Assessment: ICT Infrastructure in Support for E-Learning Environment at Isabela State University System: Management, Learning and Improvement

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***Abstract*— This is a study on the assessment of e-learning services and how it is learned, managed and improved in order to gain enriching ICT e-services of the Isabela State University (ISU) system aided by its ICT Infrastructure. It aimed at determining the status of ICT Infrastructure of ISU Campuses in terms of peopleware, hardware, software and network; it also assessed the quality of the ICT infrastructure in terms of efficiency, reliability, speed and accuracy as per assessment of the respondents; and it identified innovative plans than can strengthen the ICT infrastructure.**

The researcher used the descriptive correlation research method. It is in this method that demographic data of the deans, chairmen, and ICT faculty members of the nine campuses of ISU and the data on the leveling of ICT infrastructures and e-learning environment are considered and correlated and took the form of survey questionnaires and actual inventory to verify the infrastructure. Considered in the assessment of the e-services are factors for the success of e-learning or flip classroom such as finance, executive support, readiness of the lecturers and students, readiness of technicians and evaluation and follow-up (as cited in Rueangprathum A.(2005).

As per result of the study, it revealed that ISU System's ICT Infrastructures to e-learning services had the above standard but with minor issue as to licensed software; below standard in hardware; and above standard in peopleware. Likewise, there is a well-established local area network at ISU Systems even without the connection of internet. Conversely, the main server used the two-layered characteristic of the CISCO network model. Additional findings revealed that ISU system had already acquired servers and CISCO routers and switches and ready for deployment to other mother cluster. However, it was found that interconnectivity for the nine (9) campuses is NOT POSSIBLE due to a weak internet provider.

***Index Terms*— E-Learning, ICT infrastructure, Networking.**

I. INTRODUCTION

Advancements in ICT means opening new opportunities for e-learning. The use of appropriate ICT infrastructure in the delivery of education has major implications for learners and institutions. It is widely accepted that advances in IT and new development in learning provide opportunities to create well designed learner-centered, interactive affordable, efficient, flexible e-learning environments. Computer in Education (2011).

Today, our education sector has come to a point where almost every HEI's is greatly influenced by technological breakthrough brought about by ICT. E-learning services have evolved since computers were first used in education. There is a trend to move toward blended learning services where computer based activities are integrated with practical or classroom-based situations. It is generally designed to guide students through ICT or to help students perform in specific task.

II. OBJECTIVES

This study aims to assess the existing ICT Infrastructure of Isabela State University campuses in support for an efficient e-learning environment.

1. Determine the status of the ICT Infrastructure of the ISU campuses in terms of:
   - 1.1 Peopleware
   - 1.2 Hardware
   - 1.3 Software
   - 1.4 Network
2. Assess of the respondents relative to the quality of ICT infrastructure in terms of:
   - 2.1. Efficiency
   - 2.2. Reliability
   - 2.3. Speed and accuracy
3. Identify innovative plans that can be developed to strengthen the ICT infrastructure in support for e-learning environment.

III. METHODS AND PROCEDURES

Research Design

The researcher used the descriptive correlation research method. It is in this method that demographic data of the deans, chairmen, and ICT faculty members of the nine campuses of ISU and the data on the leveling of ICT infrastructures and e-learning environment. Factors correlated are the Importance of Developing and Investing in ICT for Education Mkhize(2012), during the Southern African ICT for Education Summit 2012 in his speech he pointed out two key

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Challenges in Higher Education such as skill challenge and network readiness challenge and right now this challenges is currently facing by ISU system. Furthermore, the readiness of ICT infrastructure and e-learning, Rueangprathum,A ,et-al, (2005), wherein in the article he compared the Education institution in Thailand "average" in terms of ICT infrastructure in other part of the worlds. Measures that have been considered are "E-readiness ranking ", "Networked Readiness Ranking" and "Technological Infrastructure Readiness". A strategy for ICT and e-learning Becta research (2006) wherein the Further Education Funding Council (FEFC) required colleges to submit completed ILT strategies for monitoring, likewise ISU systems had already a long term development plan and that includes ICT infrastructures and enhancement.

Sample and Sampling Techniques

The researcher utilized eighty percent (80%)of the total respondent from the different campuses, a simple random was used for the dean/ program coordinator, chairman, and faculty respondent.

Data Analysis

To describe the campus profile, and personal profile of the respondent, frequency and percentage were employed.

I. To present the response and assessment of the respondents in the status and quality of ICT infrastructure in terms of peopleware, hardware, software and network, Weighted Mean were employed.

T-test was used to determine if there is a significant difference on the campus administrator respondent extent of support of ICT infrastructure for e-learning environment and in the extent of ICT infrastructure when grouped according to cluster.

IV. DISCUSSION OF RESULTS

- *Status of the ICT Infrastructure of the ISU Campuses in Terms Of:*

4.2.1 People Ware

Peopleware is one core aspects in computer technology. It can refer to anything that has to do with the role of people in the development or use of computer software and hardware systems.

Table I: Summary of I.T. Core Staff f ISU System

Campus	Dean	Chairman/Coordinator	Faculty
Angadanan		1	4
Cabagan	1	3	9
Cauayan	1	3	25
Echague	1	1	18
Jones		1	4
Ilagan		1	10
Roxas		1	10
San Mariano		1	1
San Mateo		1	4
Total	**3**	**13**	**85**

Table 1. show the distribution of technology users in all campuses of ISU System. highest number of peopleware was observed from Cauayan campus and the least, from San Mariano Campus.

4.2.2 Hardware

Hardware infrastructure was assessed in the whole university, the purpose of the assessment is to evaluate ISU campuses in terms of readiness in interconnectivity.

The computers are categorized according to their type processor: Category A: (Corei7, i5,13,Core 2 Quad, AMD Phenom and Athlon X2), Category B: (Core 2 Duo, Pentium

E5**0 > E2 **0), Athlon 64 x2,Athlon 64), Category C: (Celeron Dual Core(E1*00), Celeron 4*0) Sempron), Category D: (Pentium D, Pentium 4, Celeron D, Pentium 3, Athlon XP Athlon).

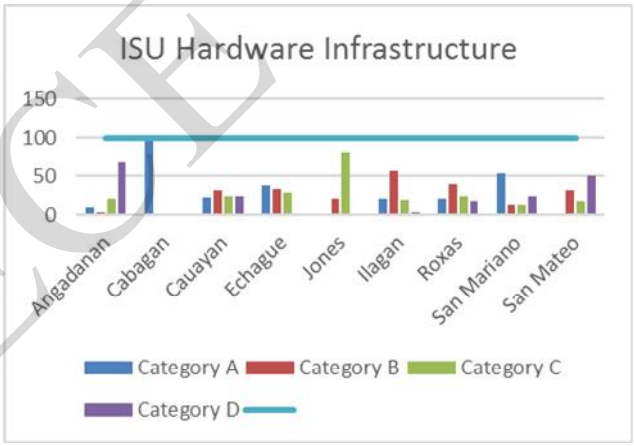


Fig 1. Summary of Hardware Infrastructures in the ISU System

Figure 1 shows the summary of hardware Infrastructure in ISU system, it further reveals that Angadanan campus with two(2) computer laboratory has more category D computers than category A, while in Cabagan campus all computers that were distributed in four (4) laboratories were classified as category A. In Cauayan campus computer were seemingly divided with eight (8) laboratories, in Echague campus it reveals that category D computers is no longer available in their seven (7) laboratories, on the other hand Jones campus with two(2) laboratory available has only two category available, category B and C. In Ilagan Campus majority of computer used in their six(6) were belong to category B with 56 percent and category A with 21%. Likewise in Roxas campus category B computers were majority use in their five(5) laboratories. San Mariano is not left behind from the big campuses because majority of the computers were

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classified as category A, and finally, in San Mateo campus, unlike San Mariano campus, 50% of the computer in their three(3) laboratory were belong to category d, and no category A classification.

4.2.3 Software

Software infrastructures were also assessed in the university. The purpose of the evaluation is to identify what specific software is used for each campus. Softwares such as operating system, application, programming and even third party software that are used by their students daily in the campus computer laboratory.

Table II: Summary of software infrastructures that are widely used in the ISU System.

Campus	Operating System	Application Software	Programming	Database
Angadanan	MS Windows	MS-Office	MS & FOSS	MS & FOSS
Cabagan	MS Windows	MS-Office	MS & FOSS	MS & FOSS
Cauayan	MS Windows	MS-Office	MS & FOSS	MS & FOSS
Echague	MS Windows	MS-Office	MS & FOSS	MS & FOSS
Jones	MS Windows	MS-Office	MS & FOSS	MS & FOSS
Ilagan	MS Windows	MS-Office	MS & FOSS	MS & FOSS
Roxas	MS Windows	MS-Office	MS & FOSS	MS & FOSS
San Mariano	MS Windows	MS-Office	MS & FOSS	MS & FOSS
San Mateo	MS Windows	MS-Office	MS & FOSS	MS & FOSS

Table 2 shows that in ISU system majority of operating system and application software that are installed and utilized by students were Microsoft while in programming and database software ISU uses both Microsoft and Free and Open Source Software.

Table III: Also shows that in terms of network infrastructure the common or widely use routers and switches were generic and the speed were evidently slow.

Campus	Network	Router	Switches	Internet Service Provider	Speed
Angadanan	Campus LAN	TPLink,D-linK	D-linK, Edimax		Up to 512mbps
Cabagan	Campus LAN	TPLink,D-linK, Linksys	D-linK, CISCO	PLDT DSL	Up to 2mbps
Cauayan	Campus LAN	TPLink,D-linK, Linksys	D-linK, CISCO	PLDT DSL	Up to 2mbps
Echague	Campus LAN	TPLink,D-linK, Linksys, CISCO	D-linK, CISCO	PLDT DSL	Up to 2mbps
Jones	Campus LAN	TPLink,D-linK	D-Link	SMART broadband	Up to 512mbps
Ilagan	Campus LAN	TPLink,D-linK, Linksys, CISCO	D-linK,	PLDT DSL	Up to 1mbps
Roxas	Campus LAN	TPLink,D-linK, Linksys	D-linK	IPSTAR/ Globe	Up to 1mbps
San Mariano	Campus LAN	TPLink,D-linK, Linksys	D-linK	Globe Broadband	Up to 5 mbps
San Mateo	Campus LAN	TPLink,D-linK	D-Link	PLDT	Up to 1 mbps

- *Assessment of the Respondents Relative to the Quality of ICT Infrastructure In Terms Of:*

4.2.4 Efficiency

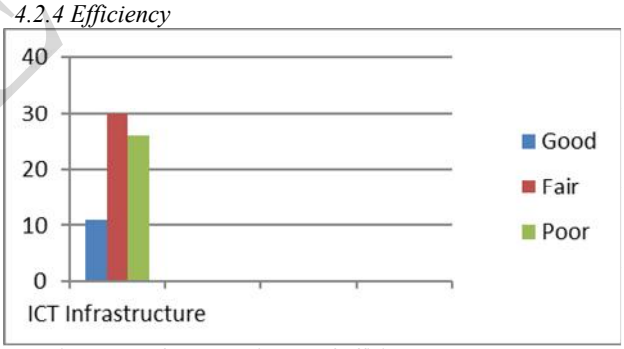


Fig 2. ICT Infrastructure in term of Efficiency

Figure 2 shows the overall assessment of the respondent in term of Efficiency in their respective campuses, it reveals that majority of the respondent that assesses the ICT infrastructures in the ISU system were “Fair”.

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4.2.5 Reliability

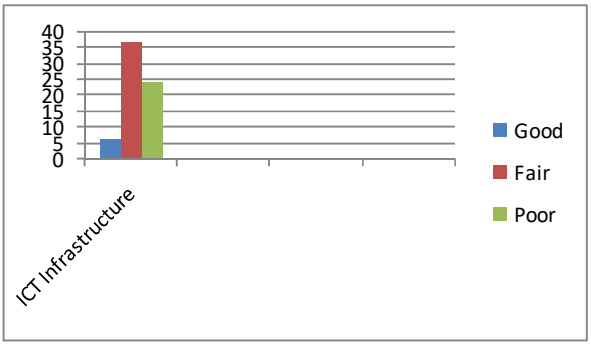


Fig 3. ICT Infrastructure in term of Reliability

Likewise in Figure 3 in terms of reliability majority of the respondents were once again assesses ICT infrastructure as "fair" and least of them assessed the infrastructure ,"good".

4.2.6 Speed and Accuracy

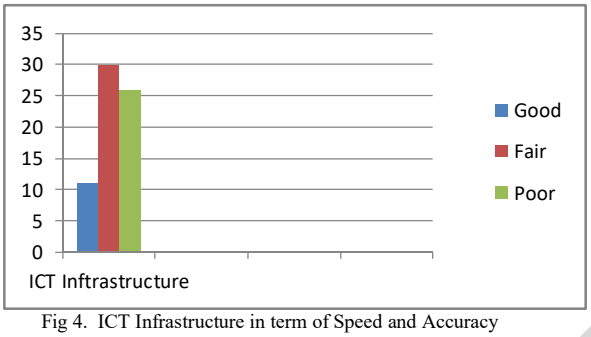


Fig 4. ICT Infrastructure in term of Speed and Accuracy

In figure 4 highest number of respondents assessed the ICT Infrastructure as "fair" in terms of speed and accuracy, not far from it is "poor" and slightly far with is "good " rating.

V. INNOVATIVE PLANS THAT CAN BE DEVELOPED TO STRENGTHEN THE ICT INFRASTRUCTURE IN SUPPORT FOR E-LEARNING ENVIRONMENT

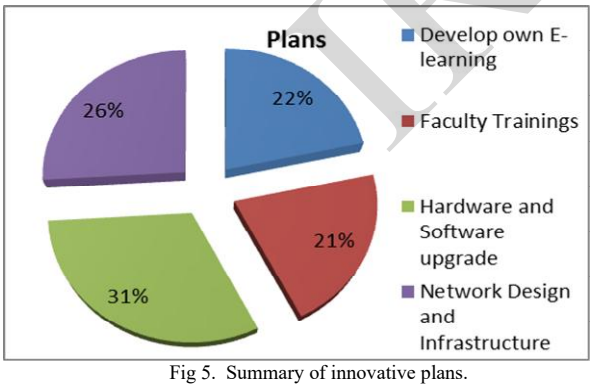


Fig 5. Summary of innovative plans.

It should be noted that in Figure 5 highest number respondents of their plans to strengthened in terms of ICT infrastructure to support for e-learning were Hardware and Software upgrade; second Network Design and Infrastructure which is a clear indication that success in e-learning and flip classroom technology lies on ICT upgrades.

VI. SUMMARY OF FINDINGS

The following are the major findings of the study:

1. The researcher found that there were specific internet connection stability problems because internet service providers do not have better services where small campuses are located. For big campuses, the issues lies on the network, like low bandwidth, latency, chatty applications network congestion and internet connection problem.
2. LAN configuration for each campus has already been used and tested working for years of operation in the ISU system.
3. Each ISU campus never stops upgrading or purchasing their computer units together with licensed softwares.

VII. CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:

1. The status of the ICT infrastructure of the ISU campuses in terms of:
   a. Software: Above Standard (but with issues not all software installed are licensed
   b. Hardware : Below Standard and
   c. Peopleware: Above Standard.
2. Local Area Networks in ISU system or within the nine (9) campuses have already been established and working even without the connection of the internet.
3. The server has already a two- layered characteristics of the CISCO network model, the core and the distribution layer, using IBM datacenter as server and CISCO router and Switch to perform the two layers in CISCO model.
4. The University had already acquired server and CISCO routers and switches and already distributed to the other mother cluster and
5. Interconnectivity for the nine(9) campuses is NOT POSSIBLE unless problems with Internet Provider is solved.

RECOMMENDATIONS

1. Campuses of ISU system should also hire Computer Technicians to serve as technical support in maintaining and repairing computer hardware and software problems to avoid IT faculty in doing the task in order to concentrate with their teaching task.
2. If budget permits, campuses of ISU system should use CISCO Routers and Switches for possible implementation of Voice Over Internet Protocol (VOIP), Data Mining, Cloud computing and E-learning technology.

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3. Campuses of ISU especially small ones should start finding ways to look for better internet service provider to solve the problem in internet connection stability and low bandwidth.
4. Use Virtual Private Network (VPN) technology to access or send and receive data from the server or from other clustered campuses, and to avoid financial allocation in acquiring leased line for each campus.

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