications to enhance the evaluation of faculty development programs. By applying AI within the framework of Kirkpatrick's Model, the research underscores the role of innovative technologies in providing more precise, comprehensive, and dynamic evaluation processes, thereby contributing to the modernization of educational assessment methods.
3. The study provides valuable insights into how AI can assess critical aspects of faculty development programs, including participants' reactions, learning outcomes, behavioral changes, and organizational impacts. This enables university administrators to identify areas for improvement, ensuring that professional development initiatives align with institutional goals and effectively address faculty needs.
4. By employing Kirkpatrick's Model to evaluate faculty development programs, this study equips decision-makers at the University of Tabuk with data-driven insights. The integration of AI offers actionable findings that can inform the design and implementation of more effective faculty training strategies, enhancing overall program outcomes.
5. This research emphasizes how AI applications can overcome the inherent challenges of traditional evaluation methods, such as subjectivity, limited scalability, and inefficiency. By exploring AI's ability to evaluate faculty reactions, learning, behavioral changes, and organizational impacts, the study paves the way for more reliable and impactful assessment practices in higher education institutions.

Definitions

Artificial Intelligence Applications

Artificial Intelligence (AI) applications in the context of this study refer to computer-based systems and algorithms designed to simulate human intelligence in performing tasks such as data collection, analysis, decision-making, and prediction. These applications leverage machine learning, natural language processing, and other AI

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techniques to provide dynamic, precise, and efficient solutions for evaluating and enhancing processes, including the assessment of faculty development programs (Khan & Baig, 2023).

Faculty Development Program

A Faculty Development Program (FDP) is a structured and systematic initiative designed to enhance the professional skills, knowledge, and competencies of university faculty members. These programs aim to improve teaching practices, research capabilities, leadership skills, and overall contributions to institutional goals, fostering faculty members' continuous professional growth and alignment with evolving educational and organizational standards (Alasmrai, 2023).

Employing Artificial Intelligence Applications to Evaluate Faculty Development Programs

Employing artificial intelligence (AI) applications to evaluate faculty development programs refers to the utilization of AI-based tools and systems, such as machine learning algorithms, natural language processing, and data analytics, to systematically assess the outcomes and impacts of these programs. This process involves measuring participants' reactions, learning achievements, behavioral changes, and organizational benefits, enabling a more precise and efficient evaluation compared to traditional methods. AI-driven evaluations offer actionable insights that support the continuous improvement of professional development initiatives in higher education (Chassignol et al., 2018).

Literature Review

Faculty Development Programs

The quality of education at any institution is heavily dependent on the effectiveness of its faculty members. In order to ensure that faculty members are equipped with the necessary skills and knowledge to excel in their roles, training programs are essential. Faculty development programs provide numerous benefits such as improving teaching strategies, updating knowledge, and enhancing collaboration.

Faculty development programs are essential for several reasons (Blanchard & Thacker 2013). First, they help faculty members remain up-to-date with the latest developments in their fields, particularly in rapidly evolving disciplines such as science, technology, engineering, and mathematics (STEM). Second, they provide opportunities for faculty members to develop new teaching techniques and strategies that can be used to improve student learning outcomes. Third, training programs offer opportunities for faculty members to engage in collaborative learning and peer mentoring, which can lead to improved collaboration, innovation, and retention.

Types of Faculty Development Programs

There are several types of faculty development programs, including workshops, seminars, conferences, and online courses. Workshops are typically short-term training sessions that focus on a specific topic or skill. They are often led by an expert

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in the field and provide participants with hands-on experience. Seminars are similar to workshops but are typically longer and more in-depth. They may be focused on a specific topic or may cover a broad range of subjects.

Conferences are larger events that bring together faculty members from different institutions to share their research and teaching experiences. They provide an opportunity for faculty members to network and learn from their peers. Online courses are becoming increasingly popular, as they provide flexibility and convenience for faculty members who may not be able to attend traditional training programs due to scheduling or geographical constraints.

Benefits of Faculty Development Programs

There are numerous benefits of faculty development programs Kumar & Shah 2020). First, they provide faculty members with the necessary knowledge and skills to remain effective in their roles, which can lead to improved student outcomes. Second, training programs can help faculty members develop new research ideas and collaborations, which can lead to increased funding and recognition for their work. Third, training programs can help improve faculty morale and job satisfaction, as they provide opportunities for professional growth and development.

Challenges of Implementing Faculty Development Programs

Despite the benefits of faculty development programs, there are several challenges associated with their implementation. First, funding can be a major barrier to implementing training programs, particularly for smaller institutions. Second, scheduling can be difficult, as faculty members may have conflicting obligations such as teaching, research, and service. Third, resistance to change can be a challenge, as some faculty members may be hesitant to adopt new teaching strategies or technologies. Finally, training programs can be time-consuming and require significant investment in terms of time and resources.

In summary, faculty development programs are essential for maintaining and improving the quality of education at any institution. There are several types of training programs available, including workshops, seminars, conferences, and online courses. These programs provide numerous benefits such as improving teaching strategies, updating knowledge, and enhancing collaboration. However, there are several challenges associated with their implementation, including funding, scheduling, resistance to change, and time constraints. Despite these challenges, educational institutions should invest in faculty development programs to ensure the continued success of their institutions.

The Impact of Faculty Development Programs

Faculty development programs have become an integral part of the professional development of faculty members in higher education institutions. These programs are designed to provide faculty members with the necessary knowledge and skills to remain effective in their roles and to improve the quality of education at their institutions. The impact of faculty development programs can be seen in several areas,

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including teaching effectiveness, student learning outcomes, faculty collaboration, and institutional success. This essay will explore the impact of faculty development programs in these areas, as well as the challenges and opportunities associated with their implementation.

Impact on Teaching Effectiveness

Faculty development programs have a significant impact on teaching effectiveness. These programs provide faculty members with the necessary tools to develop and implement effective teaching strategies (Alqarni,2023). They also facilitate the educational process and alleviate technological pressures (Al-Abyadh, 2025)). For example, faculty members can learn how to create engaging and interactive classroom activities, assess student learning effectively, and use technology to enhance instruction. In addition, training programs can help faculty members develop skills in communication, leadership, and time management, which are essential for effective teaching.

Research has shown that faculty development programs can lead to improved teaching effectiveness. For example, a study by Eddy and Hogan (2016) found that faculty members who participated in a teaching development program improved their course structure and student learning outcomes. Similarly, a study by Kember et al. (2010) found that faculty members who participated in a training program on relevance in motivating student learning were more likely to create a relevant learning environment for their students.

Impact on Student Learning Outcomes

The impact of faculty development programs on student learning outcomes is also significant. By improving teaching effectiveness, faculty development programs can lead to improved student learning outcomes (Joo & Lim, 2019). For example, faculty members who are trained in assessment strategies can more effectively measure and evaluate student learning, leading to better feedback and improved student performance. Similarly, faculty members who are trained in effective teaching techniques can create more engaging and effective learning experiences for their students.

Several studies have shown that faculty development programs can lead to improved student learning outcomes. For example, a study by Freeman et al. (2014) found that faculty members who participated in a teaching development program had higher student learning gains compared to faculty members who did not participate in the program. Similarly, a study by Hattie and Marsh (1996) found that faculty members who received training in assessment techniques had a significant impact on student learning outcomes.

Impact on Faculty Collaboration

Faculty development programs can also have a significant impact on faculty collaboration. These programs provide opportunities for faculty members to engage in collaborative learning and peer mentoring, which can lead to improved collaboration,

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innovation, and retention. For example, faculty members who participate in training programs can develop new research ideas and collaborations, leading to increased funding and recognition for their work.

Research has shown that faculty development programs can lead to improved collaboration among faculty members. For example, a study by Mandernach et al. (2016) found that an online faculty development program led to increased collaboration and communication among faculty members. Similarly, a study by Shulman and Hutchings (2016) found that faculty members who participated in a teaching and learning center had increased collaboration with colleagues across departments and disciplines.

Impact on Institutional Success

The impact of faculty development programs on institutional success cannot be overstated. These programs are essential for maintaining and improving the quality of education at any institution. By improving teaching effectiveness, student learning outcomes, and faculty collaboration, faculty development programs can contribute to the overall success of the institution.

Research has shown that faculty development programs can have a significant impact on institutional success. For example, a study by Hodge and Preston (2004) found that an institutional investment in faculty development programs led to increased student satisfaction and retention. Similarly, a study by Wilson et al. (2012) found that faculty development programs led to increased institutional effectiveness, as measured by student learning outcomes, faculty collaboration, and institutional reputation.

Challenges and Opportunities

Despite the numerous benefits of faculty development programs, there are several challenges associated with their implementation. For example, funding can be a major barrier to implementing training programs, particularly for smaller institutions. Scheduling can also be difficult, as faculty members may have conflicting obligations such as teaching, research, and service. Resistance to change can be a challenge, as some faculty members may be hesitant to adopt new teaching strategies or technologies. Finally, training programs can be time-consuming and require significant investment in terms of time and resources.

However, there are also several opportunities associated with faculty development programs. For example, online training programs can provide flexibility and convenience for faculty members who may not be able to attend traditional training programs due to scheduling or geographical constraints. Collaborative training programs can also provide opportunities for faculty members to engage in cross-disciplinary and interdisciplinary work, leading to innovative ideas and research collaborations.

Finally, faculty development programs have a significant impact on teaching effectiveness, student learning outcomes, faculty collaboration, and institutional success. These programs provide numerous benefits such as improving teaching strategies, updating knowledge, and enhancing collaboration. However, there are also

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challenges associated with their implementation, including funding, scheduling, resistance to change, and time constraints. Despite these challenges, educational institutions should invest in faculty development programs to ensure the continued success of their institutions.

Models for Training Evaluation

Training evaluation is a critical component of any organizational training program. The effectiveness of training can be measured in terms of its impact on the performance of trainees, as well as its return on investment (ROI) for the organization. There are several models for training effectiveness that can be used to evaluate the success of a training program. This part explores Kirkpatrick's model, as well as its advantages and disadvantages.

Kirkpatrick's Model

Kirkpatrick's model is one of the most widely used models for evaluating the effectiveness of training programs (Azmy & Setiarini 2023; Huang & Sheng 2019; Kirkpatrick, D. , & Kirkpatrick, J., 2006). The model was developed by Donald Kirkpatrick in the 1950s and has been widely used in the field of training and development. The model consists of four levels of evaluation:

- Level 1: Reaction - This level measures the trainees' reaction to the training program, including their satisfaction with the program and their perception of its usefulness.
- Level 2: Learning - This level measures the extent to which the trainees have learned the material presented in the training program.
- Level 3: Behavior - This level measures the extent to which the trainees have changed their behavior as a result of the training program.
- Level 4: Results - This level measures the impact of the training program on the organization, including improvements in productivity, quality, and ROI.

Advantages of Kirkpatrick's Model

One of the main advantages of Kirkpatrick's model is that it provides a comprehensive framework for evaluating training effectiveness. The model allows trainers to evaluate the impact of the training program at multiple levels, from trainee reaction to organizational results. In addition, the model is easy to use and can be adapted to suit the needs of different organizations and training programs.

Disadvantages of Kirkpatrick's Model

One of the main disadvantages of Kirkpatrick's model is that it can be time-consuming and expensive to implement. Evaluating the effectiveness of a training program at all four levels can require significant resources, including time, money, and personnel. In addition, the model focuses primarily on the outcomes of the training program, rather than the process of training itself.

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ROI vs. ROE

Return on Investment (ROI) and Return on Equity (ROE) are two fundamental financial metrics used to assess the profitability and efficiency of investments and operations within an organization. While both metrics are pivotal in evaluating financial performance, they focus on different aspects of profitability, making them useful for distinct purposes in financial analysis and strategic decision-making.

Return on Investment (ROI) measures the efficiency of an investment by comparing the net profit generated by the investment to the initial cost of the investment. ROI is calculated as:

$$\text{ROI} = \frac{\text{Net Profit}}{\text{Investment Cost}} \times 100$$

This formula provides a percentage that indicates the profitability of the investment. ROI is widely used because it offers a straightforward way to evaluate the effectiveness of different investments, allowing companies to compare the profitability of various projects, departments, or strategic initiatives (Pike & Neale, 2006). For example, in the context of faculty development programs for faculty members, ROI can be used to measure the financial return on the resources invested in training programs by examining improvements in faculty performance and student outcomes that contribute to the institution's overall success.

Return on Equity (ROE), on the other hand, measures the profitability of a company relative to shareholders' equity. ROE is calculated as:

ROE provides insights into how effectively a company is using the capital invested by

$$\text{ROE} = \frac{\text{Net Income}}{\text{Shareholders' Equity}} \times 100$$

its shareholders to generate profits. It is a key indicator of financial performance and efficiency, particularly for investors and stakeholders looking to assess a company's ability to generate returns on their investments (Brigham & Houston, 2021). A high ROE indicates that a company is effectively using its equity base to produce profits, which can signal strong management and a competitive business model.

While both ROI and ROE are measures of profitability, their applications and implications differ. ROI is often used to evaluate specific projects or investments and is more focused on assessing the direct return on an expenditure or investment. It is particularly useful for comparing the effectiveness of various investments, regardless of the source of funding. This makes ROI a versatile metric in decision-making, especially when comparing projects with different risk profiles and capital requirements (Higgins, 2016).

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ROE, in contrast, is more focused on the overall financial performance of a company from the perspective of its equity investors. It provides insights into how well the company is managing its resources to generate profits relative to the equity invested by its shareholders. ROE is particularly valuable for investors as it reflects the return they are getting on their investment in the company, factoring in both operational efficiency and financial leverage (Ross, Westerfield, & Jaffe, 2019).

In the context of educational institutions, such as Saudi public universities, understanding the distinction between ROI and ROE is crucial for effectively allocating resources and assessing the impact of faculty development programs. While ROI might be used to measure the direct financial return from investments in faculty development programs (e.g., improvements in teaching quality and student outcomes), ROE could be applied to evaluate the overall financial health of the institution in terms of its ability to generate returns on its endowment or funding from stakeholders.

Ultimately, both ROI and ROE provide valuable insights into different aspects of an organization's financial performance. Understanding the differences between these metrics and their appropriate applications can help managers, investors, and stakeholders make more informed decisions about where to allocate resources and how to optimize financial performance in alignment with strategic goals.

Recently, Saudi Arabia and other countries around the world participated in the Global Education and Innovation Summit (GEIS 2024) in South Korea. GEIS 2024 was about the artificial intelligence revolution in education towards a more equitable and quality future. At the end of the session, the participants stressed the importance of exploring and harnessing modern technologies to achieve high-quality and equitable education for all, in addition to developing the necessary policies and strategies to support the adoption of artificial intelligence in education, including investing in technological infrastructure and developing the necessary skills. Furthermore, the Saudi Minister of Education emphasized that Saudi Arabia believes that education is the focus of development, and that integrating artificial intelligence into education is an investment in the future of our generations (Ministry of Education, 2024).

Many studies (Boudreau & Ramstad, 2020; Chassignol, et al., 2018) collectively underscore the transformative potential of AI in enhancing the evaluation and effectiveness of faculty development programs. By leveraging AI technologies, educational institutions can move beyond traditional evaluation methods to a more data-driven, personalized, and dynamic approach. The integration of AI enables continuous improvement in teaching practices, supports personalized professional development pathways, and provides actionable insights into training effectiveness.

Recent studies (AlSayiryah, 2025; Bhatt, & Muduli, 2023; Alzayed & Hajj 2016). have extensively explored the transformative role of Artificial Intelligence (AI) in education, emphasizing its potential to enhance personalized learning, adaptive assessment, and institutional efficiency. Raza (2023) highlights the integration of AI in educational frameworks, focusing on individualized learning experiences and AI-driven adaptive assessments, which offer significant advantages over traditional

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methods. Similarly, Alenezi and Faisal (2020) examine the synergy between crowdsourcing and machine learning in e-learning, concluding that their integration improves the accuracy and efficiency of educational practices. Alsufyani and Alnajdi (2023) investigate AI readiness among employees at the Prince Nayef bin Abdul-Aziz Academy, identifying gender, education, and experience as key factors influencing AI adoption, while recommending systematic training and resource allocation to overcome implementation challenges.

Arqawi et al. (2022) demonstrate the application of AI in predicting student retention rates, with deep learning models achieving high accuracy, underscoring AI's potential in addressing educational challenges. Shaik et al. (2022) emphasize the role of Natural Language Processing (NLP) in analyzing student feedback, enabling sentiment analysis and text summarization to improve educational services. Khairi and Alhafidh (2024) review AI-driven technologies, advocating for their use in mitigating learning disparities and fostering inclusive educational environments through adaptive learning systems and intelligent tutoring frameworks.

Katsamakas et al. (2024) propose a systems-oriented approach to AI integration in higher education, using causal loop diagrams to map AI's transformative effects on institutional value creation. Benvenuti et al. (2023) explore AI's role in nurturing creativity, critical thinking, and problem-solving skills, suggesting AI as a valuable tool for educators. Mah et al. (2022) investigate the integration of AI and IoT in business, highlighting their impact on customer engagement and satisfaction in Industry 4.0. Martinez et al. (2023) review AI applications in primary and secondary education, emphasizing its role in automating assessments and enhancing student performance analysis.

Slimi (2023) analyzes AI's impact on higher education, noting its potential to streamline administrative tasks, personalize learning, and address ethical considerations. Maqsood et al. (2024) evaluate the effectiveness of Faculty Development Programs (FDPs) in business schools, using Kirkpatrick's model to demonstrate their role in capacity building and accreditation success. Collectively, these studies underscore AI's transformative potential in education, advocating for its strategic integration to enhance learning outcomes, institutional efficiency, and equitable access to education. However, challenges such as data privacy, algorithmic bias, and resource constraints must be addressed to fully realize AI's benefits in educational contexts.

Artificial Intelligence in Training Programs

Artificial Intelligence (AI) is transforming the way we learn and work. AI can be used in training programs to personalize learning, automate administrative tasks, and provide feedback to learners (AlGhamdi & Alfaifi, 2022, Dinget al., 2024; Duan & Zhao 2024; Mah & Groß 2024). AI can also be used to improve the quality of training programs by analyzing data on learner behavior and performance.

Applications of AI in Training development & Evaluation

AI can be used in various ways to support training programs. Some of the most common applications of AI in training programs are listed below:

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Personalization: AI can be used to personalize learning by analyzing data on learner behavior and performance. AI can then recommend content and activities that are tailored to the individual learner's needs.

Automation: AI can be used to automate administrative tasks, such as scheduling, grading, and feedback. This can save instructors time and improve the efficiency of training programs.

Chatbots: AI-powered chatbots can provide learners with immediate feedback and support. Chatbots can answer questions, provide guidance, and offer personalized recommendations.

Adaptive learning: AI can be used to adapt the learning experience based on the learner's progress and performance. This can ensure that learners are challenged appropriately and are not overwhelmed or bored.

Virtual assistants: AI-powered virtual assistants can provide learners with support and guidance throughout the training program. Virtual assistants can also provide personalized feedback and recommendations.

Benefits of AI in Training Evaluation

- Personalization: AI can personalize learning by analyzing data on learner behavior and performance. This can improve learner engagement and retention by ensuring that learners are challenged appropriately and are not overwhelmed or bored.
- Automation: AI can automate administrative tasks, such as scheduling, grading, and feedback. This can save instructors time and improve the efficiency of training programs.
- Immediate feedback: AI-powered chatbots and virtual assistants can provide learners with immediate feedback and support. This can improve learner confidence and reduce frustration.
- Adaptive learning: AI can adapt the learning experience based on the learner's progress and performance. This can ensure that learners are challenged appropriately and are not overwhelmed or bored.
- Improved outcomes: AI can analyze data on learner behavior and performance to identify areas for improvement in training programs. This can improve the quality of training programs and lead to better learner outcomes.

Challenges of AI in Training Evaluation

AlGhamdi (2022) provided some challenges of AI in training evaluation which are:

- Cost: Implementing AI in training programs can be expensive, and not all organizations may be able to afford it. This can limit access to AI-powered training programs and prevent some learners from benefiting from them.
- Technical expertise: AI requires technical expertise to develop and implement.
- Some organizations may not have the technical expertise needed to implement AI in their training programs.
- Data privacy: AI-powered training programs require access to learner data to personalize learning and provide feedback. This can raise concerns about data privacy and security.

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- Bias: AI algorithms can be biased if they are trained on biased data. This can lead to unfair and unequal treatment of learners.
- Resistance to change: Some learners and instructors may be resistant to the use of AI in training programs. This can make it challenging to implement AI-powered training programs.
- AI has many applications in training programs, including personalization, automation, chatbots, adaptive learning, and virtual assistants. AI can improve the quality of training programs and lead to better learner outcomes. However, there are also challenges associated with implementing AI in training programs, including cost, technical expertise, data privacy, bias, and resistance to change. As AI continues to evolve, the benefits of AI in training programs are likely to become even more significant, and organizations that invest in AI-powered training programs are likely to see improved learner outcomes and increased efficiency.

Applying AI Applications to Evaluate the Impact of Training Programs

Artificial Intelligence (AI) is increasingly being recognized as a transformative tool in the evaluation of training programs. Traditional methods of measuring training impact, such as surveys and performance assessments, often lack the depth and real-time insights necessary for comprehensive evaluation. AI applications, however, offer a dynamic approach to assessing training effectiveness, providing a more detailed and accurate picture of how these programs affect participants and the broader organization.

One of the primary advantages of using AI in training evaluation is its ability to analyze large datasets quickly and accurately. AI algorithms can process vast amounts of data from various sources, such as learning management systems (LMS), performance reviews, and engagement metrics, to identify patterns and correlations that human evaluators might miss(Abu Ayada, 2016). For instance, machine learning models can predict which training modules are most effective based on a range of variables, including participant demographics, engagement levels, and post-training performance (Zhou et al., 2023). This capability allows organizations to tailor training programs more precisely to meet the needs of their employees, thereby maximizing the return on investment (ROI).

Natural Language Processing (NLP), a subset of AI, has also proven valuable in analyzing qualitative data related to training programs. Traditionally, feedback from training participants is gathered through open-ended surveys or interviews, which are then manually coded and analyzed. NLP tools can automate this process, analyzing text data to extract sentiments, identify recurring themes, and gauge the overall effectiveness of training content (Nguyen & Brun, 2022). This automated analysis provides a more nuanced understanding of participant feedback, enabling organizations to make data-driven decisions about which aspects of a training program to improve or expand.

Furthermore, AI applications in training evaluation extend beyond immediate program assessment. Predictive analytics, powered by AI, can forecast the long-term impact of training on employee performance and organizational outcomes. By

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integrating data from multiple sources over time, AI can model potential future scenarios, such as the expected increase in productivity or the likelihood of employee retention following specific training interventions (Sharma et al., 2021). These predictive capabilities enable organizations to anticipate challenges and proactively adjust their training strategies to optimize impact.

Another significant benefit of using AI in training evaluation is the facilitation of personalized learning experiences. AI algorithms can analyze individual learning patterns and performance data to recommend tailored training pathways for each employee. This level of personalization not only enhances learning outcomes but also increases employee engagement and satisfaction by ensuring that the training is relevant and aligned with their career development goals (Cheng et al., 2024).

However, the application of AI in measuring training impact is not without challenges. Concerns around data privacy, algorithmic bias, and the ethical use of AI are critical considerations that organizations must address. AI systems are only as good as the data they are trained on; if the data is biased or unrepresentative, the AI model's output will likely be flawed. It is crucial to implement robust data governance frameworks and continuously monitor AI systems to ensure fairness and accuracy in training evaluations (Cheng et al., 2024).

In conclusion, the application of AI in measuring the impact of training programs offers significant advantages over traditional evaluation methods. By leveraging AI's data processing capabilities, organizations can gain deeper insights into training effectiveness, predict future outcomes, and tailor learning experiences to individual needs. As AI technology continues to evolve, its role in training evaluation is likely to expand, offering even more sophisticated tools for organizations to optimize their training programs and enhance overall employee development.

Overview of the University of Tabuk

The University of Tabuk, located in the northwest region of Saudi Arabia, is a relatively young institution founded in 2006. The university has grown rapidly to become a significant educational hub in the region, offering a wide range of undergraduate and postgraduate programs across various disciplines. Its strategic location near the Red Sea and close to several neighboring countries makes it an important center for education and research.

Mission and Vision

The University of Tabuk’s mission is to provide high-quality education and to contribute to the production of knowledge that serves the development of society. The university is committed to fostering a learning environment that promotes creativity, critical thinking, and innovation among students and faculty. The vision of the University of Tabuk is to be a leading educational institution in the region, recognized for its excellence in teaching, research, and community service. This vision emphasizes the university's aspiration to contribute significantly to the advancement of knowledge and to prepare graduates who are capable of leading and serving in various capacities both locally and globally.

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Faculty Development Initiatives

Recognizing the pivotal role of faculty in achieving its mission and vision, the University of Tabuk places a strong emphasis on faculty development. The university's faculty development initiatives are designed to enhance the professional competencies of its academic staff, ensuring they are well-equipped to provide high-quality education and contribute to the university's research agenda. These initiatives are aligned with the university's strategic goals of fostering a culture of continuous learning and improvement among its faculty members.

The university's commitment to faculty development is evident in its comprehensive programs that cover various aspects of academic life, including pedagogy, research skills, and leadership development. The programs are designed to cater to the diverse needs of the faculty, providing opportunities for both new and experienced staff to enhance their skills and knowledge.

Commitment to Innovative Technologies in Teaching and Learning

The University of Tabuk is committed to leveraging innovative technologies to enhance teaching and learning. This commitment is part of a broader strategy to integrate modern educational technologies into the curriculum, enabling more interactive and personalized learning experiences. The university has invested in a range of technologies, including digital learning platforms, online course delivery systems, and virtual laboratories, to support both faculty and students.

One of the key aspects of the university's technological initiative is the use of Artificial Intelligence (AI) and data analytics to improve educational outcomes. By analyzing student performance data and providing real-time feedback, these technologies help instructors identify areas where students may need additional support and adjust their teaching strategies accordingly. This data-driven approach not only enhances the learning experience for students but also supports faculty in their professional development by providing insights into effective teaching practices.

Faculty development programs at the University of Tabuk

The University of Tabuk has implemented several faculty development programs designed to enhance the teaching and research capabilities of its academic staff. These programs are tailored to meet the specific needs of the faculty and are aligned with the university's mission of promoting excellence in education and research.

Objectives of Faculty development Programs in University of Tabuk

The primary objectives of the faculty development programs at the University of Tabuk are to:

1. **Enhance Teaching Skills**: Improve pedagogical techniques and strategies to foster effective learning environments.
2. **Promote Research Excellence**: Equip faculty with the skills needed to conduct high-quality research and to publish in reputable journals.
3. **Develop Leadership and Management Skills**: Prepare faculty for leadership roles within the university and the broader academic community.

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4. **Foster Innovation in Teaching and Learning**: Encourage the use of innovative technologies and teaching methods to enhance the learning experience for students.

Faculty Development Programs and Evaluation Methods

The University of Tabuk offers a range of faculty development programs, each tailored to address specific areas of professional development:

1. Teaching Excellence Workshops: These workshops are designed to help faculty develop advanced teaching skills, including effective classroom management, the use of technology in teaching, and student engagement strategies. The workshops often include practical sessions where faculty can practice and refine their skills in a supportive environment. The effectiveness of these workshops is typically evaluated using participant feedback surveys, classroom observations, and self-assessment tools.
2. Research Development Seminars: These seminars focus on enhancing faculty research capabilities, covering topics such as research design, methodology, data analysis, and academic writing. Faculty are encouraged to participate in research projects and collaborate with colleagues from other institutions. The evaluation of these seminars includes assessing the quality and quantity of research outputs, such as publications in peer-reviewed journals and conference presentations, as well as feedback from participants.
3. Leadership and Management Training: Aimed at preparing faculty for administrative and leadership roles, these programs cover topics such as strategic planning, decision-making, and team management. The training often involves case studies, role-playing exercises, and mentorship from senior university leaders. Evaluation methods include performance appraisals, feedback from peers and mentors, and the success of faculty in applying these skills in leadership roles.
4. Technology Integration Programs: These programs are focused on helping faculty integrate modern educational technologies into their teaching practices. Training sessions cover the use of learning management systems, digital content creation, and the use of AI tools for personalized learning. The effectiveness of these programs is measured through faculty adoption rates of new technologies, student feedback on the use of technology in the classroom, and the impact on student learning outcomes.

Methodology

The research used the descriptive research to identify to what extent Artificial Intelligence (AI) applications measure the effectiveness of faculty development programs. In addition, a quantitative approach used to collect data from the faculty member at University of Tabuk.

Original Community and Study Sample

The developed questionnaire was distributed to all 1997 faculty members at university of Tabuk (University of Tabuk, 2025). A total of 492 were collected. The data analysis was conducted using descriptive statistics. The next stage is the results of a descriptive analysis at each level of employing AI application in four levels of the Kirkpatrick model.

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Study Questionnaire

A questionnaire was designed to measure the point of view of a sample of university students. The questionnaire content has been determined as in Table 1 below.

Table 1. Describing the content of the study tool (the questionnaire)

No.	Field of the Questionnaire	Description	No of Items
1	Faculty's Reactions	measuring employing AI applications for the trainees' reaction to the training program, including their satisfaction with the program and their perception of its usefulness.	8
2	Faculty's learning process	measuring employing AI applications for the extent to which the trainees have learned the material presented in the training program.	11
3	Faculty's behavior change	Measuring employing AI applications for the extent to which the trainees have changed their behavior as a result of the training program	11
4	The impact of the training program on the organization	Measuring employing AI applications for the impact of the training program on the organization, including improvements in productivity, quality, and ROI.	11
Total			41

Table 1 shows that the questionnaire consisted of 4 parts. The first section had eight items measuring employing AI applications for faculty's Reactions to faculty development Program. The second section involved 11 items measuring employing AI applications for faculty's learning process, the third section included 11 items measuring employing AI applications for faculty's behavior change, and the final section built in 11 items measuring employing AI applications for the impact of the training program on the organization.

Data were collected from a Google Form questionnaire developed by Azmy & Setiarini (2023) which is based on the four levels of the Kirkpatrick's model and included 41 items. Also, this questionnaire consisted of a 3-point Likert scale in which 1=Low Possibility of AI's Employment , 2= Medium Possibility of AI's Employment, and 3=High Possibility of AI's Employment.

The questionnaire used a scale of 1 (low possibility), 2 (medium possibility), 3 and (high possibility). IBM’s Statistical Package for the Social Sciences (SPSS) was used to analyze the data. The analysis is organized according to the four levels of the Kirkpatrick model to effectively measure the effectiveness of faculty development programs provided to faculty at University of Tabuk.

Measuring Questionnaire Validity

For the validity test, the r-statistic value must exceed the r-table value, and for the reliability test, the Cronbach's Alpha value must be greater than 0.7. These criteria determine the suitability of the research data.

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At this stage, the questionnaire has been distributed to 23 trainees. The process begins with a validity and reliability test. Validity test using indicators by looking at r-statistical values must be greater than (0.361). Test reliability using indicators by looking at Cronbach Alpha values greater than 0.7. Below are the results of the questionnaire validity test as follows:

Table 2. Pearson's Correlation Coefficients for Measuring The Validity Of The Questionnaire's Internal Consistency.

Item No.	Correlation coefficient	Item No.	Correlation coefficient	Item No.	Correlation coefficient	Number of Item	Correlation coefficient
V 1.1	0.853**	V 2.1	0.873**	V 3.1	0.873**	V 4.1	0.865**
V 1.2	0.850**	V 2.2	0.848**	V 3.2	0.859**	V 4.2	0.889*
V 1.3	0.878**	V 2.3	0.854**	V 3.3	0.884**	V 4.3	0.923**
V 1.4	0.882**	V 2.4	0.907**	V 3.4	0.877**	V 4.4	0.930**
V 1.5	0.897**	V 2.5	0.859**	V 3.5	0.909**	V 4.5	0.910**
V 1.6	0.879**	V 2.6	0.880**	V 3.6	0.925**	V 4.6	0.878**
V 1.7	0.875**	V 2.7	0.877**	V 3.7	0.897**	V 4.7	0.906**
V 1.8	0.860**	V 2.8	0.854**	V 3.8	0.892**	V 4.8	0.904**
		V 2.9	0.851**	V 3.9	0.900**	V 4.9	0.878**
		V 2.10	0.876**	V 3.10	0.915**	V 4.10	0.914**
		V 2.11	0.855**	V 3.11	0.898**	V 4.11	0.867**

Table (2) shows that the meaning of Pearson's r values are positive and high correlations; hence, the validity of the questionnaire's internal consistency is acceptable for the questionnaire items.

Measuring Questionnaire Reliability

The questionnaire reliability was measured using Cronbach's alpha for the fields and for the questionnaire as a whole. Below are the reliability test results as follows:

Table 3. Reliability Test

Variables Employing AI in measuring	Alpha Cronbach	Reliability Standards	Category
Faculty Reactions items	0.955	0.70	Reliable
Faculty's learning process	0.967	0.70	Reliable
Faculty behavior change	0.974	0.70	Reliable
Impact of Faculty development programs on UT level.	0.975	0.70	Reliable
Total Items	0.986	0.70	Reliable

Table (3) indicates that all research variables meet the reliability aspects. This can be seen from the value of Cronbach-Alpha greater than 0.7. All research values meet reliability standards; therefore, it can be concluded that the research record can be used as a foundation for information and meet the standards of validity & reliability.

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Results & Discussions

Employing Artificial Intelligence to Evaluate Faculty Development Programs by Kirkpatrick's Model

The data was collected using open-ended questions. Essentially, the respondents' answers showed that employing artificial intelligence applications evaluate faculty development programs in four levels based on Kirkpatrick's Model: 1) Faculty's Reactions, 2) Faculty Learning Process, 3) Faculty's Behavior and 4) The Impact of The Training Program on The Organization showen in table 4

Table 4

Means, standard deviations, and rating levels of the field of The Effectiveness of Faculty Development Programs based on Kirkpatrick's Model

Rank	Sector	Mean	SD	Category
1	The Impact Of The Training Program On The Organization	2،4501	،59333	High Possibility
2	Reactions	2،3963	،59170	High Possibility
3	Learning Process	2،3670	،62103	High Possibility
4	Behavior Change	2،2894	،66252	Medium Possibility

The results in Table 4 demonstrate variations in the perceived effectiveness of faculty development programs across Kirkpatrick's four levels of evaluation. The highest mean score is attributed to The Impact of the Training Program on the Organization (Mean = 2.4501, SD = 0.59333), indicating a "High Possibility" of positive organizational outcomes resulting from the training. This suggests that participants and stakeholders view the training as significantly contributing to organizational improvements, such as enhanced productivity, better performance, or meeting strategic goals. The emphasis on measurable outcomes at the organizational level may reflect the program's alignment with institutional priorities and its ability to demonstrate tangible benefits.

Conversely**,** Behavior Change received the lowest mean score (Mean = 2.2894, SD = 0.66252), categorized as a "Medium Possibility." This disparity could stem from the challenges in translating acquired knowledge and skills into consistent behavioral changes in professional settings. Behavior change is often influenced by various factors, such as individual motivation, workplace culture, and the availability of resources to support implementation. The relatively lower score might indicate that faculty members face barriers in applying learned competencies, thereby limiting the long-term impact of the training at this level.

Findings Related to Research Question #1:Faculty's Reactions

To determine what extent do employing artificial intelligence applications measure faculty's reaction through faculty development programs, the mean of faculty's reaction items were calculated and ranked from highest to lowest. Table illustrates the means of the eight faculty's reactions presented in table 5.

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Table 5

Means, standard deviations, and rating levels of the field of Employing Artificial Intelligence to evaluate Faculty's Reactions

Rank	Item	Mean	SD	Category
1	2. Employing artificial intelligence applications in faculty's evaluation of the training content in faculty development programs at the university	2،46	،685	High Possibility
2	1. Employing artificial intelligence applications to evaluate faculty's reactions in all conducted faculty development programs at the university.	2،45	،628	High Possibility
3	3. Employing artificial intelligence applications in faculty's evaluation of the training methods used in faculty development programs at the university	2،41	،662	High Possibility
4	6. Employing artificial intelligence applications to adapt training methods to the subject of training in faculty development programs at the university	2،39	،677	High Possibility
5	8. Employing artificial intelligence applications in evaluating the training package and its accessories in faculty development programs at the university	2،39	،677	High Possibility
6	5. Employing artificial intelligence applications to evaluate trainees on the success of organizing the training process in faculty development programs at the university	2،38	،710	High Possibility
7	4. Employing artificial intelligence applications in evaluating trainees to measure the ability of trainers to implement training in faculty development programs at the university	2،35	،688	High Possibility
8	7. Employing artificial intelligence applications to evaluate the suitability of the training environment to the nature of training in faculty development programs at the university	2،33	،700	High Possibility
Total		2،3963	،59170	High Possibility

Table 5 presents the means, standard deviations, and rating levels for various items related to employing artificial intelligence (AI) to evaluate faculty's reactions to faculty development programs. All items fall under the "High Possibility" category, with mean scores ranging from 2.33 to 2.46. The highest-ranked item, "Employing AI applications in faculty's evaluation of the training content," has a mean of 2.46, followed closely by "Evaluating faculty's reactions in all conducted faculty development programs," which has a mean of 2.45. Other items, including those evaluating training methods, training packages, and the success of organizing the training process, also show relatively high mean scores, mostly around 2.39 to 2.41, suggesting a high potential for AI use in these evaluation areas.

The lowest-ranked item, "Employing AI applications to evaluate the suitability of the training environment," has the lowest mean score of 2.33 but is still categorized under "High Possibility." One reason the item with the highest mean, evaluating training content, might rank higher is that faculty members may find it easier to assess and benefit from AI applications in content evaluation, which directly impacts the

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effectiveness of the training. In contrast, the evaluation of the training environment may be perceived as more subjective or challenging to assess, potentially leading to its slightly lower mean despite still being seen as a high-possibility application. For instance, a study by Zhao et al. (2023) utilized natural language processing (NLP) to analyze open-ended feedback from faculty members regarding new institutional policies. The AI system was able to identify prevalent themes, sentiment trends, and areas of concern more efficiently than traditional manual analysis methods. This approach not only enhances the accuracy and speed of evaluations but also allows educational institutions to respond more proactively to faculty needs, thereby fostering a more supportive and dynamic academic environment (Zhao et al., 2023).

Moreover, AI-driven tools can track and assess behavioral patterns among faculty members, such as participation in professional development activities, engagement in committee work, and responsiveness to administrative initiatives. By integrating AI with existing faculty evaluation frameworks, institutions can gain a more holistic view of faculty reactions over time. A study by Liu & Jiang (2018) highlighted the use of machine learning algorithms to predict faculty retention rates based on their engagement data, which included both explicit feedback and implicit behavior indicators. The findings suggested that AI could effectively identify early warning signs of faculty dissatisfaction or burnout, enabling targeted interventions to enhance faculty well-being and productivity (Liu & Jiang, 2018). Thus, employing AI in evaluating faculty reactions presents a significant opportunity to enhance faculty development programs and align them more closely with institutional goals.

Findings Related to Research Question #2: Faculty Learning Process

To determine what extent do the artificial intelligence applications evaluate faculty learning process in faculty development programs, the mean of faculty learning process items were calculated and ranked from highest to lowest. Table illustrates the means of the eight items for faculty learning process.

Table 6

Means, standard deviations, and rating levels of the field of Employing Artificial Intelligence to Evaluate Faculty Learning Process

Rank	Item	Mean	SD	Category
1	3. Employing artificial intelligence applications in constructing pre-tests that measure the level of the trainee before starting the faculty development programs.	2،40	،714	High Possibility
2	9. Employing artificial intelligence applications in analyzing the results of post-tests that measure the level of the trainee after completing the faculty development programs	2،40	،714	High Possibility
3	7. Employing artificial intelligence applications to compare the results of formative tests that measure the trainee's level of mastery during the professional development program to move to the next programs.	2،39	،695	High Possibility
4	4. Employing artificial intelligence applications to analyze the results of pre-tests that measure the	2،39	،729	High Possibility

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Table 6

Means, standard deviations, and rating levels of the field of Employing Artificial Intelligence to Evaluate Faculty Learning Process

	trainee's level before starting the faculty development programs.			
5	6. Employing artificial intelligence applications in analyzing the results of formative tests that measure the level of the trainee while attending the faculty development programs.	2،39	،695	High Possibility
6	8. Employing artificial intelligence applications in constructing post-tests that measure the level of the trainee after completing the faculty development programs	2،37	،708	High Possibility
7	1. Employing artificial intelligence applications in determining training outcomes for the faculty development programs.	2،37	،691	High Possibility
8	5. Employing artificial intelligence applications in constructing formative tests that measure the level of the trainee while attending the faculty development programs.	2،35	،723	High Possibility
9	10. Utilizing artificial intelligence applications in using training simulation models for the reality of work in the faculty development programs	2،35	،723	High Possibility
10	2. Employing artificial intelligence applications to link training activities with the training outcomes of the faculty development programs.	2،33	،734	High Possibility
11	11. Employing artificial intelligence applications to suggest improvement plans/recommendations based on the results of analysis of tests that measure faculty's levels of the faculty development programs	2،29	،758	Medium Possibility
Total		**2،3670**	**،62103**	**High Possibility**

Table 6 presents the means, standard deviations, and rating levels for various items related to employing artificial intelligence (AI) to evaluate the faculty learning process during development programs. All items, except one, are categorized as "High Possibility," with mean scores ranging from 2.29 to 2.40. The top-ranked items, "Employing AI applications in constructing pre-tests that measure the level of the trainee before starting the faculty development programs" and "Analyzing the results of post-tests," both have a mean of 2.40. Other items, such as those involving formative tests and training outcome analysis, also have means around 2.35 to 2.39, reflecting a high possibility of AI applications in these areas. The last item, "Suggesting improvement plans based on test results," has a lower mean of 2.29 and is categorized as "Medium Possibility."

One reason why the items related to pre-tests and post-tests have the highest mean could be that faculty members recognize the immediate value in assessing trainee levels before and after development programs. These assessments can provide clear insights into the effectiveness of the program. In contrast, the item with the lowest

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mean, "Employing AI applications to suggest improvement plans based on test results," might be perceived as less directly actionable or harder to implement effectively, which could explain its lower mean score despite still being categorized as "Medium Possibility."

AI technologies such as machine learning and natural language processing (NLP) can analyze large volumes of data generated from various faculty learning activities, such as online courses, workshops, and collaborative research projects. For example, a study by Nguyen et al. (2023) utilized AI algorithms to analyze video recordings of faculty teaching sessions, identifying key learning behaviors and patterns that were linked to effective teaching practices. By processing these data, the AI system could provide personalized feedback and suggestions for improvement, tailored to the specific learning needs and preferences of individual faculty members. This approach not only saves time compared to traditional methods of evaluating faculty learning but also allows for a more nuanced understanding of how faculty members engage with learning opportunities and apply new knowledge in their teaching practices (Nguyen et al., 2023). However, AI can facilitate continuous monitoring and support of faculty learning processes by integrating data from multiple sources, including learning management systems (LMS), peer reviews, and student evaluations.

A recent study by Kim and Park (2022) demonstrated the use of AI-driven dashboards to track faculty progress in professional development courses, offering real-time analytics and alerts to faculty and administrators. These AI systems can identify gaps in knowledge or skills and recommend targeted resources, such as readings, videos, or peer mentoring opportunities, thereby creating a more dynamic and responsive learning environment for faculty. The study found that faculty who received AI-generated recommendations showed greater improvement in their teaching practices and were more engaged in ongoing professional development activities compared to those who did not use such tools (Kim & Park, 2022). Thus, AI has the potential to revolutionize how faculty learning is evaluated, offering more personalized, efficient, and effective support for faculty development.

Findings Related to Research Question #3: Faculty's Behavior Change

To determine what extent do the artificial intelligence applications measure faculty's reaction in faculty development programs, the mean of Faculty's Behavior Change items were calculated and ranked from highest to lowest. Table illustrates the means of the eight Faculty's Behavior Change.

Table 7

Means, standard deviations, and rating levels of the field of Employing Artificial Intelligence to evaluate Faculty's Behavior Change

Rank	Item	Mean	SD	Category
1	11. Employing artificial intelligence applications to suggest improvement plans based on the results of analysis of evaluations that measure the impact of the faculty development program on faculty's behaviors.	2،33	،751	High Possibility
2	7. Employing artificial intelligence applications in peer	2،32	،731	Medium

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Table 7

Means, standard deviations, and rating levels of the field of Employing Artificial Intelligence to evaluate Faculty's Behavior Change

	evaluation (in the same department as trainees) to evaluate the impact of the faculty development program on faculty's behaviors			Possibility
3	10. Employing artificial intelligence applications in analyzing the results of the evaluation of external evaluators to evaluate the impact of the faculty development program on faculty's behaviors.	2،30	،761	Medium Possibility
4	4. Employing artificial intelligence applications in analyzing the results of faculty's self-evaluation to evaluate the impact of the faculty development program on faculty's behaviors	2،30	،777	Medium Possibility
5	5. Employing artificial intelligence applications in evaluating the heads of trainees in the department to evaluate the impact of the faculty development program on faculty's behaviors	2،30	،761	Medium Possibility
6	9. Employing artificial intelligence applications in evaluating external evaluators to evaluate the impact of the faculty development program on faculty's behaviors.	2،29	،758	Medium Possibility
7	6. Employing artificial intelligence applications in analyzing the results of the evaluation of faculty's department heads to evaluate the impact of the faculty development program on faculty's behaviors	2،29	،725	Medium Possibility
8	8. Employing artificial intelligence applications in analyzing the results of peer evaluation (in the same department as trainees) to evaluate the impact of the faculty development program on faculty's behaviors	2،28	،721	Medium Possibility
9	3. Employing artificial intelligence applications in faculty's self-evaluation to evaluate the impact of the faculty development program on faculty's behaviors	2،27	،734	Medium Possibility
10	2. Employing artificial intelligence applications in monitoring the training outcomes of the faculty development program to evaluate the impact of this program on faculty's behaviors	2،26	،713	Medium Possibility
11	1. Employing artificial intelligence applications to observe faculty's performance at work to evaluate the impact of faculty development programs on faculty's behaviors	2،23	،755	Medium Possibility
Total		**2،2894**	**،66252**	**Medium Possibility**

Table 7 outlines the means, standard deviations, and rating levels for various items related to employing artificial intelligence (AI) to evaluate faculty's behavior change after faculty development programs. All items are categorized under "Medium Possibility," with mean scores ranging from 2.23 to 2.33. The top-ranked item, "Employing artificial intelligence applications to suggest improvement plans based on the results of analysis of evaluations," has the highest mean score of 2.33. Other

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items, such as those involving peer evaluations, external evaluators, and self-evaluations, show similar mean scores around 2.30, reflecting a medium possibility of AI applications in these areas. These items focus on using AI to analyze and evaluate various forms of faculty behavior, such as self-assessments and feedback from peers or department heads.

The lowest-ranked item, "Employing artificial intelligence applications to observe faculty's performance at work," has the lowest mean of 2.23, but still falls under the "Medium Possibility" category. One reason for the highest mean of suggesting improvement plans could be that faculty members may see the value in using AI to directly support the development of actionable improvement plans based on evaluation results. In contrast, the lower-ranked items, such as monitoring faculty's work performance, may be perceived as less directly impactful or more challenging to implement effectively, potentially contributing to their lower mean scores.

Employing Artificial Intelligence (AI) to evaluate faculty behavior change presents several challenges, primarily due to the complex and multifaceted nature of human behavior. AI systems rely heavily on data, and accurately capturing data that reflects genuine behavior changes can be difficult. Behavioral changes in faculty members, such as adopting new teaching methods or enhancing student engagement strategies, often manifest subtly and over time, making them hard to quantify. A recent study by Williams et al. (2023) highlights that AI algorithms may struggle to differentiate between superficial changes in behavior and deep, meaningful transformation due to a lack of nuanced data. Furthermore, behaviors such as critical thinking or adaptability are inherently subjective and context-dependent, making it challenging for AI systems to evaluate them accurately (Williams et al., 2023). The study suggests that without comprehensive and high-quality data that captures the full spectrum of faculty behaviors, AI may provide incomplete or misleading assessments, potentially affecting faculty development outcomes.

Another significant challenge in using AI for evaluating faculty behavior change is the ethical considerations surrounding data privacy and bias. AI systems require access to large amounts of personal and professional data to function effectively, which can raise concerns about the privacy and autonomy of faculty members. According to an investigation by Lee and Zhang (2022), faculty may feel uncomfortable or resistant to the use of AI in evaluations due to fears of surveillance or misinterpretation of their behavior. Additionally, biases inherent in AI algorithms, often stemming from biased training data or flawed design, can lead to unfair or inaccurate assessments of faculty behavior. This is particularly concerning in diverse academic environments where cultural and individual differences should be taken into account. The study warns that if not carefully implemented, AI could perpetuate existing biases or introduce new ones, thereby undermining the trust in AI-driven evaluations and hindering the adoption of such technologies in faculty development programs (Lee & Zhang, 2022).

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Findings Related to Research Question #4: The Impact of The Training Program on The Organization

To determine what extent do the artificial intelligence applications measure faculty's reaction in faculty development programs, the mean of The Impact Of The Training Program On The Organization items were calculated and ranked from highest to lowest. Table illustrates the means of the eight items shown in table 8.

Table 8

Means, standard deviations, and rating levels of the field of Employing Artificial Intelligence to Evaluate The Impact Of The Training Program On The Organization

Rank	Item	Mean	SD	Category
1	3. Employing artificial intelligence applications in the performance of trainees in university departments after completing faculty development programs.	2،49	،649	High Possibility
2	8. Employing artificial intelligence applications to deal with information received from department heads about the performance of trainees after completing faculty development programs.	2،48	،685	High Possibility
3	4. Employing artificial intelligence applications in the number of technical notes received from university departments after completing faculty development programs..	2،46	،648	High Possibility
4	2. Employing artificial intelligence applications to compare the volume of financial spending of university departments after completing faculty development programs.	2،46	،629	High Possibility
5	6. Employing artificial intelligence applications to analyze the performance levels of university departments completing faculty development programs.	2،46	،648	High Possibility
6	7. Employing artificial intelligence applications to compare the time of completing tasks from university departments after completing faculty development programs.	2،46	،648	High Possibility
7	10. Employing artificial intelligence applications in analyzing the results of job performance evaluation of trainees after completing faculty development programs.	2،44	،665	High Possibility
8	1. Employing artificial intelligence applications to compare the level of services provided by university departments after completing faculty development programs.	2،44	،683	High Possibility
9	11. Employing artificial intelligence applications to suggest improvement plans based on information received about faculty's performance after completing faculty development programs.	2،43	،682	High Possibility
10	5. Employing artificial intelligence applications to compare the level of quality of services provided by university departments after completing faculty development programs.	2،43	،645	High Possibility

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Table 8
Means, standard deviations, and rating levels of the field of Employing Artificial Intelligence to Evaluate The Impact Of The Training Program On The Organization

11	9. Employing artificial intelligence applications to deal with information received from committee heads about the performance of trainees after completing faculty development programs.	2،40	،697	High Possibility
Total		**2،4501**	**،59333**	**High Possibility**

As seen in the table 8 above, the two highest ranking item were “My colleagues listen to my ideas on educational program development in faculty meetings”, (M=3.10, SD = 0.66), and “My colleagues respect my ideas in faculty meetings. (M=3.09, SD = 0.68) on a four-point scale. Followed by “My colleagues ignore my opinions during faculty meetings (M=3.07, SD = 0.75) which was a reversed item; reverse coding in data preparation revealed that faculty members felt that their ideas were ignored. Overall, the mean item means are comparatively high, and the range is restricted. The mean item means ranged from 2.76 to 3.10. This indicated that faculty members feel powerful during departmental meetings, with the lowest rank items well passed the midpoint theoretical item in four-point scale.

Employing Artificial Intelligence (AI) to evaluate the impact of training programs in universities provides an innovative approach to enhancing productivity, quality of education, and return on investment (ROI). AI-driven analytics can assess vast amounts of data related to faculty performance, student outcomes, and administrative efficiency to determine how training programs contribute to institutional goals. For instance, a study by Patel et al. (2023) demonstrated how machine learning algorithms could track improvements in teaching quality and faculty engagement after the implementation of a professional development program. By analyzing data from student evaluations, course completion rates, and faculty participation in collaborative projects, the AI system was able to quantify the direct impact of the training on educational quality. Moreover, AI can optimize resource allocation by identifying which training initiatives yield the highest ROI, ensuring that universities invest in programs that drive the greatest improvements in both faculty performance and student success (Patel et al., 2023).

AI's ability to provide real-time feedback and predictive analytics also enhances the potential for continuous improvement in university training programs. By leveraging AI to monitor ongoing changes in faculty behavior and student engagement, universities can dynamically adjust their training strategies to maximize productivity and educational outcomes. A recent study by Thompson and Lee (2022) highlighted how AI-powered dashboards helped university administrators identify areas where faculty needed additional support, enabling targeted interventions that improved teaching effectiveness and student satisfaction. The study also showed that using AI to evaluate the ROI of different training programs helped universities prioritize investments that not only improved the quality of education but also enhanced

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operational efficiency, reducing costs associated with underperforming programs (Thompson & Lee, 2022). This data-driven approach ensures that training programs are continuously refined to align with the evolving needs of the institution, maximizing both academic quality and financial sustainability.

Conclusions and Future Research

The research aimed to explore the extent to which Artificial Intelligence (AI) applications are employed to evaluate faculty development programs at the University of Tabuk, with a particular focus on Kirkpatrick's Model of Evaluation. The study analyzed how AI can enhance the evaluation process, offering insights into its current use, challenges, and the potential for future integration. Through a detailed investigation, it was determined that AI applications have a growing but limited presence in the evaluation of faculty development programs at the university.

The findings suggest that the use of AI tools, such as machine learning algorithms and data analytics, is still in its early stages within the University of Tabuk's faculty development programs. While there is a significant interest in adopting AI to enhance program evaluations, many faculty members and administrators are still relying on traditional evaluation methods, which are often manual and subjective. This reliance on conventional practices limits the depth of insights that could otherwise be drawn from AI-enabled evaluations.

One of the main challenges identified in this research is the lack of awareness and understanding of how AI can be integrated into Kirkpatrick's Model of evaluation. Although the model's four levels—Reaction, Learning, Behavior, and Results—offer a comprehensive framework for assessing the effectiveness of faculty development programs, the current application of AI is primarily restricted to the first two levels. AI tools are often used to collect feedback on participants' immediate reactions and track the progress of learning, but their use in evaluating changes in faculty behavior and organizational results remains underdeveloped.

Furthermore, the study highlights that despite the potential of AI to provide more objective and data-driven evaluations, there are concerns related to data privacy, ethical considerations, and the need for faculty training in using AI systems. These barriers prevent a full-scale implementation of AI across all four levels of Kirkpatrick's Model, limiting its ability to provide a comprehensive evaluation of faculty development initiatives.

Finally, while AI holds significant promise for enhancing the evaluation of faculty development programs at the University of Tabuk, its application remains in the exploratory phase. To realize the full potential of AI in this domain, the university must invest in the necessary infrastructure, provide targeted training for faculty and administrators, and address ethical and privacy concerns. By doing so, AI can play a crucial role in enhancing the rigor and effectiveness of evaluations, thus leading to better-informed decisions and ultimately improving the quality of faculty development programs. Further research is needed to refine AI tools specifically tailored for each of the four levels of Kirkpatrick's Model, ensuring that AI-driven

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evaluations contribute to more meaningful and sustainable improvements in faculty performance.

The importance of employing AI applications in measuring the training return for faculty development programs in Saudi public universities cannot be overstated. AI provides a powerful tool for overcoming the limitations of traditional evaluation methods, offering more precise, detailed, and dynamic insights into the effectiveness of professional development initiatives. By addressing the challenges associated with data quality, algorithmic bias, and ethical considerations, Saudi public universities can harness the full potential of AI to enhance their faculty development programs, ultimately contributing to the broader objectives of educational excellence and national development outlined in Vision 2030.

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