



Investigating the Effect of Customer Relationship Management and Open Innovation Processes on E-Business Performance with the Mediating Role of Product Innovation Agility; Case Study: Companies Based in Yazd Science and Technology Park

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Abstract

Objective: The current research aims to investigate the effect of customer relationship management and open innovation processes on e-business performance with the mediating role of product innovation agility; Case of study: Companies based in Yazd Science and Technology Park. **Methodology:** The number of samples based on the structural equation model was 5 for each item. According to the total number of items, which is equal to 30 questions, the number of the community was equal to 150 people. To collect the information needed to measure customer relationship management from the study scale of Sin et al. (2005), to measure the open innovation processes from the Aiti Mehr study scale (1400), to measure the agility of product innovation from the Ershadi study scale (2004) and to measure Business performance was used from the study scale of Itani et al. (2022). To analyze the data collected through the questionnaire, methods of confirmatory factor analysis and path analysis of structural equations from PLS software were used.

Findings: Based on the research results of customer relationship management and open innovation processes, considering the mediating role of product innovation agility, it has an impact on e-business performance. Open innovation processes and customer relationship management have an impact on product innovation agility in companies based in Yazd Science and Technology Park. Customer relationship management has an impact on open innovation processes in companies based in Yazd Science and Technology Park. Also, the agility of product innovation affects the performance of electronic businesses in Yazd Science and Technology Park.

Keywords: Customer Relationship Management, Open Innovation Processes, E-Business Performance, Product Innovation Agility.

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Introduction

The expansion of e-commerce has compelled organizations to reconsider their competitive strategies and enhance business performance in a turbulent and technology-driven environment. Infrastructure limitations in large corporations and resource constraints in small and medium enterprises have posed serious challenges to improving e-business performance. In this context, Customer Relationship Management (CRM), as a strategic approach to attracting and retaining customers, and Open Innovation, as a mechanism for simultaneously leveraging intra-organizational and extra-organizational knowledge, play pivotal roles in enhancing organizational performance. Furthermore, Product Innovation Agility, as a vital capability of technology-based organizations, enables rapid response to market changes, reduction of time-to-market, and adaptation of products to evolving customer needs. A review of research literature reveals that although the relationship between CRM, innovation, and organizational performance has received attention, the mediating role of Product Innovation Agility in explaining the mechanism through which CRM and Open Innovation affect e-business performance has been less examined in an integrated manner. Accordingly, the present research, by presenting a comprehensive conceptual model and focusing on companies located in Yazd Science and Technology Park, aims to simultaneously explain the effect of CRM and Open Innovation Processes on e-business performance with the mediating role of Product Innovation Agility, and seeks to fill the existing gap in research literature in competitive and digital environments. The research hypotheses are as follows:

1. CRM and Open Innovation Processes, considering the mediating role of Product Innovation Agility, affect e-business performance.
2. Open Innovation Processes affect Product Innovation Agility in companies located in Yazd Science and Technology Park.
3. CRM affects Open Innovation Processes in companies located in Yazd Science and Technology Park.
4. CRM affects Product Innovation Agility in companies located in Yazd Science and Technology Park.
5. Product Innovation Agility affects e-business performance in companies located in Yazd Science and Technology Park.

Previous studies have shown that electronic CRM has a positive and significant effect on innovation capability and through it affects competitive performance (Moeini, 2024). Additionally, electronic CRM positively affects marketing performance through product innovation development, and customer knowledge also plays an important role in this relationship (Arabshahi & Abbaszadeh Qareh Tekan, 2023). Product Innovation Agility connects suppliers to manufacturing companies and companies to customers, and for proper management of the supply chain, excellent customer service, low costs, and short cycle time are essential (Pooya, 2021). In international studies, CRM systems have the strongest positive effect on business performance, and technology turbulence moderates this relationship (Martino et al., 2025). Moreover, IT dimensions including CRM, knowledge management, and human resource management affect organizational agility through innovative performance, and innovative performance plays a mediating role in this relationship (Homayoun et al., 2024). However, a clear research gap in the literature is that an integrated model that simultaneously examines CRM and Open Innovation Processes as influential variables and Product Innovation Agility as a mediating construct in relation to e-business performance has been less investigated.

Methodology

The present research falls under applied research, and according to the classification of research types based on nature and method, the research method is descriptive-survey in terms of nature. The statistical population of the present research includes all managers and experts of companies located in Yazd Science and Technology Park, numbering 410 in the IT Growth Center. The sample size was



determined according to the questionnaire items (the sample size rule equivalent to five times the number of questionnaire questions based on Delavar's (2021) opinion). Since the questionnaire items were 30, the sample size was estimated at 150. Data collection was carried out using a questionnaire. To measure CRM, the scale from the study by Sin et al. (2005) was used; to measure Open Innovation Processes, the scale from the study by Aytey Mehr (2021) was used; to measure Product Innovation Agility, the scale from the study by Ershadi (2015) was used; and to measure business performance, the scale from the study by Itani et al. (2022) was used.

There are various ways to gather evidence of research instrument validity, including: content validity, face validity, and construct validity (convergent, divergent, and internal consistency evidence and factorial validity). In the first stage of the research, for face validity examination, the questionnaire was provided to university professors and other available experts, emphasizing that in qualitative content validity assessment, items such as: grammar compliance, use of appropriate words, importance of questions, placement of questions in their appropriate position, and completion time of the designed instrument should be considered. Finally, their opinions were applied to the questionnaire with minor changes. In the second stage of validity examination, expert opinions regarding the degree of content alignment of the measurement instrument with the research objective were used. After validity assessment, to examine questionnaire reliability, the internal consistency method (Cronbach's alpha method) was used; after a preliminary study (pilot) on a 20-person sample and return of questionnaires, collected data were entered into SPSS 23 software and their Cronbach's alpha was calculated. Ultimately, after completing stages of 1. content validity, 2. split-half, 3. reliability (Cronbach's alpha), and 4. test-retest, the research instrument was prepared. To describe and analyze information, descriptive and inferential statistics and SmartPLS 3 software were used.

Findings

The demographic information of study participants was as follows: Based on information obtained from questionnaire collection, 33.33% (50 persons) were female and 66.67% (100 persons) were male. 13.8% of respondents were under 25 years old (20 persons). 39.8% of respondents were between 25-36 years old (60 persons), forming the largest number of respondents. 26.3% of respondents were between 36-45 years old (40 persons). 10.4% of respondents were between 46-55 years old (16 persons). 9.6% of respondents were over 56 years old (14 persons), forming the smallest number of respondents. Most respondents had a Master's degree (44.5%) and the least, 15.6% of respondents, had a PhD.

Data analysis showed that the distribution of CRM and Open Innovation Processes variables does not follow normality, as skewness and kurtosis values fall outside the permissible range (-1 to 1); therefore, using the Partial Least Squares approach in structural equations was necessary. Multicollinearity examinations also indicated that independent variables had variance inflation factor less than 5 and tolerance higher than 0.1, and multicollinearity problem was not observed in the model. Construct convergent validity was also confirmed, such that diagonal values for each latent variable were greater than its correlation with other latent variables in the model, indicating proper construct discriminant validity. In terms of model explanatory power, CRM explains 80% of Open Innovation Processes variance, Open Innovation Processes and CRM jointly explain 87% of Product Innovation Agility variance, and Product Innovation Agility explains 78% of business performance variance. The redundancy index (Stone-Geisser) for all dependent variables was greater than zero, indicating the model's proper ability to predict observed values. Finally, path analysis results at the 0.001 significance level indicate confirmation of all five research hypotheses: Open Innovation Processes with path coefficient 0.51 ($t=10.86$) on Product Innovation Agility, CRM with coefficient 0.89 ($t=6.94$) on Open Innovation Processes and with coefficient 0.44 ($t=9.50$) on Product Innovation Agility, and Product Innovation Agility with coefficient 0.88 ($t=5.25$) have significant effects on business performance of companies located in Yazd Science and Technology Park.



Discussion and Conclusion

The main objective of this study was to investigate the impact of customer relationship management and open innovation processes on e-business performance with the mediating role of product innovation agility. Research findings indicate that CRM and Open Innovation Processes have positive and significant effects on e-business performance through the mediating role of Product Innovation Agility. Results suggest that integrating CRM systems with open innovation accelerates knowledge flow, improves organizational response to market changes, and enhances agility in product development. Product Innovation Agility, as a key strategic capability, plays a decisive role in improving financial and non-financial performance of technology companies. From a theoretical perspective, this research enriches innovation management and e-business performance literature by presenting an integrated framework based on the interaction between CRM, open innovation, and Product Innovation Agility. From a practical perspective, results emphasize the necessity of targeted investment in CRM systems, design of open innovation processes, strengthening IT infrastructure, and developing an organizational culture based on learning, stakeholder interaction, and organizational agility in technology companies located in Yazd Science and Technology Park.

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