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E-AIMSS (ELECTRONIC ASSET INVENTORY AND MANAGEMENT SYSTEM IN SCHOOL) FOR RESOURCE OPTIMIZATION AND ORGANIZATIONAL PRODUCTIVITY

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ABSTRACT

This capstone is centered around the development of an efficient electronic property inventory system tailored for school assets, driven by the overarching objective of resource optimization to ensure equitable access to vital materials for all learners. The methodology follows the "ISSO" framework (Ignite, Strategize, Systematize, Operationalize), complemented by a Logical Framework. The project employs a homegrown digitalized system constructed through a waterfall model approach, which undergoes alpha and beta testing. The study's analysis utilizes a t-Test to evaluate its impact. The outcomes reveal that real-time property monitoring significantly enhances custodianship, while digitalization yields improvements in reliability, efficiency, and usability, effectively overhauling the conventional inventory process. The electronic system fosters stakeholder engagement, supporting communication, budget allocation, and audits. Comparative testing demonstrates clear advantages over traditional manual methods. In conclusion, this study underscores the merits of a refined electronic property inventory system. Notably, the research suggests a need for careful consideration of process complexities in outsourcing decisions and showcases the swift, precise, and transparent accounting provided by e-AIMSS deployments, thereby nurturing transparency and public confidence. This innovative approach holds promise for broader application within the realm of e-government processes.

Keywords: *E-government, Government Digitalization, Homegrown Digitalization, Electronic Inventory, School Property, Asset Management, Property Inventory, Resource Optimization, Organizational Productivity, ISO 9126*

INTRODUCTION

Every learner deserves to have a textbook, chair, gadgets, and other complementary supplies and materials necessary in the teaching and learning process to have the desired literacy. As echoed by Malala Yousefzai, "One child, one teacher, one book, and one pen can change the world. Education is the only solution".

The Department of Education as mandated by the state is making efforts to deliver an appropriate, desirable ratio of those complementary aspects to ensure an effective learning experience such that every learner has a chair where he can sit comfortably for activities in a classroom with thirty-eight (38) learners. DepEd Order 74 s., 2011 for example dictates that every learner must be provided a textbook in all subjects which operationally means that the sum of the number of textbooks allocated for each public school is equal to the current enrolment plus a buffer stock of ten percent (10%) to accommodate a possible increase in enrolment, satisfying the requirements of a good education provider.

But these figures are not the ones that can be seen in the periphery. There are schools with excess buildings while there are those who still conduct classes under the tree even before the pandemic. This is supported by 2019 reports from the Education Facilities Section and LRMDS Reports, Schools Division Office of Camarines Norte. There are also issues with tracking the procurement and delivery of IT, science, and math equipment, as well as books and other instructional tools, which are frequently late and always in short supply. (Yuvienco, 2019).

Moreover, ascertaining the value of lands where the school buildings are built is a problem too due to the unsecured title of the school sites and one of the perennial observations from the Commission on Audit's (COA) Audit Observation Memorandum (AOM). As reported in 2013, 42,000 public schools all over the country are squatting on various government and privately-owned lands (Romero, 2013). In the SDO CN, only 11% have a patent or secured title, 86% are in the process of securing special patents while three percent (3%) have no document to support its possession. The absence of a comprehensive tracking tool for the Department's processes causes the delay in obtaining the same, which is further aggravated by the regular unavoidable movement of school heads from one station to another.

Any unsecured assets for education and the inequitable and unfitting distribution of resources compromise the quality and the degree of instruction delivered in public schools. It additionally exacerbates the marked compromised quality of education, considering that the complements for the teaching and learning process are not available. No matter how competent the teachers are, the teaching and learning experience suffers when there is no or there is a want for the necessary and sufficient equipment and supporting and facilitating materials. And property inventory has something to do with this.

As directed, all schools with or without organic personnel are required to submit reports of physical count semi-annually, which are done manually and collated in the districts which are submitted to the SDO for further collation and submitted further to higher governance level and oversight agencies for purposes it intends to satisfy.

Thus, the researcher hypothesized that the non-attainment of the desired ratio of a learner to building, classroom, books, chairs, supplies, and equipment and the disparity in the reported figures versus the actual physical count is due to the need for manpower and the manual processes of inventory taking. These considerably affect a gap in the system such as errors, leakages in the practice of inventory taking, and being prone to undesirable practices just for compliance. These breaches further swell to inadequate competency of personnel assigned to do the task, inflating the defective property accountability.

The absence and/or inaccurate PPE inventory reports gets bigger a problem leading to the inadequate distribution of resources and erroneous asset management; which further magnify the unjust allocation of educational resources, property wastage, unreconciled government accounts, and perennial observation memorandum from the oversight agency, which impacted a compromised delivery of education.

As the Department kicked off the Digital Rise that shifts towards gadget-based education, it is proper to establish a system to monitor and track the conditions of these gadgets to maximize their benefits. With an accurate and real-time inventory system, resources shall be managed, maximized, and productivity is optimized such that excess chairs and textbooks or gadgets from one school can easily be identified which can be redistributed to other schools in need. Equipment and school buildings needing repair can be prompted and monitored for their condition. Progress of acquiring a title can be tracked sans transfers or separations from those who have the responsibility. The accurate and real-time inventory system shall cultivate transparency, efficiency, and accountability which curves corruption and ill practices, optimizing organizational productivity.

Postulate for Change

Armed with the Department of Education's (DepEd) Mission Statement and the legislative obligation from PD 1445; it was postulated that if the asset inventory would be computerized, the need for manpower shall be addressed, and reports and information would be readily available in real-time with high degree of accuracy. Data collation shall be facilitated as required for program planning, budget allocation, and constructive property audit. The digitized method of taking the inventory shall address the non-compliance to the standardized procedure set forth by the oversight agencies and shall establish communication links among stakeholders. In short, the e-AIMSS (Electronic Asset Inventory and Management System in Schools) shall be the repository of school records of school sites, buildings, textbooks, chairs and furniture, school equipment, and apparatus, including semi-expendable items and commonly used supplies and materials being obtained by the schools from various form of acquisition up to its disposal.

Research Questions

1. Given the premises above, this capstone sought to answer the following problems:
2. What are the processes involved in inventory and asset management in the school of SDO Camarines Norte?
3. What is the effect/impact of the present inventory and asset management in optimizing resource and schools' productivity in the SDO Camarines Norte?
4. To what extent does an electronic inventory and assets management system contribute to the optimization of resources and productivity of schools in SDO Camarines Norte?
5. Is there a significant relationship between inventory and asset management, school resource optimization, and organizational productivity?
6. As to problem No 4, this hypothesis is formulated - The electronic inventory and asset management system have no significant effect on resource optimization and school productivity

REVIEW OF RELATED LITERATURE

To provide a clear background of the problem and to gain insights and relevant experiences in finding the solution at hand, relevant literature and studies were reviewed.

All property, immovable or movables, acquired by the government regardless of any mode of acquisition from any sources must be properly accounted to constitute the precise financial position of the government agency pursuant to Presidential Decree No. 1445 (Government Auditing Code of the Philippines).

The term inventory first appeared in print in 1601. It is described as the recording of a company's current asset on hand, and the worth of all ongoing and completed tasks still on the company's premises that have yet to be sold which can be easily converted into liquid cash in a short period. (Jenkins, 2020). Muller (2011) categorizes inventory into raw materials, finished goods, and work in progress.

Inventory plays a critical function in business operations preventing the loss of billions if accuracies are ascertained. A lot of business firms do not declare profits too, for having poor productivity for lack of proper inventory. Managing and controlling inventories is a crucial component of conducting business and can be the foundation for a company's superiority over its competitors. Purchasing an excessive amount of raw materials is stocking up on completed goods that might lead to a company's bankruptcy (Porra and Dekker, 2008). The success or failure of any business is determined by how well it effectively practices inventory management to ensure adequate stock of used or unused materials in store to avoid

stock-out that may disrupt the production and distribution cycle that supports the survival of all manufacturing entities. (Jenkins, 2020).

Inventory management is the art and science of managing stock levels of commodities at the lowest possible cost while adhering to management's relevant targets and objectives. It entails systems and processes for identifying inventory requirements, setting targets, providing replacement techniques, reporting current and anticipated stock status, and handling all functions linked to the tracking and management of supplies (Bounless.com, 2016). It is the tracking of materials moving in and exiting the stockroom, as well as reconciling record balances. It involves a pattern for comprehensive quality management from tracking, monitoring, resource management, and control in the organization (Tapado and Delluza, 2016, citing Salvo, et. al., 2002). Higher levels of inventory management practice are directly proportional to the firms' competitive advantage and organizational success and is thereby recommended that policymakers, universities, NGOs, and other interested parties capacitate those who are involved in the process to promote the inventory management practices and improve their competitiveness and organizational performance (Atnafu and Bolda, 2018).

Inventory management has three (3) common approaches namely: Inventory Optimization, Inventory Reduction, and Inventory Process Optimization. (Slater, 2010). Inventory optimization is an analytical technique that uses historical data and theoretical formulae to calculate the required level of inventory for a desired level of availability. Inventory Reduction is like declaring a sale to reduce the bulk required for inventory taking. Inventory Process Optimization, which addresses the challenges posed by the first two approaches, is a systematic approach that addresses process and behavior issues by combining inventory management fundamentals with optimization techniques. It utilizes systems thinking, double-loop learning, and hypothesis-driven analysis while identifying the specific inventory items to work on to achieve the goals of inventory reduction.

Absence and a disorganized system of inventory are common problems in inventory management. Setting up a system or modifying an established one would not guarantee a lasting result leading to a 'yo-yo' result and can be viewed as a waste of time and resources (Slater (2010).

Inventory management systems are rarely employed in schools because the primary focus is on providing high-quality instruction (Tapado and Delluza, 2015). Schools and universities, for example, are in charge of storing an almost infinite amount of supplies and books, ranging from front office supplies to classroom text and whole libraries. The information and materials provided at these initiations are extremely valuable, but without a good inventory management system, information can easily be lost or neglected as things can be misplaced, forgotten, or pushed to the back of storage (Sutter, 2014). An automated inventory management system has both advantages and problems. Its benefits include quick and effective document generation that would be paperless as well as timely and appropriate reports. Its drawback, on the other hand, includes reliance on technology, accuracy concerns, and the potential for deception (Conrad, 2016).

The Equipment Inventory Management System (EIMS) of Tapado and Delluza (2016) in Catanduanes State University (CSU), an automated inventory not only captured excessive papers and paperwork, minimized waiting time and turnaround time of the inventory process, but also simplified, and streamlined the long procedures of inventory. Having coherent, standardized, updated, accessible, and printable data generated from the automated system aids in the decision-making process of the university. Disposal of no longer serviceable equipment can be easily called out in the system.

After conducting property and asset inventory of various hospitals under the United States Department of Veterans Affairs, Nyaga, Young, and Moran (2016) highlighted six (6) long-standing challenge experiences by state, local government units and government agencies in asset and inventory management such as; (1) use latest IT system and prediction analytics as government agencies lagged

behind private counterparts, (2) improving contracting process on the supply side considering decision need to comply with varied rules such as procurement law, (3) lack of standardized inventory process deserting specific performance targets, (4) increase the amount of supply chain talents, (5) lack of effective performance measurement and (6) senior leadership at the government does not prioritize inventory management. Conversely, ten (10) recommended actions to improve inventory performance in the public sector are proposed, namely; (1) adopting an easy-to-use software application and providing training to encourage the use of the existing legacy system, (2) applying predictive analytics in inventory management to ensure adequate supply, (3) enhancing supplier collaboration to improve inventory replenishment processes, (4) implementing process mapping, (5) employing "A-B-C" classification of inventory and regular cycle counts, (6) conducting inventory performance benchmarking and create communities of practice to share them, (7) establishing a culture of continuous improvement in inventory management, (8) adopting more effective staff training approaches and foster a culture of teamwork, (9) increase senior leadership accountability, and last but not least, (10) establishing more effective communication channels on inventory issues.

There are hundreds of software alternatives readily available in the market instead of developing a home-grown system and finding the best inventory management software saves time and money if the same is suited to the organization's ways of business and services. (Conrad, 2016). Stevens (2021) compiled a list of top-recommended off-the-shelf inventory management solutions along with their corresponding subscription rate as of the writing of this paper.

Haider, Samdani, Ali, & Kamran (2016), did a rigorous comparison of in-house and outsourced software development to demonstrate when and where outsourcing is beneficial to a company and when it is not. Outsourcing is expected to reduce production costs as well as the complexities of jobs that are either not viable to undertake in-house or, in certain cases, are not achievable due to a lack of infrastructure, requisite experience, or other technological factors (Kremic, Tuckel Rom 2003). Offshore project outsourcing is more likely to fail because physical, time, cultural, organizational, and stakeholder distances impede communication and knowledge exchange between a firm and offshore project team members (Fabriek, Brand, Brinkkemper, Harmsen, & Helms (2008). In order for offshore outsourcing to be successful, (Khan, Niazi, & Ahmad 2011) vendors must solve common challenges such as "language and cultural barriers," "country instability," "lack of project management," "lack of protection for intellectual property rights," and "lack of technical aptitude."

Complete control, direct communication, and a hand-picked staff (Stefanowicz (2021) are several significant advantages of in-house development that are as valid today as they were before outsourcing. The opportunity to tap and develop a team from the bottom up, ensuring that they know how to use the tools available to develop software in accordance with the company's concept, communicate more effectively and quickly any unanticipated changes to the project, and virtually totally eliminate any errors caused by miscommunication. Premises considered, following a simple cost-benefit analysis, the researcher opted to construct a home-grown digitized system rather than rely on off-the-shelf inventory systems available in the market.

RESEARCH METHODOLOGY

Research Design

Developmental method of research guided by a logical framework, dubbed as "ISSO" (Ignite, Strategize, Systematize, and Operationalize), an input-process-output-feedback framework is used in creating an innovative school-based electronic inventory system intended for public schools. It is a four-phased cyclical scheme with well-defined activities, resources, and outputs, and encourages continuous improvement until the desired outcome and goal is achieved.

The term "ignite" refers to the act of mobilizing. It started with the organization of a capstone team composed of personnel from various delivery units who have appropriate knowledge, relevant experiences in school asset operation, and technical competence in computer programming. A corresponding office issuance was furnished relevant to this that signaled the approval of the implementation of the project. It was followed by a review of relevant office records and other relevant data and with a structured focused-group discussion (FGD) among concerned personnel of four (4) chosen varied schools where the proposed system shall be piloted. A walkthrough of current property inventory practices was done during the FGD along with the presentation of the proposed model of a digitalized inventory system to generate positive feedback and suggestions for improvement. As a way forward, the schools were enjoined to conduct property cleansing per COA Circular 2020-06.

The information acquired in the ignite phase was used for the creation of a prototype electronic system utilizing a “waterfall model” with a System Development Life Cycle (SDLC) framework using HTML, CSS (Bootstrap), Javascript (jQuery), AJAX, and JSON for the front end (client-side), and PHP and MySQL (Database) for the back end (Server Side). The output was presented to the key officials from the schools' division office such as the Legal Officer, School Facility Officer, and Internal Audit Officer to solicit additional inputs and concurrence to the proposed system before it was presented to the representatives of the oversight agency and top-level managers for more inputs which concluded the “strategize” phase.

Before e-AIMSS was piloted to the chosen schools, it was tested (alpha test) by three (3) experts in the field of information technology representing the government, academe, and private practitioners. This marked the transition from the “strategize” to the “systematize” phase. The alpha test yielded a favorable result that signaled for the conduct of capacity building among property custodians to understand the system's characteristics, menus, and features. The property custodians, as assigned system administrators, were given ten (10) days to enter current hard school property records into the system after the “cleansing” per COA Circular 2020-06. Following the encoding of the property documents into the system, another capacity-building session was called and attended by teacher-respondents who completed the pre-test survey using a validated self-crafted questionnaire based on ISO 9126 to know the effect and impact of current inventory practices on resource optimization and organizational productivity. Thereafter, a twenty-day (20) "honeymoon period" was implemented to allow teacher-respondents, property custodians, and school leaders to fully experience the facility of e-AIMSS. This was the “operationalize” phase. And finally, to enable an "apple to apple" comparison of e-AIMSS effectiveness versus the current (manual) practices, the same survey questionnaire used in the pre-test was administered again after the “honeymoon period” to the same teacher-respondents.

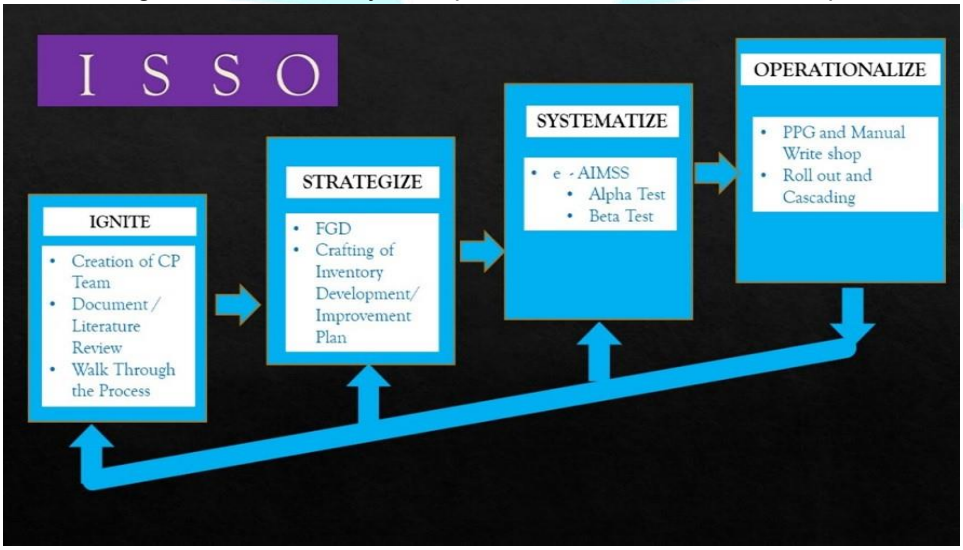

Figure 1 - The ISSO Framework

Research Respondents

Four (4) pilot schools were purposefully selected reflecting various types and characteristics of schools in dichotomous areas such as one (1) each for elementary and secondary, with organic administrative staff or none, big or small, with internet facilities or none.
Participants in the FGD are purposefully chosen, whilst all staff from the aforementioned pilot schools, as users of the digitalized systems, serve as respondents who answer the pre-test and post-test (beta testing).

Research Instrument

The researcher designed a structured FGD plan to manage the FGD Session in order to elicit quality and vital information. And considering the project occurred at the height of Covid - 19 pandemic, blended FGD was considered in the FGD plan to roll out bias and infirmities.

To execute the alpha and beta tests, the researcher employed validated instruments derived from Applying the ISO 9126 Model to the Evaluation of an E-learning System (Chua, B.B., & Dyson, L.E., 2004). The checklist with a pass or failed criteria is used by the three-expert panel during the alpha test with a designated column for notes and remarks to elicit qualitative reactions, suggestions, and recommendations. Beta testing makes use of a survey instrument on a 5 Likert scale with a space that demands comments, suggestions, and recommendations from the system's users.

Data Analysis

The following statistical tools were used in the qualitative part to treat the gathered data:
Frequency count and percentage for an alpha test. Weighted Mean and mean-variance for the responses gathered during the beta testings. t-Test is used to determine the significant relationship between inventory and asset management, and schools' resource optimization and organizational productivity.

RESEARCH FINDINGS AND DISCUSSION

Inputs from the FGD

The FGD and walk-through participated by the key informants from identified pilot schools describing the current practice of property inventory taking. Upon assumption to office, property given could hardly be recalled. No bill of property entrusted to them is given nor a formal transfer of accountability from one concerned person to another, including school site documents. In cases where there are documents, data is incomplete.

Property custodians are assigned based on the personal choice of the school head, founded on workloads distribution and program coordinator ships or availability of manpower, which is eventually recommended to the schools' division office superintendent to formalize the designation. Although there is a list of duties and functions given, there is no induction training as part of the orientation to the job. Along the process, capacity building is done occasionally providing little learning compared to the complex duties of property inventory, stewardship, responsibility, transparency, efficiency, and accountability. Moreover, forms are not user friendly with unversed abbreviations that add to the difficulty of recording and reporting exacerbating "ningas kugon", and unable to sustain efforts to do the accounting of property, such that inventory is done only when reports are being asked to be submitted. Since it was not done systematically, the reports were inaccurate and unreliable.

In addition, property from the national government is not well documented and lacks details like cost and amount for the property, hence the value could not be determined. A walk-through of the process

showed that the process followed the established appropriate practices but lacked proper documentation affecting the accuracy of the inventory.

Donated movables are not completely documented as well. Considering there is no established procedure to this effect, schools provided their own scheme as needed in relation to other projects like Brigada Eskwela but not for inventory and determination of the value of the school's assets. Donations are just recorded in the logbook leaving it in a silo, which led to inventory exclusion, undermining its additional value to government assets.

There is no clear process or procedure for requesting supplies and needed materials. School personnel just linger for what supplies and materials to be given. Prioritization of requests for supplies and repair of classrooms is based on oral requests. When there is a dire need for supplies, yet no funds have been allocated, personnel involves shells out from their pockets subject to reimbursement.

There is a record of school building but the same is deficient as to its current value, status, and improvements, Damages caused by typhoons and other natural disasters were reported in accordance with the established DepEd protocol but the amount of the assent is hard to determine. There is, in fact, an existing School Building Inventory but the same does not preclude doubling entries of the cost of repairs. As a result, schools are unable to determine the status of their school buildings, their earned value, and depreciations which is not an indication of resource optimization in the allocation of resources.

Informants' inputs from the FGD are supported by the responses in the pretest survey as a prelude for the beta testing. Of the fifty-five (55) respondents, twenty-three (23) gives similar sentiments an additional thirteen (13) called for the enhancement of the inventory system, seven (7) requested capacity building, training, and reading materials, and three (3) stressed for uniform transparency that can trace movements and whereabouts of school property.

All the respondents AGREED that the current inventory and asset management had an effect and impact on resource optimization and productivity in the schools but DISAGEE if the principle of "efficiency" is present and NEITHER AGREE NOR DISAGREE on the other five ISO 9126 principles if present in the current practice.

Result of Alpha Test

Inputs gathered from the FGD are processed to design a prototype of the e-AIMSS which thereafter is subjected to Alpha Test.

The Alpha Testing revealed that a home-grown system created has a bright future ahead of it. It passed two out of three alpha test assessors (66.67%) in all the criteria among the six (6) principles set forth by ISO 9126. Eleven (11) out of the twenty-one (21) sub-criteria of ISO 9126, or fifty-two-point thirty-eight percent (52.38%) are examined and found to be compliant with the standards. It failed on the other ten (10) sub-criteria, however, such as interoperability, maturity, recoverability, and stability, among others because these sub-criteria could not be evaluated yet for the homegrown system is a greenhorn and required further development and evolution over time to satisfy the set forth standard on the ten (10) sub-criteria and serve its function.

Considering these favorable results, the prototype is subjected to test its USABILITY with the intended users called the beta testing.

Beta Testing Results

The deployment of e-AIMSS after passing the alpha test, revealed that the electronic system supplemented the manpower and capacity required in a desirable property accounting, as supported by both qualitative and quantitative data gathered during the project's implementation.

Characteristics Based in ISO 9126	Description	Pre-Test		Post Test		Variance	
		μ	Interpretation	μ	Interpretation	Post - Pre	Rank
FUNCTIONALITY		3.96	Agree	4.49	Agree	0.53	6
Suitability	The inventory achieves transparency, efficiency, and accountability	4.15	Agree	4.53	Strongly Agree	0.38	21
Accurateness	The inventory produces accurate reports	3.95	Agree	4.56	Strongly Agree	0.62	10
Interoperability	The inventory interacts with another reporting system (i.e., reports on land, building, furniture, books, and other movables)	3.93	Agree	4.47	Agree	0.55	14.5
Security	The inventory system is secure	3.82	Agree	4.40	Agree	0.58	12
RELIABILITY		3.69	Agree	4.42	Agree	0.73	1
Maturity	The faults in the inventory can be easily eliminated	3.53	Agree	4.40	Agree	0.87	1
Fault Tolerance	The inventory can prompt errors (i.e. unbalance sheets, misdistribution of books/supplies)	3.76	Agree	4.35	Agree	0.58	12
Recoverability	The inventory can recover missing/mislaid information in case of faults	3.78	Agree	4.51	Strongly Agree	0.73	6.5
USABILITY		3.81	Agree	4.46	Agree	0.65	3
Understandability	Transparency, efficiency, and accountability is projected in the inventory mechanism	3.98	Agree	4.38	Agree	0.40	20
Learnability	I can learn the inventory process easily	3.75	Agree	4.47	Agree	0.73	6.5
Operability	I can do the inventory without much effort ***For Teachers*** *(I can request needed supplies without much effort)*	3.58	Agree	4.38	Agree	0.80	2.5
Attractiveness	The templates (report forms) used in the inventory looks good	3.95	Agree	4.60	Strongly Agree	0.65	8
EFFICIENCY		3.79	Agree	4.49	Agree	0.70	2
Time Behavior	The inventory can be done quickly (i.e. determine available stocks and needs, property beyond shelf life, the value of land and building, and who is accountable for a lost/wasted property) ***For Teachers*** *(I can determine the property/supplies issued to or under my stewardship anytime)*	3.85	Agree	4.62	Strongly Agree	0.76	4
Resource Utilization	The inventory utilizes resources efficiently (i.e demands economic use of supplies)	3.73	Agree	4.36	Agree	0.64	9
MAINTAINABILITY		3.88	Agree	4.46	Agree	0.58	4
Analyzability	Faults in the inventory can be easily diagnosed	3.71	Agree	4.45	Agree	0.75	5
Changeability	The inventory system can be upgraded easily	3.87	Agree	4.45	Agree	0.58	12
Stability	The inventory continues despite changes of personnel in charge or school leadership	4.00	Agree	4.47	Agree	0.47	18
Testability	The inventory can be tested as regards its functionality (i.e., accurateness of reports, achievement of purpose) easily	3.93	Agree	4.47	Agree	0.55	14.5
PORTABILITY		3.79	Agree	4.34	Agree	0.55	5
Adaptability	The inventory can be moved to other settings/locations	3.71	Agree	4.20	Agree	0.49	16.5
Installability	The inventory can be set up easily	3.60	Agree	4.40	Agree	0.80	2.5
Conformance	The inventory conforms with transferability standards (i.e. data/information are secured in case of changes in personnel and school leadership)	3.96	Agree	4.38	Agree	0.42	19
Replaceability	The inventory is responsive to changes in technology over time	3.89	Agree	4.38	Agree	0.49	15.5
OVERALL, the inventory addresses the management of school assets/resources to attain organizational efficiency, transparency, and accountability.		4.04	Agree	4.64	Strongly Agree	0.60	
OVERALL, the inventory optimizes school resources/assets		3.96	Agree	4.60	Strongly Agree	0.64	
OVERALL, the inventory contributes to the school productivity.		4.07	Agree	4.56	Strongly Agree	0.49	

Figure 1: Results of Pre-test and Post-test All Users

Before the introduction of e-AIMSS, the populace of the four pilot schools expressed that they *Agreed* that the property inventory practices and processes contributed to the optimization of resources and organizational productivity. But with the introduction of the e-AIMSS, changes to the means as illustrated in Table 1. Among the users, school heads were the most appreciative of the changes brought about by e-AIMSS, followed by property custodians and then teachers-users.

Table 1 Test Means, Interpretation, and Variance Among Group of Users

	n	Pre-Test		Post Test		Average Variance
		μ	Interpretation	μ	Interpretation	Post - Pre
School Heads	4	2.88	Neither Agree nor Disagree	4.79	Strongly Agree	1.91
Property Custodians	11	3.37	Agree	4.01	Agree	0.64
Teachers/User	40	4.04	Agree	4.53	Strongly Agree	0.48

Five out of twenty-one criteria or twenty-three-point eighty-one percent (23.81%) have been increased to *Strongly Agree* particularly in the areas of Time Behavior (*The inventory can be done quickly/I can determine the property/supplies issued to or under my stewardship anytime*), Attractiveness (*The templates use in inventory looks good*), Accurateness (*The inventory produces accurate reports*), Suitability (*The inventory achieves transparency, efficiency, and accountability*), Recoverability (*The inventory can recover missing/mislaid information in case of faults*)

Variations in the comparative results of the pre-test and post-test as shown in Figure 2 reduced the time efficiency of a person who works on property inventory. This claim could be supported in particulars by the variables "The faults in the inventory can be easily eliminated," "I can do the inventory without much effort," "The inventory can be set up easily," and "The inventory can be done quickly," which ranked 1, 2.5, and 4 respectively, all with variances greater than 0.75.

Figure 2 Pre-Test and Post Test Variances Among Twenty-One ISO 9126 Criteria

One of the disadvantages of digitalization (Joseph, 2015), is false accuracy or transparency and accountability. As shown in the same comparative results, the variable "The inventory produces accurate reports" was ranked 10th (0.62) out of the 21 criteria. This does not imply that reports generated by e-AIMSS were free of inaccuracies, given that the variable - "The faults in the inventory can be easily eliminated" has the highest variance score. This means that once errors were eliminated, exact details of reports could be generated. The context of the former variable includes human factors in performing the recording, whereas the context of the latter guides said human factors to produce accurate inventories. The variables – “Faults in the inventory can be easily diagnosed” and, “The inventory can recover missing/misled information in case of faults," which occupied 5th (0.75) and 6.5th (0.73) rank

respectively, were reinforcers that if there were faults, they could be identified and corrected, leaving no doubt that the system produced precise reports in real-time. As such, precision transparency and accountability were firmly established in the electronic system assuring the system's reliability.

Looking at the six (6) ISO 9126 principles, Figure 3 showed that the principles of "Reliability," "Efficiency," and "Usability" had the greatest variation in the pre-test and post-test means. This indicated that these three principles were highly valued by respondents who used e-AIMSS for asset recording and property inventory, even though all six (6) principles exhibited mean differences in excess of fifty hundred (0.50).

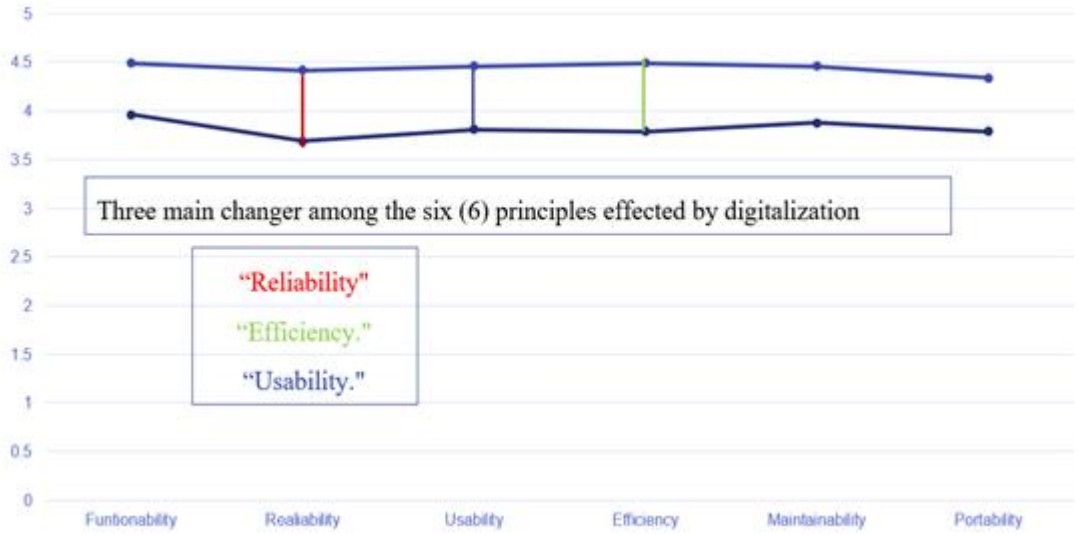

Figure 3. Variances Among Six ISO 9126 Principles

Figure 3 is supported by Table 2 which showed that three principles had the greatest means variance among categorized users. For teachers, reliability, portability, and usability mattered most while property custodians and school head chose efficiency, usability, and reliability. Thus, all users agreed that reliability, efficiency, and usability were the significant qualities that sets e-AIMSS apart from the current practice.

Table 2. User's Ranking on ISO 9126 Principles Based-on Means Variance

	Teachers	Property Custodians	School Head
Functionality	6	4.5	4
Reliability	1	3	2
Usability	3	2	3
Efficiency	4.5	1	1
Maintainability	4.5	4.5	5.5
Portability	2	6	5.5

A high level of participation is revealed too. During the pre-test, forty-one-point eighty-two percent (41.82%) of the 55 respondents were able to provide qualitative descriptive responses via the feedback and comment section of the survey. Meanwhile, in the post-test, this increased to seventy-two-point seventy-two percent (72.72%), with a variance of thirty-point ninety percent (30.90%). Of the seventy-

two-point seventy-two percent (72.72%), sixty-five percent (65%) expressed congratulatory and appreciative remarks, while twenty-two-point five percent (22.5%) anticipated continued system improvement, for a total of eighty-seven-point five percent (87.5) intended engagement and participation.

This can be attributed by the fact that while e-AIMSS provided the bill of property/assets entrusted to each employee which can be viewed anytime, reinforced transparent custody and movement of each item from one accountable person to another is enjoined. More so, the columns that showed the estimated useful life of the property versus its actual use as shown in Figure 4 kindled efforts for efficiency and accountability. During users' capacity building sessions, comments such as *"ay ang ganda, makikita na namin kung tapos na ang gamit at makakarequest na kami ng kapalit"* were heard. This also clearly demonstrated that the system expects engagement and participation from its users.

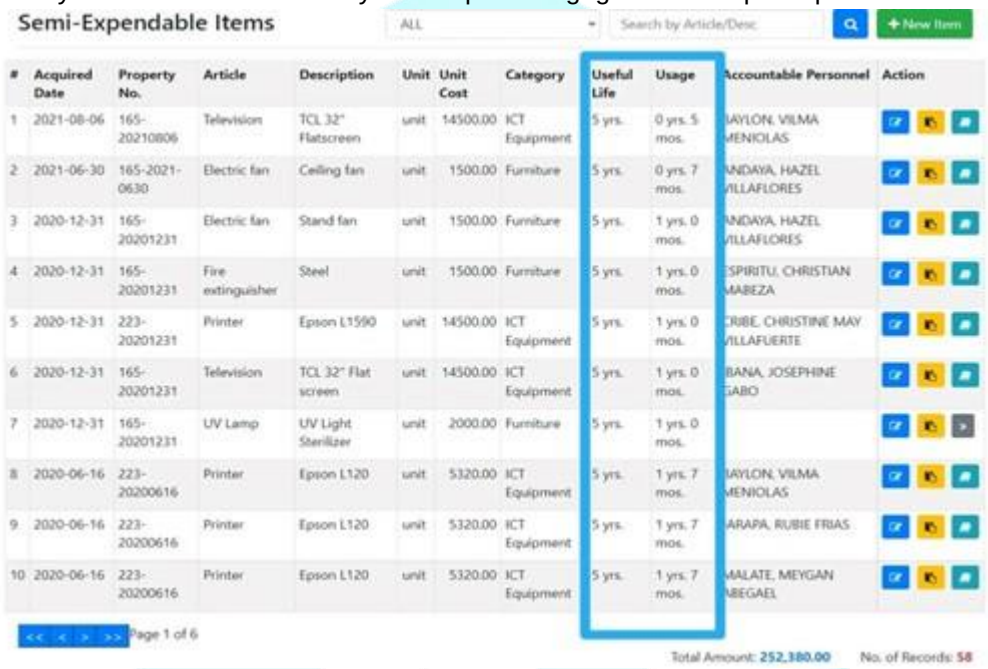

Figure 4. e-AIMSS Record Showing Estimated Useful Life and Actual Usage

The proof that e-AIMSS functioned successfully in non-IU schools confirmed that digitization would change the organization's bureaucratic landscape dramatically among IU schools. Delegation of authority by the principal to headteachers in terms of property management and budgetary allocations must not be exercised. This could result in a change of property management design from decentralized to centralized, or a customized inventory system will be designed especially for them that would perfectly fit their current organizational structure.

The grown-up values and discipline of the personnel on stewardship and the willingness to participate in new changes as projected by the figures in the previous paragraph are considered strengths to cultivate efficiency, uniform transparency, and accountability. These energies can be triggered to convert the attitude of being reactive to becoming proactive. Advancing its potencies shall escalate current practices in asset management into a higher ground of guardianship and custodianship of government assets. Capitalizing to develop these strengths by initiating related value-laden activities and programs can further optimize productivity and utilization of resources.

Since the system became accessible to all and then fueled by stakeholders' participation and engagement, the provision of property details had improved, resulting in higher quality and a larger supply of information such as the schools' assets summary properly categorized in the sum of pesos that can be generated from the system. As a result, this provided a platform for communication among school personnel. The system's "request and issuance" feature, which allowed the teacher-user to freely enter in their required supplies and resources, became an open communication channel. The inventory

process's reportorial form transformed into an operational perspective, fostering transparency, efficiency, accountability, and public trust.

After using e-AIMSS in managing assets, three overall indicators with a variance ranging from forty-nine percent (49%) to sixty-four (64%) had been raised to STRONGLY AGREE compared with the previous property management practices as seen in Table 3.

Table 3. Pre-Test and Post-Test Means Variance on the Three Overall Indicators

Description	Pre-Test		Post Test		Variance
	μ	Interpretation	μ	Interpretation	Post - Pre
OVERALL, the inventory addresses the management of school assets/resources to attain organizational efficiency, transparency, and accountability.	4.04	Agree	4.64	Strongly Agree	0.60
OVERALL, the inventory optimizes school resources/assets	3.96	Agree	4.60	Strongly Agree	0.64
OVERALL, the inventory contributes to the school's productivity.	4.07	Agree	4.56	Strongly Agree	0.49

Finally, the t-Test results in Table 4, where all the P-values are less than 0.05, demonstrated that the null hypothesis was rejected, and the alternative hypothesis was accepted. This indicates that e-AIMSS made a significant difference in the effects and impact of the inventory process for resource optimization and organizational productivity.

Qualitatively, forty (40) of fifty-five (55) gave their comments and feedback during the post-test. Sixteen (16) of them stated that *the e-AIMSS improved the current inventory practices compared to the current system such that they are now informed of the available materials in school and can request needed materials for the next school year, it will help to attain transparency and accountability of school assets/resources and supplies, is easy to access, needed to optimize school productivity", and, "secured government assets, a step up to make inventory more accessible and more updated in a technology-driven world";*

Ten (10) expressed their appreciation and approval, congratulating and acknowledging the CP Team for innovating and for a job well done; nine (9) demanded continued and immediate implementation of the project to other schools, while four (4) gave comments such as: "*supplies must be available in school", "give more time for familiarization of the system", "provide toolkits", "make a sustainability plan including the technical assistance team who can provide a prompt response in times of trouble in the utilization of the system"*; and one (1) suggested to "*provide delete key button"* for a wrong entry.

One important finding was that e-AIMSS worked well in schools with centralized structures. It did not fit well in a decentralized school where decisions and accountability were delegated by the principal to department heads.

"Yong issue namin, na pagtransfer or pag retire ng teachers, yong tracing, napakadali na na magagawa, the preparation of clearance, hindi na magtatagal. Andon na, isang click lang makikita na kung ano

property na kailangang hanapin for clearance" and, *"During the FGD, tinanong ako, kung i-aaprasie mo ang value ng iyong school, magkano? Nahirapan ako. Hindi ako makasabi kung magkano. Pero ngayon, with the use of e-AIMSS, isang click lang, pwede kong appraise ang value ng school, kung magkano ang value ng school. So napakalaki tulong ng e-AIMSS na ito. Tanungin man kayo, kaya nyo ng sagutin agad",* are key information noted from informants.

The e-AIMSS provided a significant change or impact on resource optimization and organizational productivity considering the six (6) principles of ISO 9126, a paired sample mean t-test was done with the margin of error set at 0.05.

Table 4. Result of t-Test – Paired Mean of Beta Test

	Mean		Variance		Pearson	P-Value
	Pretest	Post Test	Pre-Test	Post Test	Correlation	
Functionality	3.96	4.6	1.11	0.39	-0.162723	0.0003444
Reliability	3.69	4.416	0.756	0.50	-0.117605	1.459E-05
Usability	3.81	4.46	0.566	0.48	-0.12228	2.3E-05
Efficiency	3.79	4.49	0.716	0.49	0.036107	5.77E-06
Maintainability	3.88	4.46	0.45	0.41	-0.112427	2.276E-05
Portability	3.798	4.34	0.466	0.48	-0.20507	0.000167
OVERALL	3.828	4.44	0.50	0.384	-0.156181	1.384E-05
INVENTORY MANAGES ASSETS	4.04	4.64	0.89	0.35	-0.24276	0.000316
INVENTORY OPTIMIZE UTILIZATION	3.96	4.6	1.109	0.40	-0.162723	0.0003444
INVENTORY CONTRIBUTES PRODUCTIVITY	4.07	4.56	0.96	0.77	-0.19971	0.007163

CONCLUSION

In conclusion, the study answered the reason why inventory management systems are rarely employed in schools. The deployment of e-AIMSS supplemented the manpower and capacity requirement of a desirable school property accounting which can be done quickly to produce accurate results and can recover missing/misleading information in case of faults and errors, with transparency, efficiency, and defined accountability. The collaborative and innovative transformation of asset and property inventory in schools using ISO 9126 principles generates positive citizen-centric evidence-based outcomes. The formerly reportorial inventory procedure has transformed into an operational stance, fostering transparency, efficiency, accountability, and public trust.

In the process of considering whether to engage in outsourcing for the purpose of reducing cost and transferring risk, it is suggested that assessing the system is a highly intricate task, demanding significant construction expenses. In cases where the organization possesses capable individuals, there exists the option of selectively recruiting them to meet technological knowledge prerequisites. This selected group of personnel can be organized into a team of software developers who possess a heightened awareness of the requirements, enabling them to adeptly adapt to tasks and ensure alignment with organizational culture in safeguarding data.

It is suggested that the ISSO model, in conjunction with the Logical Framework that guides the project's budget works, resources, output, and outcome and with Waterfall Model in designing an electronic system, as used in this capstone, be examined further in designing homegrown electronic organizational processes.

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