EXPLORATORY STUDY OF HUMAN RESOURCE PRACTICES OF PRIVATE ENGINEERING HIGHER EDUCATION INSTITUTIONS

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Abstract— **This study examined the human resource practices of private Engineering Higher Education Institutions within the Cagayan Valley Region towards employee retention. It employed a quantitative approach to gather data. The study aimed to answer research questions related to the profile of engineering schools, the profile of engineering educators, the practices employed by schools to retain engineering educators, and potential differences in retention practices based on school profiles. The research was conducted among private Higher Education Institutions (HEIs) in the Cagayan Valley Region, focusing on specific engineering schools. The findings revealed various HR practices employed by engineering schools to retain educators, including hiring strategies, faculty development programs, remuneration and compensation schemes, incentive mechanisms, and management practices. The results also indicated significant differences in assessments based on factors such as training attendance and patents published. In conclusion, this study provided valuable insights into the practices and factors influencing the retention of engineering educators. The findings can inform the development of effective strategies and policies to enhance faculty retention, improve the quality of engineering education, and address the challenges faced by educators in the Cagayan Valley Region.**

Keywords: Engineering Educators, Hiring, Faculty Development Program, Remuneration and compensation, Incentive mechanisms, Other management practices

I. INTRODUCTION

Engineering is the use of science and technology to design, create, and maintain physical objects like machines and devices. The main goals of engineering schools are to expand the boundaries of knowledge, bring new technologies from the lab to society, provide a challenging education, and prepare students to become certified engineers and leaders of society (Laguador & Dotong, 2014). Additionally, it equips graduates with the skills they need to pursue rewarding careers, engage in ongoing education, and play active roles in society. The caliber of instruction determines how well higher education institutions perform. At the higher education level, it is expected that students will be self-motivated, self-disciplined, and will use their pre-existing cognitive talents to understand the teachers' instructions (Purzer et al., 2016). However, the instructor still plays a crucial and difficult role in the learning process by creating a framework that inspires students' motivation and enhances their capacity for learning and productivity. Quality can only be attained by using effective teaching strategies. Teaching involves interactions between a teacher and his or her environment as part of a learning process (Dunleavy & Dede, 2014). Teaching is a complicated process that includes both teaching and learning. Numerous variables that contribute to excellent teaching—the process of imparting knowledge and igniting students' enthusiasm—have been shown by scholars as study has progressed over time (Chalmers & Fuller, 2012).

The basis for the growth of society is laid by engineering education. Engineering education focuses on topics related to knowledge, innovation, and cooperative knowledge construction (Byers et al., 2013). Numerous engineering programs are available in the Philippines at various HEIs, both public and private. The Philippine Technological Council's Accrediting and Certification Board for Engineering and Technology-Engineering Accreditation Commission (PTCACBET-EAC), the Accrediting Board for Engineering and Technology (ABET), the Accrediting Agency of Chartered Colleges and Universities in the Philippines (AACCUP) for public institutions, and the Philippine Association of Colleges and Universities have all begun to require accreditation of their engineering programs. All engineering programs' curricula are created in accordance with the minimum standards set by CHED (Manea et al., 2021).

Engineering educators, business leaders, entrepreneurs, and members of the industry all agree that the Philippines' engineering education is either in crisis or is at least moving in that direction (Borreo, 2016; Borsoto et al., 2014). There is a critical need for professional engineers in the country's academic community, which has a population of about 100 million people. Given the sharp rise in the number of students enrolling in engineering courses at the university level, it is predicted that this issue will only get worse (Reeve, 2013). Furthermore, very few studies have focused on identifying factors that can contribute to good and high-quality teaching, particularly in engineering education in the Philippines. Most of the research methodologies previously developed were still considered and used to evaluate good teaching models. However, in the modern era of technology, there needs to be urgent attention to redefine the changing teaching context. The persistent gaps in the literature call for additional research, including identifying factors that affect engineering educators' decision to leave the teaching profession (Laguador & Dizon, 2013).

In addition, there has been growing concern about the need for initiatives to be adopted due to variables such as a decline in the number of applicants to engineering education programs and an increase in the average age of teachers in service (Wankat & Oreovicz, 2015). There are several regions of special instructor scarcity, in addition to a general desire to boost the number of highly qualified applicants to engineering education programs. First, there is an unequal regional distribution of teacher shortages. Second, some groups are underrepresented among engineering students and engineering professors in the workforce. Even though it is still too early to gauge the impact, increases in teacher compensation over the previous few years are regarded as some of the most effective initiatives undertaken. The number of engineering educators reporting experiences of social and psychological job strain is high and rising, compared to other professions, suggesting that working conditions still need to be improved (Manea et al., 2021). In addition, literature suggests issues and concerns about policies on hiring engineers to enter the academe. There is often a shortage of qualified candidates for engineering faculty positions, especially in specialized fields or emerging areas of engineering. This shortage can make it challenging for institutions to find suitable candidates who meet the required qualifications and expertise (Oke et al., 2016). Furthermore, the demand for engineering talent is high in industry, which can make it difficult for academic institutions to attract and retain highly qualified candidates. Engineering educators may be enticed by higher salaries and more immediate career advancement opportunities in industry (Moore & Fraizier, 2017). More importantly, academic hiring processes can be time-consuming and involve multiple stages, including application reviews, interviews, and presentations. The lengthy process can be frustrating for both candidates and hiring committees, potentially leading to delays in filling vacant positions (Chien et al., 2019). Finally, the field of engineering education is continually evolving, driven by advancements in technology and changes in industry practices. Institutions need to adapt their hiring policies to align with emerging trends and ensure that engineering educators possess the relevant knowledge and skills to address current and future challenges (Reyes et al., 2019).

Migration of engineers to the teaching profession is a common phenomenon that has been observed in many countries. Engineers who have gained significant experience in their field and have a passion for teaching may choose to make a career transition to become teachers (Hampton, Reeping, & Ozkan, 2021). There are several reasons why engineers may choose to make the transition to teaching. One reason is that teaching allows them to share their knowledge and expertise with the next generation of engineers. They may also find that teaching is a more fulfilling career path that allows them to have a greater impact on society. However, making the transition from engineering to teaching can be challenging, as it requires a different set of skills and knowledge. Engineers may need to obtain additional qualifications, such as a teaching degree, and undergo training in pedagogy and classroom management. In addition, engineers may need to adjust to a different work environment, with different expectations and responsibilities (Ding & Liu, 2019). They may need to learn how to communicate effectively with students, manage a classroom, and adapt their teaching style to different learning styles and abilities. In the Philippines, there is an issue with retaining teachers in the academe, especially in applied sciences such as engineering (Alvarez et al., 2020). The fast turnover of engineering educators leaving academia can be a significant challenge for educational institutions. Engineering professionals are in high demand in various industries, often offering more attractive compensation and career advancement opportunities compared to academia. As a result, engineering educators may be enticed by the prospect of higher salaries and industry work. In addition, academic institutions may not always provide adequate resources or support for engineering educators to conduct research in their respective fields. This can discourage teachers who are passionate about research from staying in academia, as they may seek opportunities in industry or research-focused institutions where they can pursue their interests more effectively (Park et al., 2020). Furthermore, engineering educators often face heavy teaching loads, which can be time-consuming and demanding. Balancing teaching responsibilities with other professional activities such as research and administrative tasks can become overwhelming.

This workload imbalance may contribute to teacher burnout and increase the likelihood of individuals seeking alternative career paths (Rajalazmi et al., 2019).

The persistent gaps in the literature call for additional research, which includes identifying factors that affect engineering teachers' decisions to leave the teaching profession. Hence, this study was conducted to look into the human resource practices of Private Engineering Higher Education Institutions toward employee retention.

II. METHODS

This study utilized a quantitative research method. The descriptive method was used to determine the different HR practices employed by schools to retain their engineering educators. At the same time, it was used to assess the practices related to retention among engineering educators.

This study was conducted among private Higher Education Institutions (HEIs) in the Cagayan Valley Region that offer engineering programs. The respondents were the engineering educators from different engineering schools in the region. However, purposive sampling was used in the selection of engineering educators, following a set of criteria: (1) at least three years in the teaching profession, (2) a graduate of any engineering program, and (3) willingness to participate in the study.

Research Instruments

Checklist

A checklist was developed to describe the profile of the engineering educators, consisting of the following: sex, age, highest educational attainment, field of specialization, number of years in the academe, civil status, number of trainings attended in the past three years, membership in professional organizations, industry experience, designation, employment status, research involvement in the past three years, and community engagement in the past three years.

Questionnaire

A questionnaire developed by the researcher was used to assess the engineering educators' evaluation of the HR practices in their institution, specifically in the areas of hiring, faculty development programs, remuneration and compensation, incentive mechanisms, and other management practices. Items within these dimensions were sourced from various faculty manuals and handbooks of different engineering schools. Prior to distribution, the tool underwent content validation by research experts in engineering education.

Data Analysis

Frequency and Percentage were used to describe the profile of engineering educators.

The weighted mean was employed to describe the assessment of the engineering educator-respondents regarding the HR practices of their institution in the areas of hiring, faculty development programs, remuneration and compensation, incentive mechanisms, and other management practices. The assessment was categorized using the following mean range and qualitative descriptions:

Mean Range	Qualitative Descriptions
3.50 – 4.00	Always
2.50 – 3.49	Often
1.50 – 2.49	Seldom
1.00– 1.49	Never

Independent Sample T-Test and One Way Analysis of Variance were used to determine significant difference on the on the assessment of the engineering educators on the HR practices of their institution when grouped according to profile of the respondents.

III. RESULTS

Table 1a. Personal Profile of the Instructor-Respondents

Variable	Frequency	Percent
Sex		
Male	62	72.9
Female	23	27.1
Age		
≤ 29	39	45.9
30 - 39	24	28.2
40 - 49	17	20.0
≥ 50	5	5.9
Mean Age = 33		
Religion		
Roman Catholic	71	83.5
Non-Catholic	14	16.5
Civil Status		
Single	43	50.6
Married	39	45.9
Widow	3	3.5

Table 1a presents the profile of engineering educators in different private engineering schools in the Cagayan Valley Region. It can be seen from the table that there are more male teachers than female teachers. Generally, the teachers are young, with a mean age of 33. Almost all of them practice the Roman Catholic faith, and many are single.

Table 1b. Educational Profile of the Instructor-Respondents

Variable	Frequency	Percent
Highest Educational Attainment		
Bachelor's Degree	18	21.2
With Masteral Units	35	41.2
Master's Degree	17	20.0
With Doctoral Units	12	14.1
Doctorate Degree	3	3.5
Field of Specialization		
Civil Engineering	28	32.9
Electrical Engineering	20	23.5
Electronics Engineering	16	18.8
Geodetic Engineering	11	12.9
Computer Engineering	9	10.6
Chemical Engineering	1	1.2
No. of Years in the Academe		
3 years	37	43.5
4 - 6	15	17.6
7 - 9	10	11.8
≥ 10	23	
Ave. No. of Years = 7		
Type of School Graduated From		
State College/University	23	27.1
Catholic HEI	55	64.7
Other Private HEI	7	8.2

In terms of their educational profile, the majority of the respondents have already obtained their master's degree. Additionally, the respondents come from various engineering fields, including Civil Engineering, Electrical Engineering, Electronics Engineering, Geodetic Engineering, Computer Engineering, and Chemical Engineering.

Moreover, many of the respondents are relatively young in the academe, with an average of seven years of teaching experience. A significant number of them graduated from Catholic Higher Education Institutions for their college degree.

Table 1c. Professional Profile of the Instructor-Respondents

Variable	Frequency	Percent
Number of training attended related to Engineering education for the past three years		
≤ 3	49	59.8
4 - 6	20	24.4
7 - 9	3	3.7
≥ 10	10	12.2
Ave. No. of training attended = 4		
Membership to Professional Organization		
Member	74	87.1
Not a Member	11	12.9
Industry Experience		
With industry experience	52	61.2
With no industry experience	33	38.8
Designation		
Program Chair/Department Head	15	18.3
Faculty	56	68.3
Laboratory in-charge	1	1.2
Research	2	2.4
Extension/Community Engagement	0	0.0
Others	8	9.8
Employment Status		
Regular/Tenured/Permanent	49	57.6
Non-Tenured/Contractual	36	42.4
Research Involvement		
Research Completed		
0	49	57.6
1 - 2	27	31.7
3 - 4	7	8.3
≥ 5	2	2.4
Ave. number of research completed = 1		
Research Presentation		
With presentation	22	25.9
Without presentation	63	74.1
Research Publication		
With publication	14	16.5
Without publication	71	83.5
Patent		
With patent	4	95.3
Without patent	81	4.7
Community Engagement		
0	29	34.5
1 - 3	24	28.6
4 - 6	25	29.8
7 - 9	2	2.4
≥ 10	4	4.8
Ave. number of community engagement activities = 3		

Finally, in terms of their professional profile, almost all of the respondents are members of their respective professional organizations. Additionally, there are more teachers in private schools with industry experience than those without prior industry experience before entering the teaching profession. However, more than half of the respondents have not produced any research output in the past three years. Specifically, only a few respondents have engaged in research activities such as research presentations, publications, or patents. Lastly, the respondents have participated in an average of three community engagement activities.

Table 3. Respondents' Assessment of Practices Employed by Higher Education Institutions to Retain Engineering Educators

Table 3a. Hiring and Recruitment

Hiring and Recruitment	**Mean**	**QD**
Timely decisions are made for those who are offered jobs from the best pool of candidates.	4.32	Often
The school administration through the Human Resource Management Office has timelines for voluntary transfers or resignations so that hiring processes can take place as early as possible, ideally in the early months of a semester of the prior school year.	4.21	Often
The school provides a variety of recruitment strategies (e.g. job fair, posting both online and offline, accredited professional organization visit of HR for recruitment, etc.) and support programs that can be tailored to each potential engineering teacher candidate during the hiring process.	4.27	Often
The school implements effective strategies in selecting new teachers to be part of the academe (e.g. one-on-one interview, panel interview, demonstration lesson, skills-based test, etc.)	4.46	Often
The school has an efficient and effective system: a. Receiving of documentary requirements b. Processing of documentary requirements c. Compliance d. Offering the job to teacher-applicants	4.46 4.49 4.45 4.39	Often Often Often Often
Category Mean	4.39	Often

Table 3a presents the respondents' assessment of the practices employed by higher education institutions to retain engineering educators. The results indicate that respondents believe their schools often implement various hiring and recruitment practices. Specifically, engineering schools make timely decisions when offering jobs to candidates from the best pool of applicants. Additionally, the school administration, through the Human Resource Management Office, follows established timelines for voluntary transfers or resignations, allowing the hiring process to begin as early as possible—ideally in the early months of the prior school year. Furthermore, schools employ diverse recruitment strategies, including job fairs, online and offline job postings, and visits by HR representatives to accredited professional organizations for recruitment purposes. They also offer support programs tailored to potential engineering teacher candidates during the hiring process. Moreover, schools implement effective selection strategies for new faculty members, such as one-on-one interviews, panel interviews, demonstration lessons, and skills-based tests. Finally, institutions maintain an efficient and effective system for handling documentary requirements, processing applications, ensuring compliance, and offering jobs to teacher applicants.

Table 3b. Faculty Development Program

Faculty Development Program	**Mean**	**QD**
There is a strong induction and support for novice teachers that can increase their retention, accelerate their professional growth, and improve student learning.	4.38	Often
Mentoring, coaching, and feedback from experienced teachers in the same program/area as the novice instructor is being practiced in the school.	4.36	Often
Instructors are given the chance to participate in conferences, e-learning courses and webinars related to engineering education.	4.46	Often

The school offers its instructors a holistic professional development program that focuses on: a. Personal growth b. Professional development program including pedagogical activities c. Spiritual d. Social	4.34 4.20 4.49 4.29	Often Often Often Often
The school offers scholarship grants and local modifications to instructors to ensure continuing professional education	4.44	Often
Category Mean	4.38	Often

Regarding the Faculty Development Program (FDP), respondents believe that strong induction and support for novice teachers contribute to their retention, accelerate their professional growth, and enhance student learning. Mentoring, coaching, and feedback from experienced teachers within the same program or area as the novice instructor are actively practiced in their respective schools. Furthermore, respondents emphasized that they are given opportunities to participate in conferences, e-learning courses, and webinars related to engineering education. Additionally, schools provide a holistic professional development program that includes personal growth, pedagogical training, spiritual development, and social development. More importantly, institutions offer scholarship grants and localized modifications to instructors to ensure their continuous professional education.

Table 3c. Remuneration and Compensation

Remuneration and Compensation	**Mean**	**QD**
The school provides competitive direct financial compensation to their teachers in the form of wages, salaries, bonuses and commissions provided at regular and consistent intervals.	4.04	Often
There is a provision of indirect financial compensation given by the school such as benefits, leaves, retirement plans, education, and employee services.	4.33	Often
The school provides non-cash benefits to their instructors (e.g. housing, material incentives, loans, vacation and sick leaves).	4.04	Often
The school gives annual general increase to instructors' salary and compensation.	3.58	Often
The school provides other means and opportunities for teachers to earn besides classroom teaching such as: a. being a resource speaker b. research adviser c. research panel member d. Statistician e. additional non-teaching duties and functions	 3.82 4.22 4.14 3.94 4.02	 Often Often Often Often Often
Category Mean	4.01	Often

Meanwhile, respondents also observed that remuneration and compensation practices are often implemented in their respective institutions. Specifically, their schools provide competitive direct financial compensation to teachers in the form of wages, salaries, bonuses, and commissions, which are given at regular and consistent intervals. Additionally, indirect financial compensation is provided, including benefits, leaves, retirement plans, educational support, and employee services. Furthermore, schools offer non-cash benefits to instructors, such as housing, material incentives, loans, and vacation and sick leaves. More importantly, annual general increases in salary and compensation are provided. Finally, institutions offer additional opportunities for teachers to earn beyond classroom teaching, such as serving as resource speakers, research advisers, research panel members, statisticians, data analysts, and taking on other non-teaching duties and functions.

Table 3d. Incentive Mechanisms

Incentive Mechanisms	**Mean**	**QD**
The school recognizes its instructors for their professional achievements, as we'll as loyalty to the institution by way of plaques and cash.	4.32	Often
Research and Development Incentives and Rewards (Cash Incentives, Publication incentives, Deloading, etc.)	4.31	Often
Travel opportunities to attend workshops, seminars, and conferences at national and international levels.	4.24	Often
Category Mean	4.29	Often

Furthermore, it was also revealed in the study that private engineering schools often practiced some incentive mechanisms for their faculty members, such as recognizing their instructors for their professional achievements, as well as loyalty to the institution by way of plaques and cash. In addition, there is also a provision for research and development incentives and rewards, such as cash incentives, publication incentives, and de-loading. Finally, travel opportunities to attend workshops, seminars, and conferences at the national and international levels are also available for faculty members.

Table 3e. Other Management Practices

Other Management Practices	**Mean**	**QD**
Provision of employee wellness and mental health programs for employees	4.14	Often
There is a positive school culture where both instructors and students are fully engaged, feel safe, feel trusted, and respected.	4.31	Often
The school provides instructors more opportunities to express their opinions and concerns.	4.11	Often
The school promotes academic freedom in which instructors are respected and valued both inside and outside of the classroom and the institution.	4.33	Often
There is an effective competition mechanism and scientific and reasonable evaluation system employed by the school to evaluate the performance of their teachers for promotion, retention, and dismissal.	4.25	Often
Category Mean	4.23	Often

Finally, there are also management practices that are often practiced by engineering schools, as assessed by their faculty members, such as the provision of employee wellness and mental health programs for employees. In addition, respondents also believe that there is a positive school culture where both instructors and students are fully engaged, feel safe, feel trusted, and are respected. Their respective schools also provide them with more opportunities to express their opinions and concerns, and at the same time promote academic freedom in which they are respected and valued both inside and outside of the classroom and the institution. More importantly, there is an effective competition mechanism and scientific and reasonable evaluation system employed by the school to evaluate the performance of their teachers for promotion, retention, and dismissal.

Table 4. Test of Significant Difference in the Assessment of Respondents of Practices Employed by Higher Education Institutions to Retain Engineering Educators when Grouped According to their Profile

Profile Variable	**Hiring and Recruitment**		**Faculty Development Program**		**Remuneration and Compensation**		**Incentive Mechanisms**		**Other Management Practices**	
	t/F value	p-value	t/F value	p-value	t/F value	p-value	t/F value	p-value	t/F value	p-value
Sex	1.426	.158	1.651	.103	.568	.572	.224	.824	1.245	.216
Age	1.092	.357	.376	.770	.221	.882	1.127	.343	.947	.422
Religion	1.083	.376	.505	.771	1.639	.159	.655	.659	.727	.605
Educational Attainment	.441	.779	.818	.517	.891	.473	1.580	.188	1.753	.147
Field of Specialization	.902	.484	1.407	.231	.642	.668	.581	.714	.267	.930

Years in the Academe	1.209	.312	.733	.535	.025	.995	1.368	.258	.396	.756
Civil Status	.204	.816	.342	.711	.442	.644	.128	.880	.026	.974
Type of School Graduated From	1.869	.161	1.082	.344	2.461	.092	1.175	.314	1.090	.341
Training Attended	.384	.765	1.477	.227	.913	.439	**2.937***	**.038**	.912	.439
Professional Membership	.742	.460	1.269	.208	.113	.910	1.804	.075	1.508	.135
Industry Experience	.239	.812	1.458	.148	.866	.389	.031	.975	.017	.987
Designation	.518	.723	.872	.485	1.342	.262	1.230	.305	1.700	.159
Employment Status	.302	.764	1.541	.127	.148	.883	1.164	.248	.576	.566
Research Involvement	.166	.868	1.106	.272	.349	.728	.311	.757	.486	.628
Research Completed	.364	.779	.472	.703	.789	.503	.951	.420	503	.681
Research Presentation	1.641	.105	.704	.484	1.824	.072	1.107	.272	1.539	.128
Research Publication	.400	.690	.111	.912	.432	.667	.594	.554	.808	.422
Patent	1.018	.312	.950	.345	.038	.969	.509	.612	**2.457 ***	**.016**
Community Engagement	.609	.657	.390	.815	.681	.607	.304	.874	.132	.970

<.05=Significant

The table shows a significant difference in respondents' assessment of HR practices along incentive mechanisms when grouped according to the number of training attended. Respondents who attended more training have a significantly different assessment of the incentive mechanisms practiced by HR than those who attended fewer training sessions. Meanwhile, there is also a significant difference in the assessment of respondents with patents and those without patents on the other management practices of engineering schools. Respondents who have registered patents have a significantly lower assessment of the other HR practices compared to those without patents.

Table 4a. Post-Hoc Test Analysis of the Significant Difference in the Assessment of Respondents on the Extent of Practice of Incentive Mechanisms when grouped according to the Number of Training Attended.

No. of Training Attended		**Mean Difference**	**p-value**
≤ 3	4 - 6	-.3540816	.097
	7 - 9	.5736961	.228
	≥ 10	-.6040816*	.031*
4 - 6	≤ 3	.3540816	.097
	7 - 9	.9277778	.063
	≥ 10	-.2500000	.419
7 - 9	≤ 3	-.5736961	.228
	4 - 6	-.9277778	.063
	≥ 10	-1.177778*	.027*
≥ 10	≤ 3	.6040816*	.031*
	4 - 6	.2500000	.419
	7 - 9	1.177778*	.027*

p<.05=Significant

Further analysis using multiple comparison revealed that respondents who attended at least 10 training related to Engineering educations for the past three years have significantly higher assessment than those who attended three or fewer training and between 7-9 trainings.

IV. DISCUSSION

Status of Private Engineering Schools in the Cagayan Valley Region

The status of engineering schools in the Cagayan Valley Region provides insights into the programs offered, accreditation status, and university status. The observation that private engineering schools in the region mostly offer civil engineering and computer engineering aligns with the trend seen in many institutions globally. Civil engineering and computer engineering are popular disciplines due to their relevance in infrastructure development and technological advancements (Beunaño-Fernandez, et al., 2019). This program offering reflects the regional demand for engineers in these fields and the alignment with local economic and development priorities. The presence of other engineering disciplines such as electrical engineering, electronics engineering, mechanical engineering, geodetic engineering, and sanitary engineering in some schools suggests a broader range of options for students. This diversity of programs allows students to specialize in different areas of engineering based on their interests and career goals (Dasgupta & Stout, 2014). It also caters to the specific needs of industries and sectors within the region.

The majority of engineering schools subjecting their programs to accreditation bodies such as the Philippine Association of Accrediting Schools, Colleges, and Universities (PAASCU) and the Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA) demonstrates a commitment to quality assurance and continuous improvement. Accreditation ensures that engineering programs meet established standards in terms of curriculum, faculty qualifications, facilities, and student outcomes (Prado, 2020). The pursuit of international accreditation, particularly the International Organization for Standardization (ISO), by almost all schools indicates a broader focus on global standards and recognition. International accreditation enhances the reputation and credibility of engineering schools, allowing for greater international collaborations, student mobility, and recognition of qualifications (Wirth, 2013; Grochau, et al., 2018). The finding that almost all private schools offering engineering in the region have achieved university status suggests institutional growth and development. Attaining university status signifies an expansion of academic programs, research activities, and the ability to grant higher-level degrees (Clarke, 2018). This elevation in status can contribute to increased prestige and competitiveness in the local and national education landscape. The transition to university status also reflects the schools' commitment to providing a comprehensive educational experience beyond technical training. Universities typically offer a broader range of disciplines, promote interdisciplinary collaboration, and emphasize research and innovation (Jacobs, 2014). This expansion in educational offerings can attract a diverse student population and cater to the evolving needs of the regional workforce.

Status of Engineering Educators Employed in Private Educational Institutions in the Cagayan Valley Region

The status of engineering educators in private engineering schools in the Cagayan Valley Region provides valuable insights into their characteristics and professional background. The observation that there are more male teachers than female teachers aligns with the broader gender disparity in the field of engineering. Research has consistently shown an underrepresentation of women in engineering disciplines and academe (Amirtham & Kumar, 2023; Smith & Gayles, 2018; Ceci, et al., 2014). This gender disparity can be attributed to various factors, including societal stereotypes, limited role models, and biases in recruitment and promotion processes. The relatively young age of engineering educators in the Cagayan Valley Region, with a mean age of 33, suggests a fresh and dynamic workforce. This finding is consistent with the notion that early-career professionals are attracted to teaching positions in higher education (Lesenyeho, et al., 2018). The majority of respondents having obtained a Master's degree indicates a commitment to advanced education and specialization, which is in line with the increasing emphasis on higher qualifications for teaching positions in engineering disciplines (Kandemir et al., 2013). The predominance of teachers practicing the Roman Catholic faith and the higher proportion of graduates from Catholic Higher Education Institutions reflect the regional context and the influence of religious institutions in shaping the educational landscape. Studies have highlighted the importance of institutional mission and values in attracting and retaining faculty members (Allui & Sahni, 2016; Wallace, et al., 2014). Catholic institutions often emphasize a holistic approach to education,

incorporating values and ethics, which may resonate with engineering educators committed to instilling broader social responsibility in their students.

The high membership rate in professional organizations among the engineering educators underscores their commitment to professional development and staying connected to their respective engineering communities. Active involvement in professional organizations provides opportunities for networking, sharing best practices, and keeping abreast of advancements in the field (Ozcelik, 2015). It also reflects a sense of professional identity and a desire for continuous growth and learning. The presence of teachers with prior industry experience highlights the potential benefits of bridging the gap between academia and industry. Teachers with industry experience can bring real-world knowledge and practical perspectives into the classroom, enhancing the relevance and applicability of their teaching (Bowen & Shume, 2018). However, the limited research output among teachers, with more than half lacking research engagement, suggests a need to foster a research culture and provide support for faculty members in conducting and disseminating research. Research productivity and engagement are essential for advancing knowledge in engineering disciplines and contributing to the academic community. Finally, the involvement of teachers in an average of three community engagement activities indicates a commitment to societal impact beyond the confines of the classroom. Community engagement initiatives allow faculty members to connect with local communities, address societal challenges, and develop students' civic responsibility (Baquedano-Lopez, et al., 2013). Such activities can foster mutually beneficial partnerships between the institution and the community, enhancing the institution's reputation and social relevance.

Engineering Educators' Assessment of Practices Employed by Higher Education Institutions to Retain Engineering Educators

a. Hiring and Recruitment

The findings of this study indicated that engineering educators perceive their schools to employ diverse practices during the hiring and recruitment process. In particular, engineering schools are noted for their timely decision-making in selecting candidates from a highly qualified pool. The school administration, facilitated by the Human Resource Management Office, establishes timelines for voluntary transfers or resignations, allowing for the early initiation of the hiring process, ideally during the early months of the prior school year's semester. Furthermore, the school utilizes a range of recruitment strategies, including job fairs, both online and offline job postings, and visits by HR representatives from accredited professional organizations. These strategies are complemented by tailored support programs that cater to the unique needs of potential engineering teacher candidates throughout the hiring process.

One noteworthy aspect highlighted by engineers is the presence of well-defined timelines established by the school administration, specifically the Human Resource Management Office, for voluntary transfers or resignations. This proactive approach allows for the early initiation of the hiring process, ideally during the early months of the prior school year. This strategy ensures that there is ample time to conduct comprehensive recruitment activities, review applications, and make informed decisions. A study by Hayes and Maslen (2015) examined the hiring practices in engineering schools and emphasized the importance of timely decision-making to secure the best candidates. Their research findings showed that institutions that initiated the hiring process early in the school year had higher success rates in attracting top talent.

In addition, the school employs diverse recruitment strategies to attract potential engineering teacher candidates. These strategies include hosting job fairs, utilizing both online and offline platforms for job postings, and organizing visits by accredited professional organizations' Human Resources representatives for recruitment purposes. These initiatives demonstrate a concerted effort by the school to reach a wide pool of qualified candidates and promote opportunities within the engineering teaching profession. In line with the respondents' perception of diverse recruitment strategies, the study by Bland, et al. (2016) explored effective recruitment methods for teachers and found that job fairs, online job postings, and collaborations with professional organizations were successful strategies to attract qualified candidates. These approaches were seen as effective in reaching a wider audience and increasing the likelihood of identifying highly skilled teachers. Additionally, collaborations with professional organizations, as mentioned in the research findings, have been shown to enhance recruitment efforts (Karam, et al., 2018). These strategies align with established literature and reinforce the importance of employing diverse approaches to attract qualified individuals.

Furthermore, the research findings highlight the importance of tailored support programs during the hiring process. It suggests that the school recognizes the unique needs of each potential engineering teacher candidate and endeavors to

provide appropriate support throughout the recruitment journey. This personalized approach not only enhances the candidates' experience but also increases the likelihood of attracting highly qualified individuals who feel valued and supported. Furthermore, the emphasis on tailored support programs during the hiring process aligns with research highlighting the significance of personalized support and mentoring programs for teacher candidates, which positively influenced their decision to pursue a career in academia. Such programs were found to enhance the recruitment process by providing candidates with a sense of belonging and support (De Vreede & Briggs, 2019). In addition, schools utilize effective strategies, such as one-on-one interviews, panel interviews, demonstration lessons, and skills-based tests, to assess and evaluate candidates. These methods enable a comprehensive evaluation of candidates' qualifications, teaching skills, and suitability for the academic environment, ensuring that the most qualified individuals are chosen to join the teaching staff. Darling-Hammond (2015) explored effective teacher selection practices and recommended the use of panel interviews, demonstration lessons, and skills-based assessments for comprehensive candidate evaluation. These methods were found to provide a holistic assessment of candidates' abilities and suitability for the teaching profession.

Lastly, the results highlight the significance of an efficient and effective system for managing the hiring process. The different institutions appear to have well-defined procedures in place, including the receipt and processing of documentary requirements, ensuring compliance with regulations, and offering job positions to successful applicants. This streamlined system enhances the overall efficiency of the recruitment process and contributes to a positive experience for both the candidates and the school administration. Peppard and Ward (2016) emphasized the importance of well-defined procedures, clear communication, and prompt handling of documentary requirements to ensure a seamless recruitment experience.

Overall, the private engineering schools in the region demonstrate a commitment to effective hiring and recruitment practices, particularly within the context of engineering teaching positions. The implementation of timely decisions, diverse recruitment strategies, tailored support programs, comprehensive selection methods, and an efficient hiring system reflects the school's dedication to attracting and selecting highly qualified individuals for the teaching profession. These findings contribute to our understanding of the practices employed by schools in the hiring and recruitment of engineering educators and shed light on the strategies that can be adopted to enhance the process in educational institutions.

b. Faculty Development Program

The results of the study indicate that the Faculty Development Program (FDP) implemented in different private engineering schools has been successful in providing strong induction and support for its teachers. This support system has played a crucial role in increasing teacher retention, accelerating their professional growth, and ultimately improving student learning outcomes. These findings align with existing literature on the importance of mentorship, coaching, and feedback for teachers. Numerous studies have emphasized the significance of mentoring and coaching programs for teachers. Darling-Hammond (2015) found that effective mentoring and induction programs positively impact teacher retention and development. Engineering educators benefit from the guidance and support of experienced educators, who can provide valuable insights and help navigate the challenges of the profession (Yadav, et al., 2016). The presence of mentoring, coaching, and feedback from experienced teachers in the same program/area as the novice instructors in the school under study demonstrates a commitment to providing comprehensive support.

Another notable aspect of the school's approach to faculty development is the emphasis on participation in conferences, e-learning courses, and webinars related to engineering education. Research suggests that engaging in professional development activities beyond the school setting can enhance teachers' pedagogical knowledge and teaching practices (Sun, et al., 2013; Patton, et al., 2015). Exposure to new ideas, research, and best practices through conferences and e-learning opportunities can inspire instructors and contribute to their professional growth. By offering such opportunities, the school demonstrates its commitment to keeping faculty members up to date with the latest advancements in the field.

Furthermore, the holistic professional development program offered by the school encompasses various dimensions of instructors' growth. The inclusion of personal growth, professional development activities, spiritual development, and social development aligns with the concept of comprehensive teacher development. The literature highlights the importance of addressing not only the professional aspects but also the personal and social well-being of educators

(Toropova, et al., 2021). Such a comprehensive approach can contribute to job satisfaction, motivation, and overall teacher effectiveness. The provision of scholarship grants and local modifications to instructors for continuing professional education is another noteworthy aspect of the school's efforts. Continuing professional development is essential for teachers to stay current with the evolving educational landscape and refine their teaching strategies (Owen, 2016). By offering financial support and local opportunities for professional growth, the school ensures that its instructors have access to ongoing learning and are empowered to enhance their instructional practices.

Overall, the results of this study, supported by relevant literature, suggest that the Faculty Development Program (FDP) implemented in different engineering schools has effectively supported novice teachers, promoted their professional growth, and contributed to improved student learning outcomes. The inclusion of mentoring, coaching, participation in external professional development activities, and a comprehensive approach to teacher development has proven beneficial. Additionally, the provision of scholarship grants and local modifications further strengthens the school's commitment to continuing professional education.

c. Remuneration and Compensation

It was revealed in the study that engineering educators observed the implementation of various practices related to remuneration and compensation in their respective institutions. These practices include both direct and indirect financial compensation, non-cash benefits, annual general increases in salary, and opportunities for teachers to earn through additional roles and responsibilities. These practices align with existing literature on the importance of competitive compensation packages and additional incentives in attracting and retaining high-quality teachers. Research supports the notion that competitive direct financial compensation plays a crucial role in attracting and retaining qualified teachers. A study by Springer and Taylor (2016) found a positive relationship between teacher salaries and student achievement. Providing competitive wages, salaries, bonuses, and commissions at regular and consistent intervals, as practiced by the school under study, demonstrates a commitment to recognizing and rewarding teachers' efforts and expertise. Additionally, the provision of indirect financial compensation, such as benefits, leave, retirement plans, education, and employee services, is recognized as an important aspect of teachers' overall compensation packages. Studies have shown that comprehensive benefit packages can contribute to teacher job satisfaction, motivation, and overall well-being (Jackson & Fransman, 2018; Mattern & Bauer, 2014). By offering such indirect financial compensation, the school demonstrates its commitment to supporting teachers' financial security and overall welfare.

Non-cash benefits, such as housing, material incentives, loans, vacation and sick leaves, are also acknowledged as valuable components of a teacher's compensation package. These benefits contribute to teachers' work-life balance, job satisfaction, and overall job attractiveness (Sudibijo & Suwarli, 2020). The provision of non-cash benefits by the school indicates a holistic approach to supporting teachers' well-being and recognizing their contributions. Annual general increases in salary and compensation are essential for addressing inflation and ensuring that teachers' compensation keeps pace with the cost of living. Accordingly, regular salary increases positively affect teacher retention (Manalo, et al., 2020; Kalaw, 2014). By providing annual general increases, the school demonstrates its commitment to valuing and investing in its teaching staff. Furthermore, creating opportunities for teachers to earn through additional roles and responsibilities beyond classroom teaching has been recognized as a way to enhance job satisfaction and professional growth. Wong and Laschinger (2013) emphasized the importance of expanding teachers' roles and providing opportunities for leadership and career advancement. The school's provision of opportunities for teachers to serve as resource speakers, research advisers, panel members, statisticians, data analysts, and in other additional non-teaching duties and functions demonstrates a commitment to recognizing and utilizing teachers' diverse skills and expertise.

In general, it can be viewed that private engineering schools have implemented various practices related to remuneration and compensation to attract and retain high-quality teachers. The provision of competitive direct and indirect financial compensation, non-cash benefits, annual general increases, and opportunities for additional earnings reflects the school's commitment to recognizing and rewarding teachers' efforts, supporting their financial security, and promoting their professional growth.

d. Incentive Mechanisms

Meanwhile, private engineering schools have implemented incentive mechanisms to recognize and reward the professional achievements and loyalty of their faculty members. These mechanisms include recognition through plaques and cash, research and development incentives, and travel opportunities to attend workshops, seminars, and conferences. These practices align with existing literature on the importance of incentives in motivating and retaining high-performing faculty members. Recognition for professional achievements and loyalty is considered an effective incentive in the academic context. Research has shown that acknowledging faculty members for their accomplishments and commitment can enhance their job satisfaction and motivation (Refozar, et al., 2017; Javier & Deligero, 2014). The practice of awarding plaques and cash to recognize faculty members' achievements and loyalty indicates the school's commitment to valuing and appreciating its faculty members' contributions. Research and development incentives and rewards are crucial for promoting scholarly activities among faculty members. Cash incentives and publication incentives have been recognized as effective strategies to encourage research productivity (Quan, et al., 2017). Providing such incentives demonstrates the school's commitment to fostering a culture of research and development, and it can contribute to the advancement of knowledge and the reputation of the institution.

De-loading, or reducing the teaching load of faculty members engaged in research and development activities, is another valuable incentive. It allows faculty members to dedicate more time and energy to their scholarly pursuits. De-loading has been shown to positively impact research productivity and the quality of teaching (Wa-Mbaleka, 2015). By offering this incentive, the school acknowledges the importance of balancing teaching and research responsibilities and supports faculty members' professional growth. Travel opportunities to attend workshops, seminars, and conferences at national and international levels are highly valued by faculty members. Such opportunities provide exposure to new ideas, collaborations, and professional networking, which can enhance faculty members' knowledge and skills (Kezar, 2020). The provision of travel opportunities indicates the school's commitment to supporting faculty members' continuous professional development and broadening their perspectives through engagement with the broader academic community.

Overall, it can be suggested that private engineering schools have implemented various incentive mechanisms to recognize and reward faculty members' professional achievements, loyalty, research and development efforts, and provide opportunities for professional growth. These practices demonstrate the schools' commitment to creating a conducive and motivating work environment for faculty members and fostering a culture of excellence.

e. Other Management Practices

And finally, private engineering schools in the region often practice certain management practices, as reported by their faculty members. These practices include the provision of employee wellness and mental health programs, fostering a positive school culture, promoting academic freedom, and employing effective competition mechanisms and evaluation systems for performance assessment. These practices align with existing literature on the significance of creating supportive work environments, promoting a positive culture, and implementing fair evaluation systems in educational institutions. The provision of employee wellness and mental health programs reflects the growing recognition of the importance of faculty members' well-being. Research has demonstrated that employee wellness programs positively impact job satisfaction, productivity, and overall well-being (Bryson, et al., 2017). By offering such programs, the engineering schools acknowledge the importance of supporting the physical and mental health of their faculty members. A positive school culture characterized by engagement, safety, trust, and respect is vital for creating a conducive learning and working environment. Studies have shown that a positive school culture fosters higher levels of job satisfaction, motivation, and performance among faculty members (Baptiste, 2019; Baluyos, et al., 2019). The teachers' belief that their respective schools have established a positive school culture indicates that the institutions prioritize creating an inclusive and supportive environment for both instructors and students.

Promoting academic freedom is an essential aspect of a healthy academic environment. Academic freedom allows faculty members to explore and express their ideas freely, contributing to intellectual growth and creativity (Lynch & Ivancheva, 2015). The acknowledgment that academic freedom is respected and valued both inside and outside the classroom and the institution indicates that the engineering schools uphold the principles of academic autonomy and intellectual diversity. An effective competition mechanism and scientific evaluation system for performance assessment are crucial for promoting excellence and ensuring fair evaluation of faculty members. Literature emphasizes the importance of fair evaluation systems that consider multiple dimensions of performance and provide

constructive feedback (Dusterhoff, et al., 2014; Zhang, et al., 2014). The employment of such mechanisms by the engineering schools indicates their commitment to maintaining high standards of teaching, research, and service.

In summary, engineering schools have implemented various management practices to support the well-being of faculty members, foster a positive school culture, promote academic freedom, and ensure fair evaluation systems. These practices demonstrate the institutions' commitment to creating an environment that nurtures the growth and success of faculty members and enhances the overall quality of education.

Test of Significant Difference in the Assessment of Respondents of Practices Employed by Higher Education Institutions to Retain Engineering Educators when Grouped According to their Profile

The results of the study indicate a significant difference in the assessment of practices employed by higher education institutions to retain engineering educators, specifically in the areas of incentive mechanisms and other management practices. These differences were observed when the respondents were grouped according to two factors: training attended and number of patents published.

In terms of incentive mechanisms, the findings demonstrate that engineering instructors who have attended a higher number of training sessions have a higher level of assessment of their institution's incentive mechanisms compared to those with less participation in training and seminars. This suggests that ongoing professional development and training opportunities positively impact instructors' perceptions of the incentives provided by their institutions to retain them. These findings are consistent with previous research that highlights the importance of professional development in attracting and retaining qualified educators in the field of engineering (Horwitz, 2013; Austin, et al., 2014). Professional development and training opportunities play a crucial role in the continuous growth and enhancement of educators' skills and knowledge. Several studies have highlighted the positive effects of professional development on educators' job satisfaction, engagement, and retention (Bin & Shmailan, 2015; Tepayakul & Rinthaisong, 2018). In the context of engineering education, professional development has been identified as a significant factor in attracting and retaining qualified instructors. Egert, et al. (2020) conducted a meta-analysis of studies on professional development and found that high-quality professional development programs positively impact teacher knowledge, beliefs, and instructional practices. Similarly, Garet et al. (2001) conducted a comprehensive review and concluded that effective professional development enhances teacher knowledge, skills, and student achievement. These findings support the notion that professional development can contribute to instructors' positive assessment of incentive mechanisms in higher education institutions. Moreover, a study by Zhang and Zeller (2016) explored the relationship between professional development and teacher retention. They found that teachers who participated in high-quality professional development programs were more likely to remain in their positions. This finding suggests that professional development opportunities not only influence educators' perceptions of incentives but also contribute to their decision to stay within their institutions. In the field of engineering education, Whitworth and Chiu (2015) conducted a literature review on professional development for engineering faculty. They emphasized the importance of continuous professional development for engineering educators to enhance their teaching effectiveness, keep up with advances in their field, and improve student learning outcomes. The study underscored the need for institutional support and resources to provide relevant and meaningful professional development opportunities for engineering instructors. Furthermore, a study by Oleson and Hora (2014) examined the impact of professional development on engineering faculty members' instructional practices. They found that faculty who engaged in professional development activities developed a stronger understanding of pedagogical strategies and adopted more learner-centered teaching practices. These outcomes contribute to a positive assessment of institutional incentive mechanisms, as instructors recognize the value of ongoing training in their professional growth and development.

On the other hand, the assessment of other management practices differed significantly based on the number of patents published by the engineering educators. Interestingly, the results indicate that teachers with no patents published had a higher level of assessment of their institution's other management practices compared to those with published patents. This implies that educators who have not yet achieved patents perceive their institutions' management practices more positively. It is important to note that this finding may be influenced by various factors, such as the academic culture surrounding patent publication and the emphasis placed on research outcomes within engineering education. Academic culture and the expectations regarding research outputs can significantly influence educators' perceptions of institutional practices. Research productivity, including patent publication, is often highly valued and considered a benchmark for success in academic settings. This emphasis on research outcomes can shape perceptions of management practices, creating a perceived association between research achievements and institutional support.

The findings of the present study support the results of a study by Weckowska (2015) which examined the relationship between academic patenting and university management practices. They found that institutions with a stronger emphasis on patenting and commercialization activities tended to adopt specific management practices that supported these goals, such as technology transfer offices and incentives for patenting. This institutional focus on patenting may create an environment where educators who have not yet achieved patents perceive greater support and positive management practices. It is important to recognize that the relationship between patent publication and perceptions of management practices is complex and may be influenced by various contextual factors. The academic culture, institutional priorities, and individual motivations can all contribute to the observed differences in perception.

These results provide valuable insights for higher education institutions aiming to retain engineering educators. Institutions should consider providing ample opportunities for professional development and training to enhance instructors' assessments of incentive mechanisms. Moreover, institutions should also be mindful of the potential impact of research outcomes, such as patents, on educators' perceptions of other management practices. Creating a supportive and inclusive environment that acknowledges and values diverse contributions beyond research achievements can help address potential disparities in the assessment of management practices.

V. CONCLUSION AND RECOMMENDATIONS

In conclusion, the study reveals the diverse range of practices employed by higher education institutions to retain engineering educators. Effective hiring and recruitment processes, faculty development programs, remuneration strategies, incentive mechanisms, and management practices are prioritized to foster retention. Engineering schools should provide adequate learning resources, support classroom management strategies, offer competitive remuneration packages, and promote a healthy work-life balance to enhance job satisfaction and retention among engineering educators. In addition, they should continue employing timely decisions and proactive hiring processes to secure the best candidates. At the same time, they need to maintain effective recruitment strategies, such as job fairs, online and offline postings, and visits from accredited professional organizations to attract potential engineering teacher candidates. School administrators should strengthen induction and support programs for novice teachers, including mentoring, coaching, and feedback from experienced teachers. At the same time, they should offer scholarship grants and local modifications to support instructors in their continuing professional education.

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