

Does technology orientation predict firm performance through firm innovativeness?

Seemab Yousaf

Department of Management Sciences, Hazara University, Mansehra Pakistan

Muhammad Khalid Anser

School of Public Administration,

Xi'an University of Architecture and Technology China, Xi'an, China

Muhammad Tariq

Government College of Management Sciences Mansehra Pakistan, Mansehra, Pakistan

Sakhawat Ur Rehman Sahibzada Jawad

Saibaan Development Organisation, Mansehra, Pakistan

Sadaf Naushad

Department of Higher Education, Government College of Management Sciences, Abbottabad, Pakistan, and

Zahid Yousaf

Government College of Management Sciences, Abbottabad, Pakistan

Abstract

Purpose – The purpose of this study is to investigate the impact of technology orientation (TO) on firm performance (FP). This study also aims to identify the mediating role of firm innovativeness (FI) in the relation between TO and FP.

Design/methodology/approach – Quantitative approach has been adopted for analyzing the impact of TO on FP in software houses located in two big cities of Pakistan. Mean, standard deviation, correlation and regression analysis were used.

Findings – Results proved that of TO predicts FP and FI mediate the relationship between TO and FP.

Practical implications – This study used cross-sectional further studies may be conducted using longitudinal research design for achieving in-depth insights.

Social implications – Software houses should focus on TO and innovativeness for improving their performance.

Originality/value – This research guides the way to improve performance TO and innovativeness of software houses based on the empirical results.

Keywords Pakistan, Technology orientation, Firm innovativeness, Software house

Paper type Research paper

1. Introduction

The software industry is one of the flourishing sectors of the economy of Pakistan which plays an indispensable role in the economic uplift of the country (Tanwir and Khemka, 2018; Ziemba, 2019). Firms involved in the software are required to pay attention not only to technology orientation (TO) but also to the orientation of the market as these have got scholarly attention from the time when it was acknowledged being the main element for the favorable outcomes of software firms. Such like orientations are very supportive and show direction to the organizations in devising proper strategies to accomplish their goals in an effective manner. Those software firms which are equipped with advanced technology are



highly aligned with the research and development (R&D) activities and make use of modern technology with a view to develop novel products (Frank *et al.*, 2016; Teubner and Flath, 2019). This study is being carried out to explore the process through which software firms perform proficiently with the application of an ideal setting in order to examine the role of orientations of technology and market (Loraas and Diaz, 2009).

The present time is an era of fast growth in all fields particularly the software sector, where change and latest developments take place unprecedentedly (Giunti *et al.*, 2019; Masa'deh *et al.*, 2018). Executive bodies of such firms mainly rely on the ability of firms with respect to their adaptability with the changing requirements as well as finding out latest methods to meet the requirements of the excellencies. Therefore, the performance of firms dealing in the software sector is highly dependent on their capacity to take initiative and get involved in innovations. A firm's knowledge with respect to technology and determines its ability of innovativeness (Parida *et al.*, 2017; Vishnivetskaya and Mikhailova, 2019). Therefore, this study involves investigations to find out that how the firms in the software industry can accomplish performance via innovativeness, market orientation as well as TO. The process of acquiring the ideal level of performance looks very difficult as well as costly, besides this maintaining continuous innovativeness itself is a difficult task (Acar and Özşahin, 2018). In order to cope with such situations, the firms dealing in software sectors should pay full attention and devise long-term strategies in accordance with market- and technology-related reforms (Tajeddini, 2016; Yeniyyurt *et al.*, 2019). Pakistan-based software firms require not only a strategic but also a proactive response in order to meet the dynamic demands of the market. While doing so, the firms should keep in mind the expected setbacks which may result due to the occurrence of high scale technological obsolescence. To address all these hurdles, this research work focuses on the capacity of the firms' in getting extensive knowledge regarding relevant market as well as technology (Joshi and Mouri, 2015; Sánchez-Martín and Keller, 2019). In order to ensure competitiveness for software firms, both the TO and market orientations play strategic role. The research studies conducted so far, do not give any substantial knowledge to explain the role of TOs along with market orientation with a view to attain firm performance (FP) with the help of firm innovativeness (FI) that constitutes a noteworthy research gap. The present study will provide a platform to the software firms to give reconsideration to the effectiveness of TO along with market orientation with a view to improve performance. Figure 1 shows the theoretical framework of this research.

It is a matter of fact that contemporary global economy is reshaping with an unprecedented growth rate, particularly the contribution of computer related services has given a new look to economic landscape. Through latest computer programs and application software technologies, competitive advantages can be obtained in every walk of life, e.g. in the healthcare sector, computer programs are used for open heart and other surgical activities, lab

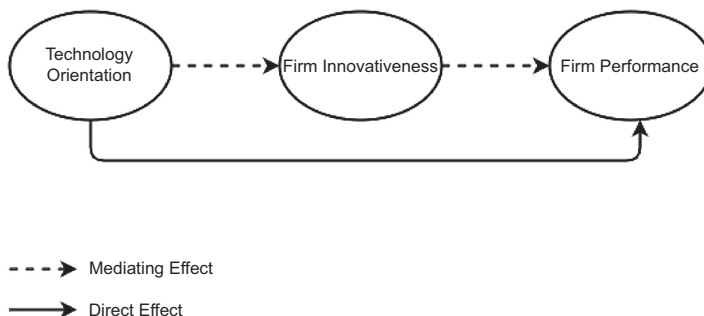


Figure 1.
Theoretical framework

diagnostic processes, pharmaceutical processes. Similarly in other fields like governance, education, defense, aeronautical operations, business, industries, marketing, engineering design, governance, genetic processes and a series of endless fields where computer usage has totally changed the traditional uses. It is therefore, imperative that the software houses are given complete patronage by the government of developing countries like Pakistan so that advancement in different sectors of economy is attained. This shift TO for improving software houses is more profound in Pakistan. Hence, the current study offers more interesting implications for practical management. The research model is presented in Figure 1.

2. Literature review

2.1 Technology orientation

Technology-driven technique is meant to proactive creation along with a quick coordination in order to get educated with the advancements in technology, and subsequent application of such innovations in the process of business, i.e. new product improvement, etc. (Tambunan, 2019; Zhang *et al.*, 2018). An organization which is technology driven perhaps goes beyond expectations in growing maximum return through provision of services and products (Jawad *et al.*, 2019; Schlaegel and Reichel, 2017) as customers show keen interest in such kind of services and products. In this way, technology-driven application enables a firm to produce quality products which instantly meet customers' demand, and all this facilitates organizational execution (Frambach *et al.*, 2016; Zulu-Chisanga *et al.*, 2016; Yousaf *et al.*, 2018). TO is a firm's inclination toward application of latest technology for introducing new products, besides improving existing products and services through encouraging and supporting innovative ideas (Ardito and Dangelico, 2018; Yousaf and Majid, 2017).

The research work of the previous scientist researchers reflects that those organizations which have technological orientation possess comprehensive knowledge with respect to extensive technological updates besides hiring the services of experts in finding out solutions for technical problems. TO causes significant achievements and assists in finding out the technological solutions and ultimately firms satisfy the demands of their clients. Technological orientation is highly essential for updating the new technology besides playing a significant role to meet the relevant challenges pertaining to business performance (Parida, 2017; Chakraborty *et al.*, 2019).

TO is deemed as an important determinant of innovation in those firms whose reliance is on technology along with this; it also acts as preliminary idea for innovation based organizations (Jongman *et al.*, 2020). Those firms which are dependent on TO have the ability for attaining a favorable technology environment and subsequently use this environment for the development of new products as well as the requisite processes of novel goods. Besides this, it pays attention on "technology push" notion within the organization, and ultimately modern technology is used instantly by the firms and ultimately avail the benefits of first mover. Those firms which give high value to technology invest a significant amount of their funds in the "Research & Development" and at all times give preference to those firms which have TOs (Frank *et al.*, 2016). TO capability facilitates an organization in becoming vigilant regarding scientific developments.

2.2 Firm innovativeness

It is a matter of fact that the innovativeness is a prerequisite not only for the survival of business organizations but also essential for their higher performance (Vanhala and Ritala, 2016; Wang *et al.*, 2020). It is the capability of a firm to link itself in introducing new ideas, products as well as services which may have positive impact on FP besides promoting

developmental process. In the broader sense, the innovativeness can be viewed through innovation breadth and innovation depth (Kim *et al.*, 2015; Danneels and Vestal, 2020). The former one is subclassified into different domains (like innovativeness in the context of product, marketing process, as well as overall innovativeness of the organization, etc.) and with the application of this an organization may introduce new idea (Zawawi *et al.*, 2016). Innovation depth refers to the organizational competency to identify new offering time and again confirm itself being ready at any time for creativity apart from domains of new offering. Innovativeness is a significant approach, with special reference to the firms involved in software research. Organizations dealing in software services face dynamic changes and usually depend on the latest technology to ensure business success (Sedera *et al.*, 2016). Organizational innovativeness has the quality to minimize mistakes with the help of advance thinking which facilitates technology-related firms, i.e. software houses in establishing their business houses, owned by technology-intensive industries.

Organizational innovativeness is one of the initial steps in introducing a culture which encourages innovative activities, which are essential for ensuring organizational performance. It is the firm innovativeness which supports not only the management of the firm but also supports the employees of the firm in creating and developing new ideas. Besides this, it also supports in resolving different problems in a newest as well as unique way. Majority of findings pertaining to research on innovation highlight that organizational innovativeness brings innovation in the firm's, yet, the current research pay attention on the FP being the core result of FI (Vij and Bedi, 2016). FI is the key element which paves the way for organizations to encourage their teams to adopt innovative work behavior in the application of new technology, new service, new product and processes alike. Actual use of imagination being the main point pertaining to innovativeness, always supports in the generation of creative ideas for innovation and subsequent execution. This is the principal tool that facilitates in achieving competitiveness, performance as well as establishing a sound business. Moreover, innovativeness facilitates organization to instantly adapt the requisite changes which abruptly arise during market operation because of the vibrant technological trends. Organizational innovativeness establishes a supportive organizational culture which motivates their workers in giving innovative ideas, providing new insights about executive decisions and above all more clearly formulating innovative strategies. Such a culture ensures an environment that is helpful in introducing creativeness, comfortable environment and target-oriented condition with a view to achieve desired results.

2.3 Technology orientation and firm performance

Those firms which have high level of TO allocate a lot of their funds for enjoying the fruits of novel innovations which play the role of trend-setter, applying new procedures, introducing new services as well as products. Along with this, the technological changes taking place in the industry may also have impact on their improvement potential or technology adoption (Zhang *et al.*, 2018). Earlier research studies reported that TO have positive effect on strategic business performance (Hao and Song, 2016). Despite the fact that the role of TO with respect to development was admitted since long, however, the previous research scholars have given least amount of importance to the association which exists between TO and business performance. Firms having high degree of TO, enjoy high business performance during the period when fast changes take place in the technology as they have the capability to meet the demands of their customers through applying new procedures, services and products (Tseng and Liao, 2015). Firms having high level of TO along with incorporating technology advancement and maintain customers' satisfaction, most probably have an upward expansion in performance, profit and also in sustainability (Tajeddini, 2016). In this respect, a lot of resources are being invested with the belief that excellent returns will come

(Zulu-Chisanga *et al.*, 2016). The earlier research studies explored that the firms make investments in their R&D activities, and enjoy its fruits through new innovations and avail the benefits of refined advanced technology. When the market is in stable condition apart from abrupt technological advancements, the effect and importance of the old technology automatically diminishes quickly. Organizations must allocate handsome resources for technological advancements, introduce different products with latest advancements and manage risk through developments else they will be thrown away from the market due to the application of obsolete technology (Frank *et al.*, 2016). Firms described with high degree of technological instability, compete only on the basis of technology rather than the firms portrayed with low level of technological instability. With the application of latest graphic and animation technology, software program upgrade planning models, enhance performance of products, hardware as well as machines (Polys *et al.*, 2018). An organization which is highly dependent on technological capability must have the ability to foresee as well as ensure technological advancement for application in its products and services, to avail the benefits of high business performance. Organizational plan may explain that how the firm will compete in the market and attain constant dominance in the industry. Despite all this, it (technological orientation) has still not considered as a significant factor for strategic orientation. Many scholars have made research studies regarding perception of TO from both individual and organizational point of view. So far very rare research work has been made regarding TO in small and medium enterprises as earlier studies mostly focus on larger organizations. Research study conducted by recommended that an organization's long-term success depends on TO which presents opportunities for provision of new technological products, procedures and services.

There is no consensus on a commonly agreed upon definition of TOs. (Saqib *et al.*, 2018) explains that TOs reflect motives of an organization as well as the attitude of its management with respect to implementation and production of new technology or services with a view to have an interconnection in the market, with the help of properly producing and combining the new technology. Thus, for the prosperity of a firm, TO is deemed as an immediate strategic orientation (Acar and Özşahin, 2018). The logic of TO highlights that a firm which has TO is always proactive in R&D activities, acquiring the newest technology along with using latest technology in the process of producing new products as well as services, etc. (Polys *et al.*, 2018).

Technology-driven firms use technology just like an information spruce (Tajeddini, 2016), and remain intensely centered about R&D processes for improvement of FP (Wamba *et al.*, 2017). All this is managed through large budgetary provisions for gathering and storing innovative information which is mostly helpful in strategic performance enhancement. Those firms which are seeking a technology-driven system give high importance to technology improvement in their system to attain their technical objectives which is significant for creating the desired products and services (Tseng and Liao, 2015). Such firms are energetic in obtaining latest technology along with making use of these developments in the process of producing new products and services with a view to meet ever evolving needs of their clients (Polys *et al.*, 2018).

Technology-driven firms highly emphasize acquisition as well as use of the novel technology and for this purpose they always keep relations with the pertinent stakeholders like research firms, competitors and suppliers, etc. in order to acquire new technology. Data technology capabilities show an organization's ability to establish and disseminate data. These capacities include data technology models for betterment of internal communication, creation of technical information as well as cross functional incorporation. Abilities of latest technology enable a firm to successfully disseminate technological data in all the working departments (Tseng and Liao, 2015). As a result of this, it is hoped that the application of

technology-driven technique demands as well as encourages the upgradation of abilities of data technology with a view to generate and disseminate specialized data (Frank *et al.*, 2016).

H1. Technology orientation predicts firm performance of software houses.

2.4 Mediator firm innovativeness

One of the key objectives of the current study is to inquire into mediating role of FI pertaining to TO vis-a-vis FI. Those firms which are technology-driven provide latest information as well as updated news regarding technology besides deeply covered R&D process in order to strengthen FI (Acar and Özşahin, 2018). Firms dealing with technology-related businesses, e.g. software houses always support collection as well as gathering innovative information, along with storing it with having heavy budget in R&D (Arora *et al.*, 2016). They make direct investment in new technology and sort out products and establish solid foundations for organizational innovativeness (Joshi, 2015). If organizational innovativeness coincides in its proper direction along with its implementation at the proper time, it may give a high profit to the firm. First mover firms, may easily get customers' attention along with developing long-term relations with the customers which will strengthen their position vis-à-vis competitiveness and performance. Firms established in developing countries like Pakistan, have to pay attention on TO, so that FI is secured which is a prerequisite for business success. It is an open secret that FP in software houses is highly dependent on novel thinking and innovative skills (Vij and Bedi, 2016). TO provides awareness about the novel trends in technology which ultimately determines FI. Accordingly, the present study investigates the impact of TO on FI with the incorporation of FI being a mediator.

One of the key aims of the current study is to find out the mediating role of FI on the relation between TO and performance. Firms that are technology-driven provide latest news and information regarding technology while remaining profoundly focused about R&D processes in order to improve their (firms) innovativeness (Ockwell *et al.*, 2015). The technology-related organizations like software houses always look forward for gathering innovative information and subsequently storing it with the help of hefty budget in R&D and directly invest in new technology that result in good organizational financial performance (Roztocki and Weistroffer, 2015). The TO supports firms' technology capacities for improving technology and segregates products and set strong foundations for FI (Lee *et al.*, 2015). FI may result in high profitability provided that it is implemented in the proper direction as well as at the proper time. The first mover firms may enjoy attention of customers and develop long-term relations with the customers that will make it sure their competitiveness as well as performance. The information technology sector of developing economies like Pakistan ought to pay attention on TO in order to It is a matter of fact that FP mainly relies on the new thinking in information technology/software houses for which the firm should be equipped with innovative skills. In a nutshell, TO determines FI which provides updates regarding the newest trends regarding technology. In light of above, this study is focused to investigate that how the FI affects as mediator, the relationship of TO vis-à-vis FI.

H2. Firm innovativeness mediates the connection between technology orientation and firm performance

3. Methodology

This study is quantitative in that way in which a survey has been conducted through questionnaire. The element of investigation for this study is software houses of Pakistan. As

the software sector fast growing industry and majorly depends on technology, where alterations and newest developments take place unprecedentedly (Masa'deh *et al.*, 2018).

3.1 Sample size and data collection

For this research, we have collected data from software houses located in Pakistan the famous cities, i.e. Lahore and Peshawar. These two cities have six IT parks having 150 to 180 employees and the total employees working in these software houses were 1,135. Before data collections, the Managing Directors were contacted for participation in survey. Simple random sampling technique was used and four software houses were agreed to participate. 657 questionnaires were distributed through email out of which 511 questionnaires returned back. After checking the missing data and incomplete questionnaire only 478 useable questionnaires were included for analysis.

3.2 Measurement of variables

All the variables were measured by using 5-point Likert-scale responses ranged from 1 for strongly disagree to 5 for strongly agree. The scale of FP was measured with three Items adapted from the work of Lee *et al.*, 2015. The questions were asked about the firms' major performance in the area of market share, sales and profitability as compare to the three largest competitors of the firm. Cronbach's α value was satisfactory for this construct 0.835. The scale of TO was measured with four items adapted from the work of Lee *et al.*, 2015. Cronbach's α value was satisfactory for this construct 0.835. The scale of FI was measured with five items adapted from the work of (Lee *et al.*, 2015). Cronbach's α value was satisfactory for mediating variable 0.868. The control variables of this research study are Respondent Age, Education and Experience.

4. Analysis and results

LISREL 8.54 and SPSS 22 software were used to scrutinize the data, Constructs validity was checked through confirmatory factor analysis (CFA) and data fitness was confirmed through structural equation modeling (SEM). This study compared the proposed models and results shows that three-factor model was fit to the data and had acceptable values of CFA (root mean square error of approximation (RMSEA) = 0.046, $\chi^2 = 946.35$ df = 456; $\chi^2/\text{df} = 2.07$; confirmatory factor index (CFI) = 0.93; incremental fit index (IFI) = 0.94; goodness-of-fit index (GFI) = 0.92).

4.1 Scale measurement

Both convergent and discriminant validity was checked. Results proved that convergent and discriminant validity was not an issue in this study. Table 1 shows composite reliability (CR) is greater than 0.98; average variance extracted (AVE) is less than 0.78; and CR is less than AVE).

Table 2 presents the values of correlations, means and SD. Results shows that TO and FI has positive association ($r = 0.43$), TO and FP has positive association ($r = 0.32$). FI and FP has positive association ($r = 0.47$).

Table 3 shows the results of hypothesis. Three-step hierarchical linear regressions have been conducted. Results of H1 proved that TO has a significant positive impact on FP (beta = 0.37, $p = \text{significant}$). To access the mediating role of FI three-step hierarchical linear regression has been used. Step 1 shows how control variables affect mediator and dependent variables. Step 2 added independent variable for checking its impact dependent variables. Step 3 added the mediator for testing the mediating effect. H2 proposed that FI acts as mediator in the relationship between TO and FP. Table shows the indirect effect of TO on FP via FI. Results shows that the impact of TO on FP has reduced from ($b = 0.37$, $p = \text{significant}$)

Factors	SL	t-value	AVE	√AVE	CR	Technology orientation on firm performance
Technology orientation			0.78	0.86	0.98	<div>147</div> <div>Table 1. Results of loading, AVE and CR values</div>
TO1	0.83	14.81				
TO2	0.94	15.73				
TO3	0.82	12.41				
TO4	0.85	13.64				
Firm innovativeness			0.74	0.98	0.83	
FI1	0.82	13.41				
FI2	0.93	14.88				
FI3	0.86	15.88				
FI4	0.93	15.98				
FI5	0.86	14.23				
Firm performance			0.79	0.96	0.88	
FP1	0.84	13.41				
FP2	0.85	13.94				
FP3	0.82	13.15				

	Variable	Mean	SD	1	2	3	4	5	6
1	Age	3.52	0.65	1					
2	Education	3.63	0.67	0.01	1				
3	Experience	3.65	0.58	0.08	0.11	1			
4	Technology orientation	3.59	0.64	0.05	0.07	0.11	1		
5	Firm innovativeness	3.75	0.68	0.06	0.08	0.12	0.43**	1	
6	Firm performance	3.69	0.69	0.12	0.09	0.09	0.32*	0.47**	1

Note(s): **Correlation is significant at the 0.01 level (two-tailed)

Table 2.
Results of correlation

Details	Firm innovativeness				Firm performance			
	Beta	t	Beta	t	Beta	t	Beta	t
<i>Step 1</i>								
Age	0.03	0.06	0.08	0.12	0.07	0.22	0.03	0.12
Education	0.02	0.13	0.04	0.13	0.11	0.17	0.04	0.14
Experience	0.04	0.21	0.03	0.14	0.8	0.19	0.05	0.18
<i>Step 2</i>								
Technology orientation			24**	8.32**	0.37**	12.65**	0.16	1.27
<i>Step 3</i>								
Firm innovativeness							0.43**	13.42**
F						15.45**		21.23
R ²						0.32**		0.34**
R ² change						0.18		0.09
Sobel test								
TO- > FI- > FP (4.32**)								

Note(s): ** shows significant level > 0.000, * shows significant level > 0.005

Table 3.
Results of H1 and H2

to ($b = 0.16, p = \text{nonsignificant}$), while FI is significantly impact ($b = 0.43, p < 0.001$). Hence, it is proved that FI fully mediate the relationship between TO-FP. Sobel test was used to investigate the mediating effect and results proved our H2 ($t = 4.32, p < 0.005$).

5. Discussion

H1 proposed the direct impact of TO on FP. Results of H1 have been made worked. The results proved that TO is the requirement of software houses of Pakistan, and TO significantly and positively affects FP. This results support the work of previous researchers (Rajapathirana, and Hui, 2018; Rydehell *et al.*, 2018; Pratono, 2018). This knowledge paves the way for software house in implementing the newest methods. Result of H2 explores that the relationship between TOs and FP is mediated by FI. Findings of the study highlighted that the FI is improved by TO of the firm.

5.1 Theoretical and practical implications

From the results of this study a number of theoretical and practical implications can be drawn. Firstly, it indicates that software houses in Pakistan ought to have modern technological applications for enhancing organizational performance. When they apply latest technology, it will enhance their overall performance. This findings support the work of previous study (Rajapathirana and Hui, 2018). Second, in this contemporary era computer technologies like cloud computing, artificial intelligence, block chain technology and machine learning are playing a significant role in the performance enhancement of firms particularly in the software industry. Thirdly, technological advancement must be supplemented by FI. The collaboration of latest technological applications along with innovation in the processes and other mechanisms will enhance FP manifold.

5.2 Limitations and future research

This research also has few boundaries that may be considered as directions for future research. Firstly, we concerned on the accomplishment of a specific aspect, i.e. TO in sightseeing and software houses; the major options are the same portion in the context of small-scale software houses. Secondly, we considered FP as an organizational-level construct and examine our research setting based on quantitative data. The future research may be conducted through qualitative approach.

References

- Acar, A.Z. and Özşahin, M. (2018), "The relationship among strategic orientations, organizational innovativeness, and business performance", *International Journal of Innovation Management*, Vol. 22 No. 1, p. 1850009.
- Ardito, L. and Dangelico, R.M. (2018), "Firm environmental performance under scrutiny: the role of strategic and organizational orientations", *Corporate Social Responsibility and Environmental Management*, Vol. 25 No. 4, pp. 426-440.
- Arora, A., Arora, A.S. and Sivakumar, K. (2016), "Relationships among supply chain strategies, organizational performance, and technological and market turbulences", *International Journal of Logistics Management*, Vol. 27 No. 1, pp. 206-232.
- Chakraborty, P., Das, S. and Nandi, A.K. (2019), "Conducting gels: a chronicle of technological advances", *Progress in Polymer Science*, Vol. 88 No. 1, pp. 189-219.
- Danneels, E. and Vestal, A. (2020), "Normalizing vs. analyzing: drawing the lessons from failure to enhance firm innovativeness", *Journal of Business Venturing*, Vol. 35 No. 1.
- Frambach, R.T., Fiss, P.C. and Ingenbleek, P.T. (2016), "How important is customer orientation for firm performance? A fuzzy set analysis of orientations, strategies, and environments", *Journal of Business Research*, Vol. 69 No. 4, pp. 1428-1436.
- Frank, A.G., Cortimiglia, M.N., Ribeiro, J.L.D. and de Oliveira, L.S. (2016) "The effect of innovation activities on innovation outputs in the Brazilian industry: market-orientation vs. technology-acquisition strategies", *Research Policy*, Vol. 45 No. 3, pp. 577-592.

- Giunti, G., Guisado-Fernandez, E., Belani, H. and Lacalle-Remigio, J.R. (2019), "Mapping the access of future doctors to health information technologies training in the European Union: cross-sectional descriptive study", *Journal of Medical Internet Research*, Vol. 21 No. 8, p. e14086.
- Hao, S. and Song, M. (2016), "Technology-driven strategy and firm performance: are strategic capabilities missing links?", *Journal of Business Research*, Vol. 69 No. 2, pp. 751-759.
- Jawad, S.U.R.S., Naushad, S., Yousaf, S. and Yousaf, Z. (2019), "Exploring performance of software houses", *World Journal of Entrepreneurship, Management and Sustainable Development*, Vol. 16 No. 1, pp. 1-11.
- Jongman, M., Carmichael, P.C. and Bill, M. (2020), "Technological advances in phytopathogen detection and metagenome profiling techniques", *Current Microbiology*, pp. 1-7, doi: [10.1007/s00284-020-01881-z](https://doi.org/10.1007/s00284-020-01881-z).
- Joshi, M.P., Das, S.R. and Mouri, N. (2015), "Antecedents of innovativeness in technology-based services (TBS): peering into the black box of entrepreneurial orientation", *Decision Sciences*, Vol. 46 No. 2, pp. 367-402.
- Jöreskog, K.G., and Sörbom, D. (1996), *LISREL 8: User's reference guide*, Scientific Software International.
- Kim, J., Kim, K.H., Garrett, T.C. and Jung, H. (2015) "The contributions of firm innovativeness to customer value in purchasing behavior", *Journal of Product Innovation Management*, Vol. 32 No. 2, pp. 201-213.
- Lee, D.H., Dedahanov, A.T. and Rhee, J. (2015), "Moderating role of external networks and mediating effect of innovation performance on the relationship between technology orientation and firm performance", *Asian Journal of Technology Innovation*, Vol. 23 No. 3, pp. 321-334.
- Loraas, T. and Diaz, M.C. (2009), "Learning new uses of technology: situational goal orientation matters", *International Journal of Human-Computer Studies*, Vol. 67 No. 1, pp. 50-61.
- Masa'deh, R.E., Al-Henzab, J., Tarhini, A. and Obeidat, B.Y. (2018) "The associations among market orientation, technology orientation, entrepreneurial orientation and organizational performance", *Benchmarking: An International Journal*, Vol. 25 No. 8, pp. 3117-3142.
- Ockwell, D., Sagar, A. and de Coninck, H. (2015), "Collaborative research and development (R&D) for climate technology transfer and uptake in developing countries: towards a needs driven approach", *Climatic Change*, Vol. 131 No. 3, pp. 401-415.
- Parida, V., Pesämaa, O., Wincent, J. and Westerberg, M. (2017), "Network capability, innovativeness, and performance: a multidimensional extension for entrepreneurship", *Entrepreneurship and Regional Development*, Vol. 29 Nos 1-2, pp. 94-115.
- Polys, N., Newcomb, C., Schenk, T., Skuzinski, T. and Dunay, D. (2018), "The value of 3D models and immersive technology in planning urban density", in *Proceedings of the 23rd International ACM Conference on 3D Web Technology*, ACM, p. 13.
- Pratono, A.H. (2018), "Does firm performance increase with risk-taking behavior under information technological turbulence? Empirical evidence from Indonesian SMEs", *The Journal of Risk Finance*, Vol. 19 No. 4, pp. 361-378.
- Rajapathirana, R.J. and Hui, Y. (2018), "Relationship between innovation capability, innovation type, and firm performance", *Journal of Innovation and Knowledge*, Vol. 3 No. 1, pp. 44-55.
- Roztock, N. and Weistroffer, H.R. (2015), "Information and communication technology in transition economies: an assessment of research trends", *Information Technology for Development*, Vol. 21 No. 3, pp. 330-364.
- Rydehell, H., Löfsten, H. and Isaksson, A. (2018) "Novelty-oriented value propositions for new technology-based firms: impact of business networks and growth orientation", *The Journal of High Technology Management Research*, Vol. 29 No. 2, pp. 161-171.
- Sánchez-Martín, J. and Keller, B. (2019), "Contribution of recent technological advances to future resistance breeding", *Theoretical and Applied Genetics*, Vol. 132 No. 3, pp. 713-732.

- Saqib, M., Zarine, R. and Udin, Z.M. (2018), "Exploring the technology orientation influence on the innovativeness-performance relationship of manufacturing SMEs", *International Journal of Innovation and Learning*, Vol. 24 No. 3, pp. 277-300.
- Schlaegel, C. and Reichel, L.M. (2017), "Organizational learning capability, firm innovativeness, and firm performance: a meta-analysis", in *Academy of Management Proceedings*, Academy of Management, Briarcliff Manor, NY 10510, Vol. 2017 No. 1, p. 16227.
- Sedera, D., Lokuge, S., Grover, V., Sarker, S. and Sarker, S. (2016), "Innovating with enterprise systems and digital platforms: a contingent resource-based theory view", *Information and Management*, Vol. 53 No. 3, pp. 366-379.
- Tajeddini, K. (2016), "Analyzing the influence of learning orientation and innovativeness on performance of public organizations: the case of Iran", *The Journal of Management Development*, Vol. 35 No. 2, pp. 134-153.
- Tambunan, T. (2019), "Recent evidence of the development of micro, small and medium enterprises in Indonesia", *Journal of Global Entrepreneurship Research*, Vol. 9 No. 1, p. 18.
- Tanwir, M. and Khemka, N. (2018), "Breaking the silicon ceiling: gender equality and information technology in Pakistan", *Gender, Technology and Development*, Vol. 22 No. 2, pp. 109-129.
- Teubner, T. and Flath, C.M. (2019), "Privacy in the sharing economy", *Journal of the Association for Information Systems*, Vol. 20 No. 3, pp. 213-242.
- Tseng, P.H. and Liao, C.H. (2015) "Supply chain integration, information technology, market orientation and firm performance in container shipping firms", *International Journal of Logistics Management*, Vol. 26 No. 1, pp. 82-106.
- Vanhala, M. and Ritala, P. (2016), "HRM practices, impersonal trust and organizational innovativeness", *Journal of Managerial Psychology*, Vol. 31 No. 1, pp. 95-109.
- Vij, S. and Bedi, H.S. (2016), "Effect of organizational and environmental factors on innovativeness and business performance relationship", *International Journal of Innovation Management*, Vol. 20 No. 3, p. 1650037.
- Vishnivetskaya, A. and Mikhailova, A. (2019), "Employment of BIM technologies for residential quarters renovation: global experience and prospects of implementation in Russia", in *IOP Conference Series: Materials Science and Engineering*, IOP Publishing, Vol. 497 No. 1, p. 012020.
- Wamba, S.F., Gunasekaran, A., Akter, S., Ren, S.J.F., Dubey, R. and Childe, S.J. (2017), "Big data analytics and firm performance: effects of dynamic capabilities", *Journal of Business Research*, Vol. 70, pp. 356-365.
- Wang, C., Kafourous, M., Yi, J., Hong, J. and Ganotakis, P. (2020), "The role of government affiliation in explaining firm innovativeness and profitability in emerging countries: evidence from China", *Journal of World Business*, Vol. 55 No. 3, p. 101047.
- Yeniyurt, S., Wu, F., Kim, D. and Cavusgil, S.T. (2019), "Information technology resources, innovativeness, and supply chain capabilities as drivers of business performance: a retrospective and future research directions", *Industrial Marketing Management*, Vol. 79 No. 1, pp. 46-52.
- Yousaf, Z. and Majid, A. (2017), "Enterprise development revisited: does coordination, relational skill and partner knowledge really matter?", *International Journal of Applied Management Science*, Vol. 9 No. 2, pp. 153-168.
- Yousaf, Z., Sahar, N., Majid, A. and Rafiq, A. (2018), "The effect of e-marketing orientation on strategic business performance", *World Journal of Entrepreneurship, Management and Sustainable Development*.
- Zawawi, N.F.M., Wahab, S.A., Al-Mamun, A., Yaacob, A.S., Kumar, N. and Fazal, S.A. (2016), "Defining the concept of innovation and firm innovativeness: a critical analysis from resource-based view perspective", *International Journal of Business and Management*, Vol. 11 No. 6, pp. 87-94.

- Zhang, S., Yang, D., Qiu, S., Bao, X. and Li, J. (2018), "Open innovation and firm performance: evidence from the Chinese mechanical manufacturing industry", *Journal of Engineering and Technology Management*, Vol. 48, pp. 76-86.
- Ziemba, E. (2019), "The contribution of ICT adoption to the sustainable information society", *Journal of Computer Information Systems*, Vol. 59 No. 2, pp. 116-126.
- Zulu-Chisanga, S., Boso, N., Adeola, O. and Oghazi, P. (2016), "Investigating the path from firm innovativeness to financial performance: the roles of new product success, market responsiveness, and environment turbulence", *Journal of Small Business Strategy*, Vol. 26 No. 1, pp. 51-68.

About the authors

Seemab Yousaf is working as a Research Assistant with Zahid Yousaf in Government College of Management Sciences, Abbottabad-Pakistan. He did his M.Com for Government College of Management Sciences, Mansehra, Pakistan. Seemab Yousaf is the corresponding author and can be contacted at: seemab.yousafpk@gmail.com or +92-0310-0977296.

Dr Muhammad Khalid Anser is an Assistant Professor in Xi'an University of Architecture and Technology, China. He obtained his master, MPhil and PhD in Economics from Bahauddin Zakariya University, The Islamia University and Shaanxi Normal University, respectively. His work has been published in *Journal of Corporate Social Responsibility and Environment Management* and *Environmental Science and Pollution Research*. He also has presented various research papers in different national and international conferences. Currently he is supervising various Pakistani and Chinese masters and PhD scholars and he can be contacted at: +8615094070607.

Muhammad Tariq is an Assistant Professor in Government College of Management Sciences, Mansehra, Pakistan. He obtained M.Com from University of Peshawar Pakistan. He obtained his MS from COMSAT University Abbottabad. He is a PhD Scholar in Department of Management Sciences in Hazara University, Pakistan.

Sakhawat Ur Rehman Sahibzada Jawad is a CEO of Saibaan, Pakistan. He is a researcher, development practitioner, lawyer and an educationist. Sahibzada Jawad is a PhD scholar of Department of Management Sciences Hazara University, Mansehra (Pakistan).

Sadaf Naushad is a Lecturer, Government College of Management Sciences for Woman, Abbottabad, Pakistan. She did MBA (Finance) from Institute of management Sciences, Peshawar, MS (Finance) from COMSATS, Abbottabad and now a PhD scholar from Hazara University, Mansehra. She has three research papers published in South East Asian *Journal of Business Economics* and *Law Journal* and *Journal of Research and Development*.

Zahid Yousaf is an Assistant Professor in Government College of Management Sciences, Abbottabad, Pakistan. He obtained from University of Peshawar Pakistan. He obtained his MS and PhD in Management Sciences from Hazara University, Pakistan. He is author of 20 publications in different peer-reviewed and impact factor research journals. His work has been published in *Journal of Change Management* and *European Journal of Innovation Management* and *Eurasian Business Review*. He has presented various research papers in different international conferences. He is supervising various international MS and PhD scholars around the globe and he can be contacted at: +092-0321-9804474.