Principals' Technology Leadership Behavior and Teachers' Use of Information and Communication Technology (ICT) in Bhutan

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ABSTRACT

The classroom teaching and learning in the 21st century stress creativity and innovation. So, the use of information and communication technology (ICT) is seen as an important means to foster innovation. However, without genuine interest from teachers, it is difficult to integrate ICT in classroom instruction. Teachers are the engines that enhance the digitization of school teaching and learning process. However, the determination to implement ICT in the school curriculum and instructions lies in the hands of school leaders as rigorous use of ICT in teaching and learning could be effective if school principals provide required support. Therefore, this study examined the relationship between principals' technology leadership behavior and teachers' use of ICT in classroom teaching and learning in Bhutan. Data was gathered from 329 middle secondary school teachers through survey questionnaires. The study found that principals' technology leadership behavior in Bhutan was at moderate levels with a positive relationship to teachers' use of ICT. Likewise, statistical analysis revealed that two predictors of the principal's technology leadership dimensions: support, management and operation; and productivity and professional practices were the best predictors of teachers' use of ICT in the classroom.

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Introduction

School leadership in Bhutan has undergone paradigm shift since 2010 when Bhutan's Ministry of Education mandated instructional leadership to be the primary roles of the school principal. However, educational issues such as student learning gaps, educational access, quality, equity and system efficiency at all levels of the education remained continued challenges (Ministry of Education, 2014, Bhutan Council of School Examination and Assessment, 2019). These educational issues call for strong school leadership to improve and advance of the school system in the country. Consequently, leveraging ICT in school curriculum has been given due importance by the Ministry of Education (Ministry of Education, 2014). Like in the western education systems, the use of information and communication technology (ICT) in classroom teaching and learning by teachers has gained momentum across the country. But to have effective use of ICT, the role of school principal in Bhutan needs to change as studies reveal that effective use of technology in schools is predicated on the leadership of the principal (Anderson & Dexter, 2005; Rose & Bailey, 1996). In addition, the world's school systems are increasingly under the burden to use technology in teaching and learning practices and school organization (Gurr, 2001). Hence, school leaders can no longer be ignorant about technology use in school (Mehlinger & Powers, 2002). Instead, school leaders need to be highly proficient in the use and implementation of information and communication technology (ICT) to succeed in information aged era (I-Hua, 2012). This means that there needs to be a paradigm shift in school leadership style from "building managers to instructional leaders" (Tice, 1992; Blasé & Blasé, 1999) to that of "technological leader" (Anderson & Dexter, 2005; Chang, Chin & Hsu, 2008; McLeod, 2008). The essence of technology leadership is the practical use of technology by school leaders. So, technological leaders are "functionally oriented leadership practices" (Chin, 2010). Although, mounting research positively confirmed the relationship between principals' technology leadership behavior and teachers' use of ICT in the classroom (Flanagan & Jacobsen, 2003; Fisher & Waller, 2013; Rogers, 2000), the examining results of such an existence of a relationship is unclear in the Bhutanese education system. Furthermore, no studies have been conducted in this aspect. Therefore, this research was conducted to shed light on the principals' technology leadership and teachers' integration of technology in the classroom teaching and learning in the Bhutanese school context. More specifically, this research aimed at investigating the following research questions in the Bhutanese school context;

1. To what level Bhutanese school principals are engaged in technology leadership behavior as perceived by the teachers?
2. Is there relationship between principals' technology leadership and teachers' use of information and communications technology (ICT) in classroom teaching and learning?
3. Which of the principals' technology leadership behavior dimensions are significant predictors of teachers' use of ICT in middle secondary schools of Bhutan?

Principals' technology leadership and teachers' use of ICT in classroom teaching and learning

Research on the use of technology in school setting has increased over the past few decades. This is because educators are using technology to "increase the productivity of the educational development" (Evmenova & King-Sears, 2007). For instance, Mumtaz (2000) expressed that successful implementation of information and communication technology (ICT) tackles three interconnecting change frameworks: students, schools and policy makers. Further, teachers' use of ICT enhances teachers'instruction and students' learning in the classroom (Jamieson-Procter, Albion, Finger, Cavanagh, Fitzgerald, Bond & Grimbeek, 2013, Jorge, Gutirrez, Garcia, Jorge & Daiz, 2003). However, infusion of ICT in the classroom teaching and learning depends on a number of factors that are often not in the hands of teachers. For

instance, factors such as "access to resources, quality of software and hardware, ease of use, incentives to change, support and collegiality in their school, school and national polices, commitment to professional learning and background in formal computer training" were found to affect teachers' integration of ICT in teaching and learning (Afshari, Bakar, Luan, Samah, & Fooi, 2009, Basargekar & Singhavi, 2017, Mumtaz, 2000). Among several factors, the most critical factor that many researchers have discovered was the support from school administrators. For example, Brigt (2011) and Kafyulilo, Fisser, and Voogt (2016) found that teachers' use of ICT depended on how school leaders support and integrate ICT in meeting the school's pedagogical goals. Hence, school leadership for ICT was found to be very relevant for teachers to incorporate ICT and be creative in their work of ICT (Kirkland & Sutch, 2009; Kozma, 2003). To this end, a study on the relationship between principals as a technological leader and the teachers' use of ICT has been inspected enormously by numerous scholars (Apsorn, Sisan & Tungkunanan, 2019, Thannimalai & Raman, 2018, Wei, Piaw & Kannan, 2016). However, no single study has been carried out on this topic in the Bhutanese school education system. Hence, this study would significantly throw insights on principals' technology leadership behavior and teachers' use of information and communication technology (ICT) in reference to the Bhutanese educational context.

Framework on technology leadership and teachers' use of ICT

Eisenhart (1991) defined a theoretical framework as a structure that describes research by relying on a formal theory assembled by using well-known rational explanation of certain occurrences and relationship. The study adopted the framework developed by technology standards for school administrator collaborative (TSSA, 2001) on the roles of school administrators as technology leaders.

According to this standard, school administrators as technology leader includes the following six tasks; (1) *leadership and vision* where school leaders inspire a shared vision for inclusive incorporation of technology and creating a favorable school culture and environment to the realization of that vision (TSSA, 2001). This requires school leaders to be visionary with the ability to see and express the school's convincing future (Ylimaki, 2012). (2) *Learning and teaching;* it means that educational leaders ensure that curricular design, instructional strategies, and learning environments integrate appropriate technologies to maximize learning and teaching (TSSA, 2001). Therefore, school leadership is vital in the development of effective, creative schools and in promoting quality teaching and learning (Dinham, 2005, ISTE, 2014). (3) *Productivity and professional practice:* Educational leaders apply technology to enhance their professional practice and to increase their own productivity and that of others by fostering the atmosphere of professional development and creativity that empowers teachers to use technology for teaching and learning (TSSA, 2001, ISTE, 2014). (4) *Support, management and operation:* Educational leaders ensure the integration of technology to support productive systems for learning and administration. In breif, school principals offer guidance and management in the digital era to continuously develop school, further making good use of information and communications technology to facilitate teaching and learning in the school (TSAA, 2001, ISTE, 2014), (5) *Assessment and evaluation:* Educational leaders use technology to plan and implement inclusive systems of effective assessment and evaluation (TSSA, 2001, ISTE, 2002) and (6) *Social, legal and ethical issues:* Educational leaders understand the social, legal, and ethical issues related to technology and model responsible decision-making related to these issues (TSSA, 2001).

To sum up, the role of school principals as technological leader ranges from the setting school vision aligned to technology use to enhance classroom teaching and learning in the school. Principals as digital leaders in the 21st century need to create a conducive school culture that supports the use of ICT and use it in every aspect of school organizations.

For teachers', the use of ICT theoretical foundations was based on the "technology acceptance model" of Davis, Baozzi and Warshaw in 1989. This model basically explains what factors influence users' decision to accept and use technology. Accordingly, there are two factors; perceived usefulness (PU) and perceived ease of use (PEOU). PU refers to the degree to which a person believes that using particular technology would enhance his or her work performance, whereas PEOU refers to the degree to which a person believes that using particular technology would free him or her of effort (Davis, Bagozzi & Warshaw, 1989). Thus, the use of ICT acceptance level is largely influenced by PU and PEOU. For instance, a study conducted by Toe (2009) found that perceived usefulness has a direct effect on pre-service teachers' technology acceptance, while perceived ease of use affects technology acceptance indirectly.

Conceptual Framework of the study

Figure 1 shows the conceptual framework for this study. The principal's technology leadership behaviour with six tasks as independent variable (IV) and teachers' use of ICT as dependent variable (DV)

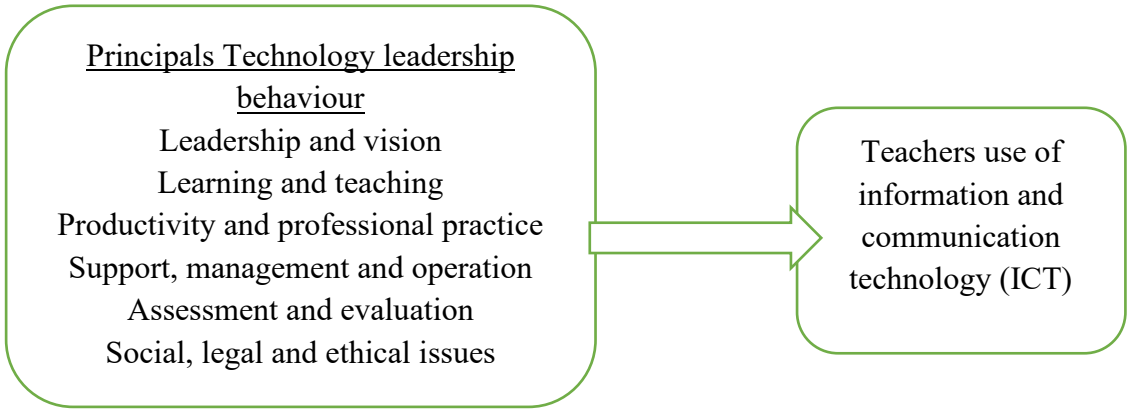

Figure 1 Conceptual framework on technology leadership and teachers use of ICT

Research Methodology

A quantitative methodology was used to investigate the principal's technology leadership practices and teachers' use of information and communication technology (ICT) in classroom teaching and learning in the Bhutanese middle secondary schools.

Population and Sample

The population of this study was the teachers of the middle secondary schools in Bhutan. There are 73 middle secondary schools which include both public and private schools with 2,479 teachers (Ministry of Education, 2019). The sample size was determined through the use of Krejcie and Morgan's (1970) formula of selecting sample size. According to this formula, the sample size of 331 teachers was selected from the population of 2479 teachers in 73 middle secondary schools of Bhutan in 2019. A simple random sampling method was used for randomizing the sample size for the study.

Research Instrument

The research instrument used in this study was a survey questionnaire developed from a literature review of technology leadership behavior and teachers' use of information and communication technology (ICT) in the curriculum instruction. The reliability of the items was

tested before the actual collection of data. The reliability test reports are given in Table 1 and 2 established that items were reliable for collection of data.

Table 1. Reliability test statistics for Principals' technology leadership behavior

Cronbach's Alpha=.963	Number of items=25

Table 2. Reliability test statistics for teachers' use of ICT in classroom teaching and learning.

Cronbach's Alpha=.822	Number of Items=12

Data Collection

The data was collected by distributing 5- point Likert scale survey questionnaires to 331 teachers during the winter marking camp of the Bhutan council of secondary examination. The respondents' return rate of the survey questionnaire was 99.4% since 2 respondents did not return the survey questionnaire.

Data Analysis

The researcher used SPSS statistical tool to analyse the survey data. The procedure for data analysis was descriptive analysis: Mean and Standard Deviation was used to study the level of principals' technology leadership behavior and six dimensions of technology leadership behavior. The Mean and Standard deviation was analyzed with reference to 5 point rating scale that are divided into 5 equal ranges; 1.00 -1.49 as very low, 1.50-2.49 as low, 2.50-3.49 as moderate, 3.50-4.49 as high and 4.50-5.00 as very high (Best & Kahn, 1998); The Pearson Product Moment Correlation Coefficient analysis was used to study the relationship between principals' technology leadership behavior and teachers' use of ICT. The effect sizes of correlation efficiency are interpreted as; 0 to 0.3 (0 to -0.3) as a weak positive (negative) correlation, 0.3 to 0.7 (0.3 to -0.7) as a moderate positive (negative) correlation and 0.7 to 1.0 (0.7 to -1.0) as a strong positive (negative) correlation (Ratner, 2009). To evaluate the predictors of teachers' use of information and communication technology (ICT) from the six dimensions of principals' technology leadership behaviors, stepwise multiple regression analyses was employed.

Findings of the study

The findings of the study are discussed below;

1. To what level Bhutanese school principals are engaged in technology leadership behavior as perceived by the teachers?

Table 3. Means, Standard Deviation and Level of Principals' technology leadership behavior as perceived by the teachers (*N*=329)

Principals' technology leadership Behavior	Mean	Std. Deviation	Level
Leadership and Vision	3.16	0.933	Moderate
Teaching and Learning	3.27	0.953	Moderate
Productivity and professional practice	3.36	0.869	Moderate
Support, management and operation	3.12	0.960	Moderate
Assessment and Evaluation	3.16	1.042	Moderate
Social legal and ethical issues	3.05	0.954	Moderate
Technology Leadership style	3.18	0.831	Moderate

Centered on the descriptive statistics in Table 3, the overall level of Bhutanese school principals' technology leadership behavior was found to be moderate with mean=3.18. The result for principals' engagement in each dimension of principals' technology leadership behavior was also indicated at a moderate level.

2. Is there relationship between principals' technology leadership and teachers' use of ICT in classroom teaching and learning?

Table 4. Correlational Analysis on Principals' technology leadership behavior and Teachers' use of ICT as perceived by teachers (*N*=329)

PrincipalsTechnology Leadership Behavior	Teachers'Use of ICT	Significancestrength & direction
Leadership and Vision	0.388**	Low positive
Teaching and Learning	0.415**	Low positive
Productivity and professional practice	0.486**	Low positive
Support, management and operation	0.502**	Moderate positive
Assessment and Evaluation	0.402**	Low positive
Social legal and ethical issues	0.450**	Low positive
Technology Leadership style	0.504**	Moderate positive

As shown in Table 4, there was a positive relationship between principals' technology leadership behavior and teachers' use of ICT as perceived by the teachers (r=0.504, p<0.01). The relationship strength was at a moderate level. Further, the analysis revealed that of six dimensions of principals' technology leadership behavior, one of the dimensions: support, management and operation were found at moderate positive relationship with teachers' use of ICT (r=0.502) while other five dimensions were found at low positive relationship with teachers' use of ICT.

3. Which of the principals' technology leadership behavior dimensions are the significant predictors of teachers' use of ICT in middle secondary schools of Bhutan?

Table 5. Analysis of variance in stepwise method of multiple regression analyses using teachers' use of ICT as criterion variable (*N*=329)

Source of variation	Sum of Squares	*df*	Mean Square	*F*	*Sig.*
Regression	29.960	2	14.980		
Residual	79.821	326	0.245	61.181	0.000[b]
Total	109.781	328			

a. Predictors: (Constant), Support management and operation
b. Predictors: (Constant), Support, management and operation, productivity and professional practice
c. Dependent Variable: Use of ICT

The ANOVA analysis in Table 5 determined whether or not the regression model outcomes in a statistically significantly better prediction of the dependent variable (teachers' technology use). Table 5 shows the stepwise method of multiple regression analyses produced F = 61.181 at 0.01 level of significance. That means the principals' technology leadership behavior and six dimensions as predictive variables were significantly related to teachers' use of information and communications technology in the classroom teaching and learning.

Table 6. Multiple coefficient of determination between significant predictive variables and teachers' use of ICT using stepwise method in multiple regression analysis (*N*=329)

Predictors	*R*	R^2	*F*	Sig Level
Support management and operation	0.502	0.252	110.088	0.01
Support, management and operation, productivity & Professional practice	0.522	0.273	61.181	

According to the data given in table 6, of the six dimensions of principals' technology leadership behavior, two dimensions, i.e; support, management and operation; productivity and professional practice construct showed to be the best predictor of teachers' use of information and communication technology (ICT) in the classroom teaching and learning. The analysis produced *R*=0.502, R^2=0.252 and *F*=110.088 at significance level 0.01 for support and operation dimension. In addition, there was change in R and F values when second dimension: productivity and professional practice entered the equation (*R*=0.522, R^2=0.272 and *F*=0.273 with significance level at 0.01

Table 7. Regression coefficient of significant predictors for teachers' use of ICT using stepwise method in multiple regression analysis (*N*=329)

Predictors	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	*Sig.*
(Constant)	2.778	0.110		25.361	0.000
Support, management and operation	0.189	0.047	0.314	4.056	0.000
Productivityand professional practice	0.158	0.052	0.238	3.072	0.002

R=0.522 R^2=0.273 F=61.181 SE=0.49482
a. Dependent Variable: Use of ICT

The multiple regression analysis produced multiple correlation (*R*) =0.522 and multiple coefficient of determinations (R^2) = 0.273 with *F* = 61.181 (significance at 0.01 level), that means 52.2% of the variation in teachers' use of information and communication technology (ICT) can be explained by support, management and operation; productivity and professional

practice dimensions of principals' technology leadership behavior with standard error of estimation = 0.41053. Thus, predictive equation for teachers' use of information and communication technology (ICT) can be formulated as: Y=2.778 + 0.189 + 0.158 in unstandardized score and Z=2.778 + 0.314 +0.238 in standardized score. Thus, a unit change in support, management and operation (0.189) and productivity and professional practice (0.158) will bring an increase or decrease in the teachers' use of information, and communication technology (ICT) in the classroom teaching and learning.

Discussion

This empirical investigation was carried out in order to shed light on principals' technology leadership behavior and its relationship to teachers' use of informations and communication technology (ICT) in the Bhutanese school context. The study confirmed that Bhutanese principals showed moderate level of technology leadership behaviors in the school; therefore, the findings were in line with earlier studies examined by Raman, Thannimalai and Ismail (2019) and Alkrdem (2014). School leaders in Bhutan are instructional leaders as mandated by the Ministry of Education; hence, the roles of Bhutanese school principals as technological leaders are modest. Besides, the competency-based framework of school principals developed by Royal Civil Service Commission (RCSC), there are no other proper concrete frameworks developed for school principals in Bhutan as technological leaders. However, it is inspiring to notice that principals in Bhutan are engaged in technology leadership behaviors which are in line with the competency based framework for principals developed in 2018. This framework demands school principals in Bhutan to be competent in the use of technology to improve teaching and learning in school as well as employ technology to enhance efficiency of organizational operation and management (Royal Civil Service Commission, 2018).

There was a positive significant relationship between the principals' technology leadership behaviors and teachers' use of ICT in the classroom teaching and learning as perceived by middle secondary school teachers in Bhutan. This finding was in line with a study conducted by Wei, Piaw, and Kannan in 2016. There is a paradigm shift in the nature of work resulting from recent technological revolution impacting and transformation of teaching and learning in a wider educational context (Perelman, 1992).

Creating a holistic environment to maximize technology usage into curriculum is viewed as key for administrators (MacNeil & Delafield, 1998), thus, school principals must ensure clarity in their roles as a technology leadership. The finding assured that teacher's use of information and communication technology (ICT) will increase when their school principals accepts their role as technological leader. In addition, the study revealed that support, management and operation; productivity and professional practice of principals' technology leadership dimensions as significant predicator that could improve teachers' usage of ICT.

Conclusion

The study conducted clearly indicated that principals in Bhutan showed some level of behaviors as technological leaders and further, affirmed that there is a significant relationship between principals' technology leadership and teachers' use of ICT in the Bhutanese school context. Although principals as technology leaders is strongly practiced in many countries (Mentz and Mentz, 2003, Schiller, 2003, Yuen, Law, & Wong. 2003), yet, in Bhutan the role of principals as technological leaders is in its infancy stage. Furthermore, there are no concrete policies and guidelines in use for principals as technological leaders, rather, principals in Bhutan are guided by general policy guidelines mandating them with management, administration and instructional responsibilities. Though, integration of ICT is seen as pivotal factor in school improvement nonetheless, unclear policy, low level of skills, knowledge,

competency and uncomfortableness (Rossafri and Balakrishnan, 2007) contributed towards not fully integrating ICT in schools. Besides, this study provided evidence that principals in Bhutan are encouraging and supporting technology use in classroom teaching by the teachers which is in line with iSherig master plan of Bhutan's education ministry (Ministry of Education, 2014). However, there is an incredible necessity needed for principals' leadership in school to implement ICT fully in classroom instruction, if not, "absence of a clear technology and stable goals, attempts by the principal to coordinate and control instruction are may likely to result in increased conflict with teachers" (Hallinger & Murphy, 1985). Above all, the study concluded that support, management and operation; productivity and professional practice of principals' technology leadership behaviors bring changes in teachers' use of ICT in the classroom. Gibson (2001) explained that fruitful implementation of technology in the classroom could happen effectively if there is a quality support and contribution from school leadership. Thus, the Ministry of Education, Bhutan should design its own technology leadership framework and provide professional development activities to cultivate technology leadership behavior competency in school principals.

Recommendations and future research

Owing to its sample size the study focused only on the middle secondary school teachers, therefore, the findings of the study cannot be taken as a broad view on principals' technology leadership behavior and its relationship to teachers' use of ICT across all levels of school, particularly for primary, lower and higher secondary schools in Bhutan. Accordingly, future research should focus on a larger sample size including all levels of school to seize more realistic findings. Similarly, principals of all school levels should be included to explore their view on technology leadership practices; this could avoid bias of the findings. Another shortcoming of the study was the single quantitative research method applied in the present study; so, a researcher interested in examining more on this topic should apply mixed method study to compare findings through qualitative and quantitative nature of studies.

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