Exploring the role of technology infrastructure capability and intrapreneurship to influence higher education institutions’ performance

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Abstract. The dawn of Fourth Industrial Revolution (4IR) has shifted the landscape of private higher education industry in Malaysia. It becomes more liberalized and competitive, raising the issue of sustainability among the private higher education institutions (PHEIs). Working within the theory of resource-based view (RBV), PHEIs need to develop their technology infrastructure capability and intrapreneurial skills among their academicians to enhance performance. The purpose of this paper is to develop a better understanding on the claim that technology influences organizational performance, and to investigate the mediating role of intrapreneurship in higher education industry. Data are collected from 261 respondents from 19 PHEIs in Malaysia and analyzed using SmartPLS 3.0. The result reveals that technology infrastructure capability have significant impact on PHEIs’ performance, and that intrapreneurship mediates the relationship between both variables. This paper also provides valuable insights for PHEIs to focus on enhancing technological infrastructure capability and developing intrapreneurial skills among their academicians. Furthermore, this paper adds value to by addressing multiple predictors in contributing to PHEIs’ performance.

1. Introduction

Without doubt, many organizations have given great emphasis in investing their technological capabilities. In a decade prior to the dawn of Fourth Industrial Revolution (4IR), technology has been regarded as applied knowledge that helps to fulfil market expectations, competition or needs [1]. In the revolutionized industry, 4IR speaks on the transformation of manufacturing processes from machine-dominant to digital-oriented, which will eventually lead to significant differences in society, education, economy and trade.

Although technological advances are expected to pose problems such as difficulties to protect intellectual properties, it may enhance innovation capability, improve flexibility and lowering the operational costs [2]. This premise is critical to the success of innovation and corporate entrepreneurship within a company, contributed by the role of information and communication
technology (ICT). The advent of ICT in a company’s strategies is believed to enhance its capability to explore and exploit the business opportunities [3].

The same plot of event is expected to occur in the higher education industry. According to [4], the advancement of technology will push private higher education institutions (PHEIs) to change the way knowledge is delivered. The crucial roles of PHEIs as producers and disseminators of knowledge are acknowledged by many authors such as [5] and [6]. It is also paramount for the universities, not only to equip their graduates with value-added knowledge that will enhance their marketability, but also the institution itself to apply technological transfers and becoming innovative, proactive and ready to take risks associated in delivering values to their stakeholders.

In recent years, there seems to be a turbulence in the private higher education industry in Malaysia because of the rising competitive market to support the 4IR. Although the establishment of PHEIs in Malaysia were encouraged in the early 2000 because of their role as “supplementary and complementary” to the tertiary education, the overall productivity performance of PHEIs declined [7]. According to [8], sustainability has become the main problem among PHEIs. This statement was supported by the Minister of Higher Education, Datuk Seri Idris Jusoh, when he announced that 33 PHEIs were closed in 2017 due to the failure to manage their financial efficiently [9].

As a way to overcome this issue, [6] posit that the universities must prepare to link its education with technology as a way to enhance the skills of faculty members and students. [10] support this premise as they recognized that technology is will enable a university’s capacity to manage its organizational knowledge, and thus meet its goals. The critical factors such as knowledge and technology are supported by [11], in which they regard for PHEIs to become sustainable. In addition, academic leaders must also enhance their problem solving and decision making skills to enhance PHEIs’ performance. [12] posit that academic leaders must exhibit high level of innovativeness, proactiveness and inclination to take risk associated with their business.

By applying resource-based view theory of the firm, this paper contends that (1) technology infrastructure capability generates better PHEIs’ performance; and (2) intrapreneurship influences the relations between technology infrastructure capability and PHEIs’ performance.

2. Literature reviews

2.1 PHEIs’ performance

The liberalization of higher educations in Malaysia has forced the universities to assess their performance in the competitive environment. [13] highlighted that performance measurement helps PHEIs to evaluate their progress towards defined goals, recognize their strengths and weaknesses and establish future plans with goals to improve performance. [14] argues that financial instruments and metrics such as ROI and cash flow, are critical in measuring business performance. However, the financial approach has insignificant presence when it comes to measuring PHEIs’ performance because of the ambiguity on the profit or non-profit role of universities due to the diversity in the objectives of the PHEIs when they were formed [15]. In addition, [16] explained that using financial performance measurement alone may also lead to inaccuracy for it only measures the financial terms, while an organization’s value might derive from intangible measures such as intellectual capital.

Due to the abovementioned factors, this study also introduces non-financial approaches to measure university’s performance. This approaches come in many dimensions such as the effectiveness and efficiencies of university education [17,18], input-process-output approach [19], and research activities [20–22]. [23] identified several critical agenda projects (CAP) that may assist the achievement of the Malaysian’s National Higher Education Strategic Plan 2007-2020 such as the number of academics with double appointments, number of expert-based councils established and number of joint publications. [24] supported the notion of non-financial performance to avoid a firm’s
measurement system being derailed from the organization’s vision, mission and strategic direction. Furthermore, [22,25–28] studied the strategies pursued by HEIs, whereas [29] explained the importance of rebranding in HEIs and [30] focused on the roles of academicians in HEI.

From the literatures, this study applies Balanced Scorecard (BSC) model in measuring perceived PHEIs’ performance, which has been tested to measure universities’ performance such as in India [31] and Lebanon [32]. As PHEIs are knowledge organizations [33], the implementation of the BSC model to measure performance rather than current quality is useful to ensure that the organizational knowledge will be preserved [27]. The four constructs of BSC model are internal business process, customer, learning and growth, and financial.

2.2 Technology infrastructure capability

Literatures on application of technology provides different arguments. However, it is agreed that technology helps to improve organizational performance (OP). According to [34], technology development had a positive impact on organizational strategy and performance. The positive relation between technology, information management and OP were also found in another studies such as [35] when they studied on business organizations in Taiwan. In addition, [36] confirmed that IT capability positively influenced OP and capable to improve profitability [37-39]. Therefore, this study asserts that technology infrastructure has an important contribution to organizations, especially on perceived PHEIs’ performance. A hypothesis is derived from the reviews and stated as follow:

H1: Technology infrastructure capability has a positive and significant impact on PHEIs’ performance

2.3 Intrapreneurship

The idea of intrapreneurship started to evolve in 1996 with the adoption of the idea of "entrepreneurial orientation" (EO) as a new viewpoint of strategic management [40]. [41] defined intrapreneurship as an entrepreneurial activity within an established organization and includes entrepreneurial behaviors and orientations of existing organizations. According to [42], intrapreneurial trait among employees is among the requirements in future jobs. He claims that entrepreneurs must instil enthusiasm and creativity among their workers. In the context of higher education, intrapreneurship has become an agenda in which universities must engage. [43] considered intrapreneurship as university’s third mission, other than teaching and research tasks. Intrapreneurship is also considered as an internal capability that can contribute to enhanced service delivery and PHEIs’ performance [41].

It is crucial for a PHEI to nurture intrapreneurship as an internal capability. According to [44], IT resources are capable to develop an intrapreneurship culture. In addition, [45] also emphasize on technological skills to promote intrapreneurship initiatives. Therefore, this study hypothesizes:

H2: Technology infrastructure capability has a positive and significant impact on intrapreneurship.

The dimensions of intrapreneurship are differed across literatures. This study adapts three dimensions of intrapreneurship from [46], namely innovativeness, proactiveness and risk taking behaviour, which are more applicable among academicians in the education industry. Innovativeness is defined as the capability of organizations to manage and deploy their resources to innovate in new ideas or products [47]. [48] assessed the role of organizational innovativeness and discovered that it improves organizational performance. [49] also explained that innovativeness influence Turkish manufacturing firms in terms of financially (e.g., profitability) and non-financially (e.g., customer and employee satisfaction). The second dimension of intrapreneurship is proactiveness, which refers to the degree to which firms seek to lead in an industry [50]. In a study by [51], proactiveness has been confirmed as one of the intrapreneurship elements that positively influenced organizational performance. According to [49], proactiveness influences customer satisfaction in a positive and significant way, which will
contribute to higher organizational performance. The third dimension of intrapreneurship, risk taking behaviour, is defined as an act of taking instant actions in a risky situation [52]. [51] proposed that risk taking has been found to influence organizational performance. In addition, [53] proved that the risk-taking dimension is positively related to performance. Therefore, the third hypothesis developed is:

H3: Intrapreneurship has a positive and significant influence on PHEIs’ performance

2.4 Linking technology infrastructure capability, intrapreneurship and PHEIs’ performance

There are rising needs to study the various effects of intrapreneurship as determinant of of organizational capabilities [54]. Previous studies on intrapreneurship confirmed its role to predict firm’s growth, sales, market share and performance [44,55–57]. However, [40] suggested that intrapreneurship should be tested for moderating, mediating, independent or interaction effects. The alternative hypotheses on intrapreneurship is expected to enhance the comprehension of intrapreneurship theory [58]. Therefore, this study treats intrapreneurship as a mediating variable.

[59] proved that intrapreneurship acted as strong mediator between organizational support and its performance. Intrapreneurship culture has also been recognized as organizational capability that mediates between IT resources and corporate performance [44]. [60] proposed that intrapreneurship mediates between technological knowledge sharing and academic leaders’ performance. Meanwhile, [57] assert that intrapreneurship mediates the relation between knowledge acquisition and firm’s performance. Their study validates what [61] proposed that entrepreneurial combination of knowledge-based resources, not the knowledge itself, will contribute to competitive advantage. Given these previous researches, it is crucial for this study to investigate the impact of intrapreneurship as a mediator between technology infrastructure and PHEIs’ performance.

H4: Intrapreneurship significantly mediates the relation between technology infrastructure capability and PHEIs’ performance

3. Methodology

A structured questionnaire was used to obtain data through convenience sampling. The respondents were targeted among academicians at management levels who are aware of and able to describe the PHEIs’ policies levels [62–64]. Subsequently, 291 answers were received and after the screening processes, only 261 usable responses were further analysed. The sources of the measurement instruments and number of items are shown in Table 1.

Table 1. Sources of measurement items

| Variables                          | Number of items | References   |
|-----------------------------------|-----------------|--------------|
| Technology Infrastructure Capability | 4               | [65]         |
| Intrapreneurship                  | 9               | [46]         |
| PHEIs’ performance                | 22              | [66-68]      |
4. Data analysis

4.1 Demographic information

The demographic information of respondents of this study is shown in Table 2.

| No. | Variable | Label       | Frequency | Percent |
|-----|----------|-------------|-----------|---------|
| 1.  | Gender   | Male        | 87        | 29.9    |
|     |          | Female      | 204       | 70.1    |
| 2.  | Age      | Below 25    | 27        | 9.4     |
|     |          | 25-34       | 93        | 32.3    |
|     |          | 35-44       | 96        | 33.3    |
|     |          | 45-54       | 63        | 21.9    |
|     |          | 55 and above| 9         | 3.1     |
| 3.  | Race     | Malay       | 201       | 69.8    |
|     |          | Chinese     | 45        | 15.6    |
|     |          | Indian      | 9         | 3.1     |
|     |          | Others      | 33        | 11.5    |
| 4.  | Religion | Islam       | 207       | 71.9    |
|     |          | Buddha      | 27        | 9.4     |
|     |          | Hindu       | 9         | 3.1     |
|     |          | Christian   | 42        | 14.6    |
|     |          | Others      | 3         | 1.0     |
| 5.  | Years of working | 3 – 5 years | 64 | 24.5 |
|     |          | 6 – 10 years | 101 | 38.7 |
|     |          | 11 – 20 years | 78  | 29.9 |
|     |          | More than 20 years | 18 | 6.9 |

The table above concludes that a typical respondent was a Malay Muslim female, aged under 25 to 44 years old who has been in the higher education industry for more than three years. This demographic information also concludes that academicians in Malaysian PHEIs came in diverse ethnicity and religions.

4.2 Analysis of multivariate assumptions

Five tests were conducted to fulfil the multivariate analysis assumptions: normality, linearity, homoscedasticity, multicollinearity, and common method bias. The results have shown that the data set is satisfactory for further multivariate analysis.

4.3 Measurement model analysis

This study analysed the reflective measurement model using SmartPLS 3.0. Four criteria were assessed as proposed by [69], namely internal consistency, indicator reliability, convergent validity, and discriminant validity. As shown in table 3, the Cronbach’s alpha (CA) values and composite reliability (CR) values were greater than 0.70 as suggested by [69], signalling a high internal consistency. One indicator (INT9) has a loading value of 0.504, which falls between 0.40 and 0.70. However, as the AVE values were higher than 0.50, thus INT9 was retained. Therefore, this study has achieved construct reliability and convergent validity.
Table 3. Reliability and convergent validity

|                        | Cronbach’s Alpha | rho_A | Composite Reliability | Average Variance Extracted (AVE) |
|------------------------|------------------|-------|------------------------|----------------------------------|
| Technology Infrastructure Capability | 0.879            | 0.883 | 0.917                  | 0.735                            |
| Intrapreneurship       | 0.947            | 0.972 | 0.956                  | 0.713                            |
| PHEIs’ performance     | 0.975            | 0.977 | 0.977                  | 0.658                            |

For discriminant validity, three approaches were engaged. First, this study examines the cross-loading test. It was found that each indicator’s outer loadings on a construct is higher than all its cross loadings with other constructs as proposed by [69]. Secondly, Fornell & Larcker criterion has shown that the square root of the AVE of each construct are higher than its highest correlation with any construct [69]. To overcome the critics that Fornell & Larcker criterion do not reliably detect the lack of discriminant validity [70], this study used a third approach in the form of heterotrait-monotrait (HTMT) ratio of correlations. The HTMT ratio values as shown in Table 4 were all below the cut-off of 0.85 as proposed by [71]. Therefore, discriminant validity has been ascertained.

Table 4. HTMT ratio

|                        | Intrapreneurship | PHEIs’ performance | Technology Infrastructure |
|------------------------|------------------|--------------------|--------------------------|
| Intrapreneurship       |                  |                    |                          |
| PHEIs’ performance     | 0.65             | (0.363, 0.608)     |                          |
| Technology Infrastructure | 0.656          | (0.52, 0.708)     | 0.618 (0.151, 0.41)     |

4.4 Structural model analysis

To estimate the structural model, this study employed a bootstrapping procedure. Table 5 and Figure 1 shows the results of regression analysis for hypotheses testing. It was found that both knowledge acquisition and knowledge protection processes have significant relationships with intrapreneurship (β=0.556, p<0.05 and β=0.278, p<0.05 respectively). Therefore, H1 and H2 are supported. Furthermore, a positive and significant relationship was found between intrapreneurship and PHEIs’ performance (β=0.255, p<0.05). This confirms the H3. The results also reveal that knowledge acquisition process is a stronger predictor of intrapreneurship than knowledge protection process.
Table 5. Results of hypothesis testing

| Hypotheses | Causal Path          | Original Sample | Standard Deviation | T Statistics | P Values | Supported |
|------------|----------------------|-----------------|--------------------|--------------|----------|-----------|
| H1         | Tech -> PPerf        | 0.279           | 0.067              | 4.194        | 0        | Yes       |
| H2         | Tech -> INT          | 0.624           | 0.049              | 12.64        | 0        | Yes       |
| H3         | INT -> PPerf         | 0.487           | 0.063              | 7.694        | 0        | Yes       |
| H4         | Tech -> INT -> PPerf | 0.304           | 0.043              | 6.995        | 0        | Yes       |

Note: p<0.05; Tech=Technology Infrastructure Capability; INT=Intrapreneurship; PPerf=PHEIs’ Performance

This study employed [72] bootstrapping method to test the indirect effect of intrapreneurship between technology infrastructure capability and PHEIs’ performance. After a bootstrapping procedure, it was revealed that the indirect effect ($\beta=0.624*0.487=0.304$) was significant with a t-value of 6.995. The mediation indirect effect was confirmed given that the indirect effect 0.304, 95% Boot CI: [LL=0.218, UL=0.338] does not span a 0 in between. Therefore, this study concludes that the mediation effect of intrapreneurship on the relationship between technology infrastructure capability and PHEIs’ performance is statistically significant, thus supporting the H4.

![Figure 1](image)

**Figure 1.** The bootstrapping result for structural model.

5. Discussions

As the 4IR becomes the talk-of-the-town topic, PHEIs must cope with the advancement of technology. It is pertinent for PHEIs to equip themselves as what the other business organizations do in the sense of providing adequacy in technology infrastructure that support daily operations. This study confirms that technology infrastructure able to increase PHEIs’ performance. Academicians in PHEIs are obliged to increase their knowledge on academic matters, not only to support their teaching and learning activities, but also in determining the PHEIs’ strategic moves. This includes the utilization of technology to analyze their competitive industry, which according to [73], could assist organizations to obtain competitive advantages by expanding their reach in business and achieving their goals.

This finding conforms to the results of previous studies such as [34], who confirmed that technology development resulted in changes in organizational strategy, which in turn will enhance organizational performance. Furthermore, the finding is also parallel to the studies by [35] and [36], who concluded that IT capability enhances business performance.
Introducing intrapreneurship as a mediator also increases the understanding of technology application in influencing PHEIs’ performance. Intrapreneurship is an emerging field of study that gains interest in recent organizational practices. This paper identifies intrapreneurship as a mediating factor that enable PHEIs to increase their performance. Despite the capability in managing technology infrastructure, PHEIs must strategize to equip their academicians with intrapreneurial skills (i.e. innovativeness, proactiveness and risk taking behavior). The result of analysis on the role of intrapreneurship as a mediating variable supports previous literatures such as [44], [59] and [60]. It also fulfilled the suggestion from [74] and [60] that intrapreneurship should be tested as a mediating variable.

The exposition of intrapreneurship’s mediating role in this research lies on the fact that organizational infrastructures are important determinants that require direct and indirect control from the management to enhance intrapreneurship and organizational performance [75]. In a PHEI, academicians are required to utilize technology infrastructure and increase their organizational knowledge. The result demonstrates that intrapreneurship acts as a conduit. It is not adequate for an academician to apply technology in increasing their knowledge. They should also increase their intrapreneurial traits to ensure that technology becomes meaningful in increasing PHEIs’ performance. Academicians must be innovative in exploiting technology. Furthermore, academicians who are proactive and risk takers will be able to add values by exploring, identifying and capturing new opportunities that will enhance the values of technology infrastructure.

This study also reveals a link between intrapreneurship and KM Capability unto PHEIs’ performance. To the author’s knowledge, this study is among the earliest to link intrapreneurship with KM technology infrastructure capability empirically in the higher education industry. In this study, intrapreneurship is highlighted and considered as a firm’s internal capability that enhances the PHEIs’ performance. Therefore, integrating intrapreneurship into the Gold’s KM Capability model will expand the application of RBV theory.

Around the edge of a competitive world, PHEIs that offer Islamic studies as their core products (hereafter known as Islamic PHEIs) must find ways to create sustainable competitive advantage. With 18 Islamic PHEIs competing with the giant players in Malaysia, this paper proposes that adequate technology infrastructure should be installed to increase their academicians’ knowledge, and instilling them with intrapreneurial traits. Using technology, the academicians in Islamic PHEIs must also prepare to acquire, convert, apply and protect their organizational knowledge to achieve organizational effectiveness. On top of that, academicians should be exposed and nurtured with innovativeness, proactiveness and risk taking behavior. These intrapreneurial traits are expected to intervene the technology infrastructure capability and increases PHEIs’ performance.

6. Conclusion and future works

This paper presents adequate evidence to support the hypothesis that intrapreneurship mediates the relationship between technology infrastructure and PHEIs’ performance. Prior researches has also focused on intrapreneurship, but has only investigated from corporate views. This paper provides an insight of how importance intrapreneurship’s role in enhancing PHEIs’ performance during the 4IR era. It points out that PHEIs’ managers must instil the intrapreneurial traits among their academicians to support knowledge management initiatives.

However, the generalizability of the findings should be interpreted with caution given that this is a cross-sectional research. Longitudinal and experimental studies may provide further support to the results. Furthermore, the convenience sampling method was applied in the data collection process, which contribute to problem of generalizability. As intrapreneurship is treated as a unidimensional
variable, future research might also consider to test three dimensions of intrapreneurship as multidimension to identify the strongest predictor to increase PHEIs’ performance.

References

[1] Mohamed M, Stankosky M and Murray A. Knowledge management and information technology: can they work in perfect harmony? 2006 J. Knowl. Manag. 10 103–16.
[2] Oztemel E and Gursoy S. Literature review of Industry 4.0 and related technologies 2020 J. Intell. Manuf. 31 127–82.
[3] Yunis M, Tarhini A and Kassar A. The role of ICT and innovation in enhancing organizational performance: The catalysing effect of corporate entrepreneurship 2018 J. Bus. Res. 88 344–56.
[4] D’Souza U J A and Mudin D K D. Industrial Revolution 4.0: Role of Universities 2018 Borneo J. Med. Sci. 12 1–2.
[5] Cunningham J A, Lehmann E E, Menter M and Seitz N. The impact of university focused technology transfer policies on regional innovation and entrepreneurship 2019 J. Technol. Transf. 44 1451–75.
[6] Gianiodis P T and Meek W R. Entrepreneurial education for the entrepreneurial university: A stakeholder perspective 2019 J. Technol. Transf. 1–29.
[7] Malaysian Productivity Corporation. MPC 23rd Productivity Report 2015/2016. MPC; 2017.
[8] Harun R. Current issues of PHEIs [Internet]. E-mail to Nur Zaireen binti Baharuddin (zaireen@mohe.gov.my) 2015 Nov 22 [cited 2020 March 21].
[9] Mohd Pilus F A 33 IPTS ditutup. Harian Metro Online [Internet]. 2017 [cited 25th December 2017]. Available from https://www.hmetro.com.my/mutakhir/2017/12/294695/33-ipts-ditutup.
[10] Nair V B and Munusami C. Knowledge management practices- An exploratory study at the Malaysian higher education institutions 2019 J. Res. Innov. Teach. Learn. JRIT-01-2019-0008.
[11] Shawe R, Horan W, Moles R and O’Regan B. Mapping of sustainability policies and initiatives in higher education institutes 2019 Environ. Sci. Policy 99 80–8.
[12] Shukri B M and Mahmood R. Linking transformational leadership and corporate entrepreneurship to performance in the public higher education institutions in Malaysia 2014 Adv. Manag. Appl. Econ. 4 109–22.
[13] Purvey S, Mukherjee K and Bhar C. Performance measurement system for healthcare processes 2007 Int. J. Product Perform. Manag. 56 241–51.
[14] Hamid MRBA. Value-based performance excellence model for higher education institutions 2015 Qual. Quant. 49 1919–44.
[15] Deiaco E, Hughes A and McKelvey M. Universities as strategic actors in the knowledge economy 2012 Cambridge J. Econ. 36 525–41.
[16] Moshari J. Knowledge management issues in malaysian organizations : the perceptions of leaders 2013 J. Knowl. Manag. Econ. Inf. Technol. 3 1–13.
[17] Sahney S and Thakkar J. A comparative assessment of the performance of select higher education institutes in India 2016 Qual. Assur. Educ. 24 278–302.
[18] Albekov A, Romanova T, Vovchenko N and Epifanova T. Study of factors which facilitate increase of effectiveness of university education 2017 Int. J. Educ. Manag. 31 12–20.
[19] Chinta R, Kebritchi M and Ellias J. A conceptual framework for evaluating higher education institutions 2016 Int. J. Educ. Manag. 30 989–1002.
[20] Kidwell J J, Linde K M Vander and Johnson S L. Knowledge management practices in higher education 2000 Educ. Q. 4 28–33.
[21] Alcaine J G Factors affecting institutional performance at high and very high research universities: Policy implications 2016 [Dissertation].
[22] Tee K F. Suitability of performance indicators and benchmarking practices in UK universities 2016 Benchmarking An Int. J. 23 584–600.
[23] Abdullah N A. Performance measurement in Malaysia’s higher education 2012 Higher Education Policy 9 309-24.
[24] Thirumanickam N and Ahmad B. Performance measurement system in higher educational institutions in Malaysia: an exploratory study of the implementation of balanced scorecard 2012 Asia Pacific Manag. Account J. 8 149–73.
[25] Bhusry M and Ranjan J. Implementing knowledge management in higher educational institutions in India: A conceptual framework 2011 Int. J. Comput. Appl. 29 34–46.
[26] Demchig B. Knowledge management capability level assessment of the higher education institutions: Case study from Mongolia 2015 Procedia-Soc. Behav. Sci. 174 3633–40.
[27] Esposito V, Nito E De, Iacono M P and Silvestri L. Dealing with knowledge in the Italian public universities: The role of performance management systems 2013 J. Intellect. Cap. 14 431–50.
[28] Warwick P. The international business of higher education- A managerial perspective on the internationalisation of UK universities 2014 Int. J. Manag. Educ 12 91–103.
[29] Goi C L and Goi M T. Rebranding of higher educational institutions in Malaysia 2009 Int. J. Bus. Manag. 4 170–7.
[30] Spender J C. Speaking about management education: Some history of the search for academic legitimacy and the ownership and control of management knowledge 2005 Manag. Decis. 43 1282–92.
[31] Umashankar V and Dutta K. Balanced scorecards in managing higher education institutions: an Indian perspective 2007 Int. J. Educ. Manag. 21 54–67.
[32] Aljardali H, Kaderi M and Levy-Tadjine T. The Implementation of the balanced scorecard in Lebanese public higher education institutions 2012 Procedia-Soc. Behav. Sci. 62 98–108.
[33] Wiig K M. Knowledge management: An introduction and perspective 1997 J. Knowl. Manag. 1 6–14.
[34] Tuanmat T Z and Smith M. The effects of changes in competition, technology and strategy on organizational performance in small and medium manufacturing companies 2011 Asian. Rev. Account. 19 208–20.
[35] Huang K, Wu J, Lu S and Lin Y. Innovation and technology creation effects on organizational performance 2016 J. Bus. Res. 69 2187–92.
[36] Turulja L and Bajgoric N. Information technology, knowledge management and human resource management: Investigating mutual interactions towards better organizational performance 2018 VINE J. Inf. Knowl. Manag. Syst.
[37] Kim T H, Wimble M and Sambamurthy V. Disaggregation of the IT capital effects on firm performance: Empirical evidence from an IT asset portfolio perspective 2018 Eur. J. Inf. Syst. 27 449–69.
[38] Pérez-Méndez J A and Machado-Cabezas Á. Relationship between management information systems and corporate performance 2015 Rev. de Contab. 18 32–43.
[39] Dale S M and Muhanna W A. IT capabilities and firm performance: A contingency analysis of the role of industry and IT capability type 2009 Inf. Manag. 46 181–9.
[40] Lumpkin G T and Dess G G. Clarifying the entrepreneurial orientation construct and linking it to performance 1996 Acad. Manag. Rev. 21 135–72.
[41] Yaakub M H The influence of knowledge management capability, intrapreneurship and religiosity on Malaysian private higher education institutions’ performance 2019 [Dissertation].
[42] Morgan J The 14 Principles of the Future Organization 2015 Forbes [cited 14 November 2019]. Available from: http://www.forbes.com
[43] Nyeko K E and Sing N K. academic entrepreneurs and entrepreneurial academics: Are they the same 2015 Int. J. Soc. Humanit. 5 1050–5.
[44] Benitez-Amado J, Llorens-Montes F J and Perez-Arostegui M N. Information technology-enabled intrapreneurship culture and firm performance 2010 Ind. Manag. Data. Syst. 110 550–66.
[45] García-Sánchez E, García-Morales V J and Martín-Rojas R. Analysis of the influence of the environment, stakeholder integration capability, absorptive capacity, and technological skills on organizational performance through corporate entrepreneurship 2018 Int. Entrep. Manag. J. 14 345–77.
[46] Jong J P J de, Parker S K, Wennekers S and Wu C 2011 Corporate entrepreneurship at the individual level: Measurement and determinants EIM research reports Zoetermeer 11 13.

[47] Alpkan L, Bulut C, Gunday G, Ulusoy G and Kilic K. Organizational support for intrapreneurship and its interaction with human capital to enhance innovative performance 2010 Manag. Decis. 48 732–55.

[48] Subramanian A and Nilakanta S. Organizational innovativeness: Exploring the relationship between organizational determinants of innovation, types of innovations and measures of organizational performance 1996 Omega Int. J. Manag. Sci. 24 631–47.

[49] Ağca V, Topal Y, Kaya H. Linking intrapreneurship activities to multidimensional firm performance in Turkish manufacturing firms: An empirical study 2012 Int. Entrep. Manag. J. 8 15–33.

[50] Covin J G and Slevin D P. The development and testing of an organizational level entrepreneurship scale 1986 Front. of Entrep. Res. 1 628–39.

[51] Felício J A, Rodrigues R and Caldeirinha V R. The effect of intrapreneurship on corporate performance 2012 Manag. Decis. 50 1717–38.

[52] Antonicic B and Hisrich R D. Clarifying the intrapreneurship concept 2003 J. Small Bus. Enterp. Dev. 10 7–24.

[53] Rauch A, Wiklund J, Lumpkin G T and Frese M. Entrepreneurial orientation and business performance: An assessment of past research and suggestions for the future 2009 Ent. Theory and Prac. 33 761–787.

[54] Zahra S A. Corporate entrepreneurship as knowledge creation and conversion: The role of entrepreneurial hubs 2015 Small Bus. Econ. 44 727–35.

[55] Covin J G and Slevin D P. A Conceptual Model of Entrepreneurship as Firm Behavior 1991 Entrep. Theory Pract. 16 7–26.

[56] Antonicic J A and Antonicic B. Employee satisfaction, intrapreneurship and firm growth: A model 2011 Ind. Manag. Data Syst. 111 589–607.

[57] Fuentes-Fuentes M D M, Bojica A M and Ruiz-Arroyo M. Entrepreneurial orientation and knowledge acquisition: Effects on performance in the specific context of women-owned firms 2015 Int. Entrep. Manag. J 11 695–717.

[58] Kahkha A O, Kahrazeh A and Armesh H. Corporate entrepreneurship and firm performance important role of small and medium enterprise 2014 Int. J. Acad. Res. Bus. Soc. Sci. 4 8–25.

[59] Antonicic B and Zorn O. The mediating role of corporate entrepreneurship in the organizational support-performance relationship: An empirical examination 2004 Manag. Glob. Transitions 2 5–14.

[60] Bakar M S, Mahmood R and Lucky E O. The mediating role of intrapreneurial orientation between leadership style, knowledge sharing behaviour and performance of Malaysian academic leaders: A conceptual framework 2015 Sains Humanika 4 17–22.

[61] Wiklund J, Shepherd D, Wiklund J and Shepherd D. Knowledge-based resources, EO, and the performance of small and medium-sized businesses 2003 Strateg. Manag. J. 24 1307–1314.

[62] Gold A H, Malhotra and Segars A H. Knowledge management capabilities: An organizational capabilities perspective 2001 J. Manag. Inf. Syst. 18 185–214.

[63] Mills A M and Smith T A. Knowledge management and organizational performance: A decomposed view 2001 J. Knowl. Manag. 15 156–71.

[64] Alaarj S, Abidin-Mohamed Z and Bustamam U S B A. Mediating role of trust on the effects of knowledge management capabilities on organizational performance 2016 Procedia-Soc. Behav. Sci. 235 729–38.

[65] Yang C and Chen L C. Can organizational knowledge capabilities affect knowledge sharing behavior? 2007 J. Inf. Sci. 33 95–109.

[66] Delaney J T and Huselid M A. The impact of human resource management practices on perceptions of organizational performance 1996 Acad. Manag. J. 39 949–69.

[67] Tseng S M. The impact of knowledge management capabilities and supplier relationship management on corporate performance 2014 Int. J. Prod. Econ. 154 39–47.

[68] Zangouinezhad A and Moshabaki A. Measuring university performance using a knowledge-
based balanced scorecard 2011 Int. J. Product Perform. Manag. 60 824–43.

[69] Hair J, Hult G, Ringle C and Sarstedt M 2014 A primer on partial least squares structural equation modeling (PLS-SEM) (Los Angeles: SAGE)

[70] Ramayah T, Yeap J A L, Ahmad N H, Halim H A and Rahman S A. Testing a confirmatory model of Facebook usage in SmartPLS using Consistent PLS 2017 Int. J. Bus. Innov. 3 1–14.

[71] Kline R B 2011 Principles and practice of structural equation modeling (New York: Guilford Publications)

[72] Preacher K J and Hayes A F. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models 2008 Behav. Res. Methods 40 879–91.

[73] Saeidi P, Saeidi S P, Sofian S, Saeidi S P, Nilashi M and Mardani A. The impact of enterprise risk management on competitive advantage by moderating role of information technology 2019 Comput. Stand Interfaces 63 67–82.

[74] Alipour F, Idris K and Karimi R. Knowledge creation and transfer: Role of learning organization 2011 Int. J. Bus. Adm. 2 61–7.

[75] Antoncic B. Organizational processes in intrapreneurship: A conceptual integration 2001 J. Enterprising Cult. 9 221–35.