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Quantitative and qualitative instruments for knowledge management readiness assessment in universities

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Abstract: Knowledge Management (KM) is the process of capturing, creating, disseminating and applying all forms of knowledge within an organization in order to fulfil one or more organizational objectives. However, universities have been slow to adopt Knowledge Management. Agarwal & Marouf (2014) came up with a 10-step process and a framework for initiating KM in universities. The steps were organized within 4 phases of plan, design, implement and scale-up. After getting top management support, forming a KM team, and identifying KM goals and priorities, the third step of their process (within the design phase) was determining the extent to which the university is ready for KM i.e. an assessment of its current state of readiness. Agarwal & Marouf propose that readiness assessment can be achieved through a survey, interview or focus groups to determine the KM capabilities relating to people, culture, processes and technology within the university. While there are a number of readiness assessment instruments, it is not clear how such instruments would look like in the context of universities and when surveying faculty members. What would be the quantitative and qualitative way of gathering KM readiness data in universities? In this study, we will design and propose a research model, a survey instrument, and an interview protocol for KM readiness assessment in universities. Readiness assessment could mean individual faculty readiness as well as organizational readiness. While the survey instrument will focus on individual faculty readiness, the interview protocol will focus on organizational factors. Where possible, survey items will be adapted from previous studies, and new ones developed where needed. The survey instrument and interview protocol could be used by other researchers to carry out mixed-method studies to assess individual KM readiness in universities. Future work will involve coming up with a survey instrument for organizational factors, and an interview protocol for individual factors, and then combining the instruments for both sets of factors.

Keywords: knowledge management, readiness assessment, universities, quantitative, qualitative, faculty, survey, interview, focus groups

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1. Introduction

Knowledge Management (KM) is the systematic process of capturing, creating, structuring, disseminating and applying all forms of knowledge throughout an organization in order to fulfil one or more organizational objectives e.g. to work faster, reuse best practices, and reduce costly rework from project to project (Nonaka & Takeuchi, 1995; Ruggles & Holtshouse, 2001). Building on the numerous past definitions, Dalkir (2011) defines KM as the deliberate and systematic coordination of an organization's people, technology, processes, and organizational structure in order to add value through reuse and innovation. This is achieved through the promotion of creating, sharing, and applying knowledge as well as through the feeding of valuable lessons learned and best practices into corporate memory in order to foster continued organizational learning.

Since the 1990s, KM has been applied in many contexts, especially for-profit companies of different sizes, and in the non-profit sector as well. While the same imperatives of knowledge reuse, transfer of best practices and sharing of lessons learned apply to universities as well, they have been slow to adopt KM. These become increasingly important with the need of universities to recruit and retain students, faculty and staff, increase research productivity and reputation, and to survive and grow in face of intense competition from other universities, and large-scale, and/or free, online programs. In addition, universities have been affected by shrinking budgets and the overall slowing of economies which affects students and their capacity to pay for high college fees. A few studies have been done investigating and advocating KM in universities (e.g. Allen, 1988; Kidwell, Linde, & Johnson, 2000; Pornchulee, 2001; Arntzen, Worasinchai, & Ribiere, 2009; Ahmadi & Ahmadi, 2012).

Agarwal & Marouf (2014) came up with a 10-step process and a framework for initiating KM in universities. The steps were organized within 4 phases of plan, design, implement and scale-up. After getting top management support, forming a KM team, and identifying KM goals and priorities, the third step of their process (within the design phase) is determining the extent to which the university is ready for KM i.e. an assessment of its current state of readiness. Agarwal & Marouf propose that readiness assessment can be achieved through a survey, interview or focus groups to determine the KM capabilities relating to people, culture, processes and technology within the university. While there are a number of readiness assessment instruments (e.g. American Productivity and Quality Center (APQC) KM capability and assessment tool, cited by O'Dell & Hubert, 2011, p.37 and Holt, Bartczak, Clark, & Trent, 2007), it is not clear how such an instrument would look like in the context of universities and when surveying faculty members.

The research question guiding this study is: *How can KM readiness be assessed in a university context using both quantitative and qualitative methods?*

In this study, we will design and propose a research model, a survey instrument, and an interview protocol for KM readiness assessment in universities. Readiness assessment could mean individual faculty readiness as well as organizational readiness. While the survey instrument will focus on individual faculty readiness, the interview protocol will focus on organizational factors. Where possible, survey items will be adapted from previous studies, and new ones developed where needed.

The survey instrument and interview protocol could be used by other researchers to carry out mixed-method studies to assess individual KM readiness in universities.

2. Literature Review

Theoretical Lens

Building on O'Dell & Grayson (1998)'s KM framework for best practice transfer, Agarwal & Marouf (2014) proposed a theoretical framework for initiating KM in a college and university (see Figure 1). The framework takes the four steps of plan, design, implement and scale-up proposed by O'Dell & Grayson for KM implementation and adds ten detailed steps within them, which are applicable in the university context. The framework also shows the enabling factors of culture, infrastructure, technology and measures which are necessary for any KM initiative to succeed. At the centre of the framework is the value proposition – which lays out the reason why KM is needed in the first place. In a university context, it could range from identified goals such as saving of resources, to student retention to increasing research productivity to enhancing faculty and staff morale, and so on.

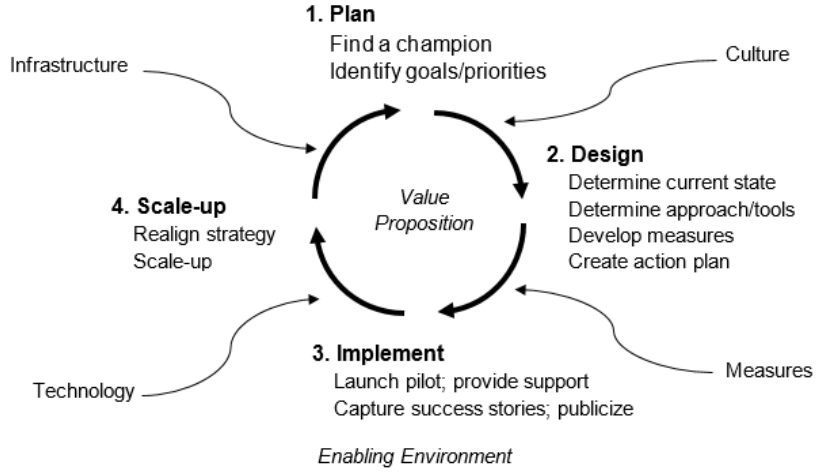

Figure 1 Framework for initiating KM in a College or University (Agarwal & Marouf, 2014)

Table 1 lists the details of each of the ten steps as identified by Agarwal & Marouf (2014). Each step includes the mechanism for achieving it, and the expected outcome at the end of each step.

		Step	***Mechanism***	***Outcome***
PLAN (KM planning team)	1	Find a champion from top administration; form a KM planning team	Consultation for team formation involving various stakeholders	Buy-in for KM; support and resources; planning team
	2	Identify KM goals and priorities ▪ Identify perceived crisis and/or opportunity ▪ Align KM goals with university/dept. goals ▪ Identify and prioritize the critical knowledge that you need to manage	3-4 retreats involving stakeholders	Identification of need, priority areas, critical knowledge; pilot site chosen; design team (including IT)
DESIGN (KM design team)	3	Determine your current state in the priority areas identified	Survey, interviews, focus groups	Relative rating for each priority area
	4	Determine approach to align with culture and capability to enable knowledge flow	Meetings / discussions based on survey results	Decision on approaches and tools for pilot site
	5.	Develop measures of success	1-2 retreats	List of measures
	6.	Create action plan and get faculty/ admin buy-in and	Meetings; update to schools	Action plan; KM implementation team

		resources		
IMPLEMENT (KM implementation team)	7.	Launch a pilot and provide support	Launch; support in pilot site	Early results; Measures of success
	8.	Capture success stories and publicize early results	Interviews, surveys, videos, storytelling; newsletters, talks, presentations	Documentation of learning; transfer of best practices; university KM team
SCALE-UP (university KM team)	9.	Use knowledge gained to realign strategy with university objectives	Meeting with administration; unit meetings to vote	University-wide guidelines; unit-specific templates
	10.	Scale up to other units and repeat	Go back to Step 2.	Need, priority and team(s)

Table 1 Ten-step KM Initiation Plan for Colleges and Universities (Agarwal & Marouf, 2014)

In the first two steps under the planning phase, Agarwal & Marouf propose getting top management support, forming a KM team, and identifying KM goals and priorities. In the third step of their process (under the design phase), they propose an assessment of the university's current state of readiness i.e. determining the extent to which the university is ready for KM.

Readiness Assessment

KM readiness evaluation is a response for two important questions: what is the current situation of KM in organization? What should be done to increase capabilities of KM in organization? (Mamaghani, Samizadeh, & Saghafi, 2011). Even before one can think of implementing KM in an organization, it needs to be determined if the organization is ready for KM or not, and if it is, to what extent is this state of readiness. A number of factors – which can be both organizational and individual, determine the extent to which an organization is ready for KM. These factors have been investigated in past research on readiness assessment (e.g. Gold & Malhotra, 2001; Al-Busaidi & Olfman, 2005; Migdadi, 2009).

Readiness Assessment in Universities

A number of researchers have investigated KM readiness assessment in the context of colleges and universities. Kruger & Johnson (2009) studied KM maturity and found that educational institutions received the lowest maturity score of all groupings they interviewed. Al-Bastaki & Shajera (2012) investigated KM readiness factors in the University of Bahrain. They found that culture (collaboration, trust, and learning), structure (centralization, formalization, and reward systems) and IT infrastructure (IT support) all help

assess KM readiness. Martin & Kashani (2012) compared readiness asessment in public and private universities. They found that public universities are not ready for KM implementation, while the readiness for private universities is at an 'average' level. Other researchers such as Rowley (2000), Basu & Sengupta (2007) and Adhikari (2010) have also studied KM readiness in different university contexts.

Readiness Assessment instruments

In order to achieve 'Step 3: Determine your current state in the priority areas identified' of their ten-step process, Agarwal & Marouf (2014) propose the mechanisms of surveys, interviews or focus groups. These would help determine the KM capabilities relating to people, culture, processes and technology within the university. Marouf & Agarwal (2016) cite a number of instruments for KM readiness assessment that past research has put forth. These include the APQC KM capability and assessment tool (O'Dell & Hubert, 2011, p.37), Holt, Bartczak, Clark, & Trent (2007), Moffett & McAdam (2006) and Al-Bastaki & Shajera (2012). The latter two are targeted to the university context, while the APQC and Holt *et al.* instruments can be applied to knowledge management across different types of organizations. However, apart from these, there are very few instruments for readiness assessment that can be adopted by universities to evaluate their state of KM readiness.

3. Research Model for KM Readiness Assessment in Universities

In Figure 2 below, we propose a research model for KM readiness assessment in universities. The model has two parts relating to individual and organizational factors that affect and individual faculty member's readiness to participate in a KM initiative, which in turn affects his/her perception of organizational readiness to adopt KM. The model has one dependent variable, one mediating variable, and ten independent variables (classified into two groups of individual and organizational factors).

Perceived organizational readiness to adopt KM (dependent variable)

Marouf & Agarwal (2016) define perceived organizational readiness to adopt KM as the degree to which an individual perceives whether and how ready one's organization-as-a-whole is to adopt KM. They measure this as low, medium or high degree of perceived readiness.

Individual readiness to participate in a KM initiative (mediating variable)

Marouf & Agarwal (2016) operationalize individual readiness to participate in a KM initiative as individual intention to share knowledge with others. This individual readiness, in turn, affects a faculty member's perception of organizational readiness to adopt KM.

Both individual and organizational factors affect an individual faculty members perceived readiness to share what one knows and to participate in a KM initiative.

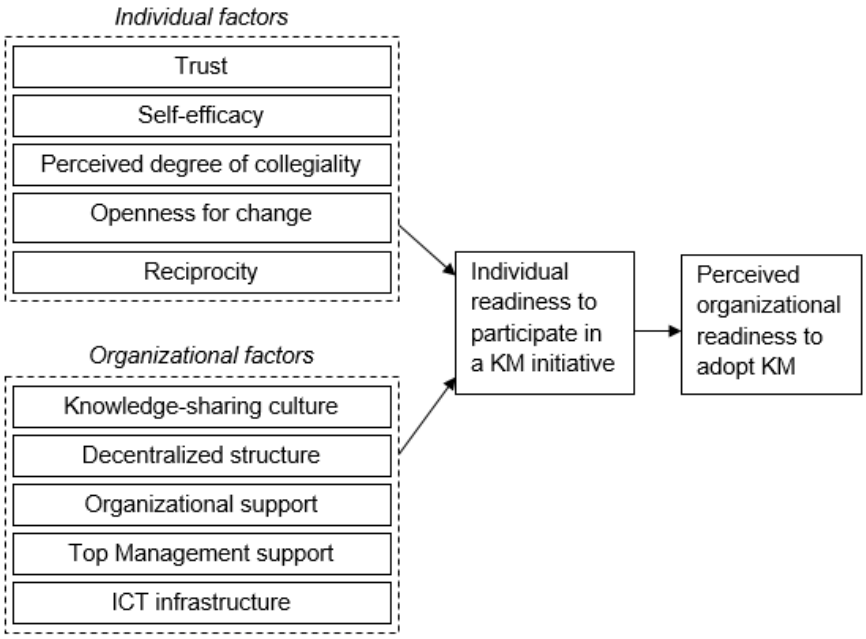

Figure 2 Research Model

Individual factors (independent variables)

The individual factors can be trust, knowledge self-efficacy, collegiality, openness for change and reciprocity. We adopt the operationalizations of Marouf & Agarwal (2016) for these factors. Trust, or generalized trust, is the belief in the good intent, competence, and reliability of employees with respect to contributing and reusing knowledge (Kankanhalli *et al*., 2005; Marouf & Agarwal, 2016). Marouf & Agarwal operationalize self-efficacy as knowledge self-efficacy i.e. a person's belief and self-judgment about possessing the knowledge and the capability to share with others. If people feel that they lack useful knowledge, they may decline from sharing as they believe that their contribution cannot make a positive impact to the organization (Kankanhalli *et al*., 2005). While there are many definitions of collegiality, Marouf & Agarwal define it as cooperating and collaborating respectfully with colleagues. They operationalize openness to change as openness to experience, willingness to support change and a positive emotion towards change. Openness to changes that are being proposed and implemented in an organization is a "necessary, initial condition for successful planned change" (Miller, Johnson, & Grau, 1994, p.60). Reciprocity is defined as the 'level of anticipated reciprocity' i.e. to what extent does a person sharing knowledge expects to receive in return. (Marouf &

Agarwal, 2016). People would want to share knowledge because they expect future help from others in lieu of their contributions (Kollock, 1999).

Organizational factors (independent variables)

The organizational factors can be knowledge-sharing culture, decentralized structure, organizational support, top management support and ICT infrastructure. A knowledge-sharing culture provides an environment that generally encourages a seeker to search for more information when faced with a task or need for information (Agarwal, Xu and Poo, 2011). Decentralized organizations are more adaptive, more innovative, and more capable to deal with complex environments than centralized organizations. Knowledge about the whole organization should be embedded in all units of the organizational structure (Macharzina, Oesterle and Brodel, 2001). Universities with decentralized structures are likely to be more open to knowledge management processes including knowledge creation/capture, sharing and use. Organizational support might include the overall infrastructure, cultural values, human resource practices and leadership. These have been found to influence knowledge exploration and management practices (Donate & Guadamillas, 2011). In a university setting, the top management might include the President, Provost, administrative offices, Deans, Program Chairs, etc. As per Kamath, Rodrigues, & Desai (2011), the support (financial, resources, personnel, creating incentives and rewards, etc.) of top management towards the KM initiative is crucial for KM to succeed. Finally, the technology infrastructure provided by information and communication technologies is crucial for KM readiness (Agarwal & Islam, 2014).

In order to test the individual part of the research model (Figure 2), we propose a survey instrument and for the organizational part, we propose an interview protocol. This is done to demonstrate the value of both qualitative and quantitative methods in gathering data for readiness assessment. While the survey could be widely distributed across universities, or to all faculty members within a single university, interviews and focus groups would be less generalizable and could help in answering more in-depth how and why questions in a unique university context. Combining the two methods will give us a richer and more holistic view of the state of KM readiness in universities.

The survey instrument focusing on the individual part has already been empirically tested by Marouf & Agarwal (2016). The survey was sent to 1263 faculty members from 59 accredited Library and Information Science programs in universities across North America. From these, 157 valid responses were received. The interview protocol focusing on the organizational part will be tested in future studies.

4. Quantitative instrument – Individual factors affecting KM Readiness

In order to test the variables/constructs of the research model (pertaining to individual factors, as well as the mediating and dependent variables), we came up with survey items for each of them. Where possible, the items were adapted from prior studies. New items were developed when needed. This helped satisfy

the content validity of the items. Table 2 lists the constructs, their respective items and abbreviated codes to uniquely identify each item. Three items KSEF4R, KSEF5R, and OPN5R were reverse coded. The items were measured on a five-point Likert scale, where 1 meant strongly disagree and 5 measured strongly agree. The items were tested for internal consistency reliability, convergent and discriminant validity. Factor analysis was performed to explain the variation among observed, correlated variables in terms of latent constructs. 7 items (out of 35 for all constructs) were dropped during factor analysis for both theoretical and statistical reasons. The dropped items were TRST1, TRST2, KSEF3, KSEF4R, OPN5R, RCP5 and IRD1. See Table 2. The main survey sent out is accessible at http://goo.gl/forms/n4idD6hTA0. See Marouf & Agarwal (2016) for details of the analysis.

Construct	Code	Item	Reference
Trust	TRST1*	I believe colleagues in my college/university are knowledgeable and competent in their area.	Adapted from Lee & Choi (2003)
	TRST2*	I believe colleagues in my college/university share the best knowledge that they have.	Adapted from Kankanhalli *et al.* (2005); Mishra (1996)
	TRST3	I believe colleagues in my college/university give credit for other's knowledge where it is due.	
	TRST4	I believe colleagues in my college/university cite the source of the knowledge they receive appropriately.	Self-developed based on Kankanhalli *et al.* (2005); Mishra (1996)
	TRST5	I believe in the good intent of colleagues in my college/university with respect to reusing knowledge.	
Knowledge self-efficacy	KSEF1	I am confident in my ability to provide knowledge that others in my college/university consider valuable.	Adapted from Lin (2007); Kankanhalli *et al.* (2005); Kalman (1999)
	KSEF2	I have the expertise required to provide valuable knowledge for my colleagues in the college/university.	
	KSEF3*	I have the capability to share with colleagues in my college/university what I know.	Self-developed

	KSEF4R*	It does not really make any difference whether I share my knowledge with colleagues or not.	Adapted from Lin (2007); Kankanhalli *et al.* (2005); Kalman (1999)
	KSEF5R	Most colleagues in my college/university can provide more valuable knowledge than I can.	
Perceived degree of collegiality	COL1	The colleagues in my college/university demonstrate respect towards each other.	Adapted from Johnston, Schimmel, & O'Hara (2012)
	COL2	The colleagues in my college/university support each other.	
	COL3	The colleagues in my college/university negotiate respectfully with each other.	
	COL4	The colleagues in my college/university cooperate respectfully with each other.	Self-developed
	COL5	The colleagues in my college/university collaborate respectfully with each other.	
Openness for change	OPN1	I am open to novel experiences and ideas.	Self-developed
	OPN2	I enjoy new experiences.	
	OPN3	I am willing to support change in my college/university.	
	OPN4	I am enthusiastic when changes are proposed in my college/university.	Developed based on Holt *et al.* (2007)
	OPN5R*	I am upset when changes are proposed in my college/university.	
Reciprocity	RCP1	When I provide an answer to a colleague's question in my college/university, I believe somebody will provide an answer to a question I might have.	Developed based on Kankanhalli *et al.* (2005)
	RCP2	When I share knowledge with colleagues in my college/university, I expect them to respond when I'm in need.	Adapted from Kankanhalli *et al.* (2005)

	RCP3	When I contribute my knowledge to colleagues in my college/university, I expect to get back knowledge when I need it.	
	RCP4	When I share knowledge with colleagues in my college/university, I believe that my queries for knowledge will be answered in future.	
	RCP5*	I believe colleagues in my college/university treat others reciprocally.	Adapted from Lee & Choi (2003)
Individual readiness to participate in a KM initiative	IRD1*	I will share my knowledge with more colleagues in my college/university.	Adapted from Bock *et al.* (2005)
	IRD2	I will always provide my knowledge at the request of colleagues in my college/university.	
	IRD3	I intend to share my knowledge with colleagues in my college/university frequently in the future.	
	IRD4	I will try to share my knowledge with colleagues in my college/university in an effective way.	
	IRD5	I will share my knowledge to anyone in my college/university if it is helpful to the college/university.	
Perceived organizational readiness to adopt KM	ORD1	I believe that my college/university is prepared for effective KM.	Self-developed
	ORD2	I believe that my college/university is ready to adopt KM.	
	ORD3	I believe that my college/university will adopt KM in the near future.	Adapted from Islam, Agarwal, & Ikeda (2014); Agarwal, Wang, Xu, & Poo (2007)
	ORD4	I believe that my college/university will adopt KM in the longer term.	
	ORD5	I believe that my	

	college/university will adopt KM.

* Items found problematic in Marouf & Agarwal (2016)

Table 2 Items for survey on individual factors affecting KM readiness (Marouf & Agarwal, 2016)

5. Qualitative instrument – Organizational factors affecting KM Readiness

To measure the organizational factors of the research model (Figure 2), we came up with a number of questions which can be used for an interview or a focus group. All the questions were self-developed. Table 3 lists the questions for each construct. Questions 7 to 9 pertain to the mediating and dependent variables in the research model. These were also measured in the quantitative survey. They need to be included in both places to help investigate the relationship between the independent variables and KM readiness.

Construct	No.	Question
Knowledge-sharing culture	Q1.	How would you describe knowledge sharing within your university? What sorts of processes do you use?
	Q2.	To what extent do you think your university has a knowledge sharing culture?
Decentralized structure	Q3.	How would you describe the organizational structure in your university? E.g. Do you have a more powerful central administration or more autonomy in individual schools or units?
Organizational support	Q4.	What kind of organizational support do you have for knowledge management initiatives in your university? E.g. time, resources, money, budget, facilities, etc.
Top Management support	Q5.	How supportive is the top management for new initiatives? Here, top management could be the President or Provost, the Dean, the Program Chair, etc.
ICT infrastructure	Q6.	What sort of Information and Communication Technology infrastructure do you have in your university? What technologies (both hardware and software) do you use for work and communication with each other? What faculty support mechanisms are in place? If you want a new tool/technology implemented, how easy or difficult is it?
Individual readiness to participate in a KM initiative	Q7.	Will you share your knowledge with anyone in your university if it is helpful to the person or to the university?

Perceived organizational readiness to adopt KM	Q8.	Do you believe that your university is ready to implement knowledge management? Are you likely to see KM implemented in the near future? Why or why not?
	Q9.	If not, what are the barriers that need to be crossed before knowledge management can be adopted by your university?
	Q10.	Do you have anything else to add?

Table 3 Questions for interview on organizational factors affecting KM readiness

6. Discussion and Conclusions

We set out to answer the research question, "How can KM readiness be assessed in a university context using both quantitative and qualitative methods?". We have proposed two instruments for measuring the factors affecting KM readiness in a university context. One of the instruments has been empirically tested in a large survey study (Marouf & Agarwal, 2016). This adds to the body of research instruments that can be used to measure KM readiness (along with the APQC instrument cited by O'Dell & Hubert, 2011, and that by Holt, Bartczak, Clark, & Trent, 2007). Along with Moffett & McAdam (2006) and Al-Bastaki & Shajera (2012), the survey instrument is among very few instruments developed to measure KM readiness in the university context, and the only one tested with faculty in Library and Information Science programs in North America. The interview protocol provides a qualitative way of gathering data for KM readiness assessment in universities.

Together, the two instruments help provide details for Step 3 of Agarwal & Marouf (2014)'s ten-step process for KM implementation in universities. This step on determining your current state deals with readiness assessment. Without this, proceeding on KM implementation is futile. The instruments can be used in a single or mixed-method study by researchers investigating KM readiness in one or more universities. University administrators, or places that have begun the KM implementation process, would also find the instruments useful.

7. Limitations and Future Work

This study has a few limitations. First, only the instrument pertaining to the individual part of the research model has been empirically tested. Future work will entail testing the interview questions pertaining to organizational factors affecting KM readiness in a single or more than one university.

Second, some of the survey items were found problematic and had to be dropped during analysis, leaving us with 28 valid items from the 35 developed. Future studies should test all the items again and see if the problematic items still need to be dropped in those contexts or not. This will help provide further

validity to the survey instrument developed for individual factors affecting KM readiness.

Third, each set of factors – individual and organizational, should ideally be tested both ways i.e. using both quantitative and qualitative data. This is so that mixed method studies could be designed whereby a researcher could start with the quantitative and then move to the qualitative part (or vice versa) for both. This would lead to a better understanding of the observed patterns and allow for triangulation of research data. However, the instruments provided are limited to one method i.e. either quantitative or quantitative for the two groups of independent variables pertaining to individual and organizational factors affecting KM readiness in universities. Future work will involve coming up with a survey instrument for organizational factors, and an interview protocol for individual factors, and then combining the instruments for both sets of factors. This would help us determine which method (qualitative or quantitative) is best suited for measuring KM readiness and its different sets of factors in a university context.

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