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Impact of Managerial Risk-taking and IRM on Innovation

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Innovation in any business comes with risk. This study aimed to explore the role of managerial risk-taking and integrated risk management (IRM) on innovation. To verify the hypotheses, a questionnaire was designed. Data were collected from 109 Insurance Managers from Iran Insurance Companies. PLS structural equation modeling was employed to test both measurement and structural model. The results demonstrate that integrated risk management and managers' risk-taking have a positive impact on innovation. This is the first study to explicitly and separately consider the effects of managerial risk-taking and integrated risk management (IRM) on innovation in the Insurance sector. Due to the lack of scales to analyze IRM, questionnaires which adopted from previous studies may not be the best scales to measure variables. This study focuses on Iran insurance industry, which limits its generalizability. Our findings highlight the need for managers in high risk-taking behavior to encourage employees to be more creative and develop organizational innovation. The authors discovered that firms should perform an effective IRM system that oversees many systematic risks through organization innovation process.

Keywords: Innovation; Managerial risk-taking; IRM; PLS-SEM

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1 Introduction

Innovation is a popular concept that has attracted the interest of both academic and business communities (Santos et al., 2014). In addition, Innovation is critically important and necessary for firms to respond to rapid changes (Kwak, Seo, and Mason, 2018), and dynamic competitive business environment in order to grow and survive (Tushman and O'Reilly III, 1996; Dess and Picken, 2000; Bowers and Khorakian, 2014; Wu and Wu, 2014; Kim, Choi and Skilton, 2015). Innovation is a high-risk process and is prone to uncertainty in business.

On the other hand, risk management is emerging as an essential contributor to most fields of decision making and firm's control in any business at the complexity and uncertainty business environment (Giannakis, Croom, and Slack, 2004; Ritchie and Brindley, 2007; Eckles, Hoyt, and Miller, 2014). This complexity shows that risks arise from various sources. Scholars believe that the extensive use of explicit risk managing might reduce expenditure on innovation failure and if it is well implemented, firms will reach their innovative plans more accelerator (Bowers and Khorakian, 2014; Stosic et al., 2017). Clearly, appropriate risk management would encourage innovation in the organization.

March (1996), argues that risk-taking is necessary for innovation. Confirming March's argument, previous research has shown that there exists a close relationship between risk-taking and innovation. Researchers believe that managers play the role of strategic decision-makers, capable of identifying opportunities and making the right decisions about innovation within the organization (García-Granero et al., 2015). In fact, managerial risk-taking requires significant investment that hopes to bring out success or profit, with a high possibility of failure or heavy debt (Latham and Braun, 2008).

Additionally, not only managers and CEO's risk-taking stimulate innovation, but also firms need to manage all sorts of risks surrounded an innovation project from planning to implementation (Wu and Wu, 2014). Integrating all risks through the different phases of innovation can (Wu and Wu 2014) help managers make the critical decision to abandon poor innovation plan (Bowers and Khorakian, 2014). This integrated approach provides for real risk management that is coordinated among all parties involved in the control of innovation's risk. It also provides management with the capacity to monitor risk mitigation performance. Besides, the potency of the risk management within an integrated approach is determined by its clear classification of any levels of business (Bilgin and Danis, 2016).

The integrated risk-taking management encompasses operational risks. According to Meulbroek(2002a), operational risks, generated from individuals, processes, and physical properties, can exert influence on innovation performance. Thus, such risks need to be carefully managed.

Although the effect of risk-taking on innovation has been well documented in various studies, research has failed to examine the impact of integrated risk-taking management on innovation. Moreover, the effect of these two types of approach on innovation has remained underexplored.

Accordingly, since innovation in the insurance industry has received little attention, the chief aim of this article is to fill the gap and to examine the effect of managerial risk-taking and IRM on innovation. The study, therefore, attempts to provide answers to the following research questions:

1. What is the effect of managers' risk-taking on insurance companies' innovation?
2. What is the effect of integrated risk-taking management on insurance companies' innovation?

The article is structured as follows. First, reviewed the literature . Next, a hypothetical model will be presented. The SEM model will be tested using data from 109 insurance managers working in Iran Insurance Companies. The article concludes with discussion, conclusion, managerial implications, and limitations of the study.

2 Literature Review

This chapter, briefly explain innovation within the context of the organization. Then it provides an introduction to the relationship between managers' risk-taking and integrated risk management which aim at promoting organizational innovation.

2.1 Innovation

Within the service industry, the primary way to gain a competitive advantage is innovation. Birkinshaw et al.,(2011) showed that product/service innovations are

just the tip of the innovation iceberg (Medrano and Olarte-Pascual, 2016). Scholars have thoroughly mentioned that the quest for innovation can be an important strategy which organizations with hyper-competitive characteristics use to remain competitive in a progressively dynamic, speedily changing and complicated market (Liu et al., 2017). In the innovation literature, various types of innovation have been considered. It can be product, process, administrative, technological, marketing, radical or incremental, (García-Granero et al., 2015; Liu et al., 2017). Service or product innovation is the first-time commercial usage of a product or service, which is new to the marketplace, whereas process innovation is the execution of methods that are new to the company, but not necessarily new on the market (Jeschke et al., 2017). Hence, this process requires clearness of thought and the capability to get things done. Evan (1966), pointed out that administrative innovation can be a concept for new policy, the allocation of resources, the structuring of responsibilities, of authority, of rewards (Pauget and Dammak, 2018). Administrative innovation increases productivity by guaranteeing efficiency in internal processes and individuals and business. Specifically, administrative innovation refers to changes in the characteristics of organizational or institutional elements. Then, adoption of any types of innovation is determined by an attitude towards the organization innovation partially.

2.2 Managing Risk-taking

Risk-taking is considered as one of the most important activities of managers to encourage innovation throughout the organization. Risk-Taking behavior is an individual's behavior in risky conditions, which is characterized by using the degree of risks involved in decision-making (Nkundabanyanga et al., 2015).

Research has shown that managers' inclination toward risk-taking has considerable influence on a company's capacity for innovation. As noted earlier, managerial risk-taking "involves investing significant resources in activities with a high possibility of failure, which includes incurring heavy debt or making large resource commitments in the hope of reaping potentially high benefits" (García-Granero et al., 2015). Hence, if expected values of taking risks for two strategies are comparable, but one is a considerable uncertain, managers will choose the one with a more specific result.

2.3 Integrated Risk Management (IRM)

Typically, RM has been about each administrator dealing with specific risks which might affect some firms' goals. In a very meanwhile, regarding risk literature, RM methods are changing from controlling risk independently and departments and in a Silo-based approach to an integrated risk approach (Tommerberg, 2010; Meulbroek, 2001, 2002b). An IRM allows firms to control a wide array of risks holistically (Togok, Isa, and Zainuddin, 2016) and consists of many different facets of an organization's activities (Wu and Wu, 2014). Such an integrated risk model combines all sorts of risks with an integrative focus (Andersen, 2008) and helps managers to identify, control, evaluate, and monitor all risks on the specific categories to make a great decision. Thus, IRM offers a steady picture of risk within the entire organization.

Accordingly, since the integrated approach to managerial risk-taking includes differing facets of the organization, companies adopting this approach, are capable of dealing with the skills and expertise necessary to face potential risks.

Although integrated risk management differs from Enterprise risk management (ERM), the other concept of holistic risk procedure, both add a wide variety of strategic, functional, and financial decisions for handling risk (Oxelheim, Wihlborg and Thorsheim, 2011; (Meulbroek, 2002b). Table 1 provides some recent definitions of IRM. Some scholars maintained that the success of IRM is greatly dependent on how proficiently it is applied in an organization (Nocco and Stulz, 2006). Meulbroek, (2002a, 2002b), observed that there are three ways of employing risk management aims: modifying the firm's procedure, altering its capital structure and utilizing targeted financial instruments. IRM identifies a theory that managers must weigh the advantages and disadvantages of the various approaches, and they must also consider the aggregation of all risks encountered by the business for choosing the perfect solutions (Tommerberg, 2010). To put it simply, IRM implementation elements depict the critical path that a comprehensive risk containment program should take to ensure proactive well as reactive measures to lessen systematic risk exposures.

Comprehensive risk containment program should take to ensure proactive well as reactive measures to lessen systematic risk exposures.

Table 1: IRM definitions and descriptions

Scholars	Definitions
Meulbroek (2002a); Bromiley et al., (2015)	IRM is the identification and evaluation of the common risks that affect the significant value and enforcing a company-wide approach to managing those risks.
Miller and Waller, (2003)	IRM is the consideration of a full variety of uncertain contingencies that affect enterprise overall performance.
(Andersen, 2008)	Activities into one unified framework and enables identification of such interdependencies as a consequence.
(Wu and Wu, 2014)	IRM entails identity of unique activities or situations applicable to product innovation's risks and possibilities typically, assessing and measuring them, integrating the risks, and formulating plans to restrict them. The process additionally consists of executing those plans and tracking development.

3 Developing Hypotheses

According to the above-stated discussion, a hypothetical model is presented in Figure 1 illustrates the effect of managers' inclination towards risk-taking and integrated risk-taking management on innovation.

3.1 Risk-appetite and Innovation

Risk-taking comes with an essential influence on organizations' long-term development and innovative activities (Li and Tang, 2010). Consequently, risk-taking is manifested in the managers' willingness to utilize opportunities, aiding their firms in getting competitive advantages through innovation activities (Faccio, Marchica and Mura, 2011). Researchers on innovation literature agree that innovations and creative behaviors are closely associated with risk-taking. In the primary, however, risk-taking should be considered as a relevant attribute of managers to accomplish innovation. In addition, managers have the authority to improve and shape the organization by their high-risk decisions. Therefore, we put forward the following hypothesis:

Hypothesis 1: Managerial risk-taking has a positive impact on innovation.

3.2 IRM and Innovation

Innovation aligns with actions that possess an excessive degree of risk, and to be successful; managers ought to manipulate this procedure and eliminate the risks into account. Tidd, Bessant, and Pavitt (2005) emphasized that even though innovation has different types, scales, and sectors, it is a process, which needs to be managed. Johnson(2010), believed that not only does risk management circulate innovation in advance, but it additionally increases its speed (Bowers and Khorakian, 2014). IRM is set the recognition and assessment of precise events or conditions related to products' risks and possibilities for innovation, integrating risks and plans to reduce risks. Implementation of those packages and their progress is likewise part of this procedure. As a result, even though each risk control hobby reduces dangers one after the other (e.g., Technical risks), integrated hazard control eliminates a few risks and preserves others by growing risk

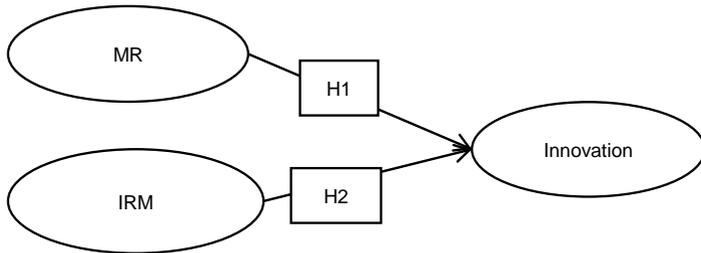


Figure 1: Conceptual model

graphs (Meulbroek, 2002b). Because of different risks in the innovation procedure, the IRM approach has emerged as one of the very most essential additives of innovation. Therefore, we formulated the second hypothesis as follows:

Hypothesis 2: integrated risk management has a positive impact on innovation

4 Methodology

The authors verified the research hypotheses based on the data obtained from insurance companies in Iran. Information in the present research was gathered from human-resource, risk, research and development managers, and managers who somehow handle innovation of insurance, and assessment of its related risks in Iran's insurance companies.

Focusing on one industry, closely examined its specific characteristics associated with innovation. The reason was that, according to Santarelli and Piergiovanni, (1996), researching a small unit make differences get reduced in data.

4.1 Data Collection

To increase response rates, and to ensure the participation of the managers, emails were sent to some managers of insurance companies. The aim of the study was explained in those emails. After receiving the managers' agreement, a questionnaire was sent to them. In addition to sending emails to some directors, some

phone calls were made to directors and deputies, and they were asked to participate in the study. Moreover, some meetings were arranged with respondents to complete questionnaires. This method ensured sufficient access to the right audience, proper use, and understanding of words, and increased the response rate. Finally, 109 valid responses were obtained, equivalent to a response rate of 94.78% (out of 115 distributed questionnaires).

4.2 Questionnaire Development

There were three primary variables in this study, including the manager's risk-taking, integrated risk management (IRM) and Innovation. A seven-point Likert-scale ranging from "1" (strongly disagree) to "7" (strongly agree) was used to measure the existing variables. Three constructs for innovation, were adapted from Jimenez-Jimenez, Sanz Valle and Hernandez-Espallardo, (2008). The managerial risk-taking and IRM were measured by three and one items, respectively, which were adapted from previous research studies by Covin and Slevin (1986) and García-Granero et al. (2015), whereas IRM was adopted from the study of (Wu and Wu, 2014). We only control firm age (number of years since the company's creation); Firm age was measured in two separate categories: " lower than 20 years= 1 and more than 20 years activity= 2".

4.3 Data Analysis and Results

Verifying the adequacy of the data check is essential before performing factor analysis. The KMO index and Bartlett's test were both used to look for the appropriateness of sample adequacy. Thus, KMO in a factorial analysis was 0.896, and thus, the sampling adequacy for this approach is significantly above the threshold value of 0.7(Bilgin and Danis, 2016).The significance level of Bartlett's test ($\chi^2 = 873.474$; $df = 78$, $p = 0.000$) is smaller than 5 percent strengthened its adequacy. Finally, the results verified that the executed dataset in this paper was ideal for exploratory factor evaluation procedures.

4.4 Measurement Model

The authors used Smart PLS software V.2.3.7 (Ringle, Wende and Becker, 2015) to analyze the measurement and structural models (Hair et al., 2017, 2016). We examined the measurement model, through Convergent and discriminant validity. Assessment of the convergent validity includes factor loadings > 0.7 , composite reliability (CR) > 0.7 and average variance extracted (AVE) > 0.5 and Cronbach alpha > 0.7 (Hair et al., 2013).

Table 2: Measurement model

First-order constructs	Second-order constructs	Item	Loadings	t-value	AVE	CR	a
Managerial Risk-taking (MR)		MR1	0/7065	7/32***	0/64	0/84	0/71
		MR2	0/9078	49/45			
		MR3	0/7803	10/42			
Product innovation		IRM	1/0000	---	1/0	1/0	1/0
		product_1	0/9044	38/40	0/76	0/90	0/84
		product_2	0/8970	51/48			
Process innovation	Innovation	product_3	0/8236	20/04			
		process_1	0/7397	12/14	0/70	0/87	0/79
		process_2	0/8905	41/63			
Administrative innovation		process_3	0/8872	36/41			
		Admin_1	0/8714	23/60	0/80	0/92	0/87
		Admin_2	0/9312	63/76			
		Admin_3	0/8854	32/04			

Notes: AVE = average variance extracted; CR = Composite reliability; a = Cronbach's alpha * for two-tailed tests; ***2.57 (1% significance level)

Table 3: Discriminant validity – Fornell- Larcker criterion

Construct	IRM	MR	Administrative	Process	Product
IRM	1/0000				
MR	0/4597	0/8025			
Administrative	0/6369	0/3419	0/8964		
Process	0/5707	0/5207	0/6464	0/8421	
Product	0/5982	0/5107	0/6163	0/6921	0/8758

Note: The bold values in the above matrix are the squared correlations between the latent constructs, and the diagonal values are AVEs

Table 2 shows that the results of the measurement model exceeded the recommended values, thus indicating sufficient convergent validity. In addition to Table 3, Table 4, and Table 5 shows the Discriminant validity. In this regard, the square root of the AVE in table 3, is higher than its highest correlation with any other construct (Fornell and Larcker, 1981; Hair et al., 2017, 2016).

The comparison of cross-loadings in Table 4 indicates that an indicator's loadings are higher than other loadings for its construction in the same column and same row. The Heterotrait- the Monotrait ratio of correlations (HTMT), is another Discriminant validity.

HTMT values shown in Table 5 imply that all values are below the threshold of 0.9 (Hair et al., 2017). Thus, the discriminant validity is established between the latent constructs and, overall, the reflective constructs are reliable and valid.

4.5 Structural Equation Modeling

As mentioned in the previous section SmartPLS 3.2.7 was used to test the structural model and hypotheses (Ringle, Wende and Becker, 2015). The primary criterion for spiritual model evolution is R², which represents the amount of explained variance of each endogenous latent variable (Hair et al., 2016). Table 6 shows that the R² for the entire model is 0/5276, which presents a reasonable explanation of the model. In addition, the effects of control variable (CV) on innovation was tested by adding Firm age as a CV to the model. By adding firm age to the model, the R² of innovation has change from 0/526 to 0/539. Using effect

Table 4: Cross-Loadings

	Managerial risk-taking	IRM	Product	Process	Administrative
Mr1	<i>0/7065</i>	0/2769	0/3747	0/3351	0/1975
Mr2	<i>0/9078</i>	0/4104	0/4527	0/4906	0/3599
Mr3	<i>0/7803</i>	0/4085	0/4002	0/4123	0/2437
IRM1	0/4597	<i>1/0000</i>	0/5982	0/5707	0/6369
product_1	0/4931	0/5259	<i>0/9044</i>	0/6298	0/5531
product_2	0/4565	0/5399	<i>0/8970</i>	0/6745	0/6149
product_3	0/3858	0/5065	<i>0/8236</i>	0/4989	0/4357
process_1	0/3844	0/2794	0/3904	<i>0/7397</i>	0/4570
process_2	0/4012	0/6154	0/6901	<i>0/8905</i>	0/6071
process_3	0/5285	0/5015	0/6284	<i>0/8872</i>	0/5562
Admin_1	0/2167	0/5057	0/4914	0/5308	<i>0/8714</i>
Admin_2	0/2863	0/5647	0/5732	0/6037	<i>0/9312</i>
Admin_3	0/4094	0/6376	0/5879	0/6000	<i>0/8854</i>

Notes: *Italic values are loadings for each item that is above the recommended value of 0.5; an item's loadings on its variable are higher than all of its cross-loadings with other variable*

Table 5: Discriminant validity– Heterotrait- the Monotrait ratio of correlations (HTMT)

Construct	IRM	MR	Administrative	Process
MR	0/5384			
Administrative	0/6783	0/4170		
Process	0/6212	0/6821	0/7681	
Product	0/6500	0/6527	0/7059	0/8183

Note: The criterion for HTMT is 0.90 (Hair et al., 2017)

Table 6: Results of R2 and Q2 value*

Endogenous latent variables	R Square	Q2-value
Innovation	0/539	0/284

Notes: *Q2 value = effect size: 0.02 = small; 0.15 = medium; 0.35 = large

size suggested by Chin, Marcolin, and Newsted, (2003): $f^2=R2_{included} - R2_{excluded}/1-R2_{included}$, The effect size 0/026 was obtained, which shows small effect. Thus, the result illustrates that firm age does not have a significant effect.

When blindfolding is run for all endogenous latent constructs in the model, they all have Q2 values considerably above zero. Table 6 shows that all Q2 values are providing support for predictive relevance (Hair et al., 2017). Table 6 shows the results of R2 and Q2 values. The result of R2 value based on Table 6, indicates that 53 percent of the variance, adjusted R2, in Innovation is explained By IRM and risk-taking with firm age as CV.

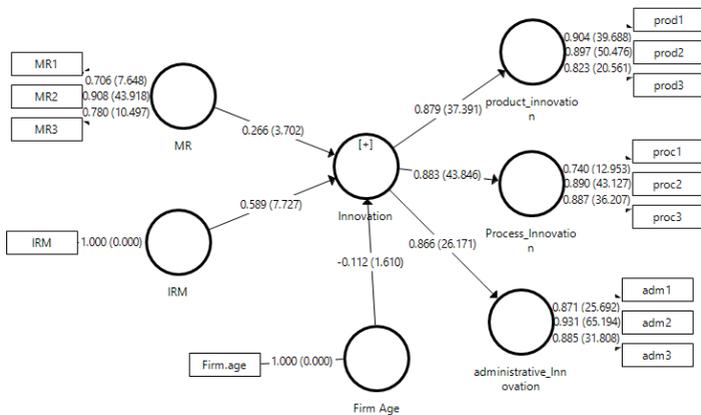


Figure 2: Structural Model Test result

Table 7: Structural results and hypothesis testing

Hypothesis	Path direction	Path coefficient		T-value		Decision
		Without CV	With CV	Without CV	With CV	
H1	MR->Innovation	0/2582	0/266	3/52	3/701	Supported
H2	IRM->Innovation	0/5705	0/589	6/97	7/27	Supported

Table 7 and Figure 2 show the structural model analysis. The results showed that the relationships between Managerial risk-taking and innovation (Path coefficient = 0/266, t-value = 3/701 with a p-value<0.01). Thus, H1 is supported and predicted that managerial risk-taking positively affects innovation in the insurance industry. Furthermore, as Table 7 shows, the relationship between IRM and innovation is significant (Path coefficient = 0/589, t-value = 7/27 and with a p-value<0.01). Thus, the H2 is supported as well.

5 Conclusion

The main aim of our study has been the study of risk management, both integrated risk management (IRM) and managerial risk-taking (MR). To the best of our knowledge, it is a new line of study, which is still fragmented and with little empirical evidence. Given this gap, our study presents, after a theoretical review of the variables, an empirical model which was tested on a sample of 109 managers from Iran's insurance companies in different types of positions.

The results of this paper suggest that both IRM and Managerial risk-taking (MRT) enable the Company's development through innovation in any types. Results show that the risk arises from a variety of sources and most importantly, innovation has a high probability of failure at several stages of organizational development; that is, all types of innovation involve risk, and all risk includes the possibility of failure.

This study offers two important implications. First, it confirms previous research findings and shows that how insurance company as a business enterprise can, to a large extent, bring success in innovation through integrated risk management.

Hence, a firm which adopts an IRM approach may gain more and useful insight about the affection of RM on the firm value and developing innovation activities because these companies have this opportunity to identify all innovation barriers through a systematic IRM framework.

On the other hand, the study predicts that managers who take risks are more inclined to develop innovative products, services, and processes.

If a manager has a low-tolerance for innovative and creative ideas, then it is unlikely to bring new product/process on a regular basis. Thus, managers with the risk appetite ability not only have a higher level of tolerance to innovation uncertainty but also have more assurance in completing innovation projects (Simon and Houghton, 2003).

The second implication of the study is that, even though the company's age did not have a significant effect on innovation; it seems that the company's age can strengthen the effect of managers' risk-taking and integrated risk on innovation. In other words, as the years of activity of insurance companies, more opportunities to innovate and use Risk Management Experience. Therefore, the nature of risk management can be associated with the company's age.

Additionally, We found that IRM was positively related to innovation. In addition, both managerial risk-taking and IRM have a significant indirect effect on product/process and administrative innovation. Thus, these risk management procedures help the companies to improve their organizational performance. This paper contributes to the literature on innovation in the insurance industry through the studying the role of IRM and Managerial risk-taking.

This study offers tremendous managerial implications. First, the hypothesized relationships are supported through the data. This contemporary model has validated to significantly explain both managerial risk-taking and IRM to acquire innovation within the insurance industry. Innovation risks in the insurance industry are among the issues that demand considerable attention. Risk management in insurance has an undeniable role in the improvement and effectiveness of insurance services and economic domains and consequently develops insurance approaches at the micro and macro levels. Thus, innovation in the insurance industry. Since Iranian insurance companies, as a business enterprise, are subject to large fluctuations including operational, national, and political fields, dealing with all risks associated with these areas in the innovation process requires the use of national leadership. This indicates the high status of IRM in an insurance company in Iran.

Consequently, the current study could assist both insurance managers and CEO's to alter better guidelines and strategies to promote the outstanding risk framework throughout the entire company.

Second, our findings provide new insights concerning the role of IRM and managers' risk-taking in facilitating innovation consequences. The results of our study challenge the existing studies that propose the complementary effects of IRM and managerial risk-appetite for innovation. Third, insurance managers ought to consider the efforts and rewards cautiously, when adopting the IRM framework. More particularly, insurance companies will reap an excessive level of revenue and overall performance and will gain more perception about every risk across innovation procedure. Therefore, insurance companies' should construct an effective IRM system that oversees many systematic and strategic risks through organizational innovation. Fourth, insurance managers, need to be conscious that managers' risk-taking will inspire employees to be creative and could proportion their new thoughts freely in their organizational development.

This study has certain limitations regarding the study's sample and setting. First, data were collected in the insurance sector as one of the leading financial institutions, in Iran; therefore, the generalization of the study' results to other financial institutions or other industries and countries with different risk cultures might be rather. Thus, further studies in other areas and sectors to test the model are highly recommended. Second, there is not a specific scale to measure IRM. Therefore, the IRM scale in this study may not be the best measurement scale.

Third, we examined the only effect of managerial risk-taking and IRM on innovation. Future research is needed to examine the effect of other variables on innovation such as innovation culture or adding some control variables such as organizational risk climate or company's size.

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