Advances in Industrial Engineering, June 2024, 58(1): 159-178
DOI: 10.22059/aie.2024.370560.1884

RESEARCH PAPER

Innovation and Technology for Neutralizing Organizational Inertia: A Structural Equation Modeling (SEM) Approach

Mahdi Ebrahimi[1*], Hossein Kouroshi Zaer[2], Milad Daei Nabi[3]

[1]*Associate Professor, Business Management Department, Allameh Tabataba'i University, Tehran, Iran.*
[2]*M.Sc., Business Management, Business Management Department, Allameh Tabataba'i University, Tehran, Iran.*
[3]*Ph.D. Candidate, Business Management, Business Management Department, Allameh Tabataba'i University, Tehran, Iran.*

Received: 03 January 2024, Revised: 26 April 2024, Accepted: 11 May 2024

Abstract

In today's competitive business environment, particularly for small and medium-sized enterprises (SMEs) in the information and communication technology (ICT) sector, survival hinges on the ability to innovate. Business Model Innovation (BMI) plays a pivotal role in driving competitiveness and enhancing performance. However, many organizations face organizational inertia, which can impede their ability to adapt to environmental changes, limiting their capacity to evolve. Organizational competencies and capabilities may play a crucial role in how businesses respond to these challenges. This study investigates the relationship between organizational inertia and BMI, focusing on the moderating effects of open innovation competencies and Information Technology (IT) ambidexterity. The research targets software companies in Tehran Province, Iran, within the ICT industry. The findings reveal that organizational inertia has a significant negative effect on BMI, highlighting the need to address inertia to foster business model innovation. Additionally, open innovation competencies serve as a key moderator in this relationship, suggesting the importance of developing these skills within organizations. Conversely, the moderating effect of IT ambidexterity was found to be insignificant.

Keywords:
Organizational Inertia, Business Model Innovation, Open Innovation Competencies, IT Ambidexterity

Introduction

Industries are undergoing substantial changes to remain competitive and successful in today's globalized business environment 1 and companies are looking for unique strategies and innovative tactics 2, including innovation in their business models which is increasingly considered as the main driver of value creation over competitors to achieve superior performance and competitive advantage 3-4. Research on business models has developed rapidly during the past decade, as it is considered to provide solutions for corporations to monetize products or services 5. However, BMI is challenging for well-established companies as they need to leverage existing capabilities, market knowledge, and stakeholder relationships in such an ongoing process, with the promise of long-term success for those that continuously

* Corresponding author: (Mahdi Ebrahimi)
Email: ebrahimistgm@atu.ac.ir

innovate their business models in response to the ever-changing market conditions and customer needs 6.

On the other hand, some organizations may suffer from organizational inertia which has an adverse effect on organizational performance and prevents companies from dealing with the changes in their environment 7. Tsai et al. 8 noted organizational inertia to be the most significant factor that causes inability to identify opportunities and threats with precision and timely which, therefore, reduces the company's flexibility and decelerates adaptation to its environment. Organizational inertia is a barrier to effectiveness, organizational change and innovation in organizations and a barrier to accepting new IT developments, which itself makes the attempt to change business model more difficult 9.

Since the seminal work by Chesbrough 10, scientific awareness about open innovation has significantly increased exponentially 11. Open innovation enables companies to save money and time, utilizing both internal and external resources and knowledge and thus, provides the grounds for the introduction of new products/services. Consideration of open innovation for Small and Medium Enterprises (SMEs) is important as they are the backbone of the economy while in comparison to large enterprises, they have different network features, are prone to more risks due to their rather insignificant market influence and their vulnerabilities. SMEs also possess fewer resources, however the same is their main motivation to look beyond their organizational boundaries and quite contrary to what is expected, they might heavily engage in open innovation activities 12. However, successful open innovation requires specific organizational competencies.

Organizational learning theory identifies exploration and exploitation as two tools for companies to utilize their resources and capabilities. Recent empirical studies have demonstrated the value of simultaneous application of the two processes, known as ambidexterity. Now, IT ambidexterity as the ability to adapt the existing IT resources with the business environment and current demands, and concurrently, focusing on development of IT resources for the sake of long-term benefits 13 was found to have a positive effect on organizational performance and so, has increasingly become a fundamental capability for contemporary business enterprises 14. It is further noted that such a dual capacity for exploration and exploitation of IT resources and methods is what enables companies to flexibly respond to changes in the market. Both of these are required for companies to achieve successful performance in the market 15, 16.

This is while the limited resources of SMEs impose a need on them for extra-organizational assistance, especially concerning new technologies, ideas, know-how. Now, software SMEs not only base their business on ICT but also their growth depends on it. Looking forward, it is predictable that the software industry will continue to undergo extensive changes and turbulence. Companies, therefore, will attempt to utilize flexibility, create and use open innovation and ambidextrous capabilities with software development and product deployment processes which can change their business model. Although change might bring several unexpected opportunities, it has also interrupted many traditional common practices. SME's are no exception and so, it cannot be expected for them to compete solely based on common parameters such as superior products and services. Instead, what is needed for them is a reconsideration of the approaches towards business models. The same way companies can produce diverse products and services, they can create various business models and so, business model innovation (BMI) has become a necessary factor for success.

As said, organizational inertia is an obstacle to the growth of the SME's. It is therefore a necessity for them to pay enough attention to this issue to prevent inherent negative impacts of organizational inertia so that, they can timely respond to changes, grow continuously and gain competitive advantage.

In this regard, companies in developed countries have adapted their administrative system

with the changes, particularly in ICT. In Iran, however, many managers are still inclined to place their systems and even strategic policies based on the old traditions and administrative methods. This caused the companies not to be very adaptive to the digital era. If not addressed properly, as the organization grow the negative inertia also grows in the organization. Then comes a day when the organization faces uncertainty and although the organization might have talents, it cannot make changes in its business model and perform flexibly and eventually suffers from the lack of capabilities required to compete in the industry. For this reason, studying all dimensions and types of organizational inertia to understand and prevent that is important 17.

Based on the above, organizational inertia is a barrier for organizations in innovation and modification of their business model. BMI also should be considered for survival and organizational inertia should be prevented accordingly. Despite several researches on BMI, there are a number of theoretical gaps. Past research mostly considered one or two influencing variables. For instance, Manteghi and Sabeti Saeedi 18 studied business models for their principals, evaluation and innovation. However, the effect of organizational inertia and IT ambidexterity that are attended here, were not included specifically. Pahlavan Ravi and Naseri 19 have investigated the relationship between organizational inertia and innovation with the mediating role of job security. They, however, did not consider the dimensions of organizational inertia or open innovation in their research. Jui-Chan et al. 20 have particularly studied organizational inertia, BMI and organizational performance from the organizational learning perspective. However, our assumed variables of IT ambidexterity or open innovation competencies were not included therein. Latilla et al. 21 have case studied organizational re-design for BMI while exploiting digital technologies without considering the influence of IT ambidexterity, open innovation and the effect of organizational inertia. It should be also noted that there are few studies in this field with a focus on SMEs. Considering the above, we aimed to study the relationship between organizational inertia and BMI while considering the moderating role of open innovation competencies and IT ambidexterity for the first time among software SMEs within the Information and Communications Technology (ICT) industry in Tehran Province, Iran.

Theoretical Framework and Hypotheses

Organizational Inertia

According to the principal of inertia in physics, a body is reluctant to change its state of uniform motion or state of rest unless outside forces act upon it. Accordingly, if an object in motion is not interrupted, it will continue its motion on the predicted track 22. Therefore, inertia is the resistance to change the motion state of an object. The same concept has been applied in organizational studies and so organizational inertia is defined with several characteristics such as the dependence of an organization on its present strategies, maintaining and continuing the present state of the organization with a resistance to change induced by external pressures, also extreme tendency towards current direction, procedures and operations of the organization with prejudice in order to maintain the status quo, including current knowledge and skills and inability of the organization to change in face of external changes and ignoring the changes in the external environment while conducting business as usual 20, 22 -26.

A key concept extracted from the definitions is the matter of organizational change which is given rise by a series of factors and drivers caused by the external environment such as new competitors, technologies, governmental rules and regulations, or even from within the organization such as managers with or without required qualifications and skills. Further, resistance is the greatest obstacle and even may neutralize the efforts to implement change. Resistance to change covers any action or inaction which its purpose is to maintain the status

quo against any factor that intends to change the present state 27 and therefore, organizational inertia, which is clearly a change resisting organizational phenomenon, causes inflexibility and is generally a negative concept as it leads to inefficiency 9.

The ability of regular transformation is critical in the attempts to adapt to external challenges; however, changes to an organization's fundamental characteristics may increase the likelihood of failure. Because of this, organizational restructuring efforts may lead to cynicism, which appears to be one of the most significant obstacles facing contemporary businesses. Organizational inertia is the term used to describe this aversion to change, as well as the desire to maintain the current status quo. According to Teofilus et al. 28 a new organizational culture capable of combating the incidence of organizational stagnation is required by massive social, economic, and technological difficulties. It is therefore of importance for organizations to be aware of and respond to the immediate threats and, if a company recognizes a threat to its survival, all managers should participate in the attempts to reduce inertia levels through performing several changes in work routines 29.

Organizational inertia, however, has been conceived by various researchers and so, entails various dimensions. In this research we consider the following six dimensions for organizational inertia. Firstly, insight inertia is defined as an interruption in the learning cycle of the organization, misinterpretation, untimely consideration and inability to make sense of the signals from the external/internal environment for a suitable response 30-32 and as a result, the organization fails to, is blocked and is distorted from an effective analysis of the environment and reality testing in a timely manner which obstructs the very required organizational adaptation 33.

The second dimension is knowledge inertia. In the face of similar problems, we may use the same methods repeatedly in order to save time and avoid the risks of change. The problem solving method for any given issue, however, may become inertial if the knowledge in an organization is not revised or updated and the reliance is maintained on past experiences and knowledge 34. Knowledge inertia prevents organizations from learning to gain new knowledge, reduces the plausible options and is an obstacle for developing suitable strategies and the organization becomes predictable for the competition. Further, the negative impacts of that may endure for decades in an organization 34, 35.

The third dimension we discuss herein is action inertia and appears when the information gathering efforts about the changing environment are insufficient and responses are too slow, preventing a timely beneficial adaptation 31. This dimension is closely related to organizational learning issues as an underlying factor causing organizational members not to act properly on their newly gained knowledge or are incapable of convincing other organizational members to act on the new knowledge acquired by them, or incorrect conclusions to be made about the organizational actions 30. There are also other learning-related factors that are based on organizational memory, particularly failure to include positive results of a solved problem into the organizational memory, failure to integrate past learnings into organizational memory, and circumvention of the organizational rules, policies and procedures due to their incompatibility with a given situation 33,36 - 37.

The fourth dimension is psychological inertia which is defined as an acquired, non-deliberate and goal-directed pattern, whether behavioral or mental, that arises in response to typical situations but is an obstacle for innovative solutions 38, 39. Resistance to change by the organizational members stems from past behavior without regard to the necessity of such a change 33, 39due to negative emotions that overwhelm them 40 or due to emotional attachment to the current functioning methods 24 preventing from rationality where analysis and clear understanding of the situation is a necessity 33.

Structural inertia is the fifth dimension. Hannan & Freeman 41 explained structures have high inertia when the reorganization process takes place much slower than the rate of change

in the conditions of the environment, with a tendency for stability in the form of difficulty changing the organizational structure. Haag 9 points out that inflexibility, rigidity and therefore resistance of the organization's structure, processes and procedures to the necessity of change could be favorable if the current way of doing things is more beneficial than the conceived alternatives. However, he notices that in most cases, such an attachment to the status quo leads to inefficiencies.

The last dimension we considered is economic inertia which relates to cost saving efforts and the experience of sunk costs especially concerning previous investments for changing processes and the transition expenses which actually led to inflexibility and maintaining the status quo 9. The organizational members continually choose to apply previous methods, as there are concerns about cost and time required for new learnings or the already invested cost and time for learning such previous methods 9

Business Model and BMI

There are a number of approaches for defining the concept of business model. Writz & Writz 42 classified them as first, the technology-oriented approach, from which Timmers 43 defined business model as an architecture for the products, services and information flows that describes the various actors, potential benefits for them and the sources of revenues. Afuah & Tucci 44 then defined it as a method utilized by the organization to build and use resources in order to offer better value than its competitors. Second is the organization-oriented approach which is concerned with structure and, thereby, business model is defined as a description of interaction of operating processes, systems, organizational structures and corporate culture that helps the organization to realize the customer benefit 45 or as the organization's fundamental logic for value creation that highlights its distinctive activities and approaches enabling the organization to succeed 46. The third approach is strategy-oriented, which specifically considers competitive aspects and attempts to connect strategy and the business model while particularly focusing on value-added logic and core competencies, altogether describing the aggregate business activities. From this approach, business model is a business concept put into practice and therefore, renewing business concepts leads to developing new streams of value creation 47.

Despite several approaches and definitions, it is evident from literature that the majority of classifications are from a component-oriented perspective and so, presenting the components of a business model is of high importance 48 as with them, business models can be divided into building blocks 49.

Osterwalder & Pigneur 50 defined business model as a description of the rationale for how an organization creates, delivers and captures value. They further provide nine building blocks for business models through which they can be described, covering customers, offer, infrastructure and financial viability as the main areas of a given business. These nine components are value proposition, customer segments, key resources, key partnerships, key activities, customer relationships, channels, revenue streams and cost structure.

BMI which is a sub-area of business model management and has received a great deal of attention from researchers in this area and even non-academics, however research on the antecedents of BMI is still evolving 51, 52.

BMI is an important construct in strategic management and entrepreneurship 53. In a world of scarce resources not only for humans but also for businesses, the most innovative way of doing businesses is chosen to preserve resources which has affected business activities and operations by change 54. Meanwhile, enterprise innovation has always been an attractive subject in enterprise development and theoretical research and the need for implementing the results in the real world has made innovation even more critical to business operations and their development 55.

BMI has also been defined by various researchers. Lindgradt et al. 56 defined it as reinvention of two or more elements of a business model to deliver value in a new way. Giessdoerfer et al. 57 call it either a process of transformation from one business model to another or the creation of entirely new business models. Osterwalder and Pingneur 50 also point out the role of the business model designer, being able to take the components of a business model to create completely new business models. Therefore, it is the core elements of the business model that are subject of innovation 51. Based on the components of a business model defined by Osterwalder & Pigneur 50, we consider new value propositions, new customers and markets, new key resources and capabilities, new key partnerships, new key activities and processes, new customer relationships, new channels, new revenue streams and new cost structure as the dimensions for BMI.

Organizational Inertia and BMI

Inability to break organizational inertia for a company in a timely manner leads to considerable challenges for the development and even survival of a company, affecting their transformation and innovation 58. Therefore, inability of an organization to change its processes and performances in light of new conditions and changes in the environment is organizational inertia, which is a major reason that companies cannot modify or change their business models or avoid them. Researchers believe that such forces are the root of resistance and become a kind of barrier to make changes in response to new conditions in the environment 59,60.

As business model design is an essential source of innovation in the current competitive world, BMI is a way to create or reinvent an existing business model by designing novel value-creation systems, proposing new value propositions, and building original value-capturing mechanisms. However, to proceed with BMI in any given organization, the inertia to change is a substantial barrier which probably neutralizes any thoughts of innovation 61, 62. Peter 63further addresses that even companies blessed with success struggle with BMI due to organizational inertia. Based on all the above, a significant relationship between organizational inertia and BMI is expected and thus, we hypothesize:

Hypothesis 1

There is significant relationship between organizational inertia and business model innovation

Open Innovation

There are two models of innovation. The traditional model of innovation in which internal innovation activities are expected to lead to internally developed products and services and open innovation which, is conceived as an antithesis for the former 64. Open innovation is the use of inflows and outflows of knowledge in a purposeful way in order to accelerate internal innovation and expand markets to use innovations externally 65. It is a systematic attempt to explore and exploit sources for innovation opportunities 66. Basically, as Chesnrough 67 modeled it, an organization can commercialize ideas coming from inside or outside the organization for the benefit of its innovation process. However, open innovation exceeds mere utilization of external sources of innovation and is as much a change in the use, management and employment of what is acquired 66 and thus, is a strategy to innovate by incorporating knowledge from both outside and inside sources, exploiting their knowledge, and exploring the knowledge of the environment. This solution is relevant for SMEs because it enables them to survive and thrive in the present turbulent and dynamic competitive environment, to increase their performance and even to reach competitive advantages 68. Furthermore, open innovation is considered as the main driver of change in a business sector in need of flexibility, resilience

and rapid adaptations 69.

In order to leverage external sources, particularly in an outside-in process which is enrichment of the knowledge base through external knowledge sourcing and integration of suppliers and customers 70, literature suggests three main steps in the process of open innovation. The first step is to acquire knowledge and/or actually obtain innovations from external sources. Then, such knowledge should be integrated into the organization's knowledge and innovative activities. The last step is commercialization of the innovation which should be in line with the business model of the organization 71. However, for these steps to be realized, the organization should have appropriate competencies for open innovation. The first is organizational readiness, which entails structural, process and cultural readiness for acquiring knowledge and making changes in the organization. The second competency is collaborative capability. This is the central competency for open innovation as the latter requires integration and leveraging mechanisms running relationships within the organization and between the organization and the external environment in the form of networking and collaborations. The last one is categorized as the absorptive capacity, which is the ability of the organization to recognize what is valuable in the external environment and internalize it to be applied and exploited accordingly 72.

In our study, we consider these three as the dimensions of the required competencies at the organizational level for open innovation. It is also recalled that a number of organizational factors, including structure, culture and leadership, among others have an influence BMI and should be aligned with such efforts while the same is closely related to the matter of organizational inertia 73.

Therefore, open innovation competencies are expected to moderate the relationship between organizational inertia and MBI and so, the following hypothesis is postulated:

Hypothesis 2

Open innovation Competencies moderate the relationship between organizational inertia and business model innovation

IT Ambidexterity

Organizational ambidexterity is the ability of an organization to go after exploitative and explorative changes at the same time 74. Such an ability resembles the alignment and efficiency of the way the organization manages its current business demands and at the same time, to be adaptive to the changes in the external environment 75 and so, an organization with such an ability has the capability to explore new opportunities and exploit its exiting competencies 76.

It is noteworthy that in the contemporary business landscape, information technology (IT) assumes a crucial role in enhancing the competitive edge of organizations. It serves as a pivotal factor in determining the competitiveness of organizations, while also providing support to a multitude of other business processes 77, 78. Heckmann 79 defines IT ambidexterity as simultaneous pursuit of both exploitative and explorative IT capabilities by the organization towards a business purpose. IT exploitation is about being capable of using and managing the existing IT resources, technologies and practices within the organization in order to strengthen their efficiency and IT exploration is about having the flexibility to seek new IT resources, technologies and practices and to adapt and combine them to create new IT capabilities 15- 16, 77.

Despite positive implications of IT ambidexterity for organizational agility or performance in literature, little attention has been paid to how to foster IT ambidexterity 80. Benitez et al. 14 pointed out that IT ambidexterity has a positive effect on the performance of organizations and also enables the organizations to respond to changes in the external environment with more flexibility and to better respond to the demands of the business 15, 77-78. Bimodality of the IT

function is one answer to the changed expectations of IT's role within an organization which aims to leverage ambidextrous capabilities, allowing it to engage in explorative and exploitative activities at the same time 81.

However, such an IT ambidexterity capability calls for change and as accepting IT systems usually requires significant organizational change, an inertial response to their adaptation is an obstacle 24. Therefore, organizational inertia is a barrier to acceptance of new IT capabilities. Further, IT exploration is considered as an enabler of organizational learning which has a significant role in BMI, while IT exploitation supports the integration and application of the learnings. Thus IT capabilities can be leveraged for BMI 82. We, accordingly, advance the following hypothesis:

Hypothesis 3

IT ambidexterity moderates the relationship between organizational inertia and business model innovation.

Based on the above, we present an overview the conceptual framework of this research and our hypotheses in Fig. 1.

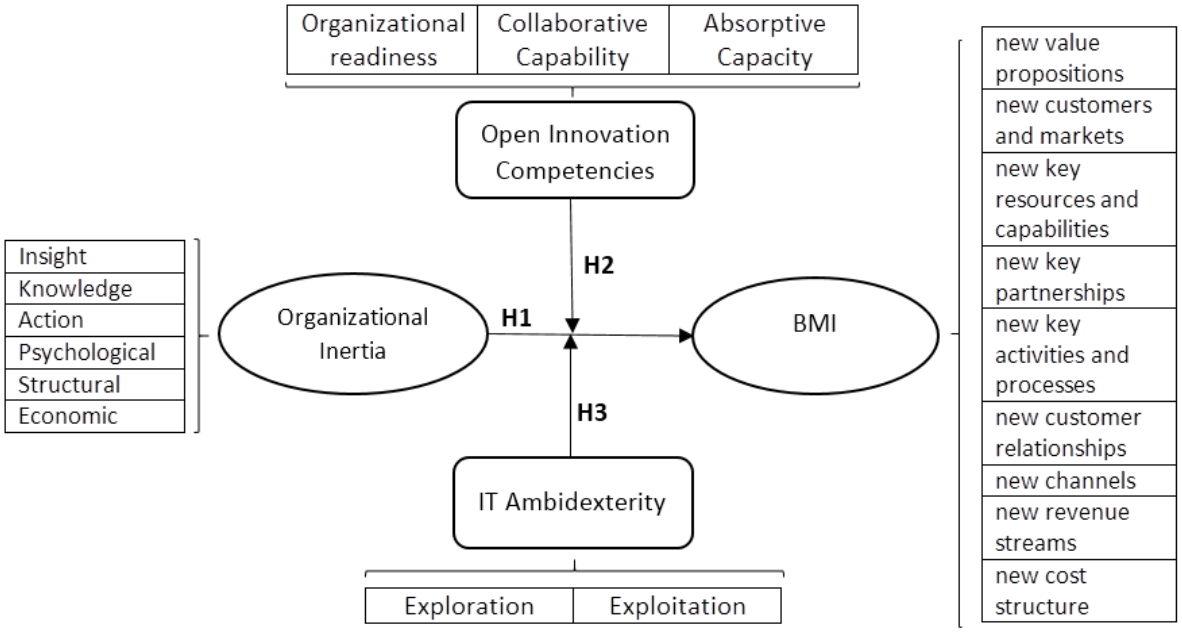

Fig 1. Conceptual Framework and Hypotheses of the Research

Method

The purpose of this research is to study the relationship between organizational inertia and BMI while considering the moderating roles of open innovation competencies and IT ambidexterity among software SMEs in ICT industry in Tehran, Iran.

In terms of purpose, this research is an applied one as it was our aim to address a practical issue and to provide solutions to the software SMEs' community. We followed the positivist paradigm and so in terms of data collection for this quantitative study we conducted a cross-sectional survey. In the context of this study, the target population comprises software SMEs operating within the ICT industry in Tehran Province, Iran. A comprehensive list identified a total of 164 active companies falling within this target population. Based on Eq.1, where N (=164) is the population, p (=0.5) is the percentage of people who have the trait under study, q (=0.5) is the percentage of people who do not have the trait under study, z *(=1.96)* is the

percentage of the standard error of the acceptable reliability coefficient and d*(=0.05)* is the desired degree of confidence or possible accuracy, the sample size (*n*) was then determined 115 companies using Cochran formula 83. The sampling method at company level was accidental sampling. However, at individual level, we used purposive sampling method and thereby we distributed questionnaires between 1 to 3 of the managers and specialists at each company.

$$n = \frac{\frac{z^2 pq}{d^2}}{1 + \frac{1}{164}\left[\frac{z^2 pq}{d^2} - 1\right]} \quad (1)$$

For data collection, our Likert 5-scale questionnaire comprised of 53 questions (Appendix). It was developed by drawing upon existing literature and tailored to suit the unique requirements of our research setting. The first 18 questions were measuring organizational inertia based on Liao 22 and Moradi et al 61. BMI was measured with questions 19-37 based on Clauss 84. IT ambidexterity was then measured through questions 38-42 adapted from Zhen et al. 85 and finally, open innovation competencies via questions 43-53 based on Hafkesbrink & Schroll 72.

We tested the data for their normality by calculating skewness and kurtosis [86]. SPSS software to analyze the demographic characteristics.

To confirm the validity of the questionnaire a total of 10 experts and professors provided their insights to refine the literature of the questionnaire and adapt it to better align with the context of participants. To assess construct validity we used the confirmatory factor analysis method 73. Reliability was tested by Chronbach's alpha coefficient using Eq. 2 where *J* is the number of subsets of questionnaire or test questions, S^2_j is the variance of the Jth subtest and S^2 is the variance of the total test.

$$r_a = \frac{J}{J-1}\left(1 - \frac{\sum S_j^2}{s^2}\right) \quad (2)$$

The resulting Chronbach's alpha for the whole questionnaire was 0.943, for organizational inertia was 0.887 and for BMI was 0.861. Chronbach's alpha for open innovation competencies and IT ambidexterity were 0.821 and 0.766, respectively. Since a result above 0.7 is acceptable, it is evident that all constructs are reliable.

Finally, we tested our hypotheses using structural equations modelling to explain more complex patterns of relations among sets of variables 88 and particularly the relationships between independent and dependent variables, which should be analyzed while considering the moderating variables. We used Smart PLS 2 software for our analysis of the paths according to the proposed conceptual model 89.

Results

Descriptive Analysis

In this research 120 questionnaires were complete and analyzable corresponding to 120 respondents, of which 80.8% were male (19.2 female), 41.7% were 30-40 years old, and 27.5 were between the ages of 40-50 and 24.2% were younger than 30 years old and only 6.7% were above 50. In terms of education, 39.1% had an undergraduate degree, 51.7 % held a master's degree and 9.2% held a PhD degree. Work experience of the respondents was distributed as 26.7% less than 5 years, while 35% had experience between 5-10 years and 21.7% between 10-15 years, and the remaining 16.7% had an experience of more than 15 years. In terms of organizational level, 43.3% were at expert level, 19.2% were a deputy and 37.5% were

managers of their division. The corresponding organizational size of the respondents indicated that 48.3% worked in an organization where the number of employees was less than 10 and 35% in an organization with 10-50 employees and only 13.3% and 3.3% worked in organizations with 50-100 employees and over 100 employees, respectively.

Table 1 shows the means, standard deviations and normality testing for all main variables and their factors. Skewness and Kurtosis values for all factors were in the range of ±3 and therefore, we confirmed that our data is normally distributed 90. Since the Likert 5-scale was used in the questionnaires, the results were converted to a quasi-interval scale. Table 2 shows the Pearson's Correlation between the variables indicating a significant relationship among all variables with a confidence level of 99%. It is noted, however, that there is a negative relationship between organizational inertia and BMI. It is further noted that the relationships between open innovation competencies and IT ambidexterity are positive with BMI and negative with organizational inertia.

Table 1 Means, standard deviations and normality testing of the variables

Main Variable	Factor	Mean	SD	Skewness	Kurtosis
Organizational Inertia	Insight	2.906	1.046	0.059	-0.856
	Knowledge	2.783	1.080	0.201	-0.588
	Action	2.658	0.934	0.014	-0.680
	Psychological	2.594	0.970	0.404	-0.416
	Structural	2.575	0.928	0.121	-0.707
	Economic	2.603	0.900	0.497	-0.336
BMI	new value propositions	4.383	0.679	-0.979	0.151
	new customers and markets	3.242	1.008	-0.279	-0.745
	new key resources and capabilities	3.936	0.894	-0.790	-0.052
	new key partnerships	3.492	1.079	-0.218	-0.798
	new key activities and processes	3.492	1.035	-0.324	-0.579
	new customer relationships	3.596	0.990	-0.311	-0.506
	new channels	3.792	0.866	-0.448	-0.448
	new revenue streams	3.638	0.941	-0.399	-0.584
	new cost structure	3.517	0.998	-0.421	-0.565
IT Ambidexterity	Exploration	1.792	0.632	0.400	-0.980
	Exploitation	1.900	0.697	0.176	-1.258
Open Innovation Competencies	Organizational readiness	3.513	0.784	-0.679	0.264
	Collaborative Capability	2.822	1.036	0.145	-0.761
	Absorptive Capacity	3.415	0.957	-0.225	-0.912

Table 2 Pearson's Correlation among variables

Variable	Organizational Inertia	BMI	IT Ambidexterity	Open Innovation Competencies
Organizational Inertia	1			
BMI	-0.876	1		
IT Ambidexterity	-0.317	0.261	1	
Open Innovation Competencies	-0.695	0.779	0.426	1

Inferential Analysis

The relationship between the main variables and the factors was examined through a confirmatory factor analysis. Factors were considered for analyzing the construct of the questionnaire and the components of each variable. The model underwent adjustments following confirmatory factor analysis (CFA) results. Furthermore, a second-order confirmatory factor analysis was employed to assess the scale model's total score validity 91. Results for the first order and the second order factors are presented in Tables 3 and 4,

respectively.

Reliability should be tested at the components level by measuring factor loadings and at the latent variable level through composite reliability criteria. At the indicator level, the value of factor loadings of the components should be at least 0.5 indicating that at least half of an item variance is explained by its latent variable 92. Factors' loading above 0.7 are desirable and below 0.4 should be eliminated, however values between 0.4 and 0.7 should be reviewed and should be removed if their elimination increased the AVE [93]. As Table 3 demonstrates, indicators for all latent variables have a factor loading value above 0.4 and are significant at the confidence level of 95% (t>1.96). We therefore conclude that all of the components are acceptably reliable.

For validity, multicolinearity is an issue, therefore, we used the variance inflation factor (VIF) to check for this. The respective formula is presented as Eq. 3 below where R^2 represents the coefficient of determination of the variable.

$$VIF_i = \frac{1}{1-R_i^2} \tag{3}$$

Henseler et al. 93 point out any VIF value greater than 1 should alert the researcher, but Hair et al [89] regard the issue of considerable multicolinearity to exist if such a value is greater than 5. As Table 3 presents, all VIF values are below 4 in our model and so, free of multicolinearity issue. Table 5 further provides results for composite reliability analysis and convergent validity of the model. This table shows the value of Chronpach's alpha for all variables are above the acceptable point of 0.7 and therefore are acceptably reliable. The values for composite reliability as a measure of internal consistency should not be lower than 0.6 93 which these values for all variables in our model are above 0.7.

For assessment of validity, we first examined convergent validity, for which the AVE value must be greater than 0.5 to indicate that each latent variable can explain more than half of the variance of its indicators 93. AVE was calculated with Eq. 4 where λ_i is the factor loading of the structure in the model, ε_i is the error value of the structure and $var(\varepsilon_i) = 1 - \lambda^2 i$.

$$AVE = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum_i var(\varepsilon_i)} \tag{4}$$

As Table 5 demonstrates, all variables met the acceptable and their AVE were greater than the requisite 0.5. Further, we examined Dijkstra Henseler's Rho-A which should have a value above 0.6 94. This measurement also displayed that all variables met this cut-off point.

Fornell–Larcker 95 criterion was then used to examine discriminant validity. According to this criterion AVE for each latent variable should be greater than the latent variable's highest squared correlation with any other latent variable 93. With this criterion, our results indicated that all variables had an acceptable discriminant validity. For example, the square root AVE for the latent variable of organizational readiness was 84.1 which was greater than its correlation with all other latent variables.

For fitness of the model, we examined our confirmatory factor analysis model with Normed Fit Index and Standardized Root Mean Square Residual Index. Lu et al. 96 suggestes that NFI acceptable value for fitness is above 0.90 and Cangur & Ercan 97 advised that acceptable fit for SRMR is when it produces a value below 0.10. The values for NFI and SRM for our model were equal to 0.907 and 0.092, respectively, and therefore our model is appropriately fit, which indicates alignment between the questions and the theoretical constructs.

Table 3 First order CFA and measurement for multicolinearity index

Main Variable	Factor (Component)	Item	First order CFA				Multicolinearity (VIF)
			Factor loading	Error	t-value	Significance level	
Organizational Inertia	Insight	A21	0.926	0.013	72.032	0.001	3.159
		A22	0.9	0.020	44.422	0.001	2.636
		A23	0.929	0.012	75.455	0.001	3.354
	Knowledge	A11	0.901	0.022	41.097	0.001	2.527
		A12	0.905	0.021	42.335	0.001	2.642
		A13	0.903	0.016	56.11	0.001	2.49
	Action	A41	0.921	0.011	85.571	0.001	2.677
		A42	0.912	0.015	61.578	0.001	2.814
		A43	0.892	0.021	42.822	0.001	2.603
	Psychological	A31	0.906	0.019	46.584	0.001	2.709
		A32	0.907	0.017	53.917	0.001	2.595
		A33	0.907	0.017	54.969	0.001	2.62
	Structural	A51	0.89	0.024	36.348	0.001	2.356
		A52	0.888	0.020	45.172	0.001	2.255
		A53	0.892	0.021	42.745	0.001	2.244
	Economic	A61	0.842	0.029	29.148	0.001	1.847
		A62	0.908	0.018	49.906	0.001	2.487
		A63	0.877	0.017	51.272	0.001	2.132
BMI	new value propositions	B11	0.876	0.041	21.623	0.001	1.341
		B12	0.859	0.037	23.447	0.001	1.341
	new customers and markets	B21	0.929	0.010	92.429	0.001	1.892
		B22	0.906	0.019	47.218	0.001	1.892
	new key resources and capabilities	B31	0.89	0.021	43.058	0.001	2.201
		B32	0.845	0.033	25.61	0.001	1.873
		B33	0.888	0.019	47.963	0.001	2.111
	new key partnerships	B41	0.946	0.009	104.564	0.001	2.375
		B42	0.93	0.018	51.442	0.001	2.375
	new key activities and processes	B51	0.943	0.009	107.073	0.001	2.453
		B52	0.938	0.016	57.091	0.001	2.453
	new customer relationships	B71	0.927	0.014	63.966	0.001	1.988
		B72	0.92	0.017	53.11	0.001	1.988
	new channels	B61	0.913	0.018	51.256	0.001	1.838
		B62	0.918	0.017	53.304	0.001	1.838
	new revenue streams	B81	0.9	0.024	37.913	0.001	1.7
		B82	0.912	0.016	55.863	0.001	1.7
	new cost structure	B91	0.875	0.030	28.992	0.001	1.682
		B92	0.931	0.011	88.367	0.001	1.682
IT Ambidexterity	Exploration	C11	0.841	0.030	28.093	0.001	1.634
		C12	0.849	0.028	30.808	0.001	1.747
		C13	0.829	0.030	27.716	0.001	1.633
	Exploitation	C21	0.925	0.095	9.783	0.001	1.386
		C22	0.811	0.085	9.513	0.001	1.386
Open Innovation Competencies	Organizational readiness	D11	0.842	0.026	32.309	0.001	1.959
		D12	0.841	0.035	24.332	0.001	2.109
		D13	0.854	0.031	27.329	0.001	2.156
		D14	0.828	0.034	24.272	0.001	1.959
	Collaborative Capability	D21	0.882	0.022	40.576	0.001	2.383
		D22	0.913	0.016	56.946	0.001	2.738
		D23	0.924	0.013	71.389	0.001	2.934
	Absorptive Capacity	D31	0.864	0.020	42.214	0.001	2.482
		D32	0.923	0.013	70.984	0.001	3.814
		D33	0.899	0.014	63.055	0.001	2.902
		D34	0.902	0.018	51.143	0.001	3.255

Table 4 Second order CFA

Main Variable	Factor (Component)	*Second order CFA*			
		Factor loading	***Error***	***t-value***	***Significance level***
Organizational Inertia	Insight	0.711	0.054	13.194	0.001
	Knowledge	0.733	0.047	15.739	0.001
	Action	0.667	0.062	10.75	0.001
	Psychological	0.642	0.062	10.29	0.001
	Structural	0.566	0.077	7.394	0.001
	Economic	0.764	0.041	18.848	0.001
BMI	new value propositions	0.535	0.082	6.543	0.001
	new customers and markets	0.67	0.064	10.506	0.001
	new key resources and capabilities	0.756	0.056	13.585	0.001
	new key partnerships	0.653	0.07	9.309	0.001
	new key activities and processes	0.647	0.074	8.761	0.001
	new customer relationships	0.675	0.076	8.922	0.001
	new channels	0.683	0.077	8.831	0.001
	new revenue streams	0.638	0.062	10.282	0.001
	new cost structure	0.66	0.054	12.181	0.001
IT Ambidexterity	Exploration	0.942	0.034	27.377	0.001
	Exploitation	0.433	0.196	2.208	0.028
Open Innovation Competencies	Organizational readiness	0.647	0.104	6.219	0.001
	Collaborative Capability	0.698	0.055	12.777	0.001
	Absorptive Capacity	0.768	0.06	12.82	0.001

Table 5 Convergent validity and composite reliability analysis of the Model

Main Variable	Factor (Component)	Chronbach's alpha CA>0.7		Rho_A coefficient ρA>0.6		Composite reliability CR>0.7		Average variance extracted AVE>0.5	
Organizational Inertia	Insight	0.907	0.902	0.91	0.906	0.942	0.915	0.844	0.578
	Knowledge	0.887		0.888		0.930		0.816	
	Action	0.895		0.909		0.934		0.825	
	Psychological	0.892		0.893		0.933		0.822	
	Structural	0.869		0.870		0.920		0.792	
	Economic	0.848		0.853		0.908		0.768	
BMI	new value propositions	0.770	0.901	0.672	0.904	0.858	0.915	0.752	0.563
	new customers and markets	0.814		0.825		0.915		0.843	
	new key resources and capabilities	0.846		0.852		0.907		0.764	
	new key partnerships	0.864		0.875		0.936		0.880	
	new key activities and processes	0.870		0.871		0.939		0.885	
	new customer relationships	0.827		0.828		0.920		0.852	
	new channels	0.806		0.807		0.912		0.838	
	new revenue streams	0.782		0.784		0.902		0.821	
	new cost structure	0.778		0.822		0.898		0.816	
IT Ambidexterity	Exploration	0.791	0.736	0.792	0.712	0.878	0.772	0.705	0.531
	Exploitation	0.791		0.780		0.861		0.757	
Open Innovation Competencies	Organizational readiness	0.863	0.840	0.865	0.845	0.907	0.874	0.708	0.589
	Collaborative Capability	0.892		0.900		0.933		0.822	
	Absorptive Capacity	0.919		0.922		0.943		0.805	

In the next step, we conducted internal assessments of the model using the coefficient of determination (R^2) and the Adjusted Coefficient of Determination (R^2_{adj}). This coefficient is a measure of the proportion of explained variance present in the data and so, the higher its value, the better the model describes the data 98. The R^2 value above 0.67 categorizes a strong model, between that and 0.33 is categorized as a moderate model, and below 0.19 is categorized as a weak model 99. Our calculations indicate that organizational inertia, solely explains 76.5% of the changes in BMI as its dependent variable. Also, the two variables of IT ambidexterity and open innovation competencies, together as moderators, increased this value to 84%. We also considered Cohen's f2 effect size measure 100. According to this measure, values of 0.02, 0.15 and 0.35 are interpreted as small, medium and large effect, respectively. Our measurements demonstrate that the effect of IT ambidexterity as a moderator equals 0.01 and therefore implies a negligible influence and the effect of open innovation competencies as moderator was 0.023 implying a medium effect 101. The results for the examination of the structural equations, R^2, R^2_{adj} and f^2 are presented in Table 6.

Table 6 Hypothesis Testing

Hypotheses	**Structural Equations**			**Determination coefficients**		**Effect**	**Result**	
	Beta	t-value	Significance level	**R^2**	**R^2_{ad}**	**F^2**	**Hypothesis**	**Direction**
Organizational Inertia > BMI (H1)	-0.624	-12.658	0.001	0.765	0.763	-	Supported	Negative
Organizational Inertia * Open Innovation Competencies > BMI (H2)	0.059	2.657	0.009	0.840	0.833	0.023	Supported	Positive
Organizational Inertia* IT ambidexterity > BMI (H3)	0.046	1.134	0.257			0.010	Not Supported	N/A

For the purpose of hypothesis testing, as the above results demonstrate, our H1 hypothesis of the relationship between organizational inertia and BMI has a t-value of -12.685 at the confidence level of 95% and the negative beta value indicates that organizational inertia has a significant and negative relationship with BMI. Therefore, H1 is supported and so, an increase in organizational inertia leads to a decrease in BMI. It was hypothesized in H2 that open innovation moderates the relationship between organizational inertia and BMI. The t-value for our second hypothesis is 2.657 significant at the confidence level of 95% and the positive beta value of 0.059 indicates that open innovation positively moderates this relationship and therefore our H2 hypothesis is supported. Lastly, we examined our H3 hypothesis, proposing that IT ambidexterity moderates the relationship between organizational inertia and BMI. The t-value for H3 is 1.134 which is not significant at the confidence level of 95% and therefore this hypothesis was not supported.

Discussion and Implications

Discussion

The present study investigated the relationship between organizational inertia and BMI with the moderating roles of open innovation competencies and IT ambidexterity among software SMEs in ICT industry. Based on the literature, we developed our conceptual framework and hypothesized accordingly. We gathered our data with 120 questionnaires and then we conducted descriptive and inferential analysis on the data, the results of which are explained in the following.

With our conceptual framework, we assumed there is a significant relationship between organizational inertia and BMI while open innovation competencies and IT ambidexterity

moderate this relationship. Out of this conceptualization, we made three hypotheses. First, we hypothesized that there is a significant relationship between organizational inertia and BMI. Our results derived from the structural equations demonstrate a t-value of -12.685 significant at the confidence level of 95% and a beta value of -0.624, indicating a significant and negative relationship between organizational inertia and BMI. Our H1 was therefore supported and we conclude that increase in organizational inertia leads to lower BMI. This result is in line with the results of the previous researches by Moradi et al. 61, Bashir and Verma 73, Doostar et al. 102 and Khashei et al. 103 as they also reported the significant negative effect of organizational inertia on BMI. Organizational Inertia and its 6 dimensions which we analyzed in this study are one of the largest causes preventing companies from making changes in their business model. We, as other researchers, came to believe that when there is any type organizational inertia in an enterprise, it is more likely for them to not to be able to develop innovative products and services, which is a result of the reported negative relationship between organizational inertia and BMI.

Regarding our second hypothesis, our results provided us with a t-value of 2.657 at the confidence level of 95% and a positive beta value of 0.059, indicating open innovation competencies actually moderate the relationship between organizational inertia and BMI and therefore our H2 was supported. This result is also consistent with the reports of Moradi et al. 61 and Khashei et al. 103. Although they did not particularly address the moderating role of open innovation competencies for the concerned relationship, however, Jafari et al. 104 reported that open innovation has a positive effect on BMI and that organizational inertia has a negative effect on open innovation. Based on our result, we point out that if enterprises encourage organizational readiness, improve their absorptive capacity and improve their capabilities for cooperation, then they can improve open innovation competencies which in turn lowers organizational inertia, specifically experience and learning inertia and in the meantime, to possibly capture new opportunities aligned with BMI.

The third hypothesis proposed IT ambidexterity moderates the relationship between organizational inertia and BMI. However, the t-value of 1.134 at the confidence level of 95% indicates an insignificant effect and so H3 was not supported, meaning high or low IT ambidexterity does not significantly moderate the relationship between organizational inertia and BMI. We did not find similar reports in previous studies.

To explain this result, we note that a limited sample population can have a huge impact on the results. Particularly as literature points out that exploration and exploitation require different structures, processes, cultures and strategies which can bring about various effects on business 105. For instance exploration is found to be consistent with an organic structure, rapid rate of changes and emerging technologies while exploitation favors bureaucratic structures, high levels of control and stability 106. Despite short-term achievements of exploitation efforts, in the long run they might lead to organizational inertia and destruct innovation. Another possible cause concerning paradoxical challenges is the leadership style in place 107 while different leadership styles suit different organizations. Therefore, if the chosen sample had an inappropriate decision-making structure and leadership style, then the business might have been facing unsuccessful experiences and so unable to recognize the advantages of employing ambidexterity which, in the long run, could lead to inertia and weakening of innovative efforts 108.

Implications

This study offers several theoretical and practical implications. We contributed to BMI literature by considering various dimensions of organizational inertia as an obstacle. Second our study demonstrated how the required competencies for open innovation and nurturing them moderates the negative effect of organizational inertia on BMI. Our findings provide important

guidelines for managers. With the presence of organizational inertia and its gradual growth within the organization, there is a tendency to act based on experience and resistance to change, which reduces the organizational capabilities for innovation in business models due to the lack of appropriate understanding and analysis of the environmental signals. In an attempt to remove this, practitioners are advised to note various dimensions of organizational inertia, their underlying reasons and act accordingly.

By confirming the moderating role of open innovation competencies we provided insight for practitioners on how organizations can attempt to reduce the impact of organizational inertia and perhaps to prevent its establishment within the organization, and in the meantime, to provide grounds for BMI. For this, managers need to nurture competencies for open innovation and prepare the organization for utilizing the benefits derived from open innovation efforts through open and extensive free information flow both within the organization and beyond, specifically through cooperating and engaging outside agents and stakeholders. Integrating any possible offerings derived from outside sources with present knowledge, requires skills which mandate trainings that help to identify, analyze and capture such new information to be combined with the accumulated organizational knowledge.

Future Research and Limitations

This study is not free from limitations. For investigating the relationship between organizational inertia and BMI with the moderating roles of open innovation competencies and IT ambidexterity, the present study provided empirical evidence only from software SMEs operating in Iran-Tehran. Further researches, therefore, can be conducted in other or multiple countries to provide more extensive data and thereby assist with the findings' generalization issue.

As the mediating role of IT ambidexterity was not supported for the relationship between organizational inertia and BMI, and considering the possible reasons we mentioned earlier, we recommend further examinations while considering the underlying condition.

The variables and dimensions of this study can be measured in other business sectors, cultures and contexts. Furthermore, leadership styles considering the context of sectors under study and the differences between Western and Asian countries, especially from the Middle East, might have an effect on findings. Therefore, comparative studies are worth exploring and we recommend considering these factors.

In our study, data was collected using questionnaires. We therefore recommend future studies to collect data with other tools, specifically qualitative tools and also to employ qualitative research methodologies to further understand the effect of contextual factors.

References

1. Remane, G., Hanelt, A., Tesch, J. F., & Kolbe, L. M. (2017). The business model pattern database—a tool for systematic business model innovation. International Journal of Innovation Management, 21(01), 1750004.
2. Sun, J., Yao, M., Zhang, W., Chen, Y., & Liu, Y. (2016). Entrepreneurial environment, market-oriented strategy, and entrepreneurial performance: A study of Chinese automobile firms. Internet Research.
3. Kim, S. K., & Min, S. (2015). Business model innovation performance: When does adding a new business model benefit an incumbent? Strategic Entrepreneurship Journal, 9(1), 34-57.
4. Evans, S., Vladimirova, D., Holgado, M., Van Fossen, K., Yang, M., Silva, E. A., & Barlow, C. Y. (2017). Business model innovation for sustainability: Towards a unified perspective for creation of sustainable business models. Business strategy and the environment, 26(5), 597-608.
5. Pan, L., Xu, Z., & Skare, M. (2023). Sustainable business model innovation literature: a bibliometrics analysis. Review of Managerial Science, 17(3), 757-785.
6. Bachmann, N., & Jodlbauer, H. (2023). Iterative business model innovation: A conceptual process model and tools for incumbents. Journal of Business Research, 168, 114177.
7. Godkin, L., & Allcorn, S. (2011). Organizational resistance to destructive narcissistic behavior. Journal of

Business Ethics, 104(4), 559-570.
8. Tsai, K. H., Hsieh, M. H., & Hultink, E. J. (2011). External technology acquisition and product innovativeness: The moderating roles of R&D investment and configurational context. Journal of Engineering and Technology Management, 28(3), 184-200.
9. Haag, S. (2014). Organizational inertia as barrier to firms' IT adoption–multidimensional scale development and validation.
10. Chesbrough, H.W. (2003-a). Open Innovation: the New Imperative for Creating and Profiting from Technology. Harvard Business School Press, Boston, MA.
11. Obradović, T., Vlačić, B., & Dabić, M. (2021). Open innovation in the manufacturing industry: A review and research agenda. Technovation, 102, 102221.
12. Spithoven, A., Vanhaverbeke, W., & Roijakkers, N. (2013). Open innovation practices in SMEs and large enterprises. Small Business Economics, 41(3), 537-562.
13. Van de Wetering, R., & Versendaal, J. (2021). Information technology ambidexterity, digital dynamic capability, and knowledge processes as enablers of patient agility: Empirical study. JMIRx Med, 2(4), e32336
14. Benitez, J., Llorens, J., & Braojos, J. (2018). How information technology influences opportunity exploration and exploitation firm's capabilities. Information & Management, 55(4), 508-523.
15. Tai, J.C., Wang, E.T., & Yeh, H. (2019)." A study of IS assets, IS ambidexterity, and IS alignment: the dynamic managerial capability perspective". Inf. Manag., 56, 55-69.
16. Peng, M. Y. P., Lin, K. H., Peng, D. L., & Chen, P. (2019). Linking organizational ambidexterity and performance: The drivers of sustainability in high-tech firms. Sustainability, 11(14), 3931.
17. Mohamad yari, Z., Sepahvand, R., Vahdati, H., & moosavi, S. N. D. (2018). Evaluating the Maturity of Human Resource Management Processes Based on Philips Model. Journal of Research in Human Resources Management, 10(1), 51-76.
18. Manteghi, M., & Sabeti Saeedi, F. (2013). Business models; principles, evaluation, innovation. Roshd-e-Fanavari, 3(35), 1.
19. Pahlavan Ravi, M., & Naseri, B. (2021). Investigating the Relationship between Organizational Inertia on Innovation with Respect to the Mediating Role of Job Security of Social Security Employees. Journal of Management and Sustainable Development Studies, 1(2), 95-119.
20. Jui-Chan, H., Lu, C., Hao-Ming, W., Ching-Tang, H., & Hui-Wen, W. (2020). The Study of Organizational Inertia, Business Model Innovation and Organizational Performance in Taiwan Financial Institutions: Organizational Learning Perspective. Revista Argentina de Clínica Psicológica, 29(5), 104.
21. Latilla, V. M. M., Urbinati, A., Cavallo, A., Franzò, S., & Ghezzi, A. (2021). Organizational re-design for business model innovation while exploiting digital technologies: A single case study of an energy company. International journal of innovation and technology management, 18(02), 2040002.
22. Liao, S., Fei, W.-C., & Liu, C.-T. (2008). Relationships between knowledge inertia, organizational learning and organization innovation. Technovation, 28(4), 183–195.
23. Gilbert, C. G. (2005). Unbundling the Structure of Inertia: Resource Versus Routine Rigidity. Academy of Management Journal, 48(5), 741–763.
24. Polites, G. L., & Karahanna, E. (2012). Shackled to the status quo: The inhibiting effects of incumbent system habit, switching costs, and inertia on new system acceptance. MIS quarterly, 21-42.
25. Shekhar Mishra, S., & Saji, K. B. (2013). Moderating roles of organizational inertia and project duration in the NPD process: an empirical investigation. Journal of Product & Brand Management, 22(1), 52-64.
26. Babazade, T., dostar, M., & moradi, M. (2019). The Impact of Learning on Innovation by Moderating Role of Organizational Inertia. Journal of Innovation and Creativity in Human Science, 9(2), 165-198.
27. Mohammadi, J., Nadaf, M., & Safarian, S. (2017). Explaining the effect of organizational trust and organizational health on resistance to change in the government employees by considering the mediated role of organizational commitment (The case: Municipality of Ahvaz). Journal of Public Administration, 9(1), 85-106
28. Teofilus T, Ardyan E, Sutrisno TFCW, Sabar S and Sutanto V (2022) Managing Organizational Inertia: Indonesian Family Business Perspective. Front. Psychol. 13:839266. doi: 10.3389/fpsyg.2022.839266.
29. Luu, T. T. (2021). Knowledge sharing in the hospitality context: The roles of leader humility, job crafting, and promotion focus. International Journal of Hospitality Management, 94, 102848. Retrieved from https://www.sciencedirect.com/science/article/ pii/S027843192030400X
30. March, J. G. & Olsen, J. P. (1975). The uncertainty of the past: Organizational learning under ambiguity. European Journal of Political Research 3, 147-158 in Godkin, L, & Allcorn, S. (2008). Overcoming organizational inertia: A tripartite model for achieving strategic organizational change. The Journal of Applied Business and Economics, 8(1), 82.
31. Hedberg, B. & Wolff, R. (2003). Organizing, learning, and strategizing: From construction to discovery. In Meinolf Dierkes, Ariane Berthoin Antal, John Child, & Ikujiro Nonaka. (Eds.). Handbook of Organizational Learning & Knowledge. (535-556). Oxford: Oxford University Press.

32. Kierser, A., Beck, N. & Tainio, R. (2003). Rules and organizational learning: The behavioral theory approach. In Meinolf Dierkes, Ariane Berthoin Antal, John Child, & Ikujiro Nonaka. (Eds.). Handbook of Organizational Learning & Knowledge. (598-623). Oxford: Oxford University Press.
33. Godkin, L., & Allcorn, S. (2008). Overcoming organizational inertia: A tripartite model for achieving strategic organizational change. The Journal of Applied Business and Economics, 8(1), 82.
34. Liao, S. (2002). Problem solving and knowledge inertia. Expert Systems with Applications, 22(1), 21–31.
35. Baker, M., & Collins, M. (2010). English commercial banks and organizational inertia: the financing of SMEs, 1944–1960. Enterprise & Society, 11(1), 65-97.
36. Kim, D. (1993). The link between individual and organizational learning. Sloan Management Review 35(1), 37-50 in Godkin, L, & Allcorn, S. (2008). Overcoming organizational inertia: A tripartite model for achieving strategic organizational change. The Journal of Applied Business and Economics, 8(1), 82.
37. Kim, L. (1998) Crisis construction and organizational learning: Capability building in catching-up at Hyundai Motor. Organization Science 9(4), 506-519 in Godkin, L, & Allcorn, S. (2008). Overcoming organizational inertia: A tripartite model for achieving strategic organizational change. The Journal of Applied Business and Economics, 8(1), 82.
38. Litvin, S. S. (2016). Types of psychological inertia. TRIZfest-2016, 401.
39. Gao, K., Yang, Y., Sun, L., & Qu, X. (2020). Revealing psychological inertia in mode shift behavior and its quantitative influences on commuting trips. Transportation Research Part F: Traffic Psychology and Behaviour, 71, 272–287.
40. Mikalef, P., van de Wetering, R., & Krogstie, J. (2018). Big Data enabled organizational transformation: The effect of inertia in adoption and diffusion. In Business Information Systems: 21st International Conference, BIS 2018, Berlin, Germany, July 18-20, 2018, Proceedings 21 (pp. 135-147). Springer International Publishing.
41. Hannan, M. T., & Freeman, J. (1984). Structural inertia and organizational change. American sociological review, 149-164.
42. Wirtz, B. W., & Wirtz, B. W. (2020). Business Model Management: Design-Process-Instruments. Springer.
43. Timmers, P. (1998). Business models for electronic markets. Electronic Markets, 8(2), 3–8.
44. Afuah, A., & Tucci, C. L. (2003). Internet business models and strategies. New York: McGrawHill.
45. Treacy, M., & Wiersema, F. (1997). Marktführerschaft: Wege zur Spitze. München: Heyne.
46. Linder, J. C., & Cantrell, S. (2000). Changing business models: Surveying the landscape. Hamilton.
47. Hamel, G. (2000). Leading the revolution. Boston: Harvard Business School Press.
48. Wirtz, Bernd W.; Piehler, Robert; Daiser, Peter (2015): E-government portal characteristics and individual appeal: An examination of E-government and citizen acceptance in the context of local administration portals. In Journal of Nonprofit & Public Sector Marketing 27 (1), pp. 70–98. In Wirtz, B. W., & Wirtz, B. W..Business Model Management: Design-Process-Instruments. Springer.
49. Osterwalder, A., & Pigneur, Y. (2002). An e-business model ontology for modeling e-business. In 15th Bled Electronic Commerce Conference, e-Reality: Constructing the e-Economy, Bled.
50. Osterwalder, A., & Pigneur, Y. (2010). Business model generation: a handbook for visionaries, game changers, and challengers (Vol. 1). John Wiley & Sons.
51. Wirtz, B. W., & Wirtz, B. W. (2020). Business Model Management: Design-Process-Instruments. Springer
52. Bashir, M., Alfalih, A., & Pradhan, S. (2023). Managerial ties, business model innovation & SME performance: Moderating role of environmental turbulence. Journal of Innovation & Knowledge, 8(1), 100329.
53. White, J. V., Markin, E., Marshall, D., & Gupta, V. K. (2022). Exploring the boundaries of business model innovation and firm performance: A meta-analysis. Long Range Planning, 55(5), 102242.
54. Kajtazi, K., Rexhepi, G., Sharif, A., & Ozturk, I. (2023). Business model innovation and its impact on corporate sustainability. Journal of Business Research, 166, 114082.
55. Jiang, S. G. (2023). The Impact of Management Innovation, Organizational Inertia, and Organizational Learning on Organizational Performance: A Case Study of the Manufacturing Industry in the Yangtze River Delta Region of China. International Journal of Science and Business, 23(1), 91-105.
56. Lindgardt, Z., Reeves, M., Stalk, G., & Deimler, M. S. (2009). Business model innovation. New York: Boston Consulting Group
57. Geissdoerfer, M., Bocken, N.M.P., Hultink, E.J., (2016). Design thinking to enhance the sustainable business modelling process. J. Clean. Prod. 135, 1218-1232.
58. Dong, B. (2023). A Systematic Review of the Organizational Inertia Literature and Future Outlook. International Journal of Education and Humanities, 8(2), 119-123.
59. Cavalcante, S., Kesting, P. and Ulhøi, J. (2011), "Business model dynamics and innovation: (re) establishing the missing linkages", Management Decision, Vol. 49 No. 8, pp. 1327-1342.
60. Zott, C., Amit, R., & Massa, L. (2011). The business model: recent developments and future research. Journal of management, 37(4), 1019-1042.
61. Moradi, E., Jafari, S. M., Doorbash, Z. M., & Mirzaei, A. (2021). Impact of organizational inertia on business

model innovation, open innovation and corporate performance. Asia Pacific Management Review, 26(4), 171-179.
62. Nijssen, E.J., Hillebrand, B., Vermeulen, P.A.M. and Kemp, R.G.M. (2006), "Exploring product and service innovation similarities and differences", International Journal of Research in Marketing, Vol. 23 No. 3, pp. 241-25.
63. Peter, T. D. (2023). The role of tie variety in successful circular business model innovation The moderating role of managerial tie variety on the relation between organizational inertia and circular business model innovation.
64. Chesbrough, H. (2012). Open innovation: Where we've been and where we're going. Research-Technology Management, 55(4), 20-27.
65. Chesbrough, H., Vanhaverbeke, W., & West, J. (Eds.). (2006). Open innovation: Researching a new paradigm. Oxford University Press on Demand.
66. West, J., & Gallagher, S. (2006). Challenges of open innovation: the paradox of firm investment in open-source software. R&d Management, 36(3), 319-331.
67. Chesbrough, H. W. (2003-b). The era of open innovation. MIT Sloan Management Review, 44(3), 35–41.
68. Carrasco-Carvajal, O., Castillo-Vergara, M., & García-Pérez-de-Lema, D. (2023). Measuring open innovation in SMEs: an overview of current research. Review of Managerial Science, 17(2), 397-442.
69. Saura, J. R., Palacios-Marqués, D., & Ribeiro-Soriano, D. (2023). Exploring the boundaries of open innovation: Evidence from social media mining. Technovation, 119, 102447.
70. Gassmann, O., & Enkel, E. (2004). Towards a theory of open innovation: three core process archetypes.
71. West, J., & Bogers, M. (2014). Leveraging external sources of innovation: a review of research on open innovation. Journal of product innovation management, 31(4), 814-831.
72. Hafkesbrink, J., & Schroll, M. (2010). Organizational Competences for open innovation in small and medium sized enterprises of the digital economy. Competence Management for Open Innovation: Tools and It Support to Unlock the Innovation Potential Beyond Company Boundaries, 30(2), 21.
73. Bashir, M., & Verma, R. (2019). Internal factors & consequences of business model innovation. Management Decision, 57(1), 262-290.
74. Tushman, Michael L. and O'Reilly, Charles A. (1996). The ambidextrous organization: managing evolutionary and revolutionary change. California Management Review, 38: 1-23.
75. Raisch, S. and Birkinshaw, J. (2008), "Organizational ambidexterity: antecedents, outcomes, and moderators", Journal of Management, Vol. 34 No. 3, pp. 375-381.
76. Raisch, S., Birkinshaw, J., Probst, G., & Tushman, M. L. (2009). Organizational ambidexterity: Balancing exploitation and exploration for sustained performance. Organization science, 20(4), 685-695.
77. Lee, O. K., Sambamurthy, V., Lim, K. H., & Wei, K. K. (2015). How does IT ambidexterity impact organizational agility?. Information Systems Research, 26(2), 398-417.
78. Heckmann, C. S., & Maedche, A. (2018). IT ambidexterity for business processes: the importance of balance. Business Process Management Journal, 24(4), 862-881.
79. Heckmann, C. (2015), "The impact of business process IT ambidexterity on business process performance", Proceedings of the 23rd European Conference on Information Systems (ECIS).
80. Zhang, Y., Wang, N., & Hu, H. (2023, May). Developing IT Ambidexterity: Insights from Knowledge Interaction Between CIO and TMT. In Wuhan International Conference on E-business (pp. 83-95). Cham: Springer Nature Switzerland.
81. Kusanke, K., & Winkler, T. J. (2022). Structural Ambidexterity through Bimodal IT–A Literature Review and Research Agenda.
82. Chen, Y., Liu, H., & Chen, M. (2020). Achieving Novelty and Efficiency in Business Model Design: Striking a Balance between IT Exploration and Exploitation. Information & Management, 103268.
83. Cochran W. G. (1977) Sampling Techniques (3rd Edn). Wiley, New York.
84. Clauss, T. (2017). Measuring business model innovation: conceptualization, scale development, and proof of performance. R&d Management, 47(3), 385-403.
85. Zhen, J., Cao, C., Qiu, H., & Xie, Z. (2021). Impact of organizational inertia on organizational agility: the role of IT ambidexterity. Information Technology and Management, 22, 53-65.
86. Levin, Richard I. Statistics for management. Pearson Education India, 2011.
87. Fabrigar, L. R., & Wegener, D. T. (2012). Exploratory factor analysis. New York, NY: Oxford University Press.
88. Preacher, K. J. (2006). Testing complex correlational hypotheses with structural equation models. Structural equation modeling, 13(4), 520-543.
89. Hair, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. (2018). Advanced Issues in Partial Least Squares Structural Equation Modeling.
90. DeCarlo, L. T. (1997). On the meaning and use of kurtosis. Psychological Methods, 2(3), 292–307.
91. Wang, P., Li, T., Wu, Z., Wang, X., Jing, J., Xin, J., ... & Dai, B. (2023). The development of career planning

scale for junior high school students based on cognitive information processing theory. Frontiers in Psychology, 14, 1106624.
92. Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. Strategies Managed Journal, 20(2), 195–204.
93. Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. In New challenges to international marketing. Emerald Group Publishing Limited.
94. Dijkstra TK, Henseler J. (2015). Consistent Partial Least Squares Path Modeling. MIS Quarterly. 39(2): 297-316.
95. Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. Journal of Marketing Research, 18(3), 328–388.
96. Lu, L., Wang, L., Yang, X., & Feng, Q. (2009). Zarit Caregiver Burden Interview: development, reliability and validity of the Chinese version. Psychiatry and clinical neurosciences, 63(6), 730-734.
97. Cangur, S., & Ercan, I. (2015). Comparison of model fit indices used in structural equation modeling under multivariate normality. Journal of Modern Applied Statistical Methods, 14(1), 14.
98. Di Bucchianico, A. (2008). Coefficient of Determination (R2). Encyclopedia of Statistics in Quality and Reliability.
99. Chin W.W. (2010). How to Write Up and Report PLS Analyses, In: Esposito Vinzi V., Chin W., Henseler J., Wang H. (eds). Handbook of Partial Least Squares. Springer Handbooks of Computational Statistics, Springer, Berlin, Heidelberg, 655-690.
100. Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences, 2nd edn, Lawrence Erlbaum Associates, Hillsdale.
101. Henseler, J., Fassott, G., Dijkstra, T. K., & Wilson, B. (2012). Analysing quadratic effects of formative constructs by means of variance-based structural equation modelling. European Journal of Information Systems, 21, 99-112.
102. Doostar, M., Mombeini, Y., & Goodarzi, M. (2016). Investigating the Effect of Transformational Leadership on Organizational Changes with an Emphasis on the Mediating Role of Political Intelligence. *Public Organizations Management*, *4*(3), 85-104.
103. Khashei, V., Mohammadi Nasab, A., & Mahdizadeh, E. (2016). An exploration of the relationship between organizational inertia with business model innovation and performance of Small and Medium-Sized Enterprises, from the perspective of open innovation. Organizational Culture Management, 14(4), 1111-1136.
104. Jafari, Seyed Mohammadbagher., Mohammadi Doorbash, Zahra., Mirzaei, Ashraf (2019). The impact of organizational inertia on innovation and innovation on performance, Journal of Technology Development Management, 6(4), 153-175.
105. Wang, C. L., & Rafiq, M. (2014). Ambidextrous organizational culture, Contextual ambidexterity and new product innovation: a comparative study of UK and C hinese high-tech Firms. British Journal of management, 25(1), 58-76.
106. Kasaeeian Naeeni, Mohammad. (2017). Impact of organizational ambidexterity on organizational agility with the mediating role of knowledge sharing (Case: Gaz Soozan Najafabad Co). Master's Thesis. Shahid Ashrafi Esfahani University.
107. Smith WK. (2014) Dynamic decision making: A model of senior leaders managing strategic paradoxes. Academy of Management Journal 57: 1592-1623.
108. Syed, T. A. (2018). IT ambidexterity: a competitive IT capability for high-tech SMEs (Doctoral dissertation, University of Sussex).