

## RESEARCH ARTICLE

# The effect of social media on open innovation mediated by knowledge construction process (the case of study: Employees of Mashhad airline agencies)

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### ABSTRACT

Marketing in tourism industry has been done in different eras based on the media available to managers of this industry. With the emergence of new media, the type of marketing activity has also changed. Employees' skills are also important and the success of the individual or the organization depends on committed and expert human resources. Therefore, the present research aimed to explore the mediating role of knowledge construction process in the relationship between social media and open innovation of employees of Mashhad airline agencies. The research population consisted of all employees of airline agencies in Mashhad. The sample size was estimated using a convenience sampling method. The final size was estimated at 348. The data collection instrument was a standard questionnaire used to check the validity of the construct using confirmatory factor analysis. Cronbach's alpha coefficient and composite reliability were used to measure reliability. The results substantiated the validity and reliability of the questionnaire. The data analysis was used through a structural equation modeling in Smart PLS. The results showed that the use of social media affected open innovation and knowledge construction. The use of knowledge construction is effective in open innovation. The knowledge construction process mediates the relationship between social media and open innovation.

**Keywords:** social media use; open innovation culture; knowledge construction process; religious tourism

## 1. Introduction

In today's highly competitive world, organizations are required to employ effective and innovative strategies to succeed and survive in business life<sup>[1]</sup>. In fact, customers' demands and needs are constantly changing, and an organization that does not provide innovative services or products and resists modern production and development is doomed to fail<sup>[2]</sup>. Innovation or creation of new ideas in organizations brings success and flourishing of functions to an organization. For this reason, an organization that welcomes innovation and creativity is widely open and actively engages all employees and customers to monitor its performance. Such an organization will succeed faster than rivals and manages to make more profit<sup>[3]</sup>.

Open innovation has turned into a significant concept in innovation management. It basically involves incorporating into the innovation process the collaboration with external agents. Open innovation may be

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particularly problematic in family businesses, where managers are often faced with a lack of resources and information<sup>[4]</sup>. Since social media can provide an opportunity to foster collaboration, they can serve as the major source of external information and a facilitator of open innovation in the workplace for business employees and external stakeholders<sup>[5]</sup>.

Social media are a primary means of mass communication to extend the horizons of communication through the cyber space. They are considered among the best practical ways of knowledge transfer in organizations<sup>[6]</sup>. Social media can be effectively used for promotion, growth and development of businesses, and to strengthen communication and information acquisition by most people and organizations<sup>[7]</sup>.

Using an open innovation approach, Zubielqui et al.<sup>[5]</sup> empirically observed that external knowledge constructed by market-based actors and social media can enhance innovation. They also noted that specific organizational mechanisms that facilitate effective knowledge transfer in this process need to be further explored<sup>[8]</sup>. Knowledge construction is especially important for organizations to innovate and secure their existence over time. Recently, organizations try to construct new knowledge by launching social media platforms.

There is a growing scholarly interest in the role of social media, i.e., digital technologies of Web 2.0 generation, in collaborative knowledge endeavors<sup>[9]</sup>.

The significant and innovative role that social media play in an organization is its capability of absorbing knowledge<sup>[10]</sup>. Employees' willingness and ability to absorb knowledge and engage in knowledge sharing can increase the organization's information levels and enrich employees' working conditions<sup>[11]</sup>. Knowledge absorption capacity represents an organization's ability to bring in new knowledge and skills for employees to use, accept and share knowledge among other members and pave the way for innovation<sup>[12]</sup>.

Most studies on social media focus on knowledge sharing. In particular, researchers emphasize that social media facilitate knowledge sharing behavior in organizations in an incomparable manner. Regardless of the efficiency of social media, little seminal research has explored the role of social media in collaborative knowledge construction. These studies further discuss social media-based knowledge construction from a technological perspective, that is, to pinpoint the information transfer capabilities of social media. In this sense, they also use a relatively technological perception of knowledge and conceptualize it as something easily stored and transmitted through social media<sup>[13]</sup>. However, knowledge acquisition theorists highlight the importance of social interaction and conversation for the construction of new knowledge in traditional contexts. They suggest knowledge acquisition emerges from communicative interactions and call for exploring these social interactions in new digital forms of collaborative knowledge acquisition. From the technological perspective of knowledge construction in social media, there is a dearth of theoretical understanding of social dynamics underlying knowledge construction processes in social media. Finally, it creates a sound understanding of social media-based knowledge construction and helps discuss how organizations can foster new knowledge construction and increase absorption capacity through social media. It has been recurrently pinpointed in the literature that companies can hope for a sustainable future if they can be well established to achieve economic and social goals. As acknowledged, the notion of innovation, social media and absorption capacity is to the interest of travel agencies to increase profitability and market share, reduce costs and improve performance. Adequate attention has not been paid to innovation, social media and absorption capacity in travel agencies in Iran and especially in Mashhad; thus, it is necessary for managers to consider these issues in the strategies they adopt.

## **2. Theoretical foundations**

### **2.1. Social media use**

Social media include a group of people, organizations or other social institutions that communicate with each other through different social interactions such as friendship, collaborative work or information exchange<sup>[14]</sup>. Today, social media act as a means of maintaining customer brand loyalty<sup>[15]</sup>. In today's technology-driven world, social networking sites have become a way for retailers to extend their marketing campaigns to a wider range of consumers. Jenkins describes social media as a culture of convergence, which translates into media convergence, collaborative culture, and collective intelligence. Social media emerge out of this unique combination of parameters. Media convergence has changed the relationship between the existing technologies, industries, markets, genres, and audiences and, thus, may be considered a paradigm-shifting culture. This can change the logic by which traditional media operate and by which they process consumer news and entertainment. The present researchers argue that this convergence is a process rather than a product, and that we have been living in this culture for some time now<sup>[16]</sup>.

In the active user satisfaction theory, there are people who do not accept the content of media and texts as they are presented and interpret it or interact with it differently. They have their own purposes and do not care about the constructive purposes of media textual content<sup>[17]</sup>. The main assumption of the use and satisfaction model is that the target population is more or less actively looking for a content that provides the most satisfaction. The extent of this satisfaction depends on individuals' needs and interests. The more people feel that the actual content meets their needs, the more likely they are to select that content<sup>[18]</sup>.

### **2.2. Open innovation culture**

Although there are many definitions and classifications of innovation, two are widely recognized due to their important yet common features at the core of the concept of innovation: newness and manageability. First, being new is a property that is common to all definitions of innovation, and is a relative concept. Innovation can be considered new for any individual innovator, for most people in the innovation adoption process, for the organization as a whole, for most organizations in an organizational population, or for the entire world. The second feature common to all definitions of innovation is belief in manageability of innovation. For example, Drucker<sup>[19]</sup> argues that innovation is a central process for a firm. He suggests that within a period of rapid changes, the best and perhaps the only way a business can hope to thrive, if not survive, is to innovate. It is the only way to turn changes into opportunities. Yet, this act of seizing opportunities requires innovation. Organized as a systematic process, innovation is not new and can emerge in many forms. Also, as many authors argue, it is important for organizations to innovate<sup>[20]</sup>.

### **2.3. Absorption capacity**

Current and future success in interorganizational competition depends partly on the allocation of physical and financial resources and largely on knowledge management. The task of leading an organization is to create an environment for knowledge management. In sum, in today's world, the challenge facing managers is to pave the way for the growth and cultivation of human mind in a knowledge-oriented organization. Therefore, the most fundamental skill for managers of knowledge-based organizations is to absorb knowledge<sup>[21]</sup>.

Research on knowledge absorption in an interorganizational context such as strategic alliances and joint ventures has been conducted by Inkpen and Dinor<sup>[22]</sup>, Lyles and Salk<sup>[23]</sup>. Cohen and Levinthal's<sup>[24]</sup> definition of firm level and proposed a relative knowledge absorption construct. Relative knowledge absorption is defined as the ability of a company to learn from another company in a hypothetical student-teacher

relationship, i.e., a learning pair. Relative knowledge absorption, like Cohen and Levinthal's definition of knowledge absorption, depends on the ability of the student company to recognize and value new external knowledge, absorb that knowledge and use it commercially. They examined, among other things, the asymmetry in knowledge absorption between partners and the likelihood of successful R&D joint ventures<sup>[25]</sup>.

### **3. Review of literature and hypothesis formulation**

Arabshahi et al.<sup>[26]</sup> investigated the effect of knowledge value of top managers on knowledge sharing practices, open innovation and organization performance. Their findings showed that the value of high management knowledge has a significant positive effect on knowledge sharing methods. Knowledge sharing methods have a significant positive effect on open innovation. Input innovation has a significant positive effect on corporate performance, but output open innovation does not have a significant impact on corporate performance. The value of high management knowledge mediated by sharing practices has had a significant effect on input and output innovation. The methods of knowledge sharing mediated by input innovation have had a significant effect on corporate performance, but the methods of sharing knowledge mediated by output innovation have not had a significant effect on corporate performance; therefore, it can be concluded that the value of top managers' knowledge affects the methods of knowledge sharing and open innovation and corporate performance in knowledge-based companies.

In another study, Roohbakhshan and Darlik<sup>[27]</sup> investigated the effect of knowledge-based leadership on open innovation mediated by absorption capacity. The results showed that knowledge-based leadership has a significant effect on open innovation and absorption capacity. Also, the effect of absorption capacity on open innovation is significant. The result of the mediation hypothesis shows that absorption capacity significantly mediates (increases) the relationship between knowledge-oriented leadership and open innovation. As a result, the research hypothesis is accepted. Babaei Farsaniet et al.<sup>[28]</sup>, investigated the effect of empowering leadership on open innovation moderated by organizational learning culture and absorption capacity. Their findings showed that the highest coefficient of path and coefficient of determination belonged to the empowerment leadership and organizational learning culture. Moreover, organizational learning culture completely mediated the relationship between empowerment leadership and internal and external open innovation.

In another related study, Sa'dabadi et al.<sup>[29]</sup>, investigated the role of social networks at the service of social innovation and social entrepreneurship, the case of Twitter. The text analysis results showed that, in general, the social entrepreneurship users pay more attention to topics such as the importance of employment in Chabahar, holding open events to identify ideas and opportunities and problems of absorbing further capital. Also, in social innovation, users pay more attention to issues such as the importance of the disabled, construction of dental centers and greenhouses in southern regions of the country and empowerment of women. Also, the emotion analysis of Persian tweets about entrepreneurship and social innovation showed positive results. The effect of social media on entrepreneurial and innovation opportunities mediated by self-efficacy and cultural intelligence was explored by Naeiji and Hooshmand<sup>[30]</sup>, The findings proved the effect of two informational and social functions on the identification of entrepreneurial opportunities and ultimately innovation. Also, self-efficacy and cultural intelligence mediated the effect of social media on seeking opportunities. It is suggested that managers and companies active in culturally diverse contexts focus on using social media to improve their own and their employees' self-efficacy and cultural intelligence.

Jandaghi et al.<sup>[31]</sup>, proposed a model for crowdsourcing innovative ideas on social media in Iran. Their case study focused on the insurance industry. In this research, the case study of Iran's commercial insurance industry and qualitative content analysis showed that the existence of eight types of official institutions, the

formation of five new categories of actors, and the existence of eight key components is needed to create such a system. Keshtkar and Pour Mazaheri<sup>[32]</sup>, tested the effect of social networks on social innovation and found that online social networks affected the development of ideas for problem-solving, product effectiveness and final achievement, as well as problem recognition, implementation and institutionalization of ideas. Cepeda-Carrion et al.<sup>[33]</sup>, investigated the mediating role of knowledge construction processes in the relationship between social media and open innovation. The results confirmed the key role of absorption capacity in the relationship between social media and open innovation. They also proved how social media use emerges as an enabling factor for open innovation practices. In addition, the findings proved the significance of using social media to acquire external information and knowledge, which in turn can help family firms gain more innovative opportunities.

The effect of absorptive capacity and creativity was investigated by Farida et al.<sup>[34]</sup>, on worker performance moderated by social media. The results showed that absorption capacity and innovation have a positive effect on job performance. Also, the results showed that the use of social media has increased the effect of absorption capacity on job performance. In contrast, social media has no power to mediate the effect of innovation on job performance. Cuevas-Vargas et al.<sup>[35]</sup>, investigated the effect of ICT Adoption on absorptive capacity and open innovation for better firm performance mediated by ACAP. The results showed that the adoption of information and communication technology has a significant effect on absorption capacity and open innovation. Furthermore, evidence shows that absorption capacity has a significant effect on innovation. In addition, absorption capacity has a significant partial mediating effect on the relationship between ICT adoption and open innovation, indicating the ability of ICT adoption to foster open innovation through absorption capacity. The results also showed that open innovation has a significant effect on corporate performance. Cruz-Ros et al.<sup>[36]</sup>, investigated absorptive capacity and its effect on innovation and performance and reported findings from SEM and fsQCA. The results showed that innovation in service delivery processes is positively influenced by two of the four dimensions of absorption capacity: knowledge transformation and knowledge exploitation. Also, innovation in service delivery processes encourages outstanding performance and mediates the relationship between absorption capacity and business performance. These findings are supported by the results of qualitative comparative analysis with a fuzzy set.

Although SEM results show that knowledge exploitation has the most direct effect on innovation, qualitative comparative analysis results with a fuzzy set show that knowledge absorption and transformation are necessary conditions for companies to outperform competitors. In another relevant work of research, De Beule and Van Beveren<sup>[37]</sup>, investigated the sources of open innovation in foreign subsidiaries. Their findings showed that technology-creating foreign subsidiaries can benefit from a combination of industry-based value chain partners and science-based partners. In particular, a combination of customers and universities strongly motivate the research efforts of technology-creating companies. Our findings also show that technology-seeking subsidiaries are more likely to use collaboration with competitors. Technology exploiting subsidiaries use significantly fewer external knowledge sources and have less research and development projects. Hossain<sup>[17]</sup>, investigated motivations, challenges, and opportunities of successful solvers on an innovation intermediary platform. The main motivational factors of successful problem solvers were money, learning, fun, sense of achievement, passion and networking. Major challenges that solvers faced were unclear or insufficient description of the problem, lack of communication alternatives, language barriers, time zone differences, difficulties finding the right team members, framing results, and difficulties becoming fast learners and players in team work. Despite the challenges, solvers had many opportunities, such as extensive knowledge, a learning culture, developing a distinctive way of thinking, gaining insight from other professionals, ability to work in diverse environments, post-retirement and distant work opportunities, and a

new source of income.

In some other work of research, Santoro et al.<sup>[38]</sup>, investigated the internet of things to build a knowledge management system for open innovation and knowledge management capacity. The findings show that the knowledge management system facilitates the development of open and collaborative ecosystems and the exploitation of internal and external knowledge flows by extending internal knowledge management capacity, which in turn increases the innovation capacity. This research further uses the findings to identify important scientific and managerial implications and suggest future research directions. Zhang et al.<sup>[39]</sup>, searched for evidence for open innovation and firm performance in Chinese mechanical manufacturing industry. The results show an inverted U-shaped relationship between open innovation and company profitability. These researchers also showed how human capital (both quality and structure) moderates the above-mentioned relationship differently. In general, a higher level of employee education intensifies the positive effect of open innovation, but for manufacturing-oriented firms, such reasoning is not true. In technology-oriented companies, as the proportion of technical employees to production employees increases, the financial performance of companies improves as a result of implementing an open innovation strategy. But in production-oriented companies, the moderating role is negative.

In light of the above-mentioned theoretical foundations and background of study, the following hypotheses are formulated:

### **3.1. Primary hypothesis**

Absorption capacity mediates the relationship between the use of social media and open innovation in airline agencies of Mashhad.

### **3.2. Secondary hypotheses**

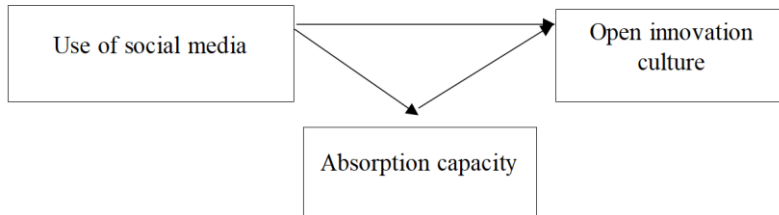
- 1) The use of social media has a significant effect on open innovation in the airline agencies of Mashhad.
- 2) The use of social media has a significant effect on the absorption capacity of the airline agencies of Mashhad.
- 3) The use of absorption capacity has a significant effect on open innovation in the airline agencies of Mashhad.

### **3.3. Description of conceptual model**

In today's world of technology, the advent of technology in marketing as online sales and the use of social media in organizations acted as an important factor in organizational change and customer demands. Among the most important online sale platforms, social media can make a significant contribution to increased creativity and innovation. As hypothesized in the research model, the use of social media can affect open innovation. Ghanadpour and Shokouhyar<sup>[40]</sup>, investigated social media and open innovation, and concluded that the use of social media creates many new opportunities for open innovation. According to another hypothesis of the research model, the use of social media affects the absorption capacity. In their study, Ortega-Gutiérrez et al.<sup>[41]</sup>, explored the relationship between the knowledge acquired from social networks by companies with the capacity to absorb knowledge and organizational learning, and concluded that the use of social media was significantly associated with the capacity to absorb and acquire knowledge. According to the research model, another hypothesis is that using absorption capacity affects open innovation. In their research, Rangus et al.<sup>[42]</sup>, contended that absorption capacity and open innovative performance are two key factors in an organization innovation, which can significantly affect the organization success. In their research, attention was drawn to the significance of innovation and absorption capacity, and that having innovative performance requires open innovation for the organization. Finally,

based on the primary hypothesis of the research model, absorption capacity mediates the relationship between social media and open innovation. In some other research, Cepeda-Carrion et al.<sup>[43]</sup>, observed that the capacity to absorb knowledge mediates the effect of using social media on innovation. In other words, the use of social media in an organization increases the capacity of absorption. Employee knowledge leads to open innovation. Open innovation and many changes in an organization are possible when the employees have the ability to absorb knowledge and acquire it. Social media provide the desired knowledge to the employees.

Thus, the conceptual model is as follows (**Figure 1**):



**Figure 1.** Proposed conceptual model<sup>[43]</sup>.

## 4. Research methodology

The overall purpose of the present study was to explore the mediating role of knowledge construction process in the relationship between social media and open innovation of Mashhad airline agencies. The present researchers did not manipulate the variables so as to achieve a desirable finding; rather, they did their best to explore and describe the existing phenomena as they actually happened. The data collection method was descriptive. To measure the variables of interest, a representative sample was selected from the research population and then the questionnaires were distributed to conduct a survey. The present study was correlational as it explored the relationship between variables to serve the purpose of study. Concerning the nature of study, this research can be considered applied as it aims to develop specific field knowledge.

### 4.1. Research population and sampling

Sampling is a process of selecting a representative number of participants from the target research population so that the researcher will be able to generalize the features to the population<sup>[44]</sup>. As all members of the population have an equal chance to be selected, the sampling method is of the probabilistic type. Yet, in order to have accurate estimates with the least errors involved and for all employees of Mashhad airline agencies to have a chance to participate, the questionnaire was distributed non-randomly and conveniently (**Table 1**). The research population consisted of all employees of airline agencies in Mashhad. To decide on the sample size, the rule of thumb in structural equations was used. Accordingly, a sample size of 350 was selected. For the final analysis, 348 questionnaires were distributed.

**Table 1.** The number of factors in the questionnaire.

Variable	Item#	n.
Use of social media	1–10	10
Absorption capacity	11–25	15
Open innovation culture	26–35	10

## 5. Instrumentation

### 5.1. Data analysis

Demographic variables are different features that can affect the type of employees' response to the research questionnaire. In this research, these variables included sex, education level, and age. **Table 2** shows a summary of the demographic variables of the research sample.

**Table 2.** Demographic variables.

Feature		f.	%
Sex	Female	177	50.9
	Male	171	49.1
Education	≥associate degree	88	25.3
	Bachelor's degree	125	35.9
	Master's degree	96	27.6
	Ph.D.	39	11.2
Age	<30 years	87	25
	30–40 years	125	35.9
	40–50 years	91	26.1
	40–50 years	35	10.1
	>60 years	10	2.9
Work experience	<5 years	87	25
	5–10 years	106	30.5
	11–15 years	83	23.9
	16–20 years	55	15.8
	21–25 years	9	2.6
	>25 years	8	2.3
Job type	Technical manager	69	19.8
	Domestic and international flight expert	90	25.9
	Tour sales expert	104	29.9
	Hotel reservation expert	85	24.4

## 5.2. Structural model

The relationship between the variables in each of the research hypotheses was tested based on a causal structure with the PLS partial least squares technique. In the overall model, which is illustrated in **Figure 2**, the measurement model (i.e., the relationship between each observed variable and the latent variable) and the structural model (i.e., the relationship between the latent variables) were calculated. To measure the significance of relationships, the t-value was estimated via the bootstrapping method, as presented in **Figure 3**. In this model, the Smart PLS output is presented as a summary of the results of the significance of standard factor loading and significance of the relationships among variables. The path coefficients and their significance are presented below.



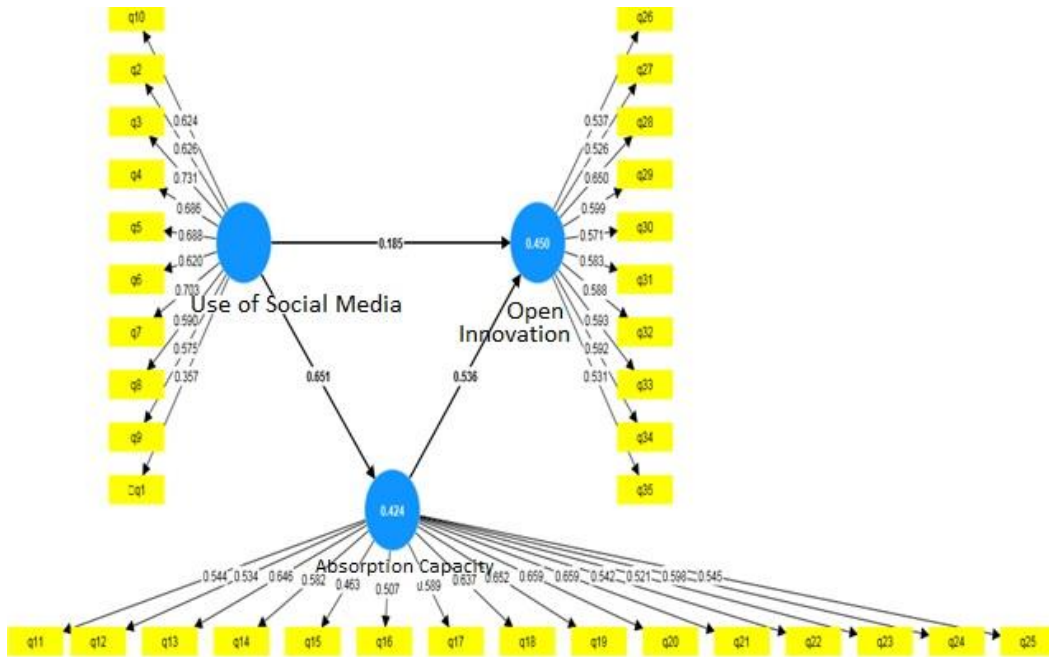


Figure 2. The overall model tested via partial least squares method.

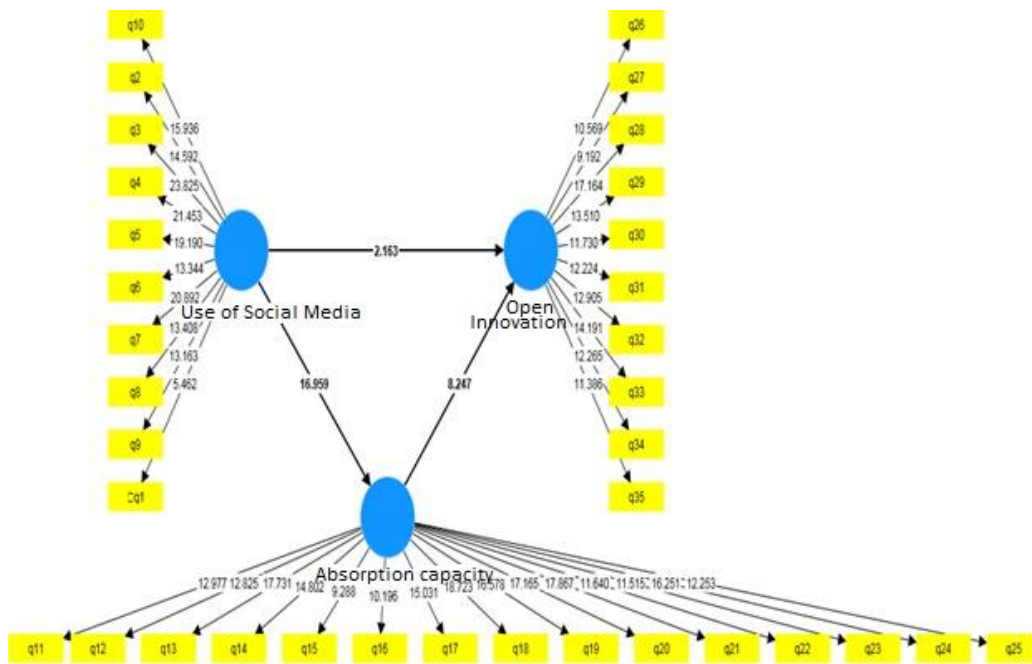


Figure 3. T-value of the overall model estimated via bootstrapping method.

### 5.3. Reliability and validity

To test the divergent validity of the proposed model, Fornell and Larker’s criterion was used. If the correlation between tests that measure different traits is found to be weak, the test diagnostic or divergent validity is confirmed. In divergent validity, the difference between the indicators of one construct is compared with other constructs within a model. The AVE root of each construct is compared with the correlation coefficients between the constructs. To this aim, a matrix should be mapped, where the main diameter represents the root matrix of AVE coefficients for each construct and the lower values of the main diameter are the correlation coefficients between each construct and the other constructs. Cronbach’s alpha and composite reliability were used to substantiate the reliability of the measurement instrument.

As it can be seen, the average value of the extracted variance (AVE) is always greater than 0.5, and the composite reliability is also greater than 0.8 in all cases, which is also greater than the value of the average variance extracted (AVE); therefore, convergent validity is substantiated. Cronbach’s alpha value is also higher than 0.7 in all cases, which points to the reliability of the measurement instrument (**Table 3**).

**Table 3.** Reliability and validity of measurement instruments.

Variable	Cr	Composite reliability (CR)	AVE
Use of social media	0.824	0.864	0.594
Absorption capacity	0.859	0.884	0.538
Open innovation culture	0.778	0.833	0.534

As it can be seen in the matrix above, in each column, the square root of AVE for each construct is greater than the correlation coefficients of that construct with other constructs, which substantiates the divergent validity. If the convergent/divergent validity is confirmed, the overall validity of the measurement model is also accepted (**Table 4**).

**Table 4.** Divergent validity of research variables.

Variable	Social media	Absorption capacity	Open innovation
Use of social media	0.628		
Absorption capacity	0.551	0.582	
Open innovation culture	0.534	0.456	0.678

#### 5.4. Overall test of the quality of structural model

Hair et al.<sup>[45]</sup>, proposed five steps to evaluate the GOF of partial least squares structural models, as described earlier in this paper. Three values of 0.10, 0.25 and 0.36 are interpreted as weak, medium and strong values for GOF, as measured using the  $R^2$  index and the mean of redundancy indices.

Once the paths have been analyzed, researchers need to evaluate the qualitative features of the model. The first assessment for model quality is the estimation of coefficient of determination, which is a measure of a model’s predictive capabilities. This value measures the degree of variance of endogenous variables explained by exogenous variables. This is critical information for reporting and the most fundamental assessment of a model’s quality. The coefficient of determination is interpreted as statistically significant if the value is 0.35 or higher. It is interpreted as moderate if the value ranges between 0.15 and 0.35, and is considered as low if it ranges between 0.02 and 0.15. Of note is that the coefficient of determination is strongly influenced by the number of constructs within the model. Thus, authors should consider co-determination coefficient values when investigating similar constructs. If the coefficient of determination value is unusually high compared to past research, the model is likely overfitting<sup>[45]</sup> (**Table 5**).

**Table 5.** Communality and  $R^2$ .

Variable	Communality	$R^2$
Use of social media	0.594	*
Absorption capacity	0.538	0.424
Open innovation culture	0.534	0.450

According to the table, the GoF value can be estimated as:

$$GoF = \sqrt{0.437} \times 0.555 = 0.492$$

The GoF value of the model was equal to 0.492, which proves the overall acceptable fit of the proposed model.

### 5.5. Criterion of predictive relevance (Stone-Geisser Q<sup>2</sup>)

This criterion was introduced by STONE<sup>[46]</sup> to determine the predictive power of the model in dependent variables. According to Stone and Geisser, a model with an acceptable structural fit should be able to predict the indicators of endogenous constructs of the model. If in a model, the relationships between the constructs are correctly defined, the constructs can adequately affect each other's indicators; thus, the hypotheses will be accepted. The Q<sup>2</sup> value should be estimated for all endogenous constructs. Three values of 0.02, 0.15 and 0.35 have been determined as low, medium and strong predictive power. Q<sup>2</sup> for the dependent variables of research is as the following:

According to **Table 6**, the predictive power of the model was low for absorption capacity and open innovation.

**Table 6.** Q<sup>2</sup> values of dependent variable of conceptual model.

Dependent variable	Q <sup>2</sup>
Absorption capacity	0.136
Open innovation	0.142

The results of testing the hypotheses of this research are reported in **Table 7**, and according to that, all the hypotheses have been confirmed.

**Table 7.** Output of research hypothesis testing.

Path	Path coefficient	t-value	p-value	Result
The use of social media has a significant effect on open innovation in Mashhad airline agencies.	0.185	2.163	p < 0.000	accepted
The use of social media has a significant effect on the absorption capacity of Mashhad airline agencies.	0.651	16.959	p < 0.000	accepted
Absorption capacity has a significant effect on open innovation in Mashhad airline agencies.	0.536	8.247	p < 0.000	accepted
Absorption capacity mediates the relationship between social media and open innovation in Mashhad airline agencies.	0.271	6.320	p < 0.000	accepted

## 6. Discussion

The results of the statistical analyses to test the research hypotheses are presented here for all hypotheses respectively.

**Primary hypothesis: Absorption capacity mediates the relationship between social media and open innovation in Mashhad airline agencies.**

The z-value was estimated at 7.41. As this value is higher than 1.96, it can be concluded that absorption capacity mediates the relationship between social media and open innovation. This research finding is consistent with the work of research by Cepeda-Carrion et al.<sup>[43]</sup>

According to Cepeda-Carrion et al.<sup>[43]</sup>, the capacity to absorb and share knowledge is an important mediating factor in the relationship between social media and open innovation, and knowledge construction that takes place in airline agencies leads to an increase in creativity and open innovation. These two studies are different in terms of research population. Thus, the significance of knowledge capacity is different in the

two research populations, the results are the same.

These digital platforms allow different groups to openly collaborate and foster knowledge sharing and crowd-sourcing among them. It fundamentally changes the way companies innovate, and guides the scope and direction of innovative processes.

**The first secondary hypothesis: The use of social media has a significant effect on open innovation in Mashhad airline agencies.**

The results showed that the effect of social media on open innovation was 0.185. The *t*-value of the relationship between the use of social media and open innovation at a CI of 95% was 2.163. As the value is higher than 1.96, it proves the significance of the effect of social media on open innovation. This finding is in line with a body of research conducted by Palacios-Marqués et al.<sup>[47]</sup>, Patroni et al.<sup>[48]</sup>, and De Bilquis et al.<sup>[49]</sup>. The results show that the use of social media is exogenous to absorption capacity. Second, the results support the theoretical proposition about the importance of absorption capacity for contradicting or filtering external information.

Social media are platforms that, since entrance to the realm of business, have brought changes to organizations over years. Through time, these media have led to innovation and creativity in the system of organizations with their own functions, which has played a major role in customers' opinion and increased new products and services.

**The second secondary hypothesis: The use of social media has a significant effect on absorption capacity.**

The results indicated that the effect of social media on absorption capacity is 0.651. The significance level of the *t*-value between the use of social media and absorption capacity at a CI of 95% was 16.959. It is higher than 1.96, which points to the significant effect of social media on absorption capacity. This finding is consistent with a body of research by Shwanglin and Hu<sup>[50]</sup>, Scotto et al.<sup>[51]</sup>, and Cepeda-Carrion et al.<sup>[43]</sup>. The findings showed that the higher the use of social media, the higher the chances of the company absorbing external knowledge. Therefore, the use of social media supports the organizational learning capabilities of companies to acquire, absorb, transform and exploit external knowledge in corporate operations.

Social media, as a means of mass communication and information transfer technology, is the key to changes in individuals' existing attitude and knowledge. As the results showed, social media can affect the ability to absorb and create knowledge. They can update and provide easy access for people and customers, because the media are constantly used by people and organizations, and to them innovation matters.

**The third secondary hypothesis: Absorption capacity has a significant effect on open innovation in Mashhad airline agencies.**

The results showed that absorption capacity had a significant effect of 0.536 on open innovation. The significance level of *t*-value for the relationship between absorption capacity and open innovation at a CI of 95% is 8.247. The value is higher than 1.96, which proves the significance of the effect of absorption capacity on open innovation. This finding is consistent with a body of research by Moilanen et al.<sup>[52]</sup>, Scotto et al.<sup>[51]</sup>, and Cepeda-Carrion et al.<sup>[43]</sup>.

These findings are in line with the results of these studies, which points to the significance of the capacity and capability of an organization and employees in absorbing and sharing knowledge to create innovation and creativity. Creativity and innovation emerge when knowledge and science are constantly growing and used, and the members of an organization are aware of its functional capabilities and increase

their desire and ability to innovate ideas.

The results confirm that, to make full use of external information collected through social media, companies should establish appropriate organizational processes and routines to transform this external information into knowledge that reflects more effective services. This finding highlights the role of absorption capacity in changing external information to real innovations and also highlights the relevance of knowledge application and transformation in this process.

## **7. Conclusion**

The present study was conducted to explore the mediating role of knowledge construction process in the relationship between social media and open innovation among employees of Mashhad airline agencies. As the results showed, the use of social media has a positive and significant effect on open innovation through the capacity of absorbing knowledge. In Arguably, in airline agencies, the use of social media in an organization leads to the capacity to absorb and construct knowledge in way that the employees get more information through the continuous use of social media. They learn online methods and come across a lot of new information in social media, which provides the basis for raising the awareness and knowledge of employees in work and other relevant domains. Knowledge construction among the employees of Mashhad airline agencies causes open innovation and motivation for better changes in an organization. Constantly browsing social media and seeing different information in social platforms that organizations and other people share based on their existing knowledge can increase employees' willingness to increase the potential of growing knowledge and awareness. It can facilitate the emergence of high capacity in absorbing new knowledge, which can be significantly involved in job-related task and duties. Similarly, by acquiring knowledge and the capacity to absorb it, people can introduce changes and transformations, which causes creativity and innovation in organizations, and enables the organization to achieve its goals.

### **Suggestions concerning the research hypotheses:**

#### **Suggestions concerning the primary hypothesis: Absorption capacity mediates the relationship between social media and open innovation in Mashhad airline agencies.**

In light of the present findings which confirmed the primary research hypothesis, the following can be suggested:

- To fully benefit from external knowledge gained from social media, agencies must have specific organizational processes to acquire and absorb external knowledge and specific procedures to exploit this knowledge and turn it into ideas or provide new services. As a result, absorption capacity seems the necessary condition for using external knowledge gained via social media to promote open innovation activities.
- Agencies improve the quality of services by examining customer feedback through social media and hope to attract new customers through social media.
- Agencies use social media to search for general information about the target market and use it to search for competitors.

#### **Suggestions concerning the first secondary hypothesis: The use of social media has a significant effect on open innovation in Mashhad airline agencies.**

In light of the present findings which confirmed the first secondary hypothesis, the following can be suggested:

- Agencies should strategically use social media to communicate with various stakeholders to be more open, responsive to the environment, and to capture valuable ideas for developing new products and

services that meet customer needs.

- In these agencies, social media should be used to meet the customer needs and they should spend time on social media according to customer needs. They should systematically collect customer feedback on social media sites.
- Agencies use social media to perform customer service activities.

**Suggestions concerning the second secondary hypothesis: The use of social media has a significant effect on absorption capacity in Mashhad airline agencies.**

Accordingly, the following suggestions are made:

- Absorption capacity seems to act as the necessary condition to make external knowledge available in a timely and complete manner. To take advantage of all potential benefits of social media, agencies should develop specific organizational routines and an appropriate culture to cultivate absorption capacity.
- Managers should develop an appropriate learning culture in their companies and provide specific training to develop employees' ability to acquire, integrate and use information collected on digital platforms.
- Agencies use social media information to provide full details of products and services. The agency should try to get information from social media to understand the needs of its customers.

**Suggestions concerning the third secondary hypothesis: Absorption capacity has a significant effect on open innovation in Mashhad airline agencies.**

Concerning the third secondary hypothesis, the following suggestions are made:

- It is essential to establish adequate communication processes and systems, share this information across agencies and use it to improve customer experience and generate new ideas for better services.
- As businesses seek to assure of their continuity in their business and tend to have long-term goals, knowledge management across generations becomes a requirement for innovation and performance improvement for businesses.
- Agencies regularly consider the implications of changing market demand for new services.
- Employees should save and recall newly acquired knowledge for future use.
- Management of agencies encourage employees to use information and employees easily share practical experiences.
- New opportunities to serve clients by agencies need to be understood quickly.
- Employees need to store and recall the newly acquired knowledge for future use, and employees need a common language to discuss products and services and constantly think how these can be used more efficiently.
- Employees can meet regularly to discuss issues and use external technological knowledge.

## **8. Suggestions for further research**

Finally, practical suggestions are provided for those interested in further research on the topic:

- Since social media use and innovation are inherently dynamic phenomena, a longitudinal analysis can be useful to enrich the findings.
- Future studies can include a multi-respondent perspective to further enrich the results.
- International samples are needed to validate and generalize findings to different contexts.
- Future research can explore the mediating role of absorption capacity between social media and open innovation in companies. The model proposed in this paper guides future researchers interested in corporate studies to explore the black box of social media in corporations.

- Further research is needed to include other variables such as value co-construction to foster the development of open innovation or use the market orientation variable to collect ideas that can improve the relationship between companies and their market.

## 9. Limitations of study

Firstly, the data collection was questionnaire-based and, thus, suffered the limitations inherent to questionnaire use. Secondly, the data were collected from the staff of Mashhad airline agencies and the results cannot be generalized to other airlines or cities. Thirdly, the data collection was cross-sectional. The key term method was used; thus, we used the managers' perceptions for data collection. Though this method has been widely used with certain benefits, it has its particular limitations, as it reflects the limited opinion of an individual.

## Author contributions

Conceptualization, SMHH and OB; methodology, SMHH and OB; software, SMHH and OB; validation, SMHH and OB; formal analysis, SMHH and OB; investigation, SMHH and OB; resources, SMHH and OB; data curation, SMHH and OB; writing—original draft preparation, SMHH and OB; writing—review and editing, SMHH and OB; visualization, SMHH and OB; supervision, OB; project administration, OB. All authors have read and agreed to the published version of the manuscript.

## Conflict of interest

The authors declare no conflict of interest.

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