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Educators' Perspectives on University Technology Transfer Processes in the Philippines: A Case Study

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Abstract: As universities extend the scope of their tasks as educational institutions to include technology transfer and commercialization of their faculty's and students' research outputs, it becomes necessary to investigate internal systems that facilitate such processes. Existing literature on technology transfer in the Philippines is mostly focused on the transfer of a specific technology, industry-academe research and development (R&D) collaboration, the experience in a specific industry, or the experience in public Philippine higher education institutions (HEIs). The perspectives of educators and researchers who are the recipients of technology transfer services within Philippine HEIs have, so far, not yet been investigated. This paper aims to fill that gap by interviewing eight educators from four colleges in a Philippine HEI. The findings primarily reveal the importance of internal

communications in the university technology transfer process. They also reveal that, aside from entrepreneurship training, educators need to understand the intellectual property rights system to see the potential benefits of intellectual property protection and be able to relate intellectual property rights to their research work. This paper therefore recommends that, to promote intellectual property awareness and academic entrepreneurship in the country, HEIs need to allocate resources for intellectual property education and entrepreneurship training to encourage active participation of researchers in Philippine HEIs in the formal technology transfer process.

Keywords: university technology transfer, intellectual property, technology commercialization, intellectual property education, internal communications

INTRODUCTION

Universities in many countries are evolving from their traditional roles of educating people and generating new knowledge through research to becoming contributors to socioeconomic growth and development through technology transfer and research commercialization (Kimura et al., 2014). In the United States, the Bayh–Dole Act was introduced in 1980 to facilitate the commercialization of university-created scientific knowledge in the public interest. The act permitted universities to own intellectual property (IP) arising from government-funded research

and to commercialize new knowledge through industry licensing (Friedman & Silberman, 2003; World Intellectual Property Organization [WIPO], 2007). Since then, U.S. universities engaging in technology transfer and the establishment of spin-offs have become a driver in the development of high-tech industries (Owen-Smith & Powell, 2001). Noting the increase in patent grants and licensing revenues at U.S. universities, other countries, including the Philippines, have introduced their own laws, modeled after the Bayh–Dole Act, to promote innovation and encourage the exploitation of the economic potential of university IP (Sampat, 2010; Zuniga, 2011, p. 3).

The pace and effectiveness of transforming university-created knowledge into new or improved products and processes have an impact on the contribution of public investments in university research being translated into economic development (Correa & Zuniga Lara, 2013). Due to the expectations of universities to act as agents of economic development and their need to function more efficiently and effectively, a better understanding of technology transfer practice is needed, especially in developing countries where technology commercialization is relatively new and where there is a lack of public awareness of the IP rights system and its potential role in economic development (Payumo et al., 2012).

Existing literature on technology transfer in the Philippine context is mostly focused on the transfer of a

specific technology (Castro et al., 2008; Catibog, 2016), industry–academe research and development (R&D) collaboration (Vea, 2014), the experience in a specific industry (Del Prado & Rosellon, 2017; Khayat, 2015; Paras & Amongo, 2005), or the experience in public Philippine higher education institutions (HEIs) (Alagao, 2014; Payumo et al., 2012; Sevilleja, 2014; Tecson-Mendoza, 2014). Others examined ownership and technology commercialization issues in technology transfer in the Philippines by reviewing relevant laws and university IP policies (Bantigue, 2019) or used the Delphi method and fuzzy cognitive mapping to identify barriers of university technology transfer (Quinones et al., 2019). The scarcity of literature on academic entrepreneurship in the Philippines was noted by Teehankee and Silapan (2019), who studied the case of a university spin-off company in Cebu City. Apparently, there is a dearth of literature that presents the perspective of Philippine researchers who play a crucial role in the technology transfer process by recommending possible uses of their discoveries, participating in obtaining patent protection for their inventions, and helping identify potential licensees (European Commission [EC], 2004).

This paper therefore investigates researchers' experiences themselves and aims to explore ways and means through which university technology transfer processes in the Philippines could be improved. However, researchers depend on the IP and related technology transfer policies

of their university. There are local universities, including De La Salle University (2023) and the University of the Philippines System (2011), that require researchers to report to their university inventions and other works in which the university has an ownership interest. Thus, to accomplish the study's goal, this paper also investigates how Philippine researchers perceive university IP policies in terms of promoting and encouraging university research. Furthermore, it identifies obstacles that discourage them from engaging in the process of transferring academe-created knowledge through licensing or establishment of new ventures, identifies obstacles that could discourage them from reporting their inventions and creative works to a university IP office, and identifies actions that could facilitate the improvement of university technology transfer processes in the Philippines.

This paper employs a qualitative analysis of data collected from educators actively involved in research in one university in Manila. The insights gathered from this study are expected to benefit other Philippine institutions engaging or intending to engage in technology transfer.

Commercialization and Patenting of University Research

The importance of IP management and transferring university research outputs to businesses through exploitation of IP rights to ensure further development

of research outputs for public benefit has become widely recognized in recent years (Correa & Zuniga Lara, 2013; WIPO, 2007). Patenting, which is a key activity in formal university technology transfer (Cartaxo & Godinho, 2017), yields patents that have the potential to deliver competitive advantages (Dolfsma, 2011). Aside from possible licensing revenues, patents also reconcile the dissemination of knowledge through publications while protecting investments in developing useful applications to bring technology to market (EC, 2004). Patents can indicate technology competence and help universities negotiate relationships with industry, which have the business skills and capital to transform inventions into new products, processes, services, etc. (Payumo et al., 2012). Aside from the number of spin-off companies and the number of joint research projects with industry that led to publications, the number of registered patents is also considered when rating universities on innovation (OCallaghan, 2024).

Firms, on the other hand, patent to protect product and process technologies, providing a means to retaliate against scheming competitors if not block competitors altogether. It also facilitates the use of bargaining power in cross-licensing. Furthermore, patenting improves the firm's image as a technological leader, thereby attracting venture capital financing and giving a positive effect on the firm's economic performance (Han & Sohn, 2017). Therefore, while universities acquire patents to facilitate

commercialization of their technology for public benefit (Meeker, 2016), firms are more interested in obtaining patents for economic benefits. The conflicting goals can give rise to culture clashes when transferring technology from academe to industry (Meeker, 2016).

Moreover, IP management costs are a major concern when a university engages in technology commercialization. Acquiring patents can put financial strain on universities and can be unprofitable since patents become valuable only when they are commercially exploited (Gubby, 2015; Love, 2014). Universities may thus opt not to protect all potential inventions due to resource restrictions and lack of industry interest and to avoid incurring high patenting costs with no commensurate benefit (Dalmarco et al., 2011; Ranga et al., 2016). The propensity to patent and the relevance of patents in protecting against imitation also differs across technologies and industries, which means that patenting may not be the best approach for some inventions (Correa & Zuniga Lara, 2013; Gubby, 2015).

Finally, Fini et al. (2010) noted that while technology commercialization activities of universities tend to concentrate on patent-based academic entrepreneurship, entrepreneurial activities of many academic entrepreneurs across a broad range of disciplines occur outside the formal IP rights system and are seldom supported by university technology transfer offices (UTTOs). West (2012) also

noted few universities generating licensing income from the social sciences and humanities and suggested that universities expand their efforts at technology transfer in these disciplines, which also produce innovations with commercial potential.

Academic Entrepreneurship and Entrepreneurial Orientation of Universities

Literature suggests the use of institutional economics (Hamilton, 1919) and/or a resource-based view perspective (Barney, 1991) to study entrepreneurial universities. Factors like entrepreneurship training, availability of qualified personnel, supporting infrastructure, encouraging entrepreneurship, networks, faculty quality, industry funding, and history of success were found to be relevant to the entrepreneurial orientation of a university which, with quality academic research, can increase university-to-firm knowledge transfer (Belluci & Pennacchio, 2016).

For instance, Gomez Gras et al. (2008), Guerrero & Urbano (2012), and Pazos et al. (2012) applied the resource-based view perspective to study entrepreneurial activities at different European universities and found that academic staff excellence was associated with the number and performance of spin-offs. They also found the availability of support measures (e.g., training and advice) during the early stages of new spin-offs, the number and skills of personnel dedicated to supporting spin-offs, and the presence of

infrastructure support measures (e.g., a business incubator) to have a positive effect on the performance of new spin-offs. They further found that favorable entrepreneurship attitudes, entrepreneurial education programs within the university, networks and alliances, and the resources associated with technology commercialization are critical for an entrepreneurial university.

Furthermore, studying U.S. universities, O'Shea et al. (2005) found that previous technology transfer success, science and engineering faculty quality, a strong funding base in science and engineering, a high industry funding percentage, and strong commercial human resources and/or an incubator are significant predictors of university spin-off activity. Finally, Roach's (2017) study of science and engineering PhD students reports that encouraging entrepreneurship in research labs increases the likelihood of invention disclosure filings.

University Technology Transfer Offices

Awarding IP rights to U.S. universities resulted in the establishment of university technology transfer offices (UTTOs), an initiative that incentivizes faculty to become involved in technology transfer and that facilitates successful commercialization of university-generated technology (Derrick, 2015). Since the coordination and management of technology transfer activities require a wide range of specialist skills and experience, for example, strategy and

business insight; entrepreneurial leadership; technical and legal know-how; effective partner engagement; and project management and governance (ATTP, n.d.), individuals in the technology transfer profession are likely to come from diverse backgrounds, including those with science, industry, legal, and entrepreneurial experience (EC, 2004).

To protect university-owned IP, UTTOs are tasked with identification of patentable inventions through processing of invention disclosures and/or review of scientific papers before publication, ensuring compliance of day-to-day research activities with IP rights securing requirements, patentability assessment of inventions, inventorship and ownership assessments of inventions, securing IP rights (e.g., filing patent applications), and managing the IP portfolio (Correa & Zuniga Lara, 2013; EC, 2004).

On the other hand, to commercialize university-owned IP, UTTOs engage in the evaluation of technologies in terms of commercial and public interest potential, marketing the IP, networking, commercialization partner searching, negotiation and execution of IP exploitation agreements (e.g., licensing, assignments, deed of sale, etc.), and defending the IP portfolio from infringement (Correa & Zuniga Lara, 2013; EC, 2004). UTTOs may also support creation of university-based spin-offs, for example, provision of capital or information about financing, incubation and coaching of spin-off companies, management of conflicts of interest involving university

staff when exploiting IP, and promotion and negotiation of collaborative and contract research (Correa & Zuniga Lara, 2013; EC, 2004).

Moreover, UTTOs may be involved in raising awareness among members of the university about university IP and technology transfer policies and the importance and benefits of obtaining IP protection and engaging in the commercialization of research outputs (Cheeptham & Chantawannakul, 2001). They may also engage in skills formation, providing training, information, and ad hoc assistance to other technology transfer offices (TTOs) (Correa & Zuniga Lara, 2013).

Derrick (2015), in a study of researchers and TTO staff in research organizations, found that researchers consider commercialization to be a new influence on research and identified the strategies adopted by TTOs to increase their effectiveness and engagement with researchers in an organization. These include efforts to become a recognized member of the research community, educating researchers about commercialization, and altering TTO practices to accommodate researchers' need to publish. Monetary incentives for commercialization were also an effective strategy to encourage commercialization. In addition, Siegel et al. (2004) show that there are organizational and managerial factors warranting consideration when universities wish to foster commercialization, like university/industry technology transfer (UITT) reward

systems, TTO staffing practices, flexible university technology transfer policies and practices, more UITT resources, and efforts to remove cultural/informational barriers impeding UITT.

Commercialization and Patenting from University Researchers' Perspective

The crucial role of researchers in operations and process management of UTTOs can be explained using an “input-transformation-output” process where researchers create IP (input of the university technology transfer process), work with the UTTO to protect the IP (transformation), and are expected to be involved in the commercial exploitation of the IP through licensing or the establishment of start-ups/spin-offs (output of the university technology transfer process). From this perspective, the presence of UTTOs can be justified when researchers need assistance to facilitate commercialization of their research outputs. Understanding the needs of researchers is thus critical to UTTO managers and has significance in shaping the objectives of UTTO operations (Slack et al., 2013).

While generating an environment where researchers proactively seek assistance in protecting their innovations is important to improve effectiveness of technology transfer operations (EC, 2004; Friedman & Silberman, 2003),

Palmer (1947) argued that discovery and development of patentable inventions are not the primary objectives of research efforts by university scientists. As noted by Fini et al. (2010), if academic entrepreneurship is to be encouraged, universities should understand how frequently they occur, who engages in them, and why. Potential professional and personal benefits are some reasons why researchers engage in commercialization and patenting activities (Owen-Smith & Powell, 2001).

In studies of European and U.S. university researchers and inventors, Baldini et al. (2007) and Lam (2011) found “prestige/visibility/reputation” and “new stimuli for research” to be more important reasons to engage in patenting activities compared to personal earnings. The desire for more research funding, reputational rewards (peer recognition), career rewards (promotion and higher salaries), and the intrinsic satisfaction of doing research are more attractive than financial rewards. In the U.S., activities by computer scientists and electrical engineers were motivated not by the possibility of obtaining patent rights but by the promise of advancing knowledge and academic career advancement (Love, 2014).

Finally, in their study of Slovenian researchers, Ruzzier and Nagy (2012) found that internal satisfaction, career, and business prospects motivate Slovenian researchers while personal, administrative, and commercialization obstacles demotivate them from engaging in the entire process of

knowledge creation, dissemination, and application. This relates to the findings of Baldini et al. (2007) who found that lack of support mechanisms, commercialization problems, lack of time, and personal and cultural problems are common obstacles to the patenting process. Support mechanisms in the institution are either lacking or are marred by excessive bureaucracy, insufficient rewards, lack of patenting support, lack of a TTO, or lack of funds for patenting expenses. Commercialization problems include lack of opportunities for exploitation, difficulties in evaluating commercial potential, and little or no industry interest toward academic research. Lack of time due to heavy teaching and administrative load, personal or cultural problems like the lack of knowledge about university-level patent regulations, and open-science mentality also get in the way of a smooth patenting process. These, however, could be addressed by providing organizational support mechanisms, creating an enabling institutional infrastructure, and relevant incentive programs (Baldini et al., 2007).

Patenting, Research Publication, and University IP and Technology Transfer Practices

Although it was suggested that patenting can cause delays in the dissemination of research findings, several studies (Crespi et al., 2011; Czarnitzki et al., 2009; Grimm

& Jaenicke, 2015; Stephan et al., 2007) focusing on academic patenting and research publishing show that they are both achievable when IP issues are understood and properly managed. However, in their study of technology transfer at two university campuses, Owen-Smith and Powell (2001) found that faculty perception of the benefits of obtaining IP protection was shaped by perceived professional and personal benefits of IP protection, ease of the local patenting process and confidence in the UTTO, and their views on the institutional environment in which academic patenting occurs. That is, when perceptions of the TTO are generally negative and there is no history of great success, noncommitted faculty may opt not to disclose their inventions since potential frustrations of the patenting process may outweigh potential professional and personal benefits. Love (2014) further found a lack of interest in patenting by university inventors to be a result of their lack of awareness of their universities' royalty sharing policies.

A lack of understanding of institutional IP policies is a concern in many countries, including developed ones (Schwartz, 2018). In a study of U.K. HEIs conducted by the Intellectual Property Awareness Network (IPAN) (2016), students and HEI staff were found to have a lack of understanding of their institution's IP policies. A low level of awareness of the university's code of practice for IP rights and consultancy was also found by Martinelli et al. (2008) in their survey of faculty members at Sussex

University. As noted by Owen-Smith and Powell (2001), when faculty inventors are unaware of internal procedures for IP protection, they are unable to evaluate the costs and benefits of obtaining patent protection, thereby affecting invention disclosures.

Because university IP policies by themselves may not be legally binding upon IP creators, Mendes (2016a, 2016b) cautioned universities from relying solely on policies to claim ownership of IP created by university staff and students. Inclusion of the obligation to disclose inventions and the vesting of IP ownership to the university in employment contracts and requiring academic inventors to assign inventions when the university has an IP ownership interest are commonly practiced to clearly establish ownership by the university (Mendes, 2016a, 2016b; Ramli & Zainol, 2014).

Internal Communications and Education and Awareness Programs in the Management of University Technology Transfer

The importance of communications strategy is widely recognized in the management literature. As an example, in the strategic management literature, Johnson et al. (2014) argued for a communication strategy to match every new strategy. Wells (n.d.) discussed the availability of a variety

of printed, oral, and technological internal communication tools to communicate strategy. In the change management literature, the lack of a vision and under communicating the vision were identified by Kotter (2017) as errors that can lead to failure of transformation efforts in an organization. Also, Lengel and Daft (1988) distinguished among various media tools in terms of their richness (or amount of learning that can be pumped through the medium) and argued that richer media (e.g., face-to-face meetings and telephone) will be more effective compared to leaner media (e.g., flyers, bulletin, memos, and newsletters) when dealing with nonroutine difficult issues. In the marketing literature, marketing communications (or promotions) is one of the “4Ps” of the marketing mix. The hierarchy of effects model proposed by Lavidge and Steiner (1961) to measure advertising effectiveness includes steps of building customer awareness and knowledge of products and services, which are relevant to nascent UTTOs.

Huyghe et al. (2016) suggested various activities, like promotion campaigns to boost campus visibility, to elicit IP disclosures, since UTTO-bypassing behavior may be attributed to researchers’ lack of awareness about UTTOs. In his study of researchers and TTO staff in research organizations, Derrick (2015) identified some communication strategies like efforts to become a recognized member of the research community and educating researchers about commercialization, adopted

by TTOs to increase their effectiveness and engagement with researchers. Aside from political, economic, social, cultural, and personal barriers that can impede technology transfer, Johnson et al. (1997) identified communication as a key process element and proposed concepts and strategies for the design of curricula related to technology transfer.

The significance of education/training to operations improvement has been acknowledged by Slack et al. (2013). Anas et al. (2014) note that technology commercialization involves business activities (e.g., market analysis, manufacturing feasibility, product certification, after-sales service, etc.) and goes beyond providing a solution to a technical problem and thus recommend seminars and trainings to increase awareness of the technology commercialization process. According to Boni and Emerson (2005), lack of early marketing input, lack of skills to lead company spin-offs, and complexity of the licensing process are some challenges with university-based technology commercialization. They also note the importance of entrepreneurship education programs to educate and support academic entrepreneurs and to build industry networks.

The 2016 IPAN study of U.K. HEIs found that many student participants lacked skills in IP in their work, the form of protection appropriate for their work, and who to ask for advice. Soetendorp (2001) discusses student and tutor responses to micro-module materials for different

forms of IP protection and the barriers like the lack of qualified faculty members that make it difficult to include IP in the non-law curriculum (2004) and proposes schemes for curriculum development across disciplines to enable IP learning and teaching (2006).

Finally, in their study of academic and research scientists in South Africa, Urban and Chantson (2019) argue that beliefs and attitudes of researchers towards academic entrepreneurship could be shaped through increased awareness of and exposure to different aspects of entrepreneurship. A similar view is shared by Heng et al. (2011), who argue that a propensity to engage in research commercialization is influenced by the researchers' perceptions toward commercialization.

Innovation in the Philippines

A macro-environment analysis of the Philippine innovation environment in terms of government R&D investments, HEIs and local IP protection, which are World Economic Forum (WEF)-identified elements of an innovative national environment (WEF, 2017), shows that the Philippines lags behind its ASEAN neighbors because of underinvestment in R&D and to the low ratio (less than 10%) of government R&D funds allocated to private HEIs compared to public HEIs (Albert et al., 2016). As noted

by Regadio and Tullao (2015), few public HEIs are R&D productive, measured in terms of their contribution to the Scopus database; that is, private HEIs are more productive in these terms than public ones.

In terms of IP rights protection in the country, Quimba et al. (2017) noted the tendency of local firms to view their product innovations as trade secrets, making resident IP filings across all industries in all types of IP few and far between. On the other hand, premature public disclosure triggered by the usual academic “publish or perish” mindset resulted in some university-generated inventions becoming ineligible for patent protection (Catibog, 2016). Other reasons for lack of patenting activity in the academe, which arguably leads to low rates of technology commercialization and adoption in the country, include inability of HEIs to identify and protect their IP, overloading of staff in TTOs, lack of incentives for IP protection, and a non-systematic invention disclosure process (Catibog, 2016).

Apart from these, RTI International (2014) listed other university-related issues that need to be addressed to promote the development of the Philippine innovation ecosystem. These are: (a) the lack of or nascent institutional procedures to support university research; (b) the lack of a highly developed research culture relative to ASEAN neighbors; (c) the concentration of research institutions in Luzon; (d) a dearth of strong researchers in Philippine universities; (e) the best university researchers are often

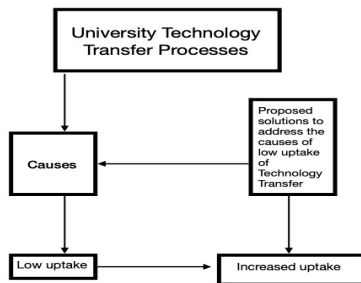
given administrative roles, losing out on research time; (f) the perception among faculty members that there is greater prestige in basic research than in applied research; (g) the perceived conflict among faculty members between patenting and academic publishing; (h) the lack of insights among university professors about how the technical needs of local industries are related to their scientific and technical disciplines; (i) universities generally do not treat collaboration with industry in research as a core mission; (j) weakness among Philippine universities at turning research outputs into products; (k) the lack of capabilities for assessing commercial applications and marketing; (l) the pressure created due to increased expectations that patent licensing will be a source of university funding; and (m) a dearth of university-based spin-offs attributable to the indifference toward entrepreneurial opportunities caused by either a lack of entrepreneurial spirit among university faculty or the fear of losing their academic jobs while launching a business, which in turn, makes it more difficult to motivate them to do spin-offs.

Efforts by various stakeholders to promote innovation in the country have begun to bear promising results. Improvements noted by Klich and Dix (2020), who studied changes to the local innovation ecosystem since the 2014 study by RTI International, include growing interest in research attributable to expansion of government-funded programs and facilities outside of the National Capital

Region; stronger linkages among government, industry, and academia, with local universities now connecting to industry for knowledge transfer; and increased interest in entrepreneurship in the country.

CONCEPTUAL FRAMEWORK

This study aims to explore possible causes of low uptake of university technology transfer processes from the perspective of Philippine researchers. By investigating how researchers perceive university IP policies and through identifying obstacles that discourage researchers from (1) reporting their inventions and creative works to a university IP office and (2) engaging in licensing or the establishment of new ventures, solutions can be proposed to increase the uptake of university technology processes among Philippine research



CASE STUDY

The University studied in this paper is among the more productive research institutions in the Philippines and has research centers with different specializations such as computing, business, engineering, natural and social sciences, and creative writing. The University has an IP office which acts as its technology licensing office. Another office was established within the University to provide IP protection services, such as patent search and drafting, patent prosecution and training, and technology commercialization assistance. These offices, together with a technology business incubator, are primarily responsible for technology transfer operations in the University and for reviewing IP policies and developing technology transfer protocols aimed at improving IP awareness and appreciation within the community. These are meant to encourage the disclosure of inventions and creative works to the University and to provide guidance for university start-ups/spin-offs.

METHODOLOGY

This paper studies a small sample of educators in the University who are also active in research. It employs a qualitative research design to analyze the perceptions of a small purposive sample of educators. Perceptions are subjective by nature, making a qualitative analysis

appropriate (Collis & Hussey, 2014; Smith, 1983). Since the aim of this study is not to attempt to bring about change and monitor results of such an attempt, which are typically associated with action research, but to obtain an understanding of educators' perceptions in one Philippine university, the case study methodology was adopted for this study (Collis & Hussey, 2014).

The following questions were posed to the respondents:

(Q1) Do university intellectual property policies promote and encourage excellence, creativity, and innovation in research and other scholarly works in your academic field here in the Philippines? Why or why not?

(Q2) What obstacles, if any, exist that discourage Philippine educators in your academic field from engaging in the process of transferring academe-created knowledge through licensing or establishment of start-ups?

(Q3) What do you think should a university technology transfer office do to encourage and promote, among Philippine educators in your academic field, participation in the process of transferring academe-created knowledge through licensing or establishment of start-ups?

(Q4) What obstacles, if any, exist that could discourage Philippine educators in your academic field from reporting their inventions and creative works to a university intellectual property office?

(Q5) What do you think should a university intellectual

property office do to encourage and promote, among Philippine educators in your academic field, the reporting of inventions and creative works?

Q1 attempts to gather educators' perceptions on how IP policies affect their work as previous research studies like those conducted by IPAN (2016) and Parasuraman et al. (1985) to understand the gaps among consumers' expectations and perceptions (e.g., researchers in the case of technology transfer) and a service provider's perceptions (e.g., the UTTO in the case of technology transfer) of consumer expectations. Q2 and Q4 align with studies that explored commercialization and patenting from university researchers' perspective, including those by Baldini et al. (2007), Lam (2011), and Love (2014). Q3 and Q5 were used to gather suggestions from educators on what could be done to encourage and promote participation by their colleagues in licensing or start-ups and the reporting of IP to the university. As noted by Slack et al. (2013), staff in an organization are a source of ideas that can inspire innovation in services.

Prior to collecting data, the questions were pretested on two educator-researchers to ensure that the questions could be used to gather the desired information. Research ethics clearance was also sought from the Internal Faculty Research Ethics Panel at the Faculty of Management & Law of the University of Bradford and the Research Ethics Office of the University before the study was conducted.

Twelve consenting participants from different colleges of the University were identified and subsequently sent an email, which explained the purpose of the study and the interview questions. In consideration of their busy schedules, the willing participants were given the option of sending their response by email or through a face-to-face interview. Follow-up emails were sent to improve the response rate. Only 8 out of the 12 responded, all of whom sent their answers by email. These are educators from the Colleges of Science, Engineering, and Computer Studies, whose research outputs are likely to involve technical solutions to technical problems, which is a requirement of patentable subject matter. Two other educators are from the College of Liberal Arts. While their research outputs are less likely to involve patentable inventions, other forms of IP protection are available. Hence, it is still possible for their research outputs to be licensed or commercialized by a start-up or spin-off. Coding was done on the collected data, reducing and restructuring them into appropriate key themes. A draft of the paper was sent to each respondent afterwards for validation.

Study respondents

College of Science	Two respondents (1 male, 1 female)
College of Engineering	Three respondents (1 male, 2 female)
College of Computer Studies	One respondent (male)
College of Liberal Arts	Two respondents (both female)

Purposive sampling allowed the researchers to choose a relatively small set of respondents that fit the study because of their involvement in IP production and experience with the University’s TTO and technology transfer guidelines and policies. The sample size of 12 is based on the small number of colleges the University had at the time of the study. The individuals were able to narrate their perception regarding the work of the University TTO and their sentiments about the University IP policies. It is noted, however, that the findings, while giving insights about how university TTOs could be improved, cannot be generalized and applied to other Philippine HEIs.

FINDINGS AND DISCUSSION

The following key themes and corresponding subthemes were gathered from the responses:

Key Themes (KT)	Subthemes (S)
KT1: Perception on promoting excellence, creativity, and innovation in research through IP policies	KT1-S 1: encouraging researchers to work on patents
	KT1-S 2: experiencing the reward system of IP policy
	KT1-S 3: experiencing difficulties with the implementation
	KT1-S4: lacking specific knowledge on the process and benefits of IP

KT2: Obstacles that discourage transfer of academe-created knowledge through licensing or establishment of start-ups	KT2-S1: lack of awareness
	KT2-S2: time constraints
	KT2-S3: too costly
	KT2-S4: ownership issues
	KT2-S4: lack of incentive mechanism
KT3: Perception on the responsibility of the university technology transfer office in encouraging and promoting the participation of educators in licensing or establishment of start-ups	KT3-S1: orientation of services
	KT3-S2: inclusivity of benefits
	KT3-S3: consideration of faculty workload
	KT3-S4: provide more accessible value-added services
KT4: Obstacles that discourage educators from reporting their inventions and creative works to a university intellectual property office	KT4-S1: lack of awareness
	KT4-S2: issues on trade-offs
	KT4-S3: time constraints
KT5: Perception on the responsibility of the university intellectual property office in encouraging and promoting the reporting of inventions and creative works among educators	KT5-S1: providing orientation and discussion of protocols
	KT5-S2: providing discussions and clarifying incentives and benefits
	KT5-S3: active monitoring (proactive engagement) of researchers and inventors
	KT5-S4: providing encompassing assistance

On KT1, three out of the eight respondents understood that the IP policies serve as the University's means of

encouraging faculty members to engage in research with potential patentability and that the policy “encourages the researchers and inventors to put forth their ideas in terms of publications or patents” (KT1-S1). Two respondents see the IP policy reward system to be beneficial in immediate and long-term impact, encouraging faculty members to involve themselves in more robust research projects. The university IP policies in the country, one respondent says, “has been very generous in rewarding publications.” On the other hand, it is also perceived negatively by some because of weaknesses in the university’s co-authorship policies. One respondent is concerned that “excellence [may be] undermined by token authorship...stemming from the rewards system” (KT1-S2). Two respondents also expressed concern about the implementation of the IP policies and whether they “encourage excellence, creativity, and innovation” and that there is a need to establish a clear link between the IP policies and research (KT1-S3). A couple of respondents also expressed ambivalence about the IP policies because of their limited knowledge of it. One says, “In actual practice, there has not been a real effort to do consciousness-raising about IP and the university’s IP policies...” (KT1-S4).

On KT2, five out of the eight respondents declared that they had little to no knowledge of IP policies and desire to know more about the options available and the trade-offs in pursuing start-ups. One respondent says, “Start-ups,

licensing, patents and the like are unfamiliar territories for most scientists” (KT2-S1). There is serious concern about the time required to engage in start-ups and doubt as to whether researchers can commit to the task (KT2-S2). On top of this, five out of eight respondents express doubt that start-up projects will go well with the faculty’s main functions, that is, teaching and research, and that faculty who get involved in them have a “hard time transitioning from that framework” (KT2-S3).

Ownership issues are also a concern, with three out of the eight respondents saying that there is no clear line between the ownership of the individual/s and the institution given academe-created knowledge. They sense that it is unfair for the University to take ownership of their outputs. The idea that the University’s ownership of their products will mean revenue for the University instead of the innovation’s intended common good is also a discouraging thought (KT2-S4). There is additionally a perception that the current functions of the faculty do not include academe-created knowledge transfer pursuits, as evidenced by the lack of incentives for such pursuits (KT2-S5).

Respondents feel the need for a thorough literacy campaign among the stakeholders, that is, faculty and students, to facilitate understanding of procedures and handholding if the UTTO expects them to engage in knowledge transfer pursuits. It is recommended that the University “embed the discussion on these processes at the

very start of a students' research career, perhaps in graduate school" (KT3-S1). A concern was raised again about the benefits of academe-created knowledge being restricted, thwarting the idea that it is supposed to be promoted for the common good (KT3-S2). Moreover, it is suggested that the faculty workload be evaluated before academe-created knowledge transfer activities are even considered as these are perceived to be activities that are over and above the chief functions of the faculty (KT3-S3). It is also recommended that "the university technology transfer office should have services such as drafting of business plan, market study, and holding shark tank sessions to expose the technologists to potential investors" (KT3-S4).

Lack of awareness is identified anew as one of the obstacles to disclosing inventions and creative works to the University. Respondents reveal that they are generally unaware of the procedures involved and the benefits of IP disclosure (KT4-S1). It is believed that while IP disclosure has clear benefits for the institution, the benefits for the individual/s are not as clear. It is also unclear to some respondents how the financial burdens are shared. There is a general perception that it is better to "start on business under the radar of the University IPO" (KT4-S2). Finally, the respondents see the process from disclosure to patenting as requiring an enormous amount of time, making engaging in it unattractive (KT4-S3).

On KT5, seven out of the eight respondents believe that the UTTO's major task is to provide a more thorough orientation that will facilitate a deeper understanding of its purpose and services and to show how different they are from scientific publications (KT5-S1). Incentives for the reporting of inventions and creative works must also be provided (KT5-S2). UTTO staff must stay in close contact with researchers to provide the assistance that is actually needed (KT5-S3). Proper support and assistance must also be attuned to the different disciplinary pursuits of the researchers, for example, "creative works" versus "inventions" (KT5-S4).

On educators' awareness of institutional IP and technology transfer policies and practices. The findings reveal that to promote effectiveness of university technology transfer programs, more time and resources are required on activities that raise awareness of educators about institutional IP and technology transfer policies and practices. As pointed out by Johnson et al. (2014), every new initiative should have a matching communications strategy. Various plans are thus needed for communicating the different technology transfer initiatives to educators. Furthermore, as suggested by Johnson et al. (2014), Lengel & Daft (1988), and Wells (n.d.), these plans should consider using a variety of communications tools and media (e.g., emails, websites, face-to-face) so that the University's intentions concerning technology transfer could reach

a broad audience. It is important for the University to communicate its vision for technology commercialization to the academic community since lack of awareness can lead to a perception that the University engages in technology transfer purely for financial gain, which in turn discourages participation by some educators in the formal technology transfer process. Moreover, educators also need a clear message from senior management that their participation in licensing and start-up activities is not entirely in conflict with their main functions in the University. As noted by Johnson et al. (2014), when senior management's intentions are not clearly articulated, others cannot be expected to understand the intentions.

On obstacles to licensing and start-ups. Based on the responses, a lack of educators' awareness and understanding of institutional IP and technology transfer policies and practices can affect the technology transfer process in two ways. First, it discourages educators from engaging in licensing or start-ups and from reporting inventions and creative works to the University. Baldini et al. (2007) and Owen-Smith & Powell (2001) identify the lack of knowledge about university-level patent regulations and procedures as a major obstacle to the patenting process. Second, lack of awareness and understanding of institutional policies on IP ownership can be a source of tension between educators and the UTTO, especially when there is a perception that the University should not have an ownership interest in educators' IP assets.

In connection with this, this study reveals that practices that encourage publication, for example, publication incentives, can move researchers away from the patent system. As noted by some respondents, compared to publishing, the patenting process requires a different set of skills and takes a long time from filing to grant, and patent drafting can be difficult. Hence, when patenting is perceived as insufficiently incentivized, educators may be discouraged from patenting their innovations. This aligns with the findings of Baldini et al. (2007).

This study further reveals that lack of educator interest and lack of time due to busy schedules are other obstacles that discourage educators from engaging in licensing or start-ups. Heavy teaching/administrative workloads were identified by Baldini et al. (2007) as obstacles suffered by researchers during the patenting process. UTTOs may then be wasting resources on patents that are difficult to license to the industry when they fail to consider inventor interest and availability to participate in licensing during their evaluation of technologies for potential patent filings.

On the responsibilities of an IP/technology transfer office. Building internal capabilities in patenting and patent management may be something educators are less interested in as they are more likely to be interested in how their research outputs can reach industry. While marketing IP may be a task commonly performed by a UTTO (Correa & Zuniga Lara, 2013; EC, 2004), RTI International (2014)

noted that this is a weakness of Philippine universities. In the University's case, the responsibility for marketing university-owned IP is unclear in current policies. If plans to market university-owned IP assets are not developed and implemented, chances of industry gaining interest in the IP assets will be slim. Moreover, as the University continues to expand its patent portfolio, higher patenting costs can put financial pressure on the University since, as noted by Gubby (2015) and Love (2014), patents will become valuable only when they are commercially exploited. Finally, various transfer modes, including patent licensing, licensing of software and creative works, and provision of knowledge-based services (e.g., technical services), may be explored when formulating the marketing plan to enable knowledge and technology transfer across a broad range of disciplines as suggested by Fini et al. (2010) and West (2012).

On encouraging disclosures. Based on the responses, educators who see the benefits of the patent system tend to have a favorable view of university IP policies. Some benefits of patenting identified in the study (i.e., a medium for sharing ideas, a source for materials that can challenge researchers, and a measure of productivity) correspond to the intangible rewards (i.e., "prestige/visibility/reputation" and "new stimuli for research") found by Baldini et al. (2007) to be more important reasons for university inventors to engage in patenting activities and the perceived professional

and personal benefits found by Owen-Smith and Powell (2001) to be factors that influence faculty decisions to engage in patent protection. This suggests the need to include a discussion on the personal and professional benefits of obtaining IP protection when designing IP workshops and seminars for researchers.

This study also shows that there is a tendency for educators in the science, technology, engineering, and mathematics (STEM) disciplines to associate IP policies with patenting. This may be attributed to the focus on patents in IP workshops/seminars given in the University for scientists. As noted by West (2012), more engagement with researchers in non-STEM disciplines is needed to enable adjustment of the content of IP workshops/seminars to fit the nature of research outputs in the various colleges. Gubby (2015) and Soetendorp (2001, 2004, 2006) argued for the inclusion of IP courses in the nonlaw curriculum. The argument is also valid in the Philippines since the subject of IP is seldom discussed in the nonlaw curriculum. Aside from seminars/workshops on patents, trademarks, copyrights, and the technology transfer process, materials on the protection of undisclosed information (e.g., trade secrets, know-how, and research data) (Schultz & Lippoldt, 2014) as well as traditional knowledge and traditional cultural expressions (Dutfield, 2003) could be developed and disseminated since these forms of IP may be highly relevant to work done by researchers in the non-STEM disciplines.

This study also reveals that universities like the one studied here, intending to transfer technology via academic spin-offs/start-ups, should consider providing entrepreneurship training to scientists. The lack of entrepreneurial spirit among university faculty and the predominant lack of business skills in university-based start-ups in the country were previously reported by RTI International (2014). Entrepreneurship training was identified by Derrick (2015), Gomez Gras et al. (2008), and Guerrero & Urbano (2012) as one way of stimulating entrepreneurship in a university. Based on the findings of Derrick (2015), educating researchers has the potential to bring the UTTO closer to them, which can increase effectiveness of technology transfer operations and researcher engagement.

At the University, responsibility for handling IP education and entrepreneurship training is unclear. If it is intended to include such training in technology transfer operations, sufficient resources (including appropriate staffing and incentives) should be allocated to the technology transfer units for them to perform their functions effectively which, in turn, promotes the effectiveness of the technology transfer process.

Comacchio and Bonesso (2012) proposed various performance metrics/indicators to evaluate technology transfer performance. When a university, such as the one studied, is at an infant stage of technology transfer,

there is little to report on the output areas of technology transfer performance. The lack of successful technology transfer within the University arguably makes it difficult for educators to see the causal link between research and the protection of IP rights, which was pointed out by some respondents. Educators may also wait for successful licensing and/or established start-ups in the University before deciding on whether they should engage in the formal technology transfer process.

Since “publicity about success” was identified by Owen-Smith and Powell (2001) as a key environmental factor that affects IP disclosures by researchers, a university like the one studied here that lacks experience in technology transfer could consider promoting successful experiences at other universities to inspire researchers to engage in the formal technology commercialization process.

CONCLUSION

This study was designed with the aim of exploring what could be done to facilitate the improvement of university technology transfer processes in the Philippines. Although the purposive sampling used may not allow the findings to be generalized or become representative of situations in other Philippine HEIs, it reveals many similarities with issues encountered in other universities abroad that were detailed in the review of literature. It therefore offers some areas that Philippine HEIs can investigate to contribute to

the improvement of technology transfer in the country.

The findings show that most respondents fail to appreciate the significance of IP policies to their research work. Those who did, however, mentioned patents, which is a narrow view of the IP policies. The lack of entrepreneurship training, lack of time, lack of interest from educators, and lack of institutional policies and/or awareness of the policies were identified as some of the obstacles that discourage educators from engaging in licensing or establishing start-ups or spin-offs. Furthermore, lack of awareness/understanding of IP policies and patenting-related factors (e.g., lack of patenting skills or understanding of the patenting process, and the length of the patenting process) were identified as some of the obstacles that discourage educators from reporting their inventions and creative works to the University. Improving awareness of institutional IP and technology transfer policies and practices among educators and the provision of IP education and entrepreneurship training were identified as some actions that could facilitate the improvement of university technology transfer processes in the country.

The importance of internal communications in the university technology transfer process also surfaced in the findings of the study. Internal communications are needed to raise educators' awareness of the university's vision for engaging in strategic initiatives relevant to the technology

transfer process and of the institutional IP and technology transfer policies and practices adopted by the university to manage the technology transfer process from IP creation to commercialization. The study also found that both IP education and entrepreneurship training are needed by educators to encourage their participation in the technology transfer process. An understanding of the IP rights system is needed for educators to see the system's significance to their research. Entrepreneurship training is also needed for educators to discover entrepreneurial opportunities in their research and to inspire them to engage in the commercialization of their research outputs.

RECOMMENDATIONS

The following are some recommendations aimed at addressing the identified challenges and capitalizing on opportunities to enhance technology transfer processes within Philippine HEIs, ultimately contributing to national innovation and economic growth.

Improve institutional policies and support and strengthen internal communication:

Develop clear institutional policies that promote and support technology transfer activities. Establish effective internal communication channels to disseminate the university's vision for technology transfer.

Enhance awareness and understanding of IP and technology transfer policies:

Increase awareness among educators about existing institutional policies and encourage their adherence to the policies. Implement comprehensive IP education programs for educators to emphasize the significance of IP beyond patents and to ensure that educators understand the entire spectrum of IP and technology transfer policies as well as their relevance to research activities.

Address obstacles and barriers:

Develop and implement entrepreneurship training tailored for educators to equip them with skills necessary for commercializing research outputs. Address time constraints and lack of interest among educators through targeted initiatives that highlight the benefits of technology transfer.

Provide continuous support and resources:

Offer support mechanisms, such as mentorship programs and resources, to guide educators throughout the technology transfer process. Facilitate access to patenting expertise and streamline the patenting process to reduce perceived barriers.

Collaborate and benchmark:

Foster collaboration with other institutions to learn best practices in technology transfer, and benchmark against successful technology transfer models abroad to adapt relevant strategies to the Philippine context.

Promote a culture of innovation and commercialization:

Cultivate a culture that values innovation and encourages educators to explore entrepreneurial opportunities arising

from their research. Celebrate successful technology transfer stories to inspire educators and students alike.

DECLARATIONS

No conflicts to declare.

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