The Knowledge Creation, Capture, Sharing and Transfer - To what extent they are interrelated in Higher Education Institutions?

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The effectiveness of knowledge management in any institution depends on having strong interrelations between each of its components with the others [(Knowledge creation (KC), Knowledge capture and storage (KCS), knowledge sharing (KS) and knowledge dissemination/ transfer (KD)]. The purpose of this research is to investigate the interrelationship between each of these components with the others in Higher Education Institutions. Quantitative research method is implemented using survey approach via questionnaire technique. The regression analysis is used to assess the impact of each component of the KM on other components. It was found that KD has the biggest impact on all the other three components of KM. The KC, which is considered the core process of KM, is well interrelated with both the KCS and KD. Finally, two-side linkage was found between KS and KD, while no significant linkage was found between KS and KC or KS and KCS. This study is expected to streamline the KM activities in Higher Education Institutions (HEIs) to improve their overall performance in teaching, research and community engagement. Therefore, this research is contributing toward the theoretical advancement in this field. The findings may be helpful for policymakers and the top management in HEIs, as it sheds the light on some mechanisms may improve the KM in the HEIs and, in turn, foster its' role in achieve the sustainable development.

Key words: *Knowledge creation, knowledge capture and storge, knowledge sharing, knowledge dissemination/ transfer, Higher Education Institutions.*

1.0 Introduction and problem statement:

The role of Higher Education Institutions become more crucial in contributing the economic sustainable development for any nation. Knowledge management (KM) is closely related to the mission of the HEI (which includes education, research, and community engagement). Therefore, having effective KM including Knowledge Creation (KC), Knowledge Capture and Storage (KSC), Knowledge Sharing (KS) and Knowledge dissemination/ transfer (KD) can significantly impact the achievement of the HEI mission. It's worthiness to say that each of these components can foster the others. Hence, the core problem of this research is to investigate the level of interrelation between each of these components with others. There is only one question which this research aims to answer, it is "what is the level of interrelationship between KM components (KC, KCS, KS and KD) in Omani HEIs?

This introduction will be followed by the second section where researchers review the literature related to KM and its detailed processes in HEIs and ended by the theoretical framework of the study. Third section demonstrates the research methodology and identify the hypotheses of the research, while the fourth Section summarizes data analysis. Finally, the discussion and conclusion are presented in section five.

2.0 Literature review

2.1. The Components of Knowledge Management in HEIs:

The KM has four components: i) Knowledge Creation (KC); ii) knowledge Capture and Storage (KCS); iii) Knowledge Sharing (KS) and iv) Dissemination / Transfer (KD). The KM in any HEI is affected mainly by the culture and the structure of the organization, implemented technology, leadership style, linkages with the industry (Veer-Ramjeawon and Rowley, 2017; Pinto 2014).

The first phase of the KM is the Knowledge Creation (KC) (Adeinat, I.M. 2019) which is considered as the core process of KM. KC is the formation of new ideas which leads to create new knowledge (Nonaka, 1994). It the continuous search *and generation of new knowledge. The KC is done by academics to have personal achievement and also to have better service to society through the HEIs.* (Ramjeawon and Rowley, 2018). KC reflects the ability of the organization to Elaborate new ideas that could be useful (Ichijo and Nonaka, 2006). It's worth to say that KC corresponds one of the main HEIs mission which aim to expand the boundaries of human knowledge and promote creativity (Alexandropoulou D. A., et al. 2009).

Knowledge is created in HEIs via the scientific research (Rowley, 2000; Serban & Luan, 2002); exchange of ideas and initiatives among research groups and individuals; socialization of research via publication of the research findings to the society (Siadat, 2012). The created

knowledge can be in the form of a discovery for new content or a recognition knowledge of existing content (Adeinat, 2019). The enhancement of KC in HEIs requires an improvement of the soft and hard aspects of the creative environment. This enhancement can depend on both technology strategies and personalization (Tian et al., 2009).

Knowledge capture occurs when the HTI identifies new knowledge as relevant and valuable for both the current and futuristic needs (Devi, Choy and Ismail, 2009). Building institutional knowledge commences by capturing the knowledge from individuals for storage in a knowledgebase and keep the accumulated knowledge available for use in the future (Dzekashu and McCollum, 2014). Hence, capture ideas from the staff and other stakeholders is considered the base of the KCS building in any HEI. There are many external sources of knowledge capture, such as: i) benchmarking best practices from other HEIs; ii) attending conferences; iii) hiring consultants; iv) collecting data from staff, students, competitors, and resources and v) building alliances and establishing knowledge links with other HIEs or institutions (Devi, Choy and Ismail, 2009). The process of codifying and storing the knowledge in a suitable format and easing the access to these stored data for all staff in the institution is called "Knowledge Storage". This process can be executed via having many tools in the HTI, such as: Database management system; data warehousing technologies; directories of expertise and handbooks include the procedures in the institution (Devi, Choy and Ismail, 2009).

Effective KCS requires a clear mechanism in place to patent and copy rights including disclosures, patenting, and licensing (Veer-Ramjeawon and Rowley, 2019). The capture of knowledge is followed by a validation process by experts who assess the content captured and approve it for storage to be accessible and used in the future by all the staff (Dzekashu and McCollum, 2014).

The process of knowledge exchange among academics and researchers within the HEI to enhance the overall knowledge inside the institution is called the Knowledge Sharing (KS) (Ramjeawon, P.V. and Rowley, J., 2018). There are many forms of KS in HEI: seminars; symposiums; conferences; workshops; training sessions; publications and teaching & learning activities. More involvement in such activities means more readiness of the HEI to share the knowledge (Cheng et al., 2009; Fullwood et al., 2013).

The existence of proper culture fosters the KS in the HEIs can foster the research and teaching activities (Fullwood, Rowley and Delbridge 2013). This culture can be developed through nurturing teamwork, networking and collaboration (Arntzen et. al., 2009; Fullwood et. al., 2013). On another hand, the KS in HEIs can be hindered if there is a lack of effective communications inside the organization or a lack of trust (Adeinat, 2019). These factors will waste any effort related to KS in the institution.

KD is the process of dissemination the created knowledge within the HEI to external stakeholders (Ramjeawon, P.V. & Rowley, J., 2018). The main purpose of KD is to enable stakeholders to use the new knowledge by externals which contribute in the enhancement of the lifestyle as a whole. There are many mechanisms to achieve the KD, such as Publications, presentations, websites, policies and reports (Devi, Choy and Ismail, 2009).

KD matches the 'third mission' of the HEI, which is community service and the participation in the nations' sustainable development (Veer-Ramjeawon and Rowley, 2019; Alexandropoulou et al., 2009). HEIs transfer the knowledge as a respond to the need of society (Bano and Taylor, 2014). The HEIs' staff conduct the research to solve any problem in the society (Neelam et al., 201; Senge et al., 2000). KD activities can be classified into two main groups, fist is the "Soft KD activities" such as public lectures and consulting while the second group of are called 'hard KD activities' such as licensing or spin-off a greater level of third-stream activities (Fuller, Beynon and Pickernell, 2019).

KD from academia to industry and public may face challenges since it requires quite space of time to identify the mutual interests between academics and industry (Gertner et. al., 2011). This challenge is higher for HEIs located in developing countries as they suffer from weak linkages between HEIs and the industry (Ramachandran et al., 2009).
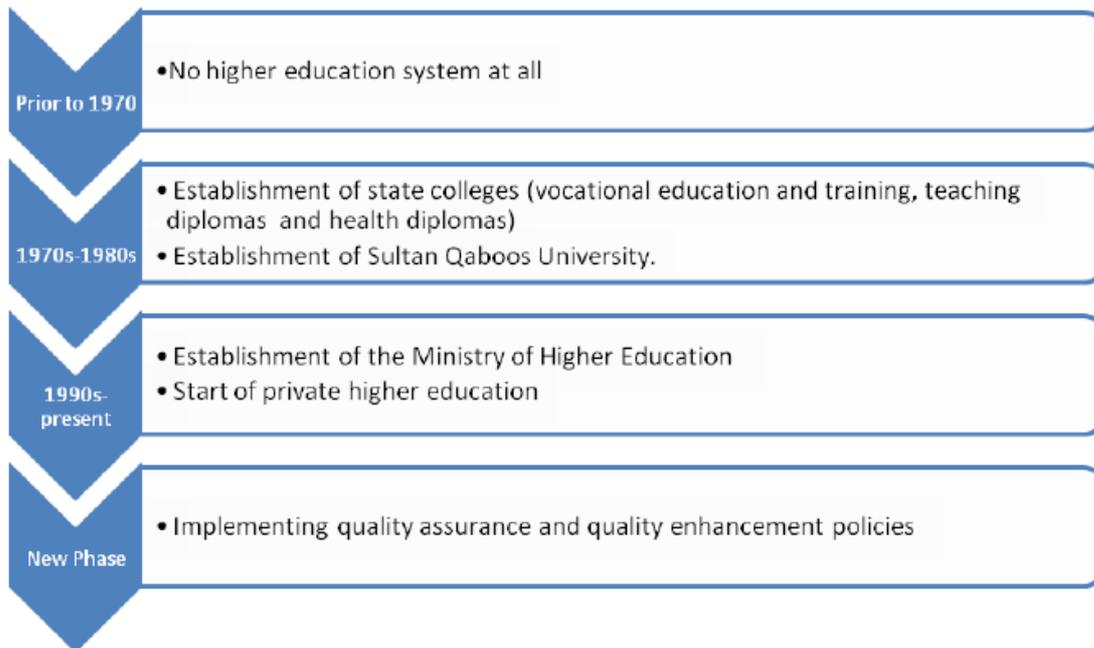
2.2. A glance for the higher education sector in Oman:

A special attention was given to the education in the Sultanate of Oman since the accession of His Majesty Sultan Qaboos bin Said in 1970. The education was considered one of main key players in the development of the Sultanate. Since that time, pre-tertiary education became available for all Omanis (Al-Lamki, 2002). This yielded with high number of secondary school graduates. Oman launched its first HE institution in 1985, which was offering specialized higher education programmes in "education" to graduate teachers for schools (Al Bandary, 2005). In 1986, Sultan Qaboos University was founded, which was followed by the establishment of several new institutions owned by the state and the private sector. In 2020, His Majesty Sultan Haitham Bin Tariq issued the royal decree no. 76/2020 to establish the "University of Technology and Applied Sciences" as second public university in the Sultanate. Recently, alongside with these two public universities, there is above 30 private higher education institutions offer graduate and undergraduate programmes in a wide range of specializations.

As per the regulations of the Omani Ministry of Higher Education, Research and Innovation (MOHERI), private higher education institutions working in Oman should be affiliated to foreign recognized university (Wilkinson & Al Hajry, 2007). The aim of these regulations is to ensure the quality and sustainability of these local private higher education institutions (Baporikar and Shah, 2012). Private HEIs working in Oman currently are colleges provide

local or imported programs and universities running independently. Baporikar and Shah (2012) referred that the Omani HE system can be divided into four main phases.

Figure (1): Phases of higher education in Sultanate of Oman

Prior to 1970
- No higher education system at all

1970s-1980s
- Establishment of state colleges (vocational education and training, teaching diplomas and health diplomas)
- Establishment of Sultan Qaboos University.

1990s-present
- Establishment of the Ministry of Higher Education
- Start of private higher education

New Phase
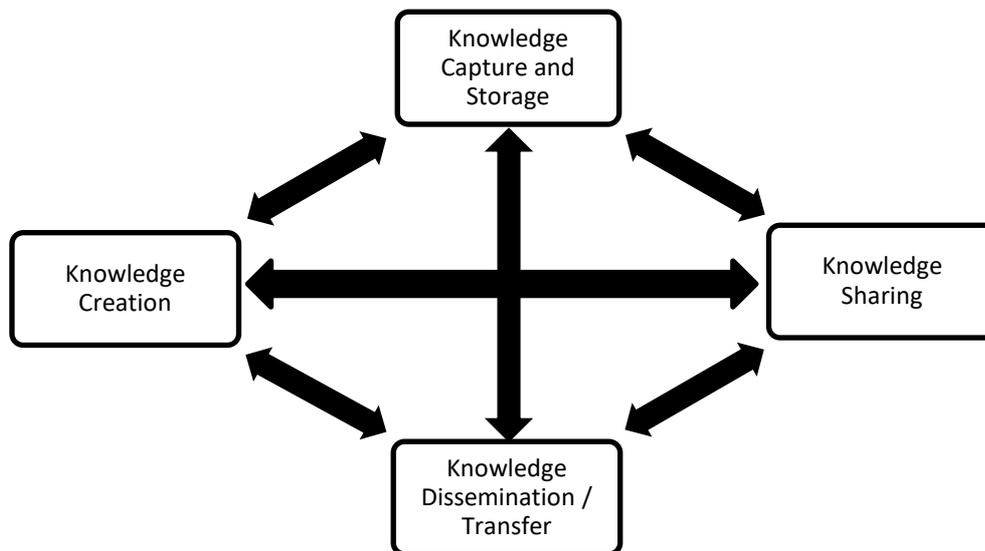- Implementing quality assurance and quality enhancement policies

Source: Baporikar, N., & Shah, I. (2012). Quality of higher education in 21st century – A case of Oman. *Journal of Educational and Instructional Studies in the World, 2*(2), 9-18.

2.3. The framework of the study:

The theoretical framework of the study is shown in figure no. 2.

Figure no. (2) - The framework of the study

Source: Developed by authors.

3.0 Research Methodology

The quantitative research method has been used for this study via survey approach. This methodology is most commonly used in business and social sciences research (Wallace et al,. 2010; Bashir et al., 2017; Saunders et al., 2016). Ghuari and Gronhaug (2002) found that surveys were effective to study perceptions to explore causal relationship.

The data collection instrument was a structured questionnaire developed based on the reviewed literature. The questionnaire was checked for content validity by sharing with experienced professionals in HEIs. Researchers received suggestions about the appropriateness of each item in the questionnaire; readability, language, clarity and understanding of the questions. Much useful feedback was received and subsequently improvements were made to the questionnaire. There were some items removed and fine-tuned to arrive at final version.

The Purposive sampling method was implemented to collect the data for this research. Staff from different Omani HEIs were contacted by sending link to the questionnaire through email and followed up by phone calls and messages. The respondents selected were those who had an experience of more than one year working in HEIs in Oman. The link was sent to 108 respondents and 76 responses were received. The response rate was fairly good for online

survey. All filled forms received were complete in terms of data sufficiency and there were no missing values, as responses were made compulsory at the design stage of the questionnaire.

The data was analysed using multiple regression technique that is recommended for finding out causal relationship (Tonidandel and LeBreton, 2011; Stanley and Doucouliagos, 2012). Hence, multiple regression was used for testing Relationship between each component of the KM and the other components. The data was checked for underlying assumptions of regression, like normality and outliers. The regression models developed were checked for goodness of fit and significance, at 0.05 level of significance. The response biases were avoided by keeping the responses anonymous, in fact the options of providing respondent identifiers were not designed in the questionnaire as suggested by Podsakoff et al. (2003). Following hypotheses were tested in analysis,

> H01: Knowledge Creation- KC factors are significantly affected by the other KM factors in the Omani HEIs.

> H02: Knowledge Capture and Storage- KCS factors are significantly affected by the other KM factors in the Omani HEIs.

> H03: Knowledge Sharing- KS factors are significantly affected by the other KM factors in the Omani HEIs.

> H04: Knowledge Application and Use- KD factors are significantly affected by the other KM factors in the Omani HEIs.

4.0 Analysis

The four hypotheses have been tested using the multiple regression modeling. Firstly, the data was checked for any outliers and non-seriousness (same/similar score across all items) of respondents before hypothesis testing. None of responses were having these errors and hence all data was used for analysis. The hypotheses test results are presented in below.

4.1. Testing hypothesis 1 - Knowledge Creation- KC factors are significantly affected by the other KM factors in the Omani HEIs.

The dependent variable in this regression model was the KC and the independent variables where the other KM factors. Specifically, they are KSC, KS and KD.

$$KC = \alpha_0 + \alpha_1 \, KSC + \alpha_2 \, KS + \alpha_3 \, KD + \varepsilon \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \; (1)$$

The test results show that the model is good with adjusted R square value of 0.821, representing that 82.1% of variations in KC being explained by the given independent variable. The F value is significant which reflects the model is significant and can be used for all practical purposes. The outcomes of these statistics are shown in tables A.1 and A.2 in Appendix (A). The results of the regression are shown in Table no. (1).

Table no. (1) – Coefficients -– KCS, KS, KD and KC

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	.035	.196		.180	.858
	KCS	.427	.093	.393	4.612	<.001
	KS	.018	.102	.017	.173	.863
	KD	.557	.120	.546	4.649	<.001

a. Dependent Variable: KC

Table no. 1 presents that KC is significantly affected by KCS and KD, while the KS has no significant impact on KC. This means that the knowledge creation in Omani HEIs is significantly affected by having a proper mechanism to respond for employees' ideas; having in-place mechanisms to capture the knowledge, which are: patents and copy rights; codifying and storing the knowledge repositories; Having a clear processes and systems for applying knowledge; developing new ideas from the output of research; encouraging the staff to apply useful ideas and having a mechanism encouraging the staff to apply their knowledge to solve problems in the society.

Therefore, the equation 1 after putting coefficients will become,

$$KC = 0.035 + 0.427\,KSC + 0.557\,KD + \varepsilon \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{(1-1)}$$

4.2. Testing hypothesis 2 - Capture and Storage (KCS) factors are significantly affected by the other KM factors in the Omani HEIs.

The dependent variable in this regression model was the KCS and the independent variables where the other KM factors. Specifically, they are KC, KS and KD.

$$KCS = \beta_0 + \beta_1\,KC + \beta_2\,KS + \beta_3\,KD + \varepsilon \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{(2)}$$

The test results show that the model is good with adjusted R square value of 0.746, representing that 74.6% of variations in KC being explained by the given independent variable. The F value is significant which reflects the model is significant and can be used for all practical purposes.

The outcomes of these statistics are shown in tables A.3 and A.4 in Appendix (A). The results of the regression are shown in Table no. (2).

Table no. (2) – Coefficients –- KCS, KS, KD and KC

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.442	.213		2.070	.042
	KC	.534	.116	.581	4.612	<.001
	KS	.013	.114	.014	.118	.906
	KD	.277	.149	.295	1.859	.067

a. Dependent Variable: KCS

Table no. 2 shows that KCS is significantly affected by KC and KD, while the KS has no significant impact on KCS. This means that the knowledge capture and sharing in Omani HEIs is significantly affected by having a mechanism to create and acquire knowledge from different sources; having clear processes for ideas knowledge exchange between individuals and groups with encouragement for this process; having a system to reward employees who have initiatives new ideas and knowledge; having a clear mechanism to create new knowledge from the existing knowledge; Having a clear processes and systems for applying knowledge; developing new ideas from the output of research; encouraging the staff to apply useful ideas and having a mechanism encouraging the staff to apply their knowledge to solve problems in the society.

The equation 2 after putting coefficients will become,

$$KCS = 0.442 + 0.534\, KC + 0.227\, KD + \varepsilon \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (2\text{-}1)$$

4.3. Testing hypothesis 3 - Capture sharing (KS) factors are significantly affected by the other KM factors in the Omani HEIs.

The dependent variable in this regression model was the KS and the independent variables where the other KM factors. Specifically, they are KC, KCS and KD.

$$KS = \sigma_0 + \sigma_1\, KC + \sigma_2\, KCS + \sigma_3\, KD + \varepsilon \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (3)$$

The test results show that the model is good with adjusted R square value of 0.731, representing that 73.1% of variations in KC being explained by the given independent variable. The F value is significant which reflects the model is significant and can be used for all practical purposes. The outcomes of these statistics are shown in tables A.5 and A.6 in Appendix (A). The results of the regression are shown in Table no. (3).

Table no. (3) – Coefficients – KC, KCS, KD and KS

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.608	.215		2.828	.006
	KD	.795	.127	.827	6.261	<.001
	KC	.024	.136	.025	.173	.863
	KCS	.014	.122	.014	.118	.906

a. Dependent Variable: KS

Table no. 3 shows that KS is significantly affected by the KD only, while the KC and KCS have no significant impact on KS. This means that the knowledge sharing in Omani HEIs is significantly affected by having a clear processes and systems for applying knowledge; developing new ideas from the output of research; encouraging the staff to apply useful ideas and having a mechanism encouraging the staff to apply their knowledge to solve problems in the society.

The equation 3 after putting coefficients will become,

$$KS = 0.608 + 0.795 \, KD + \varepsilon \; \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \; (3\text{-}1)$$

4.4. Testing hypothesis 4 – Knowledge Dissemination / Transfer (KD) factors are significantly affected by the other KM factors in the Omani HEIs.

The dependent variable in this regression model was the KD and the independent variables where the other KM factors. Specifically, they are KC, KCS and KS.

$$KD = \delta_1 \, KC + \delta_2 \, KCS + \delta_3 \, KS + \varepsilon \; \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \; (4)$$

The test results show that the model is good with adjusted R square value of 0.861, representing that 86.1% of variations in KC being explained by the given independent variable. The F value is significant which reflects the model is significant and can be used for all practical purposes. The outcomes of these statistics are shown in tables A.7 and A.8 in Appendix (A). The results of the regression are shown in Table no. (5).

Table no. (4) – Coefficients – KC, KCS, KS and KD

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-.052	.169		-.306	.761
	KC	.415	.089	.423	4.649	<.001
	KCS	.165	.089	.155	1.859	.067
	KS	.444	.071	.426	6.261	<.001

a. Dependent Variable: KD

Table no. 4 shows that KD is significantly affected by the KC and KS, while no significant impact of KS on KD. This means that the knowledge Application and Use in Omani HEIs is significantly affected by having a mechanism to create and acquire knowledge from different sources; having clear processes for ideas knowledge exchange between individuals and groups with encouragement for this process; having a system to reward employees who have initiatives new ideas and knowledge; having a clear mechanism to create new knowledge from the existing knowledge; issuing timely reports for stakeholders; Conducting regular events to share knowledge; encouraging the staff to frequently participate in informal discussions to share the knowledge and enabling employees to share the latest files.
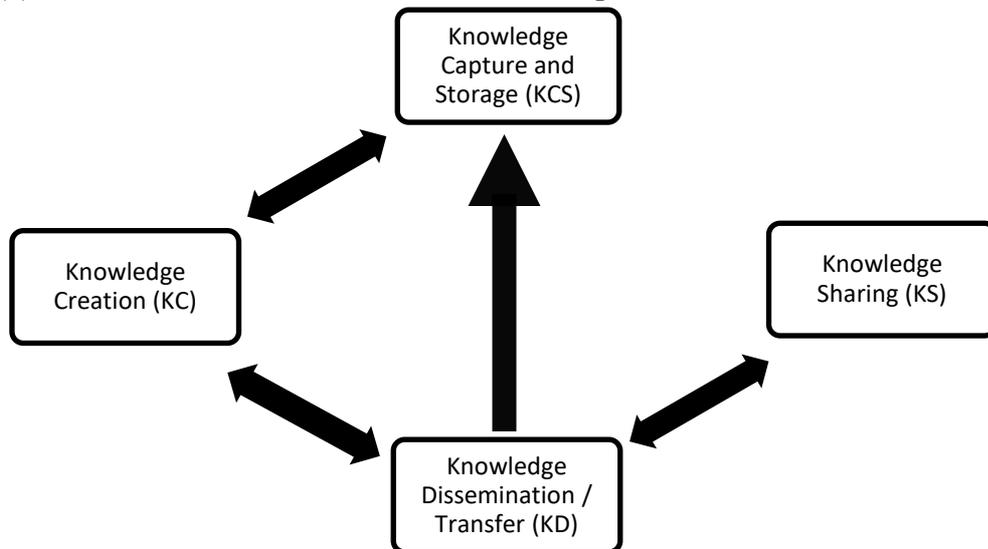
The equation 4 after putting coefficients will become,

KD = - 0.052 + 0.415 KC + 0.444 KS + ε .... *(4-1)*

5.0 Discussion and Conclusion

The outcomes of testing the interrelation between the components of the KM can be shown in figure no. (3).

Figure no. (3) - The interrelation between the KM components

KD has the biggest impact on all the other three processes of KM as it found significantly impacts the KC, KCS and KS. This means that the improvement of KD and having more ability of stakeholders to use the new knowledge created by the HEI will motivate the HEI to create more knowledge, having better capture & storage and having more knowledge sharing mechanisms as well. This result may highlight the importance of linkage between the academia and industry and how this linkage significantly fosters all perspectives of the KM in the HEIs. The KC, which is considered the core process of KM, is well interrelated with both the KCS and KD. This means the ability of Omani HEIs on knowledge creation is significantly affected by their ability capture and storage the knowledge and their ability on the dissemination of the created to external stakeholders. It can be said that the improvement of KCS and/ or KD will lead to improvement in KC and the improvement in KC will lead to improvement of both KCS and/ or KD and the vice versa.

The impact of KCS was found significant on the KC only while the KCS was significantly affected by both the KC and KD. Finally, the KS was found in significant two-side linkage with the KD only and there is no significant linkage with the KC or the KCS. This might reflect the need to have more teamwork in the research between the staff inside the HEIs themselves. Having no linkage between the KC and KS might reflects those individual efforts are taken by the individual staff while this effort not been exchanged among the staff within the HEIs. A similar conclusion can be shown when there is no significant linkage found between the KS

and KCS, which might indicate that the captured and stored knowledge by some staff in HEIs not been exchanged with the other staff in the same HEI.

This conclusion might be helpful for the management of Omani HEIs via highlighting the policies and actions might improve the process of knowledge management in their institutions, which can be summarized in fostering the linkage with the industry and motivate the teamworking in research among the staff inside the same institution.

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Appendix A

Table A.1- Model Summary – KCS, KS, KD and KC

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.910[a]	.828	.821	.430	2.141

a. Predictors: (Constant), KD, KCS, KS
b. Dependent Variable: KC

Table A.2 - ANOVA – KCS, KS, KD and KC

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	64.346	3	21.449	115.779	<.001[b]
	Residual	13.338	72	.185		
	Total	77.684	75			

a. Dependent Variable: KC
b. Predictors: (Constant), KD, KCS, KS

Table A.3- Model Summary – KC, KS, KD and KCS

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.864[a]	.746	.736	.482	2.218

a. Predictors: (Constant), KD, KS, KC
b. Dependent Variable: KCS

Table A.4- ANOVA – KC, KS, KD and KCS

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	49.092	3	16.364	70.577	<.001[b]
	Residual	16.694	72	.232		
	Total	65.785	75			

a. Dependent Variable: KCS
b. Predictors: (Constant), KD, KS, KC

Table A.5- Model Summary – KC, KCS, KD and KS

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.861[a]	.741	.731	.497	2.347

a. Predictors: (Constant), KCS, KD, KC
b. Dependent Variable: KS

Table A.6- ANOVA – KC, KCS, KD and KS

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	51.003	3	17.001	68.818	<.001[b]
	Residual	17.787	72	.247		
	Total	68.789	75			

a. Dependent Variable: KS
b. Predictors: (Constant), KCS, KD, KC

Table A.7- Model Summary – KC, KCS, KS and KD

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.931[a]	.867	.861	.371	2.322

a. Predictors: (Constant), KS, KCS, KC
b. Dependent Variable: KD

Table A.8- ANOVA – KC, KCS, KS and KD

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	64.639	3	21.546	156.233	<.001[b]
	Residual	9.930	72	.138		
	Total	74.569	75			

a. Dependent Variable: KD
b. Predictors: (Constant), KS, KCS, KC