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Development of AI-Enhanced Information Technology Program: Preparing Today's Students in AI Era

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Abstract: The Commission on Higher Education (CHED), which oversees higher education institutions (HEIs) in the Philippines, mandates HEIs to contribute to nation building by producing experts, knowledge, and technological innovations that can be resources for long-term development processes in a globalized context. In this light, St. Paul University Philippines (SPUP) considers rethinking its curricula by developing an Artificial Intelligence (AI)-Enhanced Information Technology (IT) Program foreseeing what is certain to be an outpouring of student interest about AI. This "AI-enhanced program" for "AI-driven world" anchored with spiritual dimension of mankind and the core values of the University, has been developed in a way that it leaves a legacy of positive impact to humanity. The program is values-oriented, underpinned with quality Catholic Paulinian education sealed with the indelible identity of Christ-centeredness in the form of articulation of learning outcomes through Paulinianism; commission in forming global citizens; charism in terms of internationalization of the curriculum; charity in aiming for global impact; and community in terms of promotion of sustainable communities and the environment. To see the program in context, the study aimed to come up with a development model underpinned with the major components and key factors collaboratively identified by stakeholders intended to shape the program from development and successful implementation.

Keyword: artificial intelligence, information technology, labor market

1. Introduction

Amidst the Fourth Industrial Revolution, East Asian countries have shown a growing interest in the role of universities as drivers of innovation for economic growth [8]. New business models are emerging -- driven by Artificial Intelligence (AI), defined as the science and engineering of making intelligent machines [4]. It is not easier to predict exactly how AI will evolve over the next half century than it would have been to predict the post-2000 rise of social media back in the 1960s. What is certain, however, is that artificial intelligence will be one of the defining technologies of the 21st century [6]. In fact, the World Economic Forum predicts that automation will create 58 million new jobs by 2022. This makes AI as the most sought-after field within the current computing and technology landscape [17]. Educational institutions, as knowledge providers, need to stay relevant to meet the challenges of this new era of accelerating change and innovation. Universities need to ask themselves what they can do today to prepare students to help build a future in which the power of this extraordinary technology is used in maximally beneficial ways. Universities need to be full participants in preparing students to contribute to the growth of a beneficial AI ecosystem. This means that universities should offer all students, regardless of field of study, opportunities to learn about AI in a manner contextualized for their disciplines and interests. One way to do this is through interdisciplinary courses that focus on the integration of AI with other fields. We need philosophers, lawyers, and ethicists to help navigate the complex questions that will arise as we give machines more power to make decisions. We need political scientists to help us understand the geopolitical implications of AI, urban planners who can explore opportunities to bring it into smart-cities initiatives, economists to help us understand how it will change labor and manufacturing, and public-policy experts to formulate the frameworks that will create incentives for its positive uses and mitigate its negative consequences. We also need scientists to explore how AI can provide improved climate models so we can better understand and fight climate change, and we need physicians and public-health experts to examine how AI can help expand the reach of medical care and reduce the spread and impact of disease [6]. The program, aimed at bringing about a revolution in the Philippine education system at par to the academic standards for HEIs in the Asia-Pacific region, is a promising initiative to better understand how the next wave of the industrial revolution, Industry 5.0, will define how society as a whole wants to work together with technology and how the rules of human-robot or human-machine collaboration can be shaped when decisions are made based on AI [9]. Since universities play an important role in the development of societies by training human resources, therefore, attention should be given to the spiritual dimension of mankind and values, in the curriculum of many universities worldwide [16].

2. Purpose of the Study

This study pertains to the development of an AI-Enhanced IT Program. Specifically, it delves on the following:

1. Determine the significant factors in the development of the AI-Enhanced IT Program;
2. Identify the mode of delivery for the AI-Enhanced IT Program;
3. Develop the model of the AI-Enhanced IT Program; and

4. Implement the AI-Enhanced IT Program Model starting Academic Year 2020-2021.

3. Methodology

This exploratory research utilizing the mixed approach was designed to identify the factors that affect the development of the AI-Enhanced Information Technology (IT) Program. The participants were classified into two groups as follows: professionals and students (refer to Table 1). Data were collected through online survey in checklist format, focus group discussions with faculty, and group interviews with students. These processes were employed to ensure triangulation of data and the validity of the findings. The participants' responses were tallied using frequency and rank.

Table 1. Participants' Distribution According to Classification

Classification	Specific Group	Frequency	Percentage
Professionals	IT	22	21%
	Non-IT	85	79%
	TOTAL	107	100%
Students	IT	102	38%
	Basic Education Unit (Science, Technology, Engineering and Mathematics)	168	62%
	TOTAL	270	100%
	N = 377		

4. Results and Discussion

4.1 Level of importance of the factors in the development of AI-enhanced IT program

Table 2. Top 10 important factors in the development of AI-enhanced IT program

For Professionals			For Students		
Factors	Frequency	Rank	Factors	Frequency	Rank
*Labor Market	94	1	*Labor Market	192	1
*Curriculum Design	93	2	*Technological Advancement	189	2.5
*Instructional Materials	92	3	School Climate	189	2.5
*School Facilities	85	4.5	*Learning Environment	176	4
*Technological Advancement	85	4.5	*School Facilities	144	5
*Instruction	84	6	*Curriculum Design	130	6.5
Mode of Delivery	83	7	Teacher and Student Diversity	130	6.5
*Learning Environment	74	9	*Instruction	129	8
Interest of Groups	74	9	Language Proficiency	125	9
Subject Area Expertise	74	9	*Instructional Materials	113	10
Faculty Qualification	73	10			

* common important factors

Table 2 shows the top 10 important factors considered by professionals and students in the development of the AI-Enhanced IT Program. Among the common factors considered by both groups are the following:

Labor Market. As elicited from the result, labor market is ranked by both professionals and students as the top 1 factor to consider in developing the AI-Enhanced IT Program. Both groups believe that one of the main objectives of higher education is to provide its graduates with the skills needed to succeed in the labor market [11]. The global labor markets are undergoing major transformations -- transformation of millions of jobs, requiring workers to learn new skills to stay competitive in an increasingly technological environment. Today and the immediate future, AI is the single most influential human innovation in history [12].

Curriculum Design. The curriculum should be innovative, addressing the local skill gap, relevant to current and global developments, trends and values, adaptable to a dynamic and changing learning environment, flexible instructional goals for diverse interests, experiences, and knowledge of students. Such elements of curriculum design are especially important in the context of today's innovation driven, skills-based, globalized economies [10].

Instructional Materials. Even though some educators are fascinated by the potential of instructional materials in enhancing teaching and learning, other teachers lagged behind in using instructional materials to teach [14]. No teacher should have to worry about not having quality teaching and learning resources. In this light, OER repositories like MERLOT, OER Commons, Open Education Consortium, and others offering free and open peer reviewed collection of online educational resources provide great alternatives to many expensive textbooks and other teaching materials. OERs include textbooks, curricula, lecture notes, assignments, tests, projects, audio, video and animation [2].

School Facilities. School facilities can be a major determinant toward ensuring quality education. This requires quality and accessibility of student learning support services such as ICT infrastructure and facilities, library, computing services, bandwidth availability, meeting rooms, virtual learning environment, and learning management system [2]. It is not just important that schools should be richly endowed with educational facilities. It is equally important that such facilities be well managed, maintained and modernized.

Technological Advancement. The use of digital and virtual technologies allowing for global learning and local impact. The implementation and utilization of current and emerging technologies offers many potential advantages including ready access to a vast store of the latest information, and facilitation of communication between students, and students and instructors [3].

Instruction. Effective instructional delivery means a well-designed and planned instruction tailored to the learning styles and social context of students. It requires diverse, creative and innovative instructional strategies and practices.

Learning Environment. To learn, students need to feel safe and supported. Without these conditions, the mind reverts to a focus on survival. A healthy, safe, and supportive learning environment enables students to learn in powerful ways [18]. In addition to a sustainable and positive school climate, learning environment demands access to opportunities of authentic, flexible, student-centered, powerful learning experiences through active learning spaces.

Moreover, the result of the survey revealed that the professionals consider other factors that were important which are not considered by the students as important. Mode of delivery, interest of groups, subject area expertise, and faculty qualification were regarded by the professionals as important factors which are not important for students. On the other hand, school climate, teacher and student diversity, and language proficiency were regarded by the students as important which professionals regarded as not so important.

Table 3. Key themes on the participants' comments on the factors for the development of AI-enhanced IT program

Group	Key Themes
Student	Students' initial knowledge of AI
	Competence of the institution on AI instructional delivery
Professional	*(From faculty and alumni*)
	Scope and focus, ethical and moral considerations, existing laws
	Readiness of the takers/the disposition of the AI module implementers
	Availability of students, acceptance of the mode of learning
	Availability and capability of technology
	Program goals properly mapped with the vision-mission of the institution
	Benchmark to ensure that the program is standardized
	Involvement of stakeholders in the development of the program
	Readiness to socio-economic, political, academic, and legal aspects
	The transition factor for the paradigm shift in the program
	Memorandum of Understanding or Memorandum of Collaboration
	(From industry representatives)
	Academe-industry alliance
	Accessibility to quality education
	Promotes independent learning
	Interest of the students, time availability when taking courses
	Self-face training for flexibility based on the student's availability
	Mode of delivery, flexible learning (mobile, web)
	School environment, facilities are also important
	Students exposure to practical experiences
	Curriculum design aligned with industries.
	Competition among institutions as a tough challenge
	Offering advanced courses
	Benchmarking with universities offering AI

4.2 Mode of delivery for the AI-enhanced IT Program

Despite earlier predictions that globally offered fully-online programs would dominate the education market, the hybrid/blended model – Web-supported face-to-face delivery is likely to emerge as the principal modality of tertiary education programs [3]. The COVID-19 pandemic as potentially one of the greatest threats to global education, significantly poses a challenge on student mobility. The impact of this educational crisis demands diversifying the way HEIs reach their students. The appropriate strategy in most countries is to use all possible delivery modes with the infrastructure that exists today [5].

4.3 Model of the AI-enhanced IT program

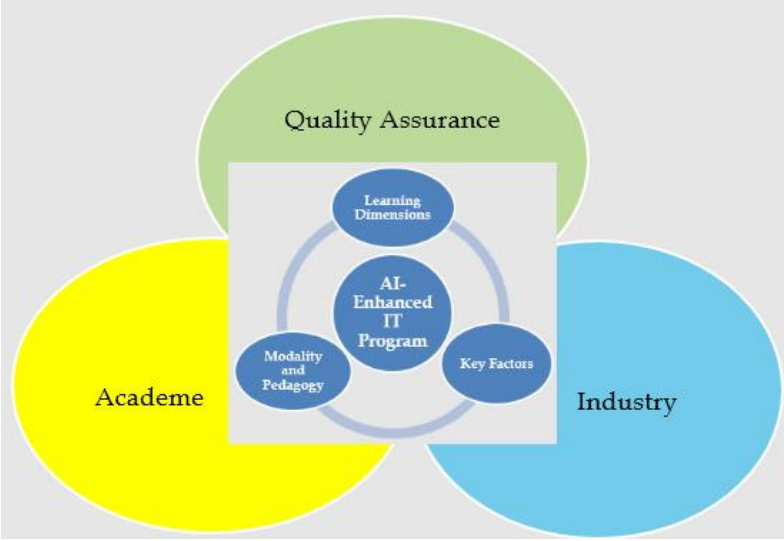

Figure 1. Model of the AI-enhanced IT program

Figure 1 graphically illustrates the relationship of the major components that underpin the development of the AI-Enhanced IT Program (from outer to inner core). The outer components are comprised of internal element (academe) and external elements (industry and quality assurance). SPUP has always been guided by its vision, mission, core values, and quality policy; and implement policies and standards set by CHED and accreditation bodies to ensure that there are mechanisms, policies, systems and procedures in place to ensure that the desired quality is delivered. Collaboration with industry is a vital component to tailor the program outcomes with industry competence standards and needs that the global labor market continuously demand. The inner components of the model are three elements, namely: key factors, modality and pedagogy, and learning dimensions. The key factors in the development of the AI-Enhanced IT Program were collaboratively identified by stakeholders. The modality of delivery that best supports the pedagogical philosophy is essential. SPUP's pedagogical philosophy on teaching, learning, and assessment are vital elements towards achieving the intended program learning outcomes, enabling the students to attain the intended graduate attributes. SPUP's learning dimensions, namely: knowledge, skills and attitudes of graduates towards artificial intelligence and how it is understood and applied in daily life, are byproduct of the core values of the University. The program is shaped with the principles of inclusive education that is evolving and immersed with the culture of problem solving, creative and critical thinking, logical reasoning, decision making, and lifelong learning, enabling graduates to live meaningfully in a complex, ever changing and globalized society.

4.4. Implementation plan of the AI-enhanced IT program

The program, prior to its implementation, goes through two phases: review of the model, curriculum and syllabus by experts and consultants, and approval of the program by CHED. Ensuring quality assurance to the program means employing a model which critically analyzes the effectiveness of quality assurance systems [7]. **A**pproach→**D**eployment→**R**esults→ **I**mprovement (ADRI) is a flexible model that can be used to review activities at a macro level as such as achievement against mission and vision statements, as well as at a micro level such as a specific area of activity [15]. ADRI is an adaptation of the Approach which means the strategies, structures and processes have been developed and why have they been chosen, Deployment which describes how have the strategies, structures and processes been put into practice, Results which show what trends do the key performance indicators (KPIs) show and how do you know this, and Improvement which defines what is the process for reviewing the appropriateness and effectiveness of the Approach and Deployment [1]. SPUP adopts ADRI Cycle for this program. An effective program design translates the University's vision, mission, goals, objectives, quality policy and graduate attributes into intended learning outcomes with the adaptation of the key factors that support the pedagogical approach for quality learning dimensions. This serves as the **A**pproach, followed by the **D**eployment phase in which the approach are put into practice. A review against performance indicators and standards is scheduled periodically and based on **R**esults, opportunities for **I**mprovement are highlighted, noting that the ADRI exists to support a continuous improvement philosophy. SPUP envisions to implement the program starting Academic Year 2020-2021.

5. Conclusion

Labor market, curriculum design, instructional materials, school facilities, technological advancement, instruction, learning environment, mode of delivery, interest of groups, subject area expertise, faculty qualification, school climate, teacher and student diversity, and language proficiency are vital considerations in the development of the program. Labor market as the top consideration conforms with findings that education continues to be the cornerstone of job preparation and success [13]. For a successful implementation of the program, a model shaping its development is necessary. SPUP, anchored in its pursuit of providing quality, Catholic Paulinian education in a caring environment is mandated to create human capital as means of economic growth and national development supporting the United Nation (UN) 2030 Agenda for Sustainable Development.

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