

# Investigating Knowledge Management and Business Intelligence Integration within Omani Organisations

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With the growing changes in the global economy, sustaining competitive advantage is becoming increasingly challenging, so organisations need to be able to effectively and efficiently respond to market and customer changes. Knowledge management and business intelligence are worthy responding mechanisms as they are recognised as key drivers for organisational competitiveness. They provide intelligent tools that support beneficial management approaches and awareness, allowing organisations to quickly respond to market changes. Quantitative empirical approach is used with Microsoft Excel data analysis tool pack as the investigative tool to develop regression models for predicting performance ratings using knowledge management and business intelligence. The findings showed that stronger correlation with performance is achievable when knowledge management and business intelligence are used together, and such combination provides better explanations of the variation in performance. The findings additionally showed that knowledge management is perceived to be more impactful on performance than business intelligence.

**Key words:** *Knowledge management (KM), Business intelligence (BI), Performance, Oman.*

## Introduction

Effectively performing organisations are crucial for economic growth, development and socio-economic thrust. They help to eradicate poverty, expand national economies, elevate social conditions and create employment (Saqib & Zarine, 2018). Upward performance allows organisations to develop the necessary capabilities to embrace the increasingly recognised performance-related concepts such as knowledge management and business intelligence, and to adopt the emerging technologies that are crucial for innovative practices and



performance enhancement (KPMG, 2017). These will stimulate vibrant economies that boost competitiveness and growth, encourage innovative undertakings and deliver a favourable investment climate to attract ventures that will benefit the entire socio-economic spectrum. It is obvious that high-performing organisations promote socio-economic development, so their continuous performance and growth are imperative (Saqib, et al., 2018).

The rapid pace of change within the global economy is threatening to any organisation, so it is important for organisations to pay closer attention to the ways and means required to achieve sustainable competitive advantage. In such economic climate, organisations need to be able to effectively and efficiently respond to market and customer changes. They need to have up-to-date business-related knowledge that is viewed as a strategic asset of organisations and to be innovative, which is viewed as strategic application of such knowledge. They have to develop capabilities for better management and optimise the use of existing knowledge and must be able to continuously create or acquire new business-related knowledge (Zarine & Saqib, 2018). They also need to be able to learn from their own experience, protect learnt knowledge, be flexible and responsive, adopt innovative practices and develop business strategies that can enhance their competitiveness, thus improving their chances to compete and survive in this intensified competitive business environment (Valdez-Juárez, et al., 2016).

Return on investment through growth and profitability is undoubtedly the ultimate goal when deciding to invest (Pirnea & Căldăraru, 2012), and this goal is becoming increasingly difficult to achieve due to the continuous shift towards globalization, which has complicated and destabilised markets, causing record high employee turnover, triggering the loss of valuable business knowledge and disrupting organisational capabilities to perform. Additionally, the continuing changes in the markets and customer preferences are putting enormous pressure on organisations' ability to maintain high-quality performance (Beccera-Fernandez & Sabherwal, 2015). The current economy has become very knowledge-intensive, thus shortening the value span of resources. Without appropriate means for continuous knowledge acquisition and management, and for early discovery of trends for better responsiveness, a firm's existing competitive edge can quickly slip away. Therefore, the capabilities to effectively and efficiently transform the vast amount of generated business data into knowledge for profitable decision-making are crucial; otherwise, the chances of achieving sustainable competitiveness will gradually reduce (Guldager-Løve & Nord-Varhaug, 2016).

Knowledge management and business intelligence (KM&BI) can be a strong responding mechanism as they are recognised as key drivers for organisational competitiveness, which provide the tools for assisting in managing organisational knowledge and mining organisational data assets. Their intelligent tools support beneficial management approaches and profitable actions awareness, allowing organisations to respond quickly to market changes. They offer real-time customer knowledge and allow for organisational flexibility with respect to their service

offerings (Byukusenge & Munene, 2017). Additionally, they can easily illustrate any potential changes in trends and likely impact so organisation can proactively prepare. This can lead to improved business planning and decision-making, efficient and streamlined business processes, differentiated services and greater risk management (Islam, 2018). As a result, effective customer segmentation approaches can also be adopted with more focused and personalised marketing for better sales leads and returns. Employees' engagement for effective use of the systems, which is crucial to the anticipated outcomes, can also be monitored and promoted. These can lead to improved customer relationships and resource planning for superior performance (Radmehr & Bazmara, 2017). Many organisations are not well prepared for such an economic shift, so competing is becoming even more challenging. Survival is thus becoming the goal of many organisations instead of growth and profitability, hindering their roles as promoters of socio-economic progress (Saqib, et al., 2018).

Considerable research has been conducted on KMBI and organisational performance for large corporations, but the research is quite limited regarding smaller organisations (Saqib, et al., 2018). Despite research showing that knowledge is a strategic asset of organisations and KMBI has the potential for creating and maintaining competitive edge that can drive the overall organisational strategies (Dalkir, 2005), awareness of these concepts in many organisations – especially the SMEs – is still quite limited (Pirnea & Căldăraru, 2012). Poor organisational performance has often been related to the absence of knowledge culture, inadequate knowledge management practices and inadequate capability to mine the organisation's data assets (Egbu, et al., 2005), (Fteimi & Lehner, 2016). Therefore, much interest has been generated for related research and practice (Dwivedi, et al., 2011), covering topics such as knowledge definitions, related technologies, business intelligence and managerial implementation approaches (Kane, et al., 2006). It is therefore the area of interest for this research.

This study seeks to investigate the extent to which organisations in Oman are using knowledge management and business intelligence to drive performance, their current impact and potential positive impacts in the short and longer term. It also seeks to provide insights about the association of knowledge management and business intelligence to performances when only one is integrated within the business environment compared with when both are integrated. The value of this study lies in filling the gap in the literature, and contributing to knowledge and the growing need for awareness, readiness and confidence of organisations to appreciate and adopt KMBI as a means to achieve organisational competitiveness, growth and profitability.

### **Relationship Between Knowledge Management and Business Intelligence**

In the management field, KM and BI sound similar in terms of objectives and goals, but they are actually quite different. KM is the process of collecting data from different resources,

managing them to create new knowledge in order to achieve better decision-making, while BI focuses on using new technologies to achieve strategic goals and enhancing decision-making processes of managers at all levels of the organisation (Gunjal, 2005). The focus of KM is more on the past and present, while BI adds the future aspects, including forecasting.

KM implementation is increasingly becoming more common within organisations, since it has been recognised as having a positive impact on organisational performance (Haas & Hansen, 2005; Liao & Wu, 2009; Safa, et al., 2006). This is supported by the Resource-Based View (RBV) and Knowledge-Based View (KBV) theories, together with much other research identifying knowledge as an essential organisational resource for a firm's continued existence, steadiness and progress ((Ho, 2008; Kim & Gong, 2009). It is obvious that KM and BI are interdependent. KM forms the basis of BI while BI can optimise the positive outcome of KM, and thus the decision-making capability and performance. So the stronger the KM practice is, the more effective the BI tools would be (Byukusenge & Munene, 2017). Separately, both KM and BI can drive organisational performance but together they can assist with even much greater performance. Therefore, it is important for organisations – regardless of size – to put in the necessary effort to implement KM and BI. The approach does not have to be sophisticated, as simple techniques may also produce positive outcomes in terms of innovativeness and competitiveness (Rasula, et al., 2012). Even common technologies that are readily available and accessible to all organisations provide basic capabilities, such as speed and accuracy for data manipulation, effective storage and data retrieval to support data manipulation, simple pattern findings and presentation for decision-making. These can assist with simple KM and BI practices for quick and simpler problem solving, better responsiveness to market changes and potentially innovation (Altmann, 2010). Table 1 shows some of the common features of KM and BI.

**Table 1:** KM and BI features

<b>Knowledge management</b>	<b>Business Intelligence</b>
Tacit in nature	Explicit in nature
Only internal	Both internal and external
Both structured and unstructured information	Only structured information
Identification, acquisition, application and construction of new knowledge	Technology management and operationalisation of information
Organisational processes, dynamic learning, existing knowledge to support decision making	Business oriented, descriptions, forecasting, analysis and decision-making

## **Organisational Performance**

Given the ongoing debates about defining organisational performance, organisations are devising their own performance-measurement process to assist in monitoring and enhancing their performances (Gavrea, et al., 2011). This usually relates to measuring activity outcomes against strategic goals, with success level determined by the effectiveness and efficiency of processes and quality of decisions taken. Through effective use of KM and BI, relevant organisational knowledge resources can be made available to help decision-makers to realise the organisational goals, and thus the desired performance (Jenatabadi, 2015).

Knowledge-based resources relating to KM and BI are unique, and they provide opportunities for knowledge discovery and exploitation, which positively contribute towards superior performance and enable sustainable differentiation (McEvily & Chakravarthy, 2002). Additionally, knowledge-based resources create values, innovative opportunities, proactiveness and risk management that impact performance (Wiklund & Shepherd, 2003). They help to promote entrepreneurial orientation, stimulate novel ideas and identify emerging markets and opportunities, which are also quite influential with respect to higher levels of performance (Rua, et al., 2018).

KM and BI can strengthen performance capabilities and provide a sustainable competitive lead through product and service leadership, close customer relationship and operational superiority (Treacy & Wiersema, 1995). Therefore, effective practices of KM and BI prepare organisations to embrace these required competitive factors in order to develop strategic performance capabilities, and thus higher levels of performance (Zack, et al., 2009).

## **Research Methodology**

The research design of this study is quantitatively oriented, as primary quantitative data are collected and analysed. Based on the literature, and as suggested by Bennett (2003), a suitable research method for such quantitative research is survey method (Bennett, 2003). The survey method is more functional, and matches the current research, which includes the development and exploration of ideas and finding justifications for specific accomplishment. This is also supported by Sekaran and Bougie (2016) and Zikmund and colleagues (2013).

Johnson (2001) and Hussey (1997) explain that while looking at the target population, it is important to take note of heterogeneity to assist in enhancing sampling, research variable as well as suitable statistical tool for data cleaning and analysis (Johnson, 2001), (Hussey & Hussey, 1997). The consideration of heterogeneity and appropriate calculation formula can then allow for the determination of the sample size, as described by Krejcie and Morgan

(1970). This study has used a ‘random sampling’ technique to select the sample, as it is easier and less expensive to collect data (Krejcie & Morgan, 1970)(Sekaran & Bougie, 2016).

This technique agrees with the probability sampling method, which theoretically suggests that every organisation selected for the sub-set can be a reasonable representative within the sample, allowing for a close representative sub-set of the organisations from the targeted population. It is sufficient for this study, given the restrictions on time, achievability and overheads (Thomas, 2004), as was the choice of self-completion questionnaires.

Meta-analysis was also used as statistical functionalities were applied to the responses to obtain an overall index for each question and component. Such analysis facilitates measuring, assimilating and examining of empirical study findings with regard to a certain topic (Fraenkel & Wallen, 2001).

## **Data Analysis**

### ***The Measuring Instrument***

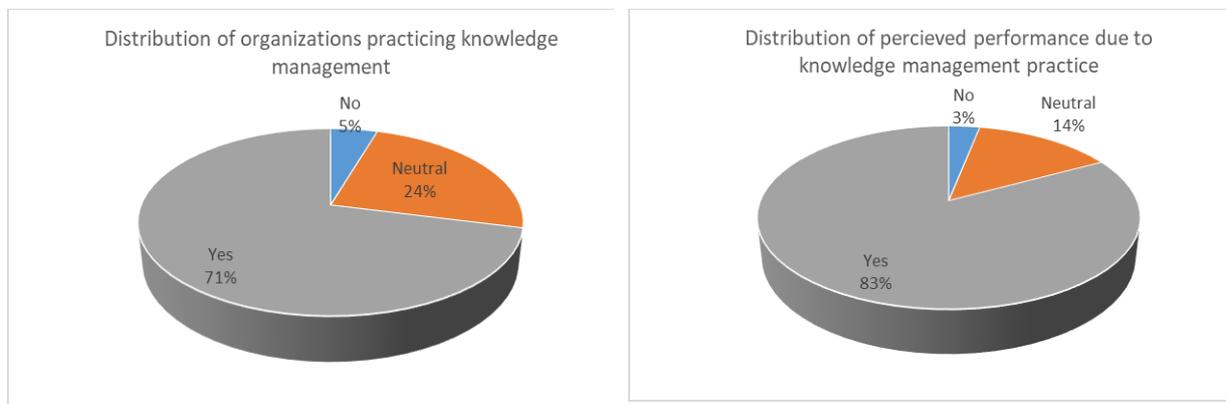
In this study, a range of industries were targeted, including the banking industry, the educational sector and the petroleum, telecom, car sales, airline and IT industries. An already established questionnaire was adapted (Sirbel, 2012) to reflect the focus of this study with a Likert scale of 1–5, where 1 represents ‘Strongly Disagree’, 2 represents ‘Disagree’, 3 represents ‘Neutral’, 4 represents ‘Agree’ and 5 represents ‘Strongly Agree’. The questionnaire focused on knowledge-management practices and business intelligence implementation, and their impact on organisational performance. More than 250 questionnaires were distributed across those industries, with 52 per cent completed and used for the data analysis.

The questions covered key areas of knowledge management and business intelligence, with their perceived impacts on the performance of organisations. The key areas of knowledge management included knowledge creation through the use of internal and external experts, knowledge application and dissemination through the integration of acquired knowledge within their systems and processes, knowledge capture and sharing culture through identification, elicitation and capturing of knowledge from knowledge workers and making it available to all relevant employees, and the perceived impact on performance through the kind of support and competitiveness it provides to individuals, groups and the organisation. The key areas of business intelligence included IT systems capabilities to support business plans, process integration and effective data collection, business intelligence-related functionalities for analytical and reporting capabilities to support innovative decision-making across the organisation, the efficiency of IT systems use by having specialised personnel

within the organisation to promote and ensure effective use of the available IT systems, and the perceived impact on performance and employees' and customers' satisfaction of business operational efficiency.

### ***Findings of Knowledge Management (KM) Practices***

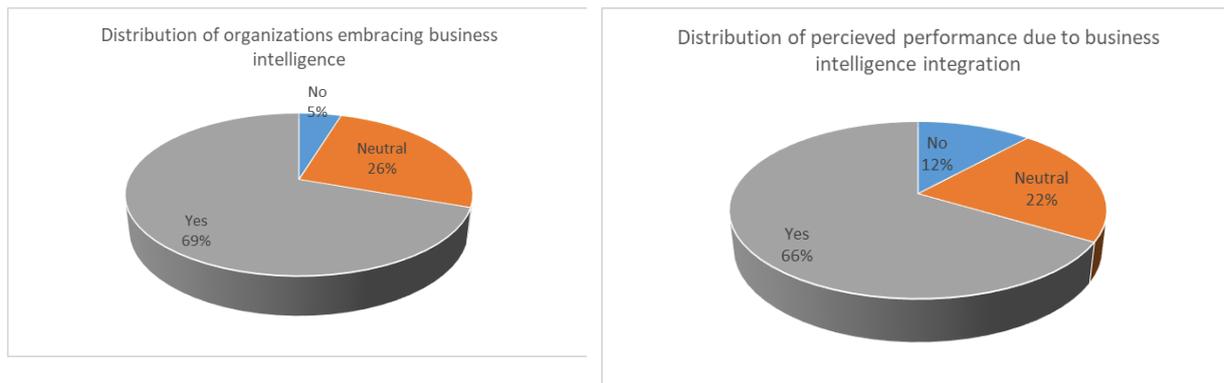
Average ratings of 3.9 and 4.01 were recorded for knowledge management practice within the participating organisations and its perceived impact on the performance respectively. This is an acknowledgement of knowledge management being practised within organisations in Oman and it is perceived to be having a positive impact on the performance. Figure 1 shows the organisations' distributions with respect to knowledge management practice and its perceived impact on performance.



**Figure 1.** Distribution of knowledge management engagement and its perceived impact on performance

### ***Findings of Business Intelligence (BI) Implementation***

An average rating of 3.89 and 3.8 were recorded respectively for business intelligence implementation within the participating organisations and its perceived impact on the performance. This is also an acknowledgement of business intelligence being implemented within organisations in Oman and it is perceived to be having a positive impact on the performance. Figure 2 shows the organisations' distributions with respect to business intelligence implementation and its perceived impact on performance.



**Figure 2.** Distribution of business intelligence implementation and its perceived impact on performance

Based on the analysis, it can be noted that organisations in Oman tend to give almost equal importance to both knowledge management and business intelligence (71 per cent and 69 per cent respectively), based on the distributions of organisations. Still, they are fairly low when considering how highly these two concepts are recommended for organisational performance enhancement. When it comes to perceived impact on performance, only 66 per cent of participating organisations acknowledged a positive impact from business intelligence compared with 83 per cent acknowledging a positive impact from knowledge management practices, explaining the slight preference towards knowledge management practices by organisations in Oman. The significant difference of 17 per cent in perceived impact between these two concepts needs to be investigated further and explained.

To further scientifically examine knowledge management and business intelligence with respect to organisational performance, multiple regression analysis was undertaken – first to look at knowledge-management practice as an explanatory variable on its own for performance in the context of Oman, second to look at business intelligence implementation as an explanatory variable on its own for performance in the context of Oman, and third to look at their combination as explanatory variables for performance in the context of Oman.

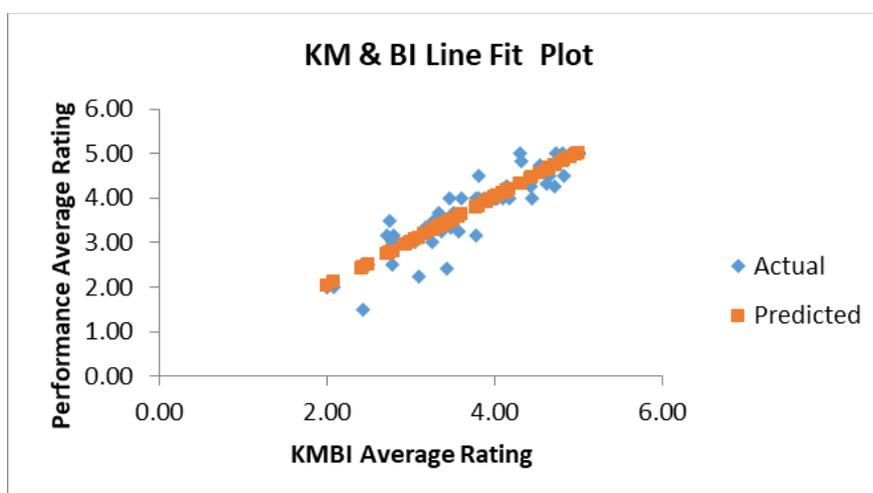
## Findings and Discussion

The powerful analytical tools of Microsoft Excel allowed for easy and effective comparisons between data sets, including data analysis to discover trends and patterns that influence decisions. They provided regression models needed to explain the correlation between the different variables, the regression statistics for measuring the strength of the correlation and the analysis of variance (ANOVA) for determining the reliability of the different explanatory variables within the regression model. Table 2 and Figure 3 show the results from the regression analysis.

**Table 2:** Regression statistics showing the strength of the correlation between the different variables

KM practice only		BI implementation only		KM & BI combined	
<i>Regression Statistics</i>		<i>Regression Statistics</i>		<i>Regression Statistics</i>	
Multiple R	0.84608659	Multiple R	0.90529674	Multiple R	0.95726777
	8		0.81956218		7
R Square	0.71586253	R Square	0.81813014	R Square	0.91636159
	2		0.81813014		6
Adjusted R Square	0.71360747	Adjusted R Square	0.42759005	Adjusted R Square	0.91502338
	3		7		1
Standard Error	0.39082045	Standard Error	128	Standard Error	0.23327930
	2		128		3
Observations	128	Observations		Observations	128

The Multiple R values of 0.85 and 0.91 indicate very strong correlations between knowledge-management practice and performance, and business intelligence implementation and performances respectively. When knowledge-management practice and business intelligence implementation are combined, the Multiple R value increased to 0.96, indicating an even stronger correlation with performance. The R Square values of 0.72 for knowledge management practice and 0.82 for business intelligence implementation show that only 72 and 82 per cent of the variations in organisational performances respectively can be explained by knowledge-management practice and business intelligence implementation respectively, while the Adjusted R Square (multiple independent variables) value of 0.92 for their combination indicates that 92 per cent of the variations in organisational performances can be explained by the combined knowledge-management practice and business intelligence implementation within the organisations. These results are supported by suggestions that KM and BI are interdependent, and together they can strengthen decision-making capability and performance (Byukusenge & Munene, 2017). Figure 3 illustrates this.



**Figure 3.** KM & BI Combination line fit plot (regression line)

Based on the findings, it can be strongly argued that organisations can better control their performances by incorporating both knowledge-management practices and business intelligence implementation within their daily operations; therefore, the follow-on analysis focuses only on the combined explanatory variables regression model. Tables 3 and 4 provide statistics that relate to the reliability of the regression model.

**Table 3:** Analysis of Variance showing the reliability of the model

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	2	74.52870479	37.26435239	684.7643782	4.47053E-68
Residual	125	6.802404152	0.054419233		
Total	127	81.33110894			

The small ‘Significance F’ value is an indication that the model is unlikely to give incorrect predictions, and so this case, it is clear that the regression model is reliable.

Both knowledge management and business intelligence proved to be reliable individual explanatory variables within the model (small P-value). It could therefore be argued that knowledge management and business intelligence can reliably be used to explain variations in performance and to predict the kind of performance they can achieve (see Table 4).

**Table 4:** Analysis of Coefficients showing the reliability of the explanatory variables

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.003952652	0.107509829	0.036765494	0.970730636
KM Practices	0.671975709	0.066767344	10.0644367	8.18433E-18
BI Integration	0.329795585	0.064577528	5.10697134	1.18905E-06

Combined knowledge management and business intelligence also proved to be reliable explanatory variable within the model (small P-value). Therefore, it could also be argued that the combination of knowledge management and business intelligence can be reliably used to explain variations in performances and to predict the kind of performance that they can achieve (see Table 5).

**Table 5:** Analysis of Coefficients showing the reliability of the explanatory variables

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.028738658	0.109662112	0.262065518	0.793698883
KMBI	0.995815007	0.027622495	36.05087087	3.09667E-68

The analysis of coefficients showed an intercept value close to zero for both scenarios, indicating that without knowledge-management practices and business intelligence, very little gain in performance can be achieved. It also showed that for every unit increase in the combined scenario, the average rating of performance would double, meaning a 100 per cent increase in performance while, separately, engaging in knowledge-management practices would see an average rating increase of 0.67 in performance (67 per cent increase in performance) and engaging in business intelligence implementation would see an average rating increase of 0.33 in performance (33 per cent increase in performance). Based on the regression model, the combined scenario would give a more desirable outcome, but still both knowledge-management practices and business intelligence implementation would positively impact organisational performance. However, the impact factor of knowledge-management practices appeared to be twice that of business intelligence implementations.

As it stands, in the context of Oman, organisations may want to focus on having the combined scenario concentrate more on their knowledge management practices as a second-best option for a more productive performance. This should not mean neglecting the growing importance of business intelligence, which is already positively contributing towards their performance within this increasingly competitive business environment (Saqib & Zarine, 2018),(Islam, 2018), (Radmehr & Bazmara, 2017).

### **Recommendations**

Currently, with regard to impact level on performances, organisations in Oman should prioritise a combination of knowledge management and business intelligence integration for optimum performances or emphasise more on knowledge management as a second-best option.

Additionally, organisations in Oman should pay closer attention to the importance and role of business intelligence within this modern competitive economy, so as to develop effective implementation mechanisms of business intelligence-related activities that can bring about more direct performance enhancement. Business intelligence should be able to play a more advantageous role.

Despite the differences in impact on performance by knowledge-management practices and business intelligence implementation, at present organisations are rating them fairly equally. In the short term, organisations in Oman would perform better by prioritising knowledge management over business intelligence-related activities. However, in the longer term, business intelligence implementation should be well aligned with business goals in order to reap the performance benefits that business intelligence normally offers. This will ensure improved efficiency of business operations, an enhanced decision-making process, sustainable innovative solutions and superior organisational performance.

### **Knowledge Contributions of This Study**

This study reaffirms the very strong correlation between knowledge management and performance (0.85), and business intelligence and performance (0.91), but when knowledge-management practice and business intelligence implementations are used together as explanatory variables for performance, an even stronger correlation exists (0.96). Knowledge-management practice and business intelligence implementation as individual explanatory variables for organisational performance can only explain 72 and 82 per cent respectively of the variations in organisational performances respectively; when combined, the level of explanation of the variations in organisational performances increases significantly 92 per cent. Therefore, organisations should note that using those two explanatory variables together would provide a more reliable association and control over their performances compared with using them separately.

Although organisations in Oman tend to give equal importance to knowledge management and business intelligence, both the perceived and calculated impacts on performance by business intelligence are low compared with that of knowledge management. This does not reflect the roles and contributions of business intelligence in this modern business environment, which are boasted by much of the literature, so there is a need for further exploration in this area to shed some light on this unexpected result in the context of Oman.

Furthermore, despite the determination that little or no gain in performance can be expected by organisations without engaging in knowledge management and business intelligence, something that is also supported by much of the research (Byukusenge & Munene, 2017), the percentage of organisations in this context that are actively engaged in knowledge management and business intelligence is still relatively low (71 and 69 per cent respectively). Knowledge management and business intelligence awareness campaigns among business decision-makers should be in place to ensure that there is sustainable growth of organisations and thus of the economy.

## **Limitations and Future Research**

This study is industry-independent, so it is a generalisation of organisations. Given that each industry may have its own specific characteristics, organisations have to take these into consideration when adopting the results. Replicating this research in an industry-specific way would be very useful for Omani organisations when it comes to applicability.

The much lower perceived and calculated impact on performance from business intelligence compared with that from knowledge management is an unexpected deviation from the literature, which needs to be investigated and explained (Al-Busaidi, et al., 2010), (Lim, et al., 2012).

Despite the recognition of knowledge management and business intelligence as key drivers of organisational competitiveness, the proportion of organisations embracing them is still relatively low. Greater understanding of such behaviour would be very useful for the relevant authorities.

## **Conclusion**

Very strong correlations exist between knowledge management and performance (0.85), and business intelligence and performances (0.91), but such correlations can be strengthened further by using them together as explanatory variables to performance (0.96). Similarly, knowledge management and business intelligence as individual explanatory variables for organisational performance can only explain 72 and 82 per cent of the variations in organisational performances respectively, while the level of explanation can be increased significantly (92 per cent) when combined, providing a more reliable association and control over performances.

Organisations in Oman tend to give equal importance to both knowledge management and business intelligence, while both the perceived and calculated impacts on performance by business intelligence are low compared with that of knowledge management, deviating from the literature. At present, it would be more productive for organisations in Oman to emphasise a combined scenario or focus on knowledge management-related activities while paying closer attention to how to develop more effective implementation mechanisms of business intelligence for more direct performance enhancement.

Little or no gain in performance can be expected by organisations without engaging in knowledge management and business intelligence, yet the proportion of organisations that are actively engaged in knowledge management and business intelligence is still relatively low. An awareness of the business potential and opportunities that could be created by knowledge management and business intelligence needs to be promoted.



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