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Investigating the Transformational Role of Social Media Adoption in Explaining the Key Components of Problem Solving in Technology-Oriented Small and Medium-Sized Enterprises

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ABSTRACT

Background and Purpose: With the expanding role of social media in business environments, technology-oriented small and medium-sized enterprises (SMEs), especially those based in industrial parks, have found new opportunities to enhance organizational problem-solving processes and learning. Despite extensive research on the impacts of social media, scientific evidence regarding the role of these tools in organizational problem-solving within Iranian SMEs remains limited. Therefore, the present study examines the impact of social media adoption on different aspects of problem solving (problem identification and documentation, improvement of problem association, problem-solving process, solution standardization, and learning solutions) in technology-oriented SMEs located in the industrial parks of Alborz province.

Methodology: This research is applied in objective and correlational by nature, conducted through a quantitative approach. The statistical population includes all senior marketing and sales managers and experts of technology-oriented SMEs located in the industrial parks of Alborz province (265 individuals), among whom, using Cochran's formula, 385 were selected as the sample through convenience random sampling. Data were collected via a standard questionnaire, whose reliability was confirmed by Cronbach's alpha and construct validity by AVE and Fornell-Larcker criteria. Data were analyzed using SPSS version 24 and SmartPLS version 3.

Findings: The results showed that social media adoption has a significant impact on all aspects of problem solving, especially on problem identification and enhancement of problem association. Although the impact on solution standardization was less significant, the findings highlight the prominent role of social media in facilitating organizational learning and experience sharing.

Conclusion: Purposeful use of social media can improve problem-solving processes and organizational learning in technology-oriented SMEs. However, in order to transform informal experiences into standardized solutions, it is necessary—alongside technological adoption—to develop managerial measures and formal documentation systems. It is recommended to establish specialized knowledge management and social media working groups in these companies and to strengthen related training.

Keywords: Social media adoption, Organizational problem solving, Problem identification, Small and medium-sized enterprises (SMEs)

Introduction and Problem Statement

In an era of rapid advances in information technology, technology-oriented small and medium-sized enterprises (SMEs) are recognized as key drivers of innovation and economic development. However, these organizations increasingly face complex challenges in identifying, analyzing, and solving environmental and organizational problems (Almeida, 2024). Ensuring a sustainable competitive advantage for such enterprises requires the adoption of novel approaches in knowledge management and organizational learning (Li & Wang, 2023). In recent years, social media platforms have created new opportunities for problem-solving performance improvement within organizations by enabling rapid information exchange, professional networking, and cognitive synergy (Fiedermuc et al., 2024; Rahman et al., 2023; Kamali et al., 2024). Effective utilization of these capabilities can transform key problem-solving dimensions such as issue identification, strengthening problem-related communications, developing creative solutions, standardizing solutions, and fostering continuous learning (Golmohammadi & Samadi, 2024; Karimi & Jarahi, 2023; Sajjadi & Amiri, 2024).

Nevertheless, the current body of research still presents significant gaps in conceptual models that comprehensively examine the catalytic role of social media adoption across the interactions among problem-solving components (Almeida et al., 2024; Fiedermuc et al., 2024; Ngai et al., 2015; Sigala & Chalkiti, 2015). Most previous studies have primarily focused on the marketing or public relations aspects of social media, while overlooking the influential chain of this phenomenon on organizational problem-solving and organizational learning processes within technology-oriented SMEs (Rahman

et al., 2023; Mazloumi et al., 2020; Rahimi & Rezaei, 2022). More importantly, most existing models structurally lack an integrated view of the dynamic links among diverse problem-solving components and organizational learning feedback within the problem-solving cycle (Jafari et al., 2023).

Within the Iranian innovation ecosystem, despite the widespread penetration of communication technologies and the increasing adoption of social networking platforms by technology-based businesses (Statistical Center of Iran, 2024), there is a clear lack of model-driven and data-based studies that analyze the transformative role of social media adoption across all stages of the problem-solving process in these enterprises. This gap is felt even more acutely given the environmental complexity, resource constraints, the necessity for optimizing organizational knowledge, and the growing push towards open innovation in the competitive landscape of Iranian SMEs (Sajjadi & Amiri, 2024; Zare et al., 2023). Therefore, the present research seeks to thoroughly examine the role of social media adoption in shaping the links and interactions among the key components of problem solving—including problem identification, problem association, problem-solving process, solution standardization, and solution learning—within Iranian technology-oriented SMEs through a systematic conceptual model. The findings of this study are expected to address existing theoretical and methodological gaps, and provide an evidence-based framework to empower decision-making, enhance problem-solving and organizational innovation capacities within the knowledge-based business ecosystem of the country.

Theoretical Framework

With the advent of the digital economy and unprecedented development of communication technologies, technology-oriented SMEs have emerged as frontrunners of organizational transformation and innovation within entrepreneurial ecosystems (Zare et al., 2023). Success in such a dynamic environment is more than ever dependent on organizations' capacities to instantly identify emerging issues, establish effective communication about key challenges, generate innovative solutions, document best practices, and continuously learn from the problem-solving cycle (Fiedermuc et al., 2024). Social media platforms have played an accelerating role in fostering these dimensions by providing avenues for networking, swift information exchange, and facilitating group learning.

The present study draws on Technology Acceptance Models (TAM/UTAUT), Social Capital Theory, and organizational learning models to elaborate how social media infrastructures impact the problem-solving process. In line with TAM and UTAUT, variables such as perceived ease of use and perceived usefulness are central engines for the adoption of digital tools—including social media platforms—within organizations (Venkatesh & Davis, 2000; Marangunic & Granic, 2015). Recent studies indicate that higher levels of social technology adoption among SME employees significantly enhance knowledge flows and the quality of problem solving (Karimi & Jarahi, 2023; Parvin et al., 2023).

From a social capital perspective, virtual networks strengthen trust, collective identity, and intellectual capital formation, thereby dramatically improving knowledge synergy within firms (Rahman et al., 2023). One distinctive capability of technology-oriented SMEs is their ability to leverage social media for rapid issue identification. Studies by Almeida et al. (2024) and Zare et al. (2023) highlight the role of social media in clarifying issues, extracting environmental data, and promoting systematic thinking. These platforms facilitate the exchange of diverse viewpoints, customer interactions, and even the outsourcing of problem identification. Organizational social networks allow members to build both horizontal and vertical professional relationships, laying the groundwork for deeper exchange on critical organizational issues (Wang & Li, 2023; Nahavandian & Khalilzadeh, 2024).

At the next stage, creative problem solving is elevated through enhanced access to collective global experiences and digital brainstorming. Research by Fiedermuc et al. (2024) and Parvin et al. (2023) shows that active participation in social discussions fosters both innovation and the localized generation of creative solutions to organizational problems. Another important point is the ability to standardize and document successful solutions on platforms such as expert groups and discussion forums, which promotes replicability and effective organizational learning (Golmohammadi & Samadi, 2024; Jafari et al., 2023). Ultimately, social media acts as an organizational collective memory, sustaining and transferring "problem-solving learning" through documented resources and the recall of previous knowledge (Karimi & Jarahi, 2023; Sigala et al., 2015; Kamali et al., 2023).

Drawing from both global and domestic experience, the present study's conceptual model posits both direct and indirect effects of social media adoption on five key elements of problem solving (identification, association, creative solution, standardization, learning) in technology-oriented SMEs. A review of the Iranian literature reveals a lack of comprehensive, systematic, and data-based research that simultaneously addresses these components within the real-world context of technology-oriented SMEs using state-of-the-art approaches (Mazloumi et al., 2020; Kamali et al., 2024). Thus, the theoretical framework provided in this study can serve as an innovative, interdisciplinary model for policymakers and managers analyzing the social effectiveness of technology and organizational problem solving within Iran's knowledge-based ecosystem.

Conceptual Model and Research Hypotheses

The conceptual model of this study, grounded in the integration of organizational learning theory, social capital theory, and technology acceptance theories (TAM and UTAUT), illustrates the transformative role of social media adoption as the main independent variable in explaining the key dimensions of organizational problem solving within technology-oriented small and medium-sized enterprises (SMEs). In this model, social media adoption is defined as the extent and manner in which employees effectively accept and utilize social media platforms in the workplace. It is hypothesized that social media adoption simultaneously exerts a direct and significant influence on the five key components of problem solving, including: 1) Problem Identification (the ability to detect and conceptualize new organizational issues); 2) Problem Association (effective interaction and collaboration among members for deeper understanding of problems); 3) Creative Problem Solving (generating innovative solutions for organizational challenges); 4) Solution

Standardization (documenting and reapplying successful solutions); and 5) Problem-Solving Learning (the process of individual and collective learning from problem solving and transferring experiences).

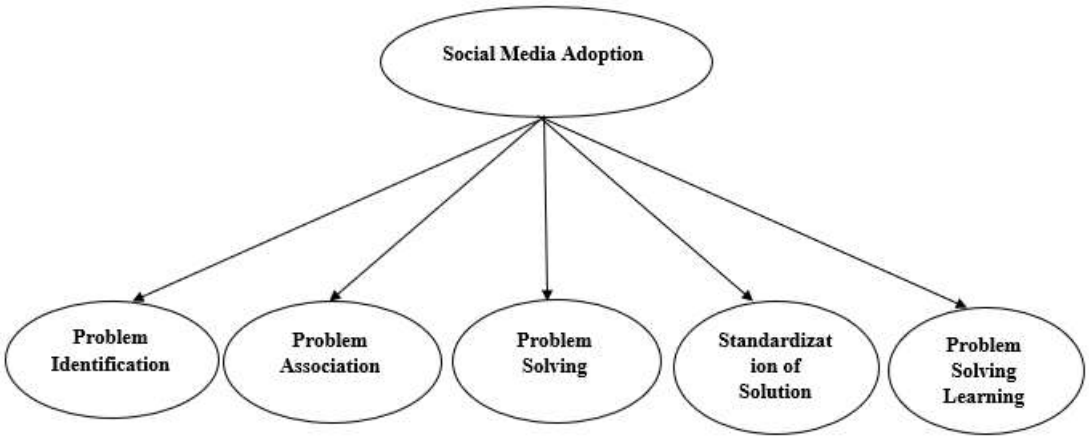

Figure – Conceptual Model of the Research

1. Social media adoption has a significant impact on problem identification and registration in technology-oriented small and medium-sized enterprises (SMEs) located in the industrial zones of Alborz province.
2. Social media adoption has a significant impact on improving problem association in technology-oriented SMEs located in the industrial zones of Alborz province.
3. Social media adoption has a significant impact on the problem-solving process in technology-oriented SMEs located in the industrial zones of Alborz province.
4. Social media adoption has a significant impact on solution standardization and learning in technology-oriented SMEs located in the industrial zones of Alborz province.
5. Solution standardization has a significant impact on problem identification in technology-oriented SMEs located in the industrial zones of Alborz province.
6. Solution learning has a significant impact on problem identification in technology-oriented SMEs located in the industrial zones of Alborz province.

Research Methodology

This study is correlational in nature, as it aims to investigate the relationships between "social media adoption" and the multiple components of "problem solving" (problem identification and registration, improved problem association, creative problem solving, solution standardization, and solution learning). The study is also applied in its objective, aiming to provide actionable recommendations to enhance the performance of technology-oriented SMEs by identifying the factors influencing problem solving through social media adoption.

The statistical population of this research includes all managers and senior experts in marketing, sales, and research & development departments of technology-oriented SMEs located in the industrial zones of Alborz province. According to data from the Iranian Small Industries and Industrial Parks Organization, the number of such companies in Alborz province was reported to be approximately 265 by the end of 2023. Based on this clearly defined population, the sample size was determined to be 385 people using Cochran's formula for finite populations, with the sample selected through convenience random sampling.

Data collection for this study was conducted using both library methods (examining documents, academic papers, and books) and field surveys (questionnaire). To measure the variables of social media adoption and the dimensions of problem solving, standardized questionnaires (Tortorella et al., 2023) were utilized, localized and validated for the research context. The validity of the questionnaires was confirmed through convergent validity (AVE index) and discriminant validity (Fornell-Larcker method). The reliability of the research instruments was assessed using Cronbach's alpha coefficient. Data analysis and hypothesis testing were carried out using SPSS software version 24 and SmartPLS version 3.

Research Findings

Since understanding the demographic characteristics of the sample can facilitate the generalization of results to other statistical populations with similar general features, this section describes the demographic characteristics of the respondents based on the collected demographic data. Accordingly, the

general status of respondents in terms of age, work experience, educational background, and other relevant factors will be described and analyzed using frequency tables, percentages, cumulative percentages, and appropriate charts.

Table 1 – Descriptive Statistics of the Research Sample

Variable	Category	Absolute Frequency (Number)	Relative Frequency (%)
Age	Under 25 years	102	27
	26–35 years	137	35
	36–45 years	81	21
	46–55 years	48	12
	Over 55 years	17	5
Education	Bachelor's degree	198	51
	Master's degree	152	40
	Doctorate	35	8
Work Experience	Less than 5 years	54	14
	5–10 years	150	39
	10–20 years	131	34
	20–30 years	50	13
Gender	Male	285	74
	Female	100	26

Normality Assumption Test Using the Kolmogorov-Smirnov (K-S) Test

In studies conducted at the nominal or ordinal scale, it is necessary to use non-parametric tests for data analysis. Among the common tests for ordinal-level data is the Kolmogorov-Smirnov (K-S) test. This test is a simple non-parametric approach for determining the congruence of empirical data with selected statistical distributions. Thus, the Kolmogorov-Smirnov test (abbreviated as K-S) is a method for evaluating the goodness-of-fit of a theoretical frequency distribution with empirical data. The K-S test compares the observed cumulative distribution function with the theoretical (normal) cumulative distribution function (Abbaszadeh et al., 2014). In other words, this test is used to identify influential factors or to assess the normality of data distributions.

In the K-S test, the null hypothesis (H0) states that the distribution of the observations conforms to a specific distribution (with particular parameters) assumed based on prior knowledge or evidence. The test evaluates whether the observed data matches the specified distribution.

- **H0:** The data distribution for each variable is normal.
- **H1:** The data distribution for each variable is not normal.

Table 2 – Kolmogorov-Smirnov Test Results

Variable	Mean	Standard Deviation	Significance (p-value)	Z Statistic	Test Result
Social Media Adoption	3.547	0.487	0.076	1.291	Null hypothesis confirmed
Problem Identification	4.523	0.625	0.130	1.237	Null hypothesis confirmed
Problem Association	3.524	0.421	0.086	1.369	Null hypothesis confirmed
Problem Solving	4.367	0.587	0.102	1.497	Null hypothesis confirmed
Solution Standardization	3.627	0.512	0.061	1.184	Null hypothesis confirmed
Problem-Solving Learning	3.443	0.721	0.129	1.148	Null hypothesis confirmed

Based on Table 2, since the significance level (Sig) for the data is greater than 0.05 and the Z statistic falls within the confidence interval of ±1.96 at a 95% confidence level and 5% error rate, it can be concluded that there is no significant difference between the observed and expected frequencies. Therefore, the assumption of data normality is not met, and the use of non-parametric statistical tests is justified.

Reliability and Validity of the Measurement Model

The first criterion checked in reflective measurement models is internal consistency reliability. The acceptable threshold for Cronbach's alpha coefficient varies according to different researchers. Some consider alphas above 0.60 acceptable, while others set the threshold at 0.70 or higher. As observed, the Cronbach's alpha values for all variables are above 0.70. Based on these coefficients, it can be inferred that the model exhibits good internal consistency reliability.

Composite reliability for a construct is calculated as the ratio of the variance shared between a construct and its indicators to the total variance, including measurement error. A value greater than 0.70 indicates stability, whereas values below 0.60 suggest a lack of reliability (Davari & Rezazadeh, 2013). As shown in the table below, all values are above 0.70, indicating that the model enjoys good composite reliability.

Convergent validity refers to the extent to which two measures of the same concept are correlated. To assess convergent validity, Fornell and Larcker (1981) introduced the average variance extracted (AVE) as a criterion. A minimum AVE value of 0.50 indicates adequate convergent validity. As seen in the AVE table, all research variables report AVE values greater than 0.50, demonstrating that the model has satisfactory convergent validity.

Discriminant validity means that the items or indicators for a variable measure only that specific variable. According to Fornell and Larcker (1981), in PLS analysis, the square root of the AVE of each variable should be greater than its correlations with other variables in the study.

Table 3 – Internal Consistency Reliability Coefficients

Variable	Cronbach's Alpha	Composite Reliability	Convergent Validity (AVE)	Discriminant Validity (√AVE)
Social Media Adoption	0.962	0.966	0.615	0.784
Problem Identification	0.903	0.940	0.839	0.916
Problem Association	0.874	0.923	0.799	0.894
Problem Solving	0.915	0.946	0.855	0.924
Solution Standardization	0.899	0.937	0.831	0.912
Problem-Solving Learning	0.858	0.915	0.783	0.885

As observed in the correlation matrix, the square root of AVE (shown on the diagonal) for each variable is greater than the correlations of that variable with all other variables, indicating satisfactory discriminant validity of the model.

Table 4 – Comparison of the Square Root of AVE of a Variable with Its Correlations with Other Research Variables

	Social Media Adoption	Problem Identification	Problem Association	Problem Solving	Solution Standardization	Problem-Solving Learning
Social Media Adoption	0.784					
Problem Identification	0.315	0.916				
Problem Association	0.367	0.269	0.894			
Problem Solving	0.513	0.322	0.418	0.924		
Solution Standardization	0.632	0.568	0.227	0.546	0.912	
Problem-Solving Learning	0.419	0.477	0.367	0.439	0.412	0.885

The values in bold on the diagonal represent the square roots of the AVE for each construct. These values are greater than the correlations of each construct with the other constructs, providing evidence of satisfactory discriminant validity according to the Fornell-Larcker criterion.

Inferential Findings

The factor loading is a numerical value that indicates the strength of the relationship between a latent variable and its corresponding observed variable in the path analysis process. The higher the factor loading of an indicator for a specific construct, the greater its contribution in explaining that construct. The first aspect to consider when evaluating reflective models is the unidimensionality of the indicators. This means that each indicator, among the total set of indicators, should have a high loading only on a single dimension or latent variable. In this context, factor loadings above 0.60 are considered acceptable.

Using PLS software, the factor loadings for the measurement model relating to social media adoption, the problem-solving process, and its dimensions were calculated. All coefficients were found to be significant at the 95% confidence level. Therefore, the results of the factor loadings confirm the high validity of the model.

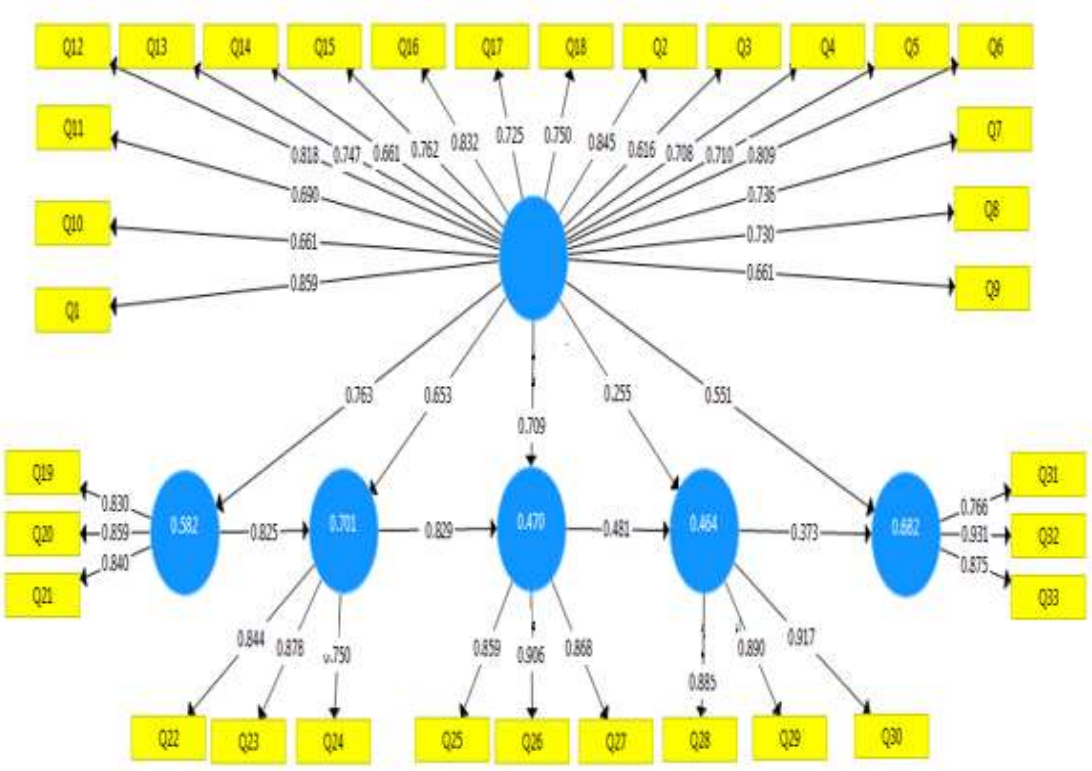

Figure 2 – Research Model with Estimated Standardized Coefficients

The diagram below (significance values of the hypotheses) presents the research models in terms of the significance of the coefficients (t-values). This model tests all measurement equations (factor loadings) and structural equations (path coefficients) using the t-statistic. According to the hypotheses formulated in the present study, a hypothesis will be supported if its corresponding path coefficient is positive and its significance value, which is represented by the t-statistic, is statistically significant.

In this model, a path coefficient or factor loading is considered significant at the 95% confidence level if its t-value falls outside the interval of -1.96 to +1.96. If the t-value lies within this interval, the factor loading or path coefficient is not significant. At the 99% confidence level, significance is achieved if the t-value falls outside the interval of -2.58 to +2.58. Based on the results of the t-test, all factor loadings were significant at the 95% confidence level and made a meaningful contribution to the measurement of their respective constructs.

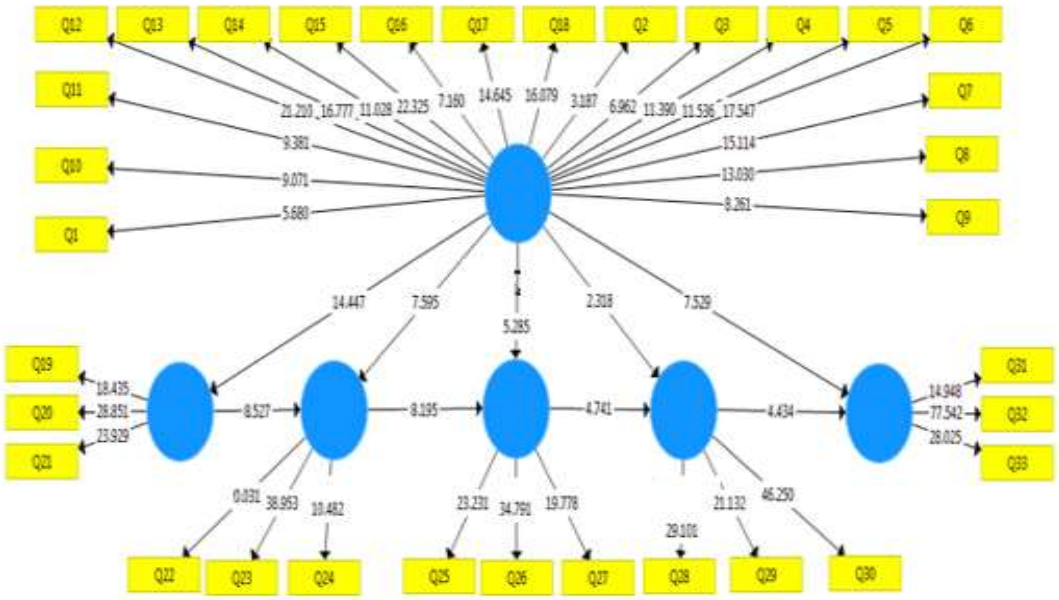

Figure 3 – Significance Coefficients of the Hypotheses in the Model

One of the methods for evaluating formative models is the coefficient of determination (R^2). The coefficient of determination (R^2) assesses what percentage of the variance in a dependent variable is explained by the independent variable(s).

Evaluation of Formative Measurement Models

The coefficient of determination (R^2) assesses the proportion of variance in the dependent variable that is explained and accounted for by the independent variable(s). Naturally, this value is zero for independent variables and greater than zero for dependent variables. The higher this value, the greater the explanatory power of the independent variables for the dependent variable (Hanafi Zadeh & Zare Ravasan, 2012).

According to the R^2 in this model, it can be stated that the variable "Social Media Adoption" has been able to explain 0.682 of the variance in the "Problem-Solving Process" variable. Researchers have proposed 0.19, 0.33, and 0.67 as benchmark values for weak, moderate, and strong R^2 coefficients, respectively. Accordingly, it can be concluded that the model has a high predictive capability. The remaining value pertains to prediction error and may include other factors affecting the problem-solving process.

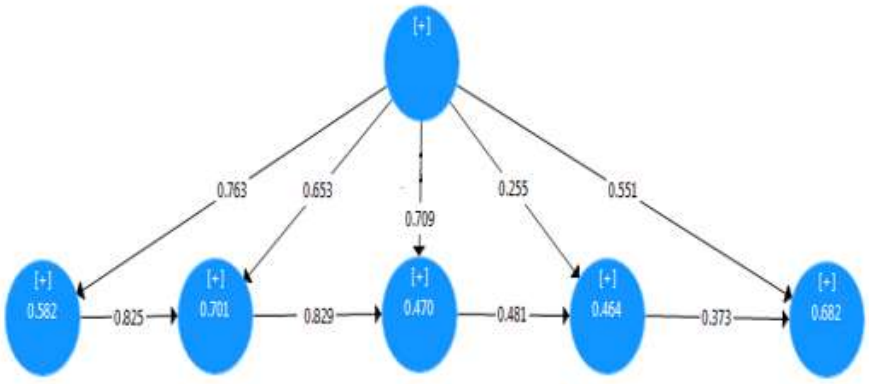

Figure 4 – Evaluation of Formative Measurement Models

PLS Model Fit

One of the fundamental differences between LISREL and Partial Least Squares (PLS) is the inadequacy of traditional fit indices for assessing models estimated using PLS. Although existing PLS algorithms report fit statistics such as the Bentler-Bonett Normed Fit Index, these statistics are based on the assumption that estimated model parameters minimize the difference between the observed and reproduced covariance matrices—an assumption not inherent to PLS.

Tenenhaus et al. (2005), however, introduced a global model fit index for evaluating the overall fit in PLS models. The Goodness of Fit (GOF) index is calculated as the geometric mean of the average communality and the average R^2:

$GOF = \sqrt{(\text{average communality} \times \text{average } R^2)}$

According to Tenenhaus et al. (2005), the GOF index provides a practical solution for assessing the overall model fit in PLS, functioning similarly to fit indices in covariance-based approaches. It can be used to evaluate the overall validity or quality of a PLS model. The GOF index, like LISREL fit indices, ranges from zero to one, with values closer to one indicating better model quality. However, it is essential to note that, unlike chi-square-based indices in LISREL, the GOF index does not measure the fit of the theoretical model to the observed data; rather, it assesses the model's overall predictive power and whether the tested model has been successful in predicting the endogenous latent variables.

Table5 – Communality Test

Variable	Communality
Social Media Adoption	0.887
Problem Identification	0.902
Problem Association	0.897
Problem Solving	0.910
Solution Standardization	0.884
Problem-Solving Learning	0.819

The average communality was calculated using the following formula:

$\text{Communality} = (1/N) \times \sum \text{Communality}$

The average communality is 0.883.

The R^2 value was 0.682, as observed from the standardized path coefficients output. Based on the GOF calculation formula, we have:

$GOF = \sqrt{(0.883 \times 0.682)} = 0.640$

The GOF index ranges from zero to one. Wetzels et al. (2009) suggested that benchmark values of 0.01, 0.25, and 0.35 represent weak, moderate, and strong GOF, respectively. Given the value of 0.640, the research model demonstrates a high level of overall fit.

Table 5 – Summary of Research Hypotheses Results

Hypothesis	Standardized Path Coefficient (β)	t-value	Significance	Hypothesis Supported/Rejected
Social Media Adoption → Problem Identification in Technology-Oriented SMEs	0.763	14.447	Sig < 0.05	Supported
Social Media Adoption → Problem Association in Technology-Oriented SMEs	0.653	7.595	Sig < 0.05	Supported
Social Media Adoption → Problem Solving in Technology-Oriented SMEs	0.709	5.285	Sig < 0.05	Supported
Social Media Adoption → Solution Standardization in Technology-Oriented SMEs	0.255	2.318	Sig < 0.05	Supported
Social Media Adoption → Problem-Solving Learning in Technology-Oriented SMEs	0.551	7.529	Sig < 0.05	Supported

Discussion and Conclusion

The findings of the present study demonstrate that social media adoption in technology-oriented small and medium-sized enterprises (SMEs) located within Alborz province's industrial zones exerts a positive and significant impact on several aspects of organizational problem solving. As revealed by

the path analysis, the strongest effects were observed for problem identification and registration (β=0.763) and improving problem association (β=0.653). This suggests that the use of social media enables organizations to rapidly and broadly gather information, exchange tacit knowledge, and provide timely alerts on operational challenges.

These results are closely aligned with the findings of international studies such as Kim et al. (2024) and Garcia & Martinez (2023), which emphasize the role of social media in enhancing teamwork and information sharing within industrial contexts. Domestically, research by Rahmani et al. (2023) and Shariati & Mohammadi (2022) has highlighted the role of social media platforms in experience transfer, collective learning, and increased engagement in decision-making processes.

The findings of the current research clearly indicate that social media adoption not only improves the identification and diagnosis of root problems but also, by enabling interactive organizational learning, creates an environment for the generation of creative ideas in the problem-solving process (β=0.551).

At the same time, the relatively lower impact of social media on solution standardization (β=0.255) suggests that converting individual and collective experiences from online interactions into formal, referenceable knowledge still requires the development of complementary organizational mechanisms and interventions. Consistent with international studies such as Kim et al. (2024), integrating knowledge management systems with formal documentation processes and targeted training for standardizing procedures can help bridge this gap. This is also emphasized in domestic research (e.g., Davoudi et al., 2021), identifying the reinforcement of documentation infrastructures and formalization of knowledge as essential for sustaining organizational learning.

Based on these findings, a practical recommendation for managers and policymakers is to establish a specialized Social Media and Knowledge Management Taskforce within firms. This unit, leveraging social media platforms, can structure and document processes for problem identification, idea synergy, and the sharing of successful experiences. By developing formal guidelines for transferring solutions to organizational procedures, creating incentive systems to enhance employee participation, and providing training on communication and digital documentation skills, the link between informal social interactions and formal problem-solving mechanisms can be strengthened. It is also recommended that technology-oriented SMEs draw on the experiences of leading international industries in utilizing social media as a complementary tool for knowledge management and organizational learning, and investigate possibilities for implementing hybrid strategies (such as digital data analysis and project-based organizational learning).

Finally, for future research, it is recommended that mediating or moderating variables—such as organizational culture, the digital maturity level of firms, and industry type—be considered in similar models to outline a more precise and comprehensive pathway for the effective utilization of social media in organizational problem solving.

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