

Prioritization and Implementation of ICT Infrastructure in the Higher Education Institutions in the Philippines

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This paper presents the statistical result of the level of prioritization and implementation of information and communication technology (ICT) Infrastructure in the higher education institutions (HEIs) in the Philippines. A total of 95 HEIs in the Philippines participated in the study. The respondents are all heads in the Management of Information and Communication Technology in the HEIs in the Philippines. The instrument used in data gathering was a self-constructed survey questionnaire based from EDUCAUSE.

ICT infrastructure has an aggregate mean of 4.06 which is described as high priority in the HEIs in the Philippines. It indicates that the infrastructure component is prioritized and needs to be done in the next three years in the HEIs. The degree of implementation of ICT infrastructure in the HEIs shows an aggregate mean of 3.27 described as moderately implemented, indicating that this component is in the strategic plan of the HEIs, however, there is no action done yet. The level of prioritization on infrastructure has significant correlation at 0.01 level of confidence with the degree of implementation to these components. There is a significant difference between the level of prioritization and degree of implementation of ICT in the higher education institutions in the Philippines in terms of the: total number of years of existence of the HEIs, annual ICT expenditures of the HEIs, total Internet bandwidth of the HEIs, and extent of participation in decision-making of the respondents.

The HEIs in the Philippines are challenged in coping up with the new trends and development in ICT that affect the teaching-learning process. It is recommended that the HEIs should review their strategic plan and assess significant priorities in relation to ICT infrastructure. HEIs should strategically develop tactical plan to implement effectively the identified priorities.

Sub-theme #3 – Problems, Barriers, Reforms and Solutions

Keywords: ICT Infrastructure, Management, Information and Communication Technology

I. INTRODUCTION

ICT infrastructure is described by the increasing use of computer, information and communication technology necessary for knowledge acquisition, distribution, and knowledge preservation. It refers to the “middle layer that would act as a first-class tool to enable a new level of science”. (Ocean ITI Working Group. 2004.) ICT infrastructure may explain the institution’s collection of people, data, processes, hardware and software, interacting with each other to collect, process, store, and provide a common goal for the organization. Advancements in ICT infrastructure includes deploying technology that makes easy to collaborate and network in the workplace both internally and externally (Corporation for National Research Initiatives, 2009).

Reports show that ICT in the HEIs impact the way the educational system operates. ICT infrastructure in education describes the equipment, process and tools in the teaching-learning process as media and methodology. Sufficient ICT infrastructure is an ideal condition for the adaptation of e-learning (Lee, 2011). The Silliman Online University Learning (SOUL) is among the successful eLearning infrastructure (Marcial, 2010).

Investment of ICT infrastructure challenges the educational institutions both administrative and academic processes. Yap (2005) reported that education sector garnered 20% of the Asia’s top ICT-using institution. In 2006 Frost and Sullivan study (cited by Tsang, 2007), reported that fast-changing technology trends re-defined the way educational institutions operate. “HEIs try to capitalize on 21st century tools and technologies to address 21st century issues and challenges” (Tan, 2011).

EDUCAUSE reported that ICT infrastructure ranked 8th in the 2011 top 10 ICT-related issues in HEIs (Ingerman, B., Yang, C. and the 2010 EDUCAUSE Current Issues Committee, 2011). In 2010, ICT infrastructure ranked 10th (Ingerman, B., Yang, C. and the 2010 EDUCAUSE Current Issues Committee, 2010). It shows that ICT infrastructure is an increasing issue in the HEIs.

This paper investigates the level of prioritization and degree of implementation of ICT infrastructure in the HEIs in the Philippines. Prioritization refers to the level of importance or urgency of ICT infrastructure in the HEIs while implementation refers to the degree of realization or execution of ICT infrastructure in the HEIs in the Philippines. This paper also demonstrates the relationship between the level of prioritization and degree of implementation of ICT infrastructure in the HEIs in the Philippines. It further demonstrates the significant differences between the level of prioritization and degree of implementation of ICT infrastructure in the HEIs in the Philippines in terms of the: HEIs’ total number of years of existence; HEIs’ annual ICT expenditures; HEIs’ total Internet bandwidth; respondents’ level of proficiency of technical skills; respondents’ rating of human skills; respondents’ rating of conceptual skills; and extent of participation in decision-making of the respondents.

II. METHODOLOGY

This paper is a derived document from the study on the landscape of ICT in the HEI in the Philippines. The respondents of the study are all HEIs in the Philippines particularly all ICT Manager or the person in-charge of the management of information systems.

A sample size of the respondents was determined where the total number of population (N) was based on the list of HEIs published in the official website of CHED. In this case, the total HEIs based on the list is 1,496; 112 of which are public colleges and universities and 1,384 are private colleges and universities. The sample size was rounded off to 316 HEIs. Computation of the sample size is $n = \frac{N}{1 + Ne^2}$, A 5% margin of error (e) is used in the study. Using the stratified sampling procedure, $\% = \frac{n}{N}$, a total of 316 HEIs in the Philippines was included in the survey. Respondents per region in the Philippines were identified randomly. Table 1 shows the regional distribution of the respondents.

Table 1. Respondents' Regional Distribution

Regions in Philippines	Public	Private	HEIs- Respondents
1 (Ilocos Region)	1	3	4
2 (Cagayan Valley)	0	5	5
3 (Central Luzon)	1	4	5
4 (Calabarzon)	1	3	4
5 (Bicol Region)	3	3	6
6 (Western Visayas)	1	11	12
7 (Central Visayas)	1	17	18
8 (Eastern Visayas)	2	4	6
9 (Zamboanga Peninsula)	0	5	5
10 (Northern Mindanao)	1	1	2
11 (Davao Region)	2	6	8
12 (Soccsksargen)	0	4	4
13 (National Capital Region)	0	9	9
14 (Cordillera Administrative Region)	0	2	2
15 (Autonomous Region of Muslim Mindanao)	0	1	1
16 (Caraga)	0	2	2
17 (MIMAROPA)	2	0	2
TOTAL	15	80	95

The survey questionnaire is composed of close-ended questions that are based on the critical questions that EDUCAUSE has pointed out in the 2010 top ICT issues in higher education, particularly on the critical questions concerning infrastructure. Respondents were asked to evaluate the level of prioritization according to the five alternative choices: 1-Not a priority, 2-Low priority, 3-Medium priority, 4-High priority, and 5-Essential. Likewise, respondents were asked to evaluate the degree of implementation of each ICT component according to the five alternative choices: 1-Not Implemented, 2-Fairly Implemented, 3-Moderately Implemented, 4-Highly Implemented, and 5-Very Highly Implemented.

III. RESULTS AND DISCUSSION

The Prioritization and Implementation of ICT Infrastructure

The level of prioritization of ICT infrastructure, presented in table 2, has an aggregate mean of 4.06 which is described as *high priority*. It indicates that the infrastructure component is prioritized and needs to be done in the next 3 years in the HEIs. There are specific items that are rated *essential* such as on items 1, 5, 6, 7 and 15. The interpretation is that these items have the highest level of prioritization and are already in place in the respondent's school.

The degree of implementation of ICT infrastructure in the HEIs (Table 2) shows an aggregate mean of 3.27 described as *moderately implemented*, indicating that this component is in the strategic plan of the HEIs, however, there is no action done yet. Items 1, 3, 5, 6 and 15 are rated *high* in implementation showing that these components are currently performed by the HEIs and on-going in their implementation.

Table 2. Level of Prioritization and Degree of Implementation of ICT Infrastructure in the HEIs

Items on Infrastructure Component	Prioritization		Implementation	
	\bar{x}	Description	\bar{x}	Description
1) ICT infrastructure should be addressed in the institution's strategic plan	4.39	E	3.61	HI
2) A "green computing" program should be initiated at the institution	3.85	HP	2.90	MI
3) The technical network staff should be up-to-date on emerging technologies and standards	4.19	HP	3.43	HI
4) The infrastructure should have a built-in redundancy to provide continuous service	4.08	HP	3.21	MI
5) Deans, chairs, faculty, and administrators should periodically be consulted about the adequacy of the ICT infrastructure	4.35	E	3.52	HI
6) Students' satisfaction with the ICT infrastructure should be measured	4.20	E	3.48	HI
7) The institution should have a replacement plan for servers, appliances, network devices, and other hardware	4.14	E	3.33	MI
8) The institution should compare lease and purchase options	3.97	HP	3.31	MI
9) The institution should have good monitoring and benchmarking practices	4.02	HP	3.18	MI
10) Network and systems administrators should have the tools and training to automate problem detection and notification	4.06	HP	3.23	MI

11) The institution should have an information life-cycle management plan to ensure the continued availability and usability of information	3.96	HP	3.02	MI
12) The institution should evaluate or deploy virtualization techniques for storage, network, or server consolidation	3.78	HP	3.01	MI
13) The institution should have adequate planning, staff and infrastructure resources, and funding to support research computing	3.88	HP	3.16	MI
14) The institution should account for the dynamic change and pace of policy, security, and compliance requirements	3.82	HP	3.13	MI
15) The institution should effectively meet the current demand for both wired and wireless connectivity and mobile applications	4.25	E	3.48	HI
Aggregate Mean	4.06	HP	3.27	MI

Legend: E-Essential; HP-High Priority; HI-Highly Implemented; MI-Moderately Implemented

The Correlation and Difference between the Level of Prioritization and Degree of Implementation of ICT

The level of prioritization in all ICT infrastructure components is rated *high priority*. The result shows that these components are prioritized and need to be done in the next 3 years. On the other hand, all ICT infrastructure components were rated *moderately implemented*. The result shows that these components are already in the strategic plan but there is no action exercised.

Shown in Table 3, the level of prioritization on ICT infrastructure has significant correlations at 0.01 level of confidence with the degree of implementation to these components.

Table 3. Test of Correlation between the Level of Prioritization and Degree of implementation of ICT Infrastructure

Infrastructure	ρ -value	p-value (two-tailed test)	Remarks
	0.949 **	0.000	Significant

Legend: ** Correlation is significant at the 0.01 level (2-tailed).

Tables 4 shows that there is a significant difference between the level of prioritization and degree of implementation of ICT infrastructure in the HEIs in the Philippines in terms of the HEIs' total number of years of existence, total number of curricular offerings, annual ICT expenditures, total Internet bandwidth, respondent's level of proficiency of technical skills, rating of human skills, rating of conceptual skills, and extent of participation in decision-making.

The mean values of all items in ICT infrastructure show that the degree of implementation is less than the level of prioritization. It indicates that there is a disparity or

significant difference in the implementation of ICT infrastructure against the prioritization of ICT infrastructure in the HEIs in the Philippines. This suggests that the HEIs in the Philippines have notable planning; however, implementation plans are needed for improvement. This result may indicate also that ICT managers do not fully implement formal strategizing and planning processes that meet established objectives and install disciplines to manage application acquisition and operation (Frenzel, 1999).

Table 4. Test of Difference between the Level of Prioritization and Degree of Implementation of ICT Infrastructure

Variables	F-value	p-value	t-value	p-value	Remarks
No. of years of existence , Prioritization, Implementation	221.3683	4.35E-58	6.856095	1.04E-10	Significant
Annual ICT Expenditures, Prioritization, Implementation	13.16172	4.00134E-06	6.122542	8.09E-09	Significant
Total Internet Bandwidth, Prioritization, Implementation	11.61308	1.88802E-05	5.556795	1.88E-07	Significant
Level of Proficiency of Technical Skills, Prioritization, Implementation	21.95239	1.44351E-09	5.427072	1.81E-07	Significant
Rating of Human Skills, Prioritization, Implementation	68.68906	6.86371E-25	6.776571	1.65E-10	Significant
Rating of Conceptual Skills, Prioritization, Implementation	47.76102	1.63659E-18	5.108236	8.16E-07	Significant
Extent of Participation in Decision- making, Prioritization, Implementation	47.76102	1.63659E-18	5.108236	8.16E-07	Significant

IV. CONCLUSION AND RECOMMENDATION

The higher education institutions in the Philippines are challenged technologically. Priorities, initiation and integration of ICT in the higher education institutions in the Philippines is a pressing issue that needs to be addressed not only by the school administration but a collaborative effort among faculty, staff, students and others. ICT infrastructure is more than just an investment. It is a commitment to keep by all stakeholders in the higher education institution. HEIs should review its strategic plans to identify the gap of the priorities and implementation of ICT infrastructure as determined by the management of information systems. HEI should elevate its infrastructure into collaboration, networking and other emerging trends such as virtualization and cloud computing. Improving ICT infrastructure always entails financial consideration. School Administrators should consider identifying the strength, weaknesses, opportunities and threats of infrastructure to facilitate sufficient e-Learning infrastructure.

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