Natural Resources for Human Health
eISSN: 2583-1194

Original Research

Received 14 May 2026
Revised 20 June 2026
Accepted 05 July 2026

Natural Resources for Human Health 2026, Vol. 6 (11s): 1059–1067

KEYWORDS:
AI Enablement, Technostress, work agility, work engagement, Light Gradient Boosting Machine (LBGM), Optuna algorithm, Shapely Additive Explanation (SHAP).

Balancing Innovation and Pressure: Oman Faculty's Responses to AI Enablement, Agility and Technostress

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ABSTRACT: The enablement of AI has transformed faculty dynamics by improving their instructional efficiency, work agility, decision making agility, resource utilization and research pro-ductivity. The technostress in work environment disturbs the cognitive load and emotional resilience of the faculty leading to the mental fatigue. This proposed study aims to examine how AI enablement, work agility and technostress impact the work engagement among university faculties. A survey was conducted from 300 faculties across different age groups, qualification and work experience and it is normalized for handling missing data. The proposed Optimized Light Gradient Boosting Machine (LGBM) Multi Output Likert Explainer (OLMOLE) model classifies the faculty members based on their levels of work engagement using their experience with AI tools, agility to adapt and their technostress level. The predictive LBGM model is tuned with Optuna algorithm and interpretation is derived with the Shapely Additive Explanation (SHAP) AI method with an accuracy of 90

I. INTRODUCTION

Artificial Intelligence (AI) is recently gaining attention in the higher education due to its agile adaptive strategies. The intervention of AI has influenced the faculty roles by demand-ing more agility, technological engagement, digital fluency and innovative teaching approaches. However, the integration of AI has opened new opportunities for the faculty by enabling their personalized learning space with new technology and resources. Faculty members are expected to depend on the AI based teaching framework for evaluation, research and decision making. The AI enablement has enhanced the higher education teachers (HET) to disseminate the knowledge among the students. The information and communication technologies (ICT) have integrated many technologies to redefine the learning environment. Over the last 10 years the adoption

of AI technology has been seeking its peak due to its wide adaptability and reliability. Education has become limitless and it is continually evolving to address the requirements of the society. Though the intervention of AI has promising technological improvements, it also introduces the issues like technological competence, excessive workload, administrative burden and work strain. This digital transformation also causes psychological strain to the faculties, as they need to adapt to new technology often. Frequent technological changes demand more work agility and engagement constantly. This constant pressure may sometimes mislead the faculties and increase their stress level. This negative pressure directly affects the work engagement in the academic environment. The faculties need to respond rapidly to technological hindrances, institu-tional changes, administrative pressure and student's problem too. The technostress, work agility and work engagement are the important constructs which are interlinked in analyzing the faculties performance. This study aims to bridge these dynamics by examining how AI enablement, adaptive agility, and technological stress interact to influence work engage-

ment. This research contributes to the understanding of faculty behavior in AI-integrated ecosystems and suggests strategies for creating more agile and engaging academic workplaces.

A. Objectives

- To examine the role of AI integration enablement and effectiveness on work engagement among faculty members in educational institutions in Oman.
- To identify how the AI enablement contributes to mitigate technostress among the faculties.
- To examine how AI integration in educational institutions affects workforce agility and engagement.
- To examine the relationship between techno stress creators and work engagement.
- To determine whether techno stress creators moderate the relationship between enablement and effectiveness of AI and faculty members' work engagement.
- To research whether workforce agility mediates the relation-ship between enablement and effectiveness of AI and work engagement.

II. RELATED WORKS

Currently, AI based academic environment [1], [2], [3] is not solely depend on effective teaching and research output alone. It relies on the adaptability of educators on both the technological improvements and disruptions. The faculties and academician have to respond to multiple factors like institutional pressures, student's demands and sustain intrinsic encouragement. Analyzing and understanding the interplay between these factors is challenging for the faculty well-being [4], [5] and excellence. The optimal performance lies at the intersection of factors such as work agility, work engagement and Technostress. The technostress deals with emotional parameters of faculty like anxiety [6] to adapt, overloaded information that leads to fatigue [7], uncertainty [8], [9] in their work. The parameters like decision making [20], speed [21], [22], technology adoption [10] is monitored by their work agility. Their energy level, cognitive absorption and involvement is measured using work engagement factor. Artificial Intelligence (AI) enables effective administration [11], [12] precision teaching and technological advancement. However, when it empowers, it also creates pressure among the academicians and faculties which need to be balanced to avoid performance degradation [13],[14],[15].

III. METHODOLOGY

The proposed Optimized LGBM Multi Output Likert Ex-plainer OLMOLE model is a hybrid model which investi-gates the influence of AI in universities and colleges. The faculty dynamics such as work agility (AGL), technostress (TS), work engagement (WE) and AI enablement is validated using both statistical metrics and machine learning models. The monotonic relationship between the TS, WE and AI enablement is measured to predict the work level engagement. Experience with AI tools, technostress level and agility to adapt are the driving factors for predicting the response of the faculty members. The overall architecture of this proposed model is shown in Fig.1 Several demographic information is considered for choosing the participants and the survey is conducted among the faculties working in OMAN. This proposed model is framed by considering the factors like missing and redundant data, hyperparameter selection, training and classifying the optimized results. The detailed explanation of the functioning of the proposed model is

briefed in the subsequent sections.

The Optimized Light Gradient Boosting Machine Multi-Output Likert Explainer (OLMOLE) process is presented in Figure 1 to highlighting the proposed workflow method for predicting faculty work engagement and analyzing the effects of the variables and factors of techno-stress, work agility, and AI enablement in Higher Education Institutions (HEIs). Col-lecting the demographical and professional information from faculty members, like Gender, Age, Qualification, designation, type of institution and working experience of faculty is in the beginning. In the data preprocessing stage, missing values are imputed by mean values and the mean aggregation technique is used to create the scores for the constructs of the survey. Afterwards, feature selecting is executed by the Spearman Correlation Coefficient ρ.

To conclude, significant monotonic relationships between

the techno-stress, work agility, AI enablement variables and work engagement were identified. Selected features are then fed into the proposed OLMOLE framework whose classifica-tion model is a Light Gradient Boosting Machine (LGBM). To maximize accuracy and minimize the loss function and optimize learning parameters, the results' models are tuned using Optuna based hyperparameters optimization. The opti-mized model is used to predict several Likert-scale outcomes for faculty engagement and workplace adaptability. Addition-ally, support techniques of explainable artificial intelligence (XAI) are incorporated by implementing the SHAP (Shapley Additive Explanations) model which illustrates how summary, beeswarm, and waterfall plots enable transparent interpretation of the model prediction. Standard evaluation metrics such as accuracy, precision, recall and F1 score are used to measure the performance of the model. Lastly, the proposed framework is a multivariate analysis that examines all measures including work agility, techno-stress, AI enablement and faculty experi-ences, and offers actionable insight into faculty's adaptability, technological readiness and engagement in AI-based educa-tional experiences.

IV. Results & Discussion

The macro level relationship between the constructs is analyzed with the reduced heatmap as shown in Fig.2. The constructs such as work engagement (WE), Technostress (TS), AI enablement, Work agility (AGL) is examined deeply to understand their correlation. The construct such as work agility (AGL) and AI enablement (AI) is positively correlated and it is represented in orange shade. However, the technostress (TS) is negatively correlated with work engagement level (WE) of the faculty members and it is highlighted in light blue shade.

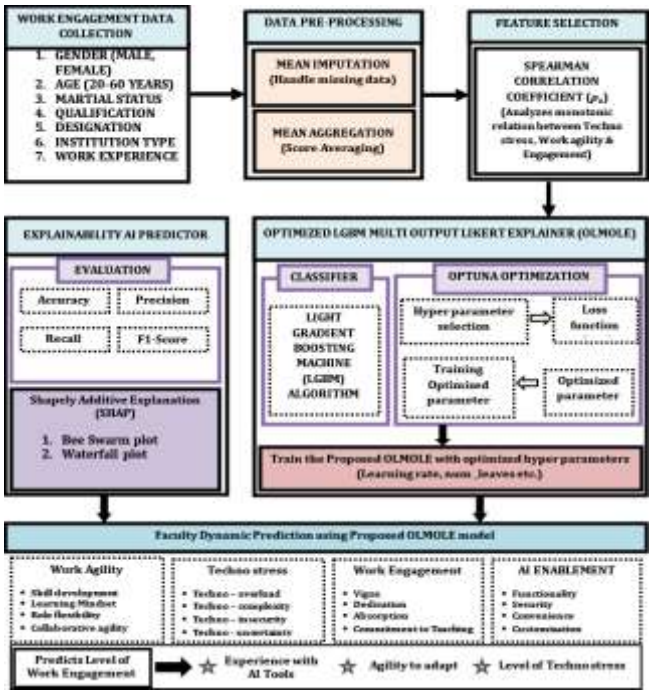

Fig. 1. Overall architecture of the proposed OLMOLE classification Model

The AI enablement factors (light blue - white) such as functionality, security, convenience and customization act as neutral factors and emphasis that the better technology en-ablement improves the work engagement level of the faculty members. The pairwise correlation among the sub variables of the constructs that supports to identify the micro-level relationship of the constructs. Therefore, from the above observation it is witnessed that the work agility improves the work engagement, technostress reduces work engagement and finally AI enablement supports the work engagement level of the faculty members. The dark red regions in the diagonal format represents the variables with perfect correlation with itself. In the color coding the red / orange color ranging approximately from '0.4 – 0.6' denotes the positive correla-tions. Similarly, the blue color ranging approximately form '0 – 0.2' denotes the negative correlations. The variables with negative correlation are represented in white color near range of '0'. The variables like vigor, dedication, absorption and commitment is positively correlated (white - deep blue) with Work engagement level and it supports the hypothesis that work agility influences the work engagement level (WE_level) highly. However, the technostress factors (Blueish color) like overload, complexity, insecurity and uncertainty mostly indi-cate the negative correlation with work engagement level. It is inferred that the higher technostress act as hindrance for work engagement in fig 3.

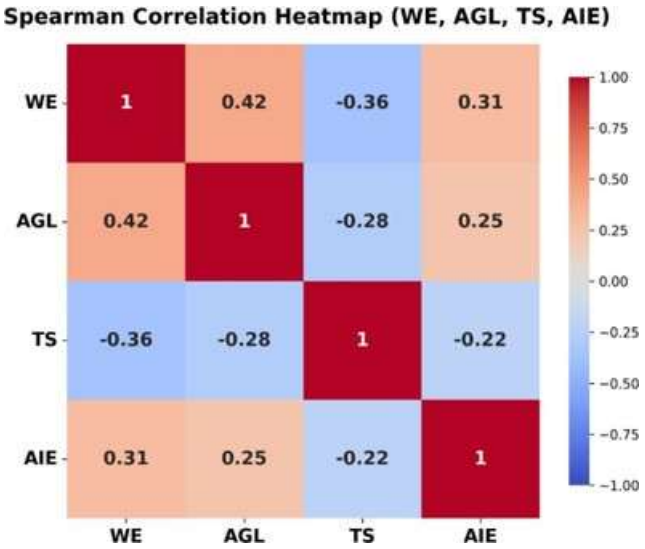

Fig. 2. Reduces Spearman Correlation Matrix for analyzing the macro relationship between the variable

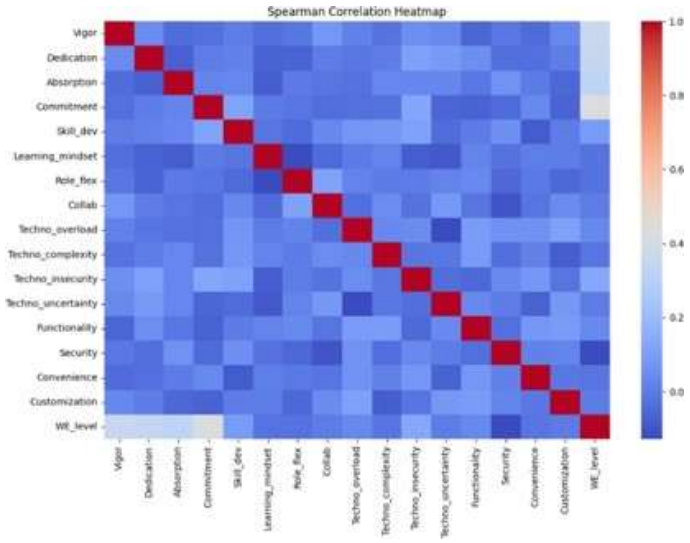

Fig. 3. Detailed Spearman Correlation Matrix for analyzing the micro relationship between the variables

Natural Resources for Human Health
eISSN: 2583-1194

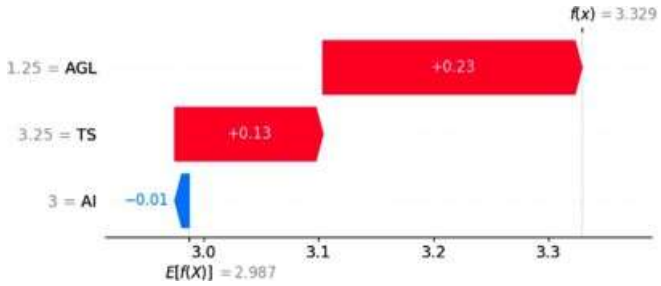

Fig. 4. Waterfall plot of the proposed OLMOLE model using SHAP AI

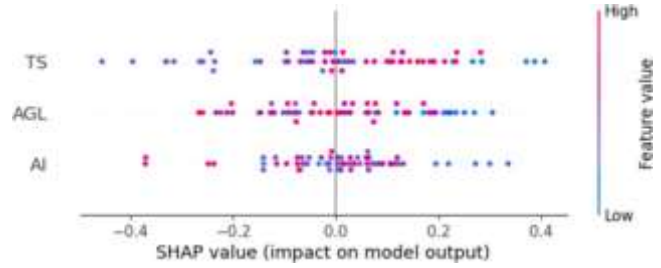

Fig. 5. Bees worm plot of the proposed OLMOLE model using SHAP AI

The SHAP waterfall plot implies that a faculty member's ability to effectively use AI tools is a strong predictor of higher work engagement. The x-axis represents the predicted value of the proposed OLMOLE model and y-axis represents the corresponding features (AGL, TS, AI). The effectiveness of AI enablement among faculty members increases towards the right side of the x-axis. It is evident from the plot that as the AI score increases, the SHAP value becomes more positive. The features of AI enablement and work agility (AGL) contribute positively, pushing the score up. The technostress features contribute negatively, pulling the score down. The starting point of the waterfall represents the average prediction of the entire proposed dataset and it is termed as the baseline value ($E[f(x)] = 2.987$). The contribution of the features either pushed or pulled based on this baseline value. The red bar represents the positive contribution, pushing the prediction upward and the blue bar represents the negative contribution, pushing the prediction downward. The proposed model's final output is denoted as $f(x)$, which is the final work engagement score. The OLMOLE model has $f(x) = 3.329$, which is slightly higher than the average baseline model. Hence, it is evident that the proposed model is successfully identifying and quantifying the positively influenced features in fig 4.

The Bee Swarm plot predicts the important feature that in-fluences the work engagement by analyzing the overall distribution of the constructs. The X-axis represents the SHAP value of the OLMOLE model and Y-axis represents the features (TS, AGL& AI). The positive SHAP value indicates that the feature has strong prediction and the negative SHAP value indicates the features has low prediction. Each dot in the plot represents a single faculty and the actual feature value is differentiated using colors. The red color shade denotes the high feature value and blue shade denotes the low feature value. The dots are spread between the range of '-0.4 to 0.4'. It is observed that the feature such as Technostress (TS) and Work Agility (AGL) has strong positive correlation on work engagement level of the faculty members. The SHAP value is highlighted with red dots which pushes the prediction upwards. Though AI enablement has smaller effect, but still the enablement of AI tools slightly increases the work engagement level of the faculty members. Henceforth it is evident that the technostress and work agility are the highly influencing constructs whereas the AI has the moderate impact. The classification report of the proposed OLMOLE implies that the accuracy rate is 0.899% and F1-score is 0.88 approximately. Due to imbalance data in class 2 (AI enablement), the recall is low and precision is '1'. The proposed model performs well on work agility (class 3) and technostress (class 4) which is a major driven force for predicting the work engagement level of the faculty members in fig 5.

The reliability of each set of questions are validated statis-tically using the Cronbach's Alpha (α) in Statistical Package for the Social Science (SPSS) tool. The internal consistency of each question in the survey is analyzed using this tool. The

survey is conducted using the reliable and consistent set of questions that is formulated with the support of SPSS tool. Each construct comprises a set of questionaries and it is validated using the Cronbach's alpha coefficient and shown in Table I.

TABLE I STATISTICAL ANALYSIS OF THE PROPOSED OLMOLE MODEL USING CRONBACH'S ALPHA

Construct	Items	Cronbach's Alpha (*a*)
AI Enablement	3	0.833
AI Effectiveness	16	0.944
Technostress	15	0.897
Workforce Agility	7	0.882
Work Engagement	9	0.910

The internal consistency of each set of questions is analyzed and it is evident that all the Cronbach's alpha values are greater than '0.8'. The variables under each construct are reliable and it is retained in the questionaries for conducting survey among the faculty members. To validate the relationship between the variables the normality test is performed. The dependency between the variables (enablement, stress, agility, work engagement, is clearly observed with the support of Shapiro Wilk and Kolmogorov – Smirnov statistical test and shown in Table II.

It is evident from the previous statistical analysis that the sample data are not normally distributed. Therefore, the monotonic relationship between the variables is measured using the Spearman Correlation Coefficient (ϱ). The variables considered in this survey, namely Technostress, AI Enable-ment, Workforce Agility, and Work Engagement, are measured using a five-point Likert scale ranging from Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), to Strongly Disagree

(1). Since Likert-scale responses are ordinal in nature and the normality assumption is violated, Spearman's rank correlation coefficient is considered an appropriate statistical measure for evaluating the relationships among the variables. The proposed hypotheses (H1–H7) are tested using Spearman's Correlation Coefficient (ϱ), and the corresponding associations among the variables are presented in Table III.

V. CONCLUSION

The proposed research work investigated the influence of AI tool usage in academic environment by collecting the feedback from the faculty members of OMAN. This research provides insight about how the digital transformation through AI impacts the human's professional life in academic en-vironment. The survey has been collected from 300 faculty members and it is pre-processed using mean imputation and aggregation techniques to handle the missing and redundant data. Addictive. In this proposed research work, AI enable-ment act as predictor, working agility is used as mediator and technological stress is used as moderating factor. A predictive hybrid model is framed using the Light Gradient Boost Machine (LBGM) and Optuna optimization algorithm, for hyperparameter tuning with spearman correlation and Shapely Additive Explanation (SHAP) for interpretability. The features such as Technostress (TS), Work agility (AGL), AI enablement (AI) and Work engagement (WK) are analyzed using the Spearman's correlation coefficient algorithm. The interdependencies between these constructs is observed and the dominant features are extracted to classify through the LGBM algorithm. The hyperparameters are optimized using Optuna algorithm and later subjected to the SHAP explainable AI predictor. The features influencing the work engagement level of the faculty members is investigated and validated using the corresponding metrics which is discussed in the results section. This proposed OLMOLE model achieves an accuracy of 90% approximately by correlating each construct and its sub constructs precisely. This proposed model's findings highlight the faculty with greater AI enablement and agility tends to report higher levels of work engagement. The increased technological stress negatively affects this relationship.

Natural Resources for Human Health
eISSN: 2583-1194

VI. LIMITATIONS

- The geographical limitations: The proposed study is limited to the geographical scope of OMAN universities and colleges. The proposed model should be validated with the other countries with varying infrastructure and organizational cultures.
- The Potential unmeasured variables: Unmeasured factors like leadership style, institutional policy and digital literacy levels could significantly influence the faculty engagement and perceptions of AI.
- Limited Mediation Analysis: This proposed work utilized workforce agility as the mediator, but did not explore other potential mediators or moderators.

VII. FUTURE WORK

This proposed research work investigates the impact of AI integration on faculty dynamics in Omani educational institutions, focusing on technostress, work engagement and agility. However, it highlights the necessity of expanding this research across worldwide institutions with versatile envi-ronment. Moreover, this research depends on the qualitative analysis which could be improved by incorporating qualitative methods like interviews and case studies to deeply analyze the experience of the faculty members while adopting the AI technology. Future research should explore the factors like digital literacy, organizational support, leadership style and professional development. Longitudinal study must be carried out to observe the attitudes and behavior of the faculties.

TABLE II STATISTICAL ANALYSIS OF THE PROPOSED OLMOLE MODEL USING SHAPIRO–WILK AND KOLMOGOROV–SMIRNOV NORMALITY TESTS

2*Variable	Kolmogorov–Smirnov[a]			Shapiro–Wilk		
	Statistic	df	Sig. (p-value)	Statistic	df	Sig. (p-value)
Enablement Mean	0.106	303	0.000	0.970	303	0.000
Effectiveness Mean	0.113	303	0.000	0.971	303	0.000
Stress	0.067	303	0.002	0.979	303	0.000
Agility	0.123	303	0.000	0.959	303	0.000
Engage	0.158	303	0.000	0.950	303	0.000

[a] Lilliefors Significance Correction

TABLE III HYPOTHESIS TESTING USING SPEARMAN'S CORRELATION METHOD

Hypothesis No.	Relationship	Type of Effect	Direction	Effect Description
H1	AI Enablement → Work En-gagement	Direct	Positive (ρ = 0.62)	Vigor, dedication, absorption, and commitment towards teaching.
H2	AI Enablement → Work Agility	Direct	Positive (ρ = 0.47)	Skill development, learning mindset, role flexibility, and collaborative agility.
H3	Work Agility → Work En-gagement	Direct	Positive (ρ = 0.35)	Work agility of the faculties positively influences their work engagement.
H4	Technostress → Work	Direct	Negative (ρ	Technostress reduces the involvement and interest of faculty members and diminishes their

	Engage-ment		= −0.29)	professional re-sponsibilities.
H5	Technostress → Work Agility	Direct	Negative (ϱ = −0.41)	Technostress disturbs the faculty's ability to remain agile and adaptable in the working environment.
H6	AI Enablement → Work Agility → Work Engagement	Mediation	Positive (ϱ = 0.55)	Work agility acts as a mediator and strengthens the positive relationship between AI enablement and work engagement.
H7	Technostress → AI Enable-ment → Work Engagement	Moderation	Negative (ϱ = −0.68)	Technostress weakens the positive effects of AI enable-ment on the work environment and affects the involve-ment level of faculty members.

Additionally future research should focus on how AI affects aspects such as academic work, job satisfaction, innovation, collaboration and ethical concerns to understand the role of AI in academic.

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