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Designing Stakeholder Engagement Framework for Technology Leadership Competencies

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Abstract: The emergence of technology is intensifying and changing the realm of education, thereby calling for a new leadership approach to champion change. This study identified the technology leadership competencies of people in key positions from selected public and private senior high schools in the National Capital Region and are offering a technology-vocational-livelihood track with the Information and Communications Technology (ICT) strand; described the challenges and recommended a framework for technology leadership competencies. A qualitative research method using a phenomenological approach was employed with triangulation as a data-gathering technique. Results show competencies identified were on: leadership and vision (support initiatives for state-of-the-art and collaboration with other institutions); teaching and learning (implement blended/ flexible learning, use of differentiated instruction); productivity and professional practice (collaborate using technologies, continuing professional development); support, management and operation (policy implementation, technology resource maintenance); assessment and evaluation (initiate technology innovation, data management); and social, legal and ethical issues (promoting data privacy, appropriate electronic waste disposal). Financial constraints, limited facility, computer illiteracy, minimal administrative support for a number of respondents, and limited time appeared to be the challenges. The technology leadership competencies and the challenges pointed out the areas necessary for the development of the framework. These areas are **V**ision, **U**tilization, **Mo**tivation, **Co**llaboration, and **S**ustainability. VUMoCoS framework was formulated for technology leadership competencies in the Philippines.

Keywords*:* Technology Leadership Competencies, Stakeholder Engagement, Technology Engagement, Technology Leadership Framework, VUMoCoS Framework

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INTRODUCTION

Changes in society are evolving at a dizzying pace. Successfully managing this tension won't come simply from resourcing a technology function (Distefano, 2018) but it requires a new way of doing things and a leadership mindset to champion change. School leaders must not only adapt to this new milieu but also change the way they lead their people. K-12 leaders must understand the new educational terrain since global education and technology have altered the landscape of what learners know and how they learn (Papa, 2011). Technology leadership competencies are an edge in the K-12 competitive environment.

It was reported in the Global Leadership Forecast 2018 that 50% of the 25,812 leaders all over the world were leading through technology (Dettman et.al 2018). These leaders which they called "the pioneers" outperformed the organization with less technologically capable leaders, "the laggards" who underperformed others by -28% in financial measures.

In Asia, the Microsoft Asia Digital Transformation Study surveyed 1,494 business leaders, including 111 from the Philippines. 86% of those in the country believe that they need to transform technologically to enable future growth and that new insights can lead to revenue streams for their organizations. The transformation journey for most organizations in the Philippines is still in its infancy because only 32% of these leaders have a full digital transformation strategy (Microsoft Philippines PR Team, 2017).

If this is the scenario for both private and public educational institutions, it is considered that technology leadership competencies are a big call for Filipino school leaders; because this can be an edge to respond to the call of catering to the need for delivering the necessary skills expected among the 21st-century educators and learners. But how can these be demonstrated if there are no specific technology leadership standards that these leaders should put into practice? In the country, what was only developed is the National ICT Competency Standards for Teachers (Commission on Information and Communications Technology, 2012). Some Filipino researchers (Diaz, 2016; Ronato, 2015) attempted to identify the technology leadership competencies of school leaders; but there were no attempts of elevating the results into the development of technology leadership competency standards and framework for the country.

In this sense, this research identified how people in key positions from the selected public and private schools in the National Capital Region (NCR) described their technology leadership competencies in terms of leadership and vision; learning and teaching; productivity and professional practice; support, management, and operations; assessment and evaluation; and social, legal, and ethical issues; the challenges they encountered and on these bases, formulated the framework for technology leadership competencies.

TECHNOLOGY LEADERSHIP COMPETENCIES

With the emergence of technology, leadership styles, and competencies also changed. In fact, "Technology has a powerful impact on every aspect of our lives (Arians, 2017). At a high management level, technology can be one of the most useful tools to help one become a better leader. It is the driving force behind the new style of leadership which embraces change, learning, communication, and diversity."

Technology leadership competencies areas evolved as time pass by. Many countries designed their technology standards not only for school leaders but also for students, and teachers. The following table shows how areas of technology leadership competencies changed and what areas in this leadership were introduced in the Philippines.

As shown in Table 1, Filipino researchers (Ronato, 2015 and Diaz, 2016) identified areas of technology leadership competencies in the country by which some (Vision and Professional Development for Ronato; Technology Operations and Concept and Social and Ethical for Diaz) were closely the same with the standards of ISTE. The latter's components being more comprehensive was the rationale for the areas to be considered in this study.

The Commission on Information and Communication Technology (CICT) was in-charge of developing technology competency standards in education. The ICT competency standards for teachers were already established but there were none yet for school administrators or leaders, hence this study.

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Table 1

Areas of Technology Leadership

Author/s or Proponent/s	Areas of Technology Leadership
International Society for Technology in Education Standards: National Educational Technology Standards-Technology Leadership (2001b)	– Technology Operations and Concepts – Planning and Designing Learning Environments and Experiences – Teaching, Learning, and the Curriculum – Assessment and Evaluation – Productivity and Professional Practice – Social, Ethical, Legal, and Human Issues – Procedures, Policies, Planning, and Budgeting for Technology Environments – Leadership and Vision
International Society for Technology in Education: National Educational Technology Standards for Administrators (2002)	– Leadership and Vision – Learning and Teaching – Productivity and Professional Practice – Support, Management, and Operations – Assessment and Evaluation – Social, Legal, and Ethical Issues
International Society for Technology in Education: National Educational Technology Standards for Administrators (2009)	– Visionary Leadership – Digital-Age Learning Culture – Excellence in Professional Practice – Systemic Improvement – Digital Citizenship
Ronato, Hermito E. Jr. (2015) (Philippines)	– Vision – Innovation – Collaboration – Goal Orientation – Motivation – Planning and Budgeting – Team Building and Staffing – Professional Development
Diaz, Sergio S. Jr. (2016) (Philippines)	– Technology Operations and Concept – Social and Ethical – Pedagogical – Professional

TECHNOLOGY FRAMEWORK

The technological and scientific revolution is one of the defining features of modern human history. We cannot imagine today's world without the technologies of communication via mobile and cordless phones, tablets, and computers. Educational systems in many countries throughout the world use them for pedagogic purposes, to adapt to the learning processes of the 21st century.

As such, engagement with ICT and technology as elements of human culture has been deemed the prerogative and goal of every individual, independent of his or her occupational needs. While ICT and technology are significant from an economic perspective, they also form an integral part of a broad-based liberal education (The Aharon Ofri MASHAV International Educational Training Center or METC, 2018).

Technology really can be a powerful tool for transforming learning. It can help affirm and advance relationships between educators and students, reinvent the approaches to learning and collaboration, shrink long-standing equity and accessibility gaps, and adapt learning experiences to meet the needs of all learners (U.S. Department of Education, 2017).

The use of ICT can support new instructional approaches and make hard-to-implement instructional methods such as simulation or cooperative learning more feasible (Chang & Wu, 2012). Educators commonly agree that ICT has the potential to improve student learning outcomes. Integration has a sense of completeness or wholeness, by which all essential elements of a system are seamlessly combined to make a whole.

Table 2

Constructs/Stages Used in the Models of Technology Utilization

Model/Framework	Developed By	Year	Constructs/Stages
Technology Acceptance Model (TAM)	Davis	1989	Perceived Usefulness and Perceived Ease of Use
Model of PC Utilization	Thompson et.al	1991	Job-Fit, Complexity, Long-Term Consequences, Affect Towards Use, Social Factors, Facilitating Conditions
Extended Technical Adoption Model (ETAM)	Venkatesh & Davis	2000	Social Influence Processes (subjective norm, voluntariness, and image) and cognitive instrumental process (job relevance, output quality, result demonstrability, and perceived use)
Unified Theory of Acceptance and Use of Technology (UTAUT)	Venkatesh et.al	2003	Unified Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions
Computer Technology Integration Five-Stage Model	Toledo	2005	Pre-Integration, Transition, Development, Expansion, Systemwide Integration
Structural Equation Model (SEM)	Lai	2013	Perceived Usefulness, Attitude to Technology Use, Learning Motivation, Self-Regulation, Computer Efficacy, Facilitating Conditions, Education Compatibility, Social Influence, Situated Interpretation, Learning Approach
Knowledge-Innovation Matrix	Gregor & Hevner	2015	Invention, Exaptation, Advancement, and Exploitation
Technological, Pedagogical, and Content Knowledge (TPACK)	Phillips	2015	Technological Knowledge, Pedagogical Knowledge Content Knowledge, Technological/Pedagogical Knowledge, Pedagogical Content Knowledge, Technological Content Knowledge

Note: Some data came from Sharma & Mishra (2014)

However, to realize fully the benefits of technology in our education system and provide authentic learning experiences, educators need to use technology effectively in their practice. Education stakeholders should commit to working together to use technology to improve education. These stakeholders include leaders; teachers, faculty, and other educators; researchers; policymakers; funders; technology developers; community members and organizations; and learners and their families (U.S. Department of Education, 2017).

To understand the models/frameworks of utilizing technology the summary is shown in Table 2. It shows that constructs and stages change as time goes by. It is a call for researchers to continue developing frameworks of technology utilization responsive to our dynamic environment.

But, developing a framework or model for utilizing technology in education is a very challenging task. This requires deep knowledge, understanding, and experience in the use of technology. Moreira, Rivero & Alonso (2016) found that teachers in their study who developed a model of intensive educational use of ICTs were the ones with many years of professional experience, make regular use of ICTs, and perceive themselves as sufficiently trained and with a highly developed digital competency.

METHODOLOGY

Using qualitative research design, data were gathered from the thirty (30) school heads/principals and coordinators of the ten (10) participating public and private schools in the Department of Education (DepEd) Division of Muntinlupa and Las Piñas for the School Year 2018-2019. The majority were female, 31-40 years old, and served in their position for about five years. Senior high school in the Philippines commenced only in June 2016.

Triangulation composed of Focus Group Discussion (FGD), observations, and documents/artifacts were utilized together with the tools: consent forms, observation form, interview schedule, and recording instruments (notebook, pens, cellphones, digital camera, and similar). Data obtained from FGD were first transcribed, coded, and reduced. Then, thematic analysis was undertaken while utilizing the information obtained from observations and documents/artifacts as confirmatory data.

RESULTS AND DISCUSSION

TECHNOLOGY LEADERSHIP COMPETENCIES

1.1. LEADERSHIP AND VISION

IDEAL AND/OR THE REAL

Good leaders always dream or desire the best for their people and the institution he serves. When the participants were asked about a dream for their school concerning technology, they shared a technology-enriched school community that was still far from the real situation of their school as documented during the observations (Table 3).

The majority of the responses were a desire of having digital and multimedia facilities (9 or 21.95%) in school. Education World (2020) reflected the principal's dream school from the 20 Principal-files. In their report, it was shown that these school leaders see their school in the future as rich in technology facilities where students and teachers can easily manage their data.

No school leader would not desire the best facilities for their school. And nowadays, technology facilities are the best that a school can offer to their stakeholders to cope with the rapid change in the educational system. Without this, it is hard for educators to incorporate technology into the teaching and learning process.

The main purpose of incorporating technology into schools is to change how teachers and students gather, access, analyze, present, and transmit information for this can democratize information in classrooms, as well as help, differentiate instruction (Waddell, 2015). As a technology leader, he/she must be able to foresee the provision of the best technological facilities for the school.

Table 3

Participants' Dreams in Relation to Technology

Participants' Dream (# of responses)	Schools' Real Situations
1:1 Ratio of Computer to Student	1:6 ratio of computer to student
1:1 Ratio of Computer to Student	1:3 ratio of computer to student
Advance Equipments	Outdated Equipments
Automated Operations (2)	Manual Operations
Classroom of a Future (3)	Classroom of the Past
Creation of Useful Computer Programs	Creation of Usual Computer Programs
Digital and Multimedia Facilities (9)	Limited or not available for use
Information Technology Community (2)	Selective IT community
Internet Connection (2)	No Internet Connection
Online Access to All Information (5)	Manual or No Access to Information
Paperless Environment (3)	Paper more Environment
Technology Updates (5)	Outdated Facilities and Training
Technology Competent/Equipped (5)	Computer Illiteracy of Seasoned Teachers
Technology Maximization	Using technology only when encouraged

BUILDING BRIDGES: AN INITIAL STEP

The majority agreed that technology vision is possibly achieved if they will be *partnering* with other institutions. Doing this will also make school leaders effective. This is what the University of San Diego (2019) emphasized when they published that effective school leaders build and sustain reciprocal family and community cooperative relationships and leverage partnerships to cultivate inclusive, caring, and culturally responsive school communities. Partners can be of help with the needed technology facilities for a classroom of a future where Information and Communications Technology (ICT) is integrated.

By building connections, the school leaders will be able to acquire funding opportunities for technology-related facilities and professional continuing development, provide hands-on experiences for teachers and students by visiting partner companies, and update available resources and skills. A partnership is the best technique that a technology leader could do to build connections with others.

CLASSROOM OF THE FUTURE FOR AN IT SCHOOL COMMUNITY'S CULTURE

In the classrooms of the future, teachers would not be limited by physical space or location. Rather, they'll have the ability-through remote access technology and online screen-sharing options to teach from anywhere (In-Service Guest Blogger, 2018).

For Lynch (2017), classrooms of the future need to secure spaces where technology can be kept; and students have a 1:1 ratio with the technology. IT community is dedicated to the continuous improvement of the facility management profession through exploration and analysis of technology tools, solutions, and methods and educating and communicating these findings to the profession (International Facility Management Association, 2019). Participants envision a classroom where technology facilities are complete and enriched with technology devices that can be utilized by teachers as teaching aids or instruments necessary for meeting K-12 technology skills requirements not only for students but also for teachers. Technology leaders don't just dream and always strive to develop a school community with ICT-augmented classrooms.

FINANCIAL AND ADMINISTRATIVE SUPPORT: HOPE FOR REALIZATION

U.S. Department of Education (2017) suggested in their National Education Technology Plan to develop funding models and plans for sustainable technology purchases and leverage openly licensed content while paying attention to eliminating those resources and tasks that can be obsolete by technology. This is a very good suggestion for school leaders in the Philippines because technology devices are costly and keep on upgrading. Not only financial allocation but also support from the administrative body are considerations.

In public schools, the Department of Education (DepEd) has the power to boost technology integration. In private schools, the owner or the school directors and administrators must identify the needed technology facilities and be able to provide this for the stakeholders. Mwawasi (2014) believed that school leaders should facilitate increased access to ICT facilities for teachers and enable them to explore various ways of integrating ICT into teaching and learning. As support to their teachers, they lead by example and practice a high level of technology leadership so that they can also help their people to have a high level of acceptance (Wei et.al., 2016) of the technology resources available.

1.2. LEARNING AND TEACHING

SOFTWARE-BASED INSTRUCTION: WAY TO PROCESS DATA IN EDUCATION

Data revealed that the school leaders (interviewees) mostly utilized different software or computer programs in teaching and learning such as *SPSS, eco-stat, GPS, GIS (STEM),* c++, vb.net, java, HTML, notepad, hardcoding, photoshop, SQL server, Toonboom and adobe flash, publisher, Eclipse, Netbeans, PHP, tourist attraction, AutoCAD, Sketch-Up, etc (specialization), Quipper, EDMODO, social media (FB), messenger, Google Classroom (online classes), MS Math and Geogebra (Mathematics). All the participants utilized basic office applications such as Microsoft Word, Excel, and Powerpoint. The results agreed with the report of Quick Base (2020) that Microsoft Office is the most common application software program used by millions every day.

TECHNOLOGY-INTERACTIVITY

Participants facilitate activities for students which support the use of technology inside the classroom despite the limited facilities available in the school. Common activities employed either in the classroom or school are animation, assembly and servicing, creating film and blogs, empowerment technology, field trips, Google Classroom and Edmodo, Media Information Literacy, Programming, and Powerpoint presentation. A number added EPASS or electronic products and Turnitin for checking students' papers. As a technology leader, he/she always initiates technology-enriched activities for the learners.

COLLABORATING TECHNOLOGY IN INSTRUCTION

Collaboration helps expand access to education and with it, schools can reach more students. Using video and online instruction can also be as effective as traditional face-to-face interaction (Gallegos, 2018). Since the participants are doing this in the classroom, they will be able to transform how students are engaged in the classroom activities. As technology is increasingly used in the educational process, it is becoming a more powerful tool in putting multiple intelligences to use (Dimick, 2016).

The association of technology while accommodating the multiple intelligences and learning styles brings benefits because teachers' and students' abilities are developed and showcased. Sample responses were the use of Google docs, Physics simulation, Kahoot, snake craze, a calculator program, "Who wants to be a millionaire", and e-games. All technology leaders ensure technology-integrated instructions in every aspect of the teaching and learning process.

1.3 PRODUCTIVITY AND PROFESSIONAL PRACTICE

COLLABORATION THROUGH TECHNOLOGY ADOPTION

Collaborative learning is even more pervasive within K-12 schools and advances in digital and mobile technology (Hayes, 2017). It is the educators' job to leverage the collaborative tools in the classroom such as technology which is used to communicate with anyone, anywhere, and anytime through the simple click of a button (Martino & TeachThought Staff, 2019).

The participating school leaders mostly utilized online collaboration by the use of social media such as Facebook, chat groups, and messenger; taking LAC (Learning Action Cell) sessions related to subjects taught, joining Microsoft community, and email. Some used webcasting and video conferencing to communicate, collaborate and attend seminars and training. The latter appears to be the most prevalent continuing professional education. Planning and developing technology-supplemented professional development activities for teachers are the best techniques that a technology leader can do to strengthen collaboration.

CONTINUING PROFESSIONAL DEVELOPMENT

Respondents participated in technology-related seminars and National Certification (NC II, NC III, NC IV), training, conferences, and advanced higher education (graduate programs) and still, some acquired Training Methodologies (TM). These continuing professional developments are mostly related to the use of technology, a good manifestation of involvement in activities where technical knowledge is updated to improve productivity as well.

Webster University (2018) provided opportunities for educational leaders to be involved in planning professional development experiences. This means that every school leader must not only pursue this activity for themselves but also create a professional development plan for their people, specifically for the teachers. Professional development training programs for teachers played a key role in enhancing students' quality learning (Ghavifekr & Rosdy, 2015). As technology leaders, they must be able to provide activities for their stakeholders to become not only updated with technology but also become skillful in utilizing them for performing their educational roles.

1.4 SUPPORT, MANAGEMENT AND OPERATIONS

Educational leaders in this criterion are expected to ensure the integration of technology in supporting productive systems of learning and school administration (International Society for Technology Education, 2002).

UTILIZATION OF TECHNOLOGY: UPHELD BY POLICY AND FACILITY

Policies of the participating schools include the use of RFID (1), online registration (1), license computer programs (1), Bundy clock (1), biometrics (5), face ID (1), and automated machines for entrance and exits of the school. The technology-related facilities to apply said policies include CCTV cameras (9), printers (10), monitors (10), computer laboratories (10), projectors (10), scientific calculators (1), digital devices for Physics and Chemistry laboratories (1), Wifi (8), Digital devices in the clinic (1), engine simulator (1), Biometrics (6), an elevator (1), and digital long screens for announcements (1).

School leaders need to facilitate increased access to technical facilities for the teachers, support and enable them to explore various ways of integrating these facilities into teaching and learning (Mwawasi, 2014). The school's facilities must be utilized properly, and training must also be provided for the users to become knowledgeable about its use.

TECHNOLOGY RESOURCE MAINTENANCE: THE DUTY OF THE PERSONNEL AT HAND

The majority of the participating schools have property custodians. Two schools identified departments assigned for monitoring. Effective use of technology resources (Eristi, Kurt & Dindar, 2012) requires not only proper

integration but also proper utilization and maintenance.

Appears to be improper that students will be taken charge of maintaining these facilities, as that practice was shared by one school, even though students have to be taught to use it with care. School's technical supports need to be enhancing Internet and computer facilities (Azlim, Amran, & Rusli, 2015).

Technical support workers manage, maintain, and repair IT systems, and their responsibilities include diagnosing and repairing faults, resolving network issues, and installing and configuring hardware and software (Betterteam, 2019). Technology school leaders guarantee support workers for technological aspects of the school's system.

1.5 ASSESSMENT AND EVALUATION

In the 21st century, educational leaders must be capable of utilizing technology to assess students' learning and to evaluate the state of education not only for students but most importantly for teachers.

ASSESSMENT AND EVALUATION, FACILITATED WITH TECHNOLOGY UTILIZATION

Commonly utilized were Google Forms, Keeper Classroom, Edmodo, and Google Classroom. One participant used Scantron for checking test papers. In public schools, the e-class record was employed for keeping and computing students' performance. These are indicative of varied ways to employ technology in assessing and evaluating performances in school for both students and teachers.

Effective technological leaders must administer procedures for measuring the growth of each teacher (Chang and Wu, 2012), and even for students. One way of doing this is to make use of the available technological resources which are mostly technical. As a technology leader, s/he can utilize technology in the conduct of assessment and evaluation.

TECHNOLOGICALLY MANAGED DATA AND INFORMATION

School administrators must evolve into leaders who use data and information to lead and maybe inspire teachers and parents to support educational goals and objectives (Picciano, 2014). Participants mostly utilized the MS Excel application to manage school, students, and teachers' data. Some utilize online portals to store personal data sheets and students' grades, Biometric for attendance monitoring, and others used computer applications (Kit Application).

One school stored lesson logs, activity sheets, ratings, and evaluations in EDMODO. Effective technology integration can be achieved by simply choosing a type of technology activity (Phillips, 2015) relevant to the need. Being a technology leader means ensuring all school data and information are technologically managed.

INITIATE TO INNOVATE

Participating school leaders innovated their usual practices in education in the field of monitoring employees' attendance (biometrics instead of logbooks), teaching students (combination of online and face-to-face teaching), communicating with people (use of social media), registering or enrolling students (online instead of manual registration), and evaluating performance (online evaluation).

These were all implemented by the leaders in the advent of technology in school. They were willing to accept changes and trends to cater to the needs of their stakeholders. Technology changes fast and so with the ability to implement and introduce changes in the school. Sheninger (2014) emphasized the need to acknowledge societal changes and embrace them recognizing the importance of keeping up to date (Hail, 2018). In response to this, technology leaders must be able to initiate technology innovation within the school community.

1.6 SOCIAL, LEGAL, AND ETHICAL ISSUES

Social, legal, and ethical issues on technology are significant concerns of all technology leaders. As they become technologically skillful leaders; they ensure that these three (3) aspects are not taken for granted.

DATA PRIVACY: PRACTICED, TAUGHT AND PROMOTED

The most common practice to promote data privacy is to constantly discuss and remind the students and teachers about it in different areas sometimes through chat groups. All data about students and even teachers are kept in school and disclosed only to authorized persons. School leaders consciously observe this and promote it religiously among students and teachers alike.

PROMOTING APPROPRIATE ELECTRONIC WASTE DISPOSAL ACTIVITY

Public schools have supply officers who are in charge of disposing of electronic waste. But still, these officers could not just throw away these wastes because only the DepEd Material Resource Facility has the authority to do it. The private schools have unique ways of electronic waste disposal because the majority of them have identified agencies or departments assigned to disposing of e-waste (ITM for PUSM-D, IT Department for PUSM-E, PRSL-I, and PRSL-J). Others recycle these wastes for as much as possible.

Instead of disposing of e-waste, recycling is more encouraged because as Leblanc (2019) reported, old electronic devices contain toxic substances such as lead, mercury, cadmium, and chromium; proper processing is essential to ensure that these materials are not released into the environment.

In addition, Leblanc (2019) said that e-waste is a rich source of raw materials like gold. As technology leaders, s/he must be able to apply the most appropriate e-waste disposal to protect humans and the environment.

CHALLENGES IN TECHNOLOGY ENGAGEMENT

Financial constraints made the stakeholders' technology engagement most challenging. They cannot build the necessary technological infrastructure, in the acquisition of devices with updated features needed, low bandwidth internet providers, and cannot buy new computer applications.

This concern contributes to the problem of limited facility and space (few types of equipment for multimedia applications and K-12 faculty compete with higher education students for use), requisitions become obsolete before they can be budgeted, computer illiteracy (scarce funding for training especially of the traditional teachers who do not know even the basic office and would rather ask younger ones or fresh graduates to help them), limited time (teachers were overloaded with teaching and clerical works), and administrative support (either indifference from the administration or if willing to support but budget is limited).

Budgetary bear on matters most if a school leader wants his/her people to be technologically engaged. Truly it would require a lot of creativity on the part of school leaders to be able to source funds and be able to address preceding enumerations such as physical infrastructure and technical support that will make ICT accessible and useful for students, teachers, administrators, and support staff as stated in the ICT Plan for the 21st century (Rosas, 1997).

FRAMEWORK FOR TECHNOLOGY ENGAGEMENT

Identified competencies for each area are shown in Table 4. There are five competencies in leadership and vision; six in teaching and learning; four in productivity and professional practice; four in support, management, and operations, four in assessment and evaluation; and four in social, legal, and ethical issues.

These competencies were regrouped and combined in a meaningful thought as exhibited in the 7th column. Five colors were assigned to easily identify how each sub-competencies emerged to form areas of technology leadership competencies. They are Vision (Purple), Utilization (Blue), Motivation (Yellow), Collaboration (Orange), and Sustainability (Green). These major areas of competencies served as the main component of the developed framework (see Figure1) for stakeholders' technology engagement named VUMoCoS.

Furthermore, columns in Table 4 were presented reflecting the origin or from where each sub-competencies were identified among the technology leadership competencies of ISTE (2002).

The pattern of identified competencies established the framework of technology leadership competencies of school leaders. Thoughts and ideas shown or seen from each of the identified competencies were combined into recognizable ideas including the colors and shapes. These were enumerated and a new set of major areas of competencies (the VUMoCoS) became the basis for developing the framework.

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Table 4.

Technology Leadership Competencies and Sub-competencies (Color Coded)

LEADERSHIP AND VISION	TEACHING AND LEARNING	PRODUCTIVITY AND PROFESSIONAL	SUPPORT, MANAGEMENT, AND OPERATIONS	ASSESSMENT AND EVALUATION	SOCIAL, LEGAL, AND ETHICAL ISSUES	TECHNOLOGY LEADERSHIP COMPETENCES
Build bridges by partnering and making connections with other institution to realize the schools' technology vision.	Make use of computer programs or software to support teaching instruction.	Encourage employees to collaborate with others using technology.	Create and implement policies on the use technology not only in teaching and learning but in all schools operation.	Utilize technology in formative and summative assessment.	Apply and promote data privacy to all stakeholders.	*Educational leaders...* •Support and implement a shared vision of comprehensive use and acquisition of technology resources for teaching and learning among stakeholders. •Advocate for policies and programs to support the implementation of the
Envision a classroom of the future rich in technology devices and an IT school community.	Conduct and support technology-based classroom activities and programs.	Provide and support technology-related continuing professional education or development.	Provide technology-related facilities for the school.	Evaluate students and teachers' performance using technology.	Dispose electronic waste properly.	•Promote and model intensive, frequent, and effective utilization of technology resources in instruction, evaluation, and data management. •Advocate for policies and programs to support the implementation of the technology-infused vision.
Allocate finances for technology-related facilities and programs for all the stakeholders.	Apply technology-collaborative activities during the teaching and learning.	Participate in a technology-enriched professional development and activities.	Allocate technology resource maintenance or personnel who will monitor, check, clean, and upgrade technology resources; and replace these resources in terms of defects.	Manage all the school-related data and information using technology.	Recycle electronic waste to help save the environment.	•Ensure on-going professional growth in technology fluency and inclusion of digital devices in educational endeavour. •Advocate for policies and programs to support the implementation of the technology-infused vision. •Empower educators to enhance digital literacy by providing technology-related facilities & supporting technology-imparted trainings &development.
Support all initiatives to achieve the technology vision.	Use differentiated technology instruction to cater the learner's multiple intelligences and learning styles.	Collaborate with learners and employees using technology	Designate a department in school responsible for all technology-related facilities.	Initiate technology innovation for the development of the school and its stakeholders.	Designate a department responsible for electronic waste disposal.	•Initiate effective collaboration or social interaction among stakeholders using digital tools. •Stay abreast of the emerging trends by engaging with technology-instilled continuing professional development. •Support the stakeholders in learning effective use of technology.
Update the technology-related facilities, curriculum.	Implement blended learning using technology.					•Sustain a vigorous technology resource maintenance by allocating personnel in-charged of monitoring, and upgrading technology resources. •Uphold with legalities regarding proper use of technology tools and devices; and disposal of e-waste. •Promote, initiate, and institute safe and ethical use of technology tools and information. •Sustain and continuously improve the educational institution through the effective use of technology resources.
	Encourage learners to collaborate with others using technology.					

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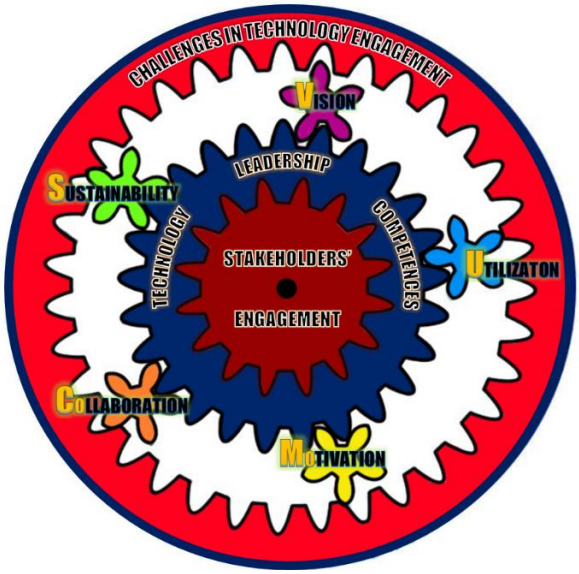

Figure 1. VUMoCoS Framework

Figure 1 presents four (4) different sizes of gear to represent the framework for stakeholders' technology engagement. Gears were chosen to symbolize the word "technology". The small gears colored purple, blue, yellow, orange, and green represent the five (5) major areas of technology leadership competencies of school leaders identified from the gathered data namely: Vision, Utilization, Motivation, Collaboration, and Sustainability (VUMoCoS). The medium size gear at the center of the model represents the stakeholders' technology engagement having 16 cogs (original course offering of the institution) and representing the institutional mandate's logo. The outer gear of it has 16 cogs inside and 25 (5 major competencies multiplied by 5 teeth for each competency) outside characterizing the base of the five major areas which are named "Technology Leadership Competencies". It is colored dark blue as it symbolizes strength (Chapman, 2017) and competencies (McLeod, 2016).

The biggest gear was colored red which symbolizes fire, anger, and danger (Chapman, 2017). It is pinned inner and represents the challenges or problems encountered by the school leaders in the technology engagement. The inner gear continues rolling the five major competencies of technology leadership along with the different challenges that were or may be encountered to utilize technology. The challenges mentioned by the participants that sometimes hinder them to use technology were financial incapability and lack of facilities. It is also one of the hindering factors for Metro Manila teachers to become ICT competent (Elazegui, Ranay, & Ching, 2016). In this study, these challenges inspired the participating school leaders to find ways for them to be still engaged and be updated with the use of technology. One school did this by asking for donations.

> **"** I think finances are needed to achieve this because, at this point, technology is not cheap. As time goes by, technology is upgrading, and innovating every day. We don't know if there are discoveries now and it is always valued by money. We cannot easily buy these things without money. Of course, we have donations! But the financial capability of a school is still different and here …, it's important to have sponsors for that!"

Financial incapability challenge is probably the easiest way to look for solutions and having solutions for this will lead to solving a problem of lack of technological facilities. As these and other challenges occur, technology leadership competencies and stakeholders' engagement will have a connection as designed in the model.

The five major technology leadership competencies played a very significant role for these gears to continue moving. School leaders always envision for technology school community; utilize technology devices skillfully, collaborate with others, motivate, and sustain the technical facilities of the school. Three of these identified

competencies (Vision, Motivation, and Collaboration) (Ronato, 2015) together with the other ICT competencies are expected of a teacher in the Philippines.

These were manifested also by the participating school leaders; which means that if teachers are expected to be competent in vision, motivation, and collaboration; the more that it should be with school leaders.

VISION - In the figure, its gear is colored purple with 5 teeth (representing the 5 major areas of identified technology leadership competencies). In color psychology (McLeod, 2016), this color symbolizes ambition and faith. As technology leaders, they must be able to dream of a technology-rich school environment and be able also to support their stakeholders in achieving it.

UTILIZATION - Its color signifies competencies and intellect. The school leaders can use technology skillfully. From the technology leadership competencies in Support, Management, and Operations; were created. But here, its focus is more on the technical skills aspect. As technology leaders, they must be the first to know and have skills in using different technology devices available in school so that they can support their stakeholders; and be able to lead by example (Jennstal, 2014).

MOTIVATION - It is colored yellow symbolizing energy and happiness (Chapman, 2017). The school leaders can encourage their stakeholders and create excitement among them by engaging with the use of technology. Ronato (2015) also identified this technology leadership competency and claimed to contribute a positive effect on technology utilization for teaching.

COLLABORATION - Its color symbolizes friendliness. A technology school leader utilizes technology to collaborate with all his/her stakeholders (teachers, parents, students, administrators, support staff, school leaders, etc.). A leader can interact with others with the use of technology (Ronato, 2015).

SUSTAINABILITY - Its color means quality and nature. This competency was different from the previous study on technology leadership competencies in that it enables the school leaders to make use of the technology resources and facilities of the school for a long time while considering the positive and negative effects on people and the environment.

CONCLUSIONS

Educational technology leaders had a great desire for widespread technology integration not only in the classroom but also in the school community. They were willing to employ varied ways to reach the realization of the schools' technology vision but, they lacked competencies in terms of technology plans. These leaders also supported technology use in teaching and learning; management, and operations; and assessment and evaluation which implied their competencies in the proper and skillful utilization of technology. They were also committed to improving collaboration by participating in technology-related continuing professional development and activities regarding technology. They also upheld legalities with data and information and advocate for saving the environment by proper disposal of electronic waste. Educational technology leaders were technologically competent in terms of Vision, Utilization, Motivation, Collaboration, and Sustainability. These major areas of technology leadership competencies were manifested to influence their stakeholders to be technologically engaged as well. Despite the different challenges they faced; they still devoted serious efforts to using technology to meet the 21st century standards for education and exercised resourcefulness. The challenges encountered together with the technology leadership competencies that were identified made the VUMoCos framework more meaningful. This framework implicates a need for further identifying the technology leadership competencies of Filipino school leaders, comparing them with the international standards, and finalizing the technology leadership standards for school leaders.

Considering the foregoing, it is recommended for the school administrators to create and implement a clear technology plan for their school to achieve the vision for technology use. The model developed in this study can be

utilized by school administrators to engage their stakeholders in the use of technology. The technology leadership competencies crafted in this study can also be utilized by the Commission on Information and Communications Technology (CICT) as the basis for developing technology leadership standards for school administrators in the Philippines. They can pattern the technology competencies revealed in this study for developing specific competencies in the standards.

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