INTELLECTUAL PROPERTY (IP) MANAGEMENT AND MONITORING PROTOTYPE SYSTEM FOR UNIVERSITY INNOVATION CENTRE

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ABSTRACT

Knowledge is considered a principal economic asset for the knowledge economy in which the management and protection of the knowledge assets are critical to an organization strategy. The knowledge assets which exists in various organizations including the education industry has to be protected through efficient management of the intellectual property rights (IPR). Universities around the world have realized that there is a need to improve the IPR monitoring and management to respond to the internal and external expectations. Research outcomes which are scattered in various faculties of the university can be better managed through the use of information technology (IT) specifically through an Intellectual Property (IP) management system. This paper highlights the concepts for managing IP through an IPR management and monitoring framework. This framework will serve as a guideline to enable efficient IPR management tailored to the specific environment of the University's Innovation Centre that is responsible for managing IPR for the university. A semi-structured interview was conducted to the IP management unit of the university innovation center to understand the as-is scenario and challenges in managing IPR in the university. Results of the interview were analysed and used as a basis to develop a framework for the IP management and monitoring system. The framework comprises of IP Awareness, IP Mining and IP Screening processes. In order to verify the user's acceptance of the framework, a think-aloud technique was used to validate the concepts that was proposed in the framework through a prototype system. Qualitative data analysis results indicated that the IP management and monitoring framework and prototype system provides significant improvement to the existing IP management issues and work practices. The framework was carefully designed to enable relevant information pertaining to IP to be acquired, stored, managed and deployed in a manner that is more efficient based on effective information management concepts.

Keywords: *Intellectual Property, Intellectual Property Right, Intellectual Property Management, Intellectual Property Monitoring, Knowledge Assets*

1. INTRODUCTION

Knowledge is considered as a key asset in organizations of the knowledge economy. Management and protection of intangible assets is increasingly becoming the basis for organization strategy. A wide range of intangible business assets such as skills, experience and know-how are considered to be more important and valuable than tangible assets. Intangible asset usually in the form of knowledge must be protected by the law of intellectual property rights (IPR). The increasing importance of these assets may cause private and public institutions to review their organizational strategy to incorporate the protection and management of the IPR. The increasing number of university's innovative research leads to several challenges on the effective management of IPR especially in areas of knowledge acquisition and dissemination [1, 2, 3]. Most Malaysian universities will have a university innovation center that is responsible for identifying, evaluating, and collecting research information conducted within various faculties and research centers. Universiti Kebangsaan Malaysia (UKM), one of the oldest Malaysian national university is also currently facing numerous challenges in managing IPR. IP management practices in universities and organizations need to be reviewed in order to determine how these practices can influence the creation of knowledge to drive innovation [2]. Due to poor IPR management, universities may face the

loss of knowledge assets that are significantly important for the institution's knowledge growth [4]. Thus, managing IPR using a proper IP management system is vital for the knowledge organization [1, 5, 4, 6, 3]. Arumugam & Jain [7] also emphasized the importance of IP management system to increase IP management effectiveness. Assimilation and the use of information systems and information technology (IT) have an important role in improving the performance of the firm [8]. Hence, IP management effectiveness can be enhanced with the use of IT [6]. There has been less emphasis on the use of IT as a mechanism to manage the pre-application process of IPR that involves awareness, mining process and screening of research findings. Data that are scattered throughout the faculty can be integrated through the use of IT tools such as intranets, data warehousing, electronic whiteboard, artificial intelligence and expert systems. These technologies are being recommended in order to have scattered academic and research data organized in a more efficient manner [9]. This study focuses on the IP management and monitoring framework development, which includes elements of dissemination, acquisition and knowledge repository. The research context is limited to universities and respondents involved are the executives of Centre for Collaborative Innovation, UKM. The main objective of the study is to design an IP management and monitoring framework in the UKM innovation center. In particular, the objective of the study is to identify and analyze the knowledge, procedures and processes involved in the management and monitoring of the IPR application, design the IP management and monitoring framework, validated through a prototype system testing on the effectiveness and efficiency of the proposed IP management and monitoring processes.

2. IP KNOWLEDGE MANAGEMENT

Intellectual property knowledge management activities is created and distributed in university innovation centers to promote organizational learning, information sharing and knowledge empowerment to improve organizational performance and competitive advantage [10, 11]. The research outcomes in a university were defined through Pries & Guild [12] as the development of creative work undertaken systematically to increase existing knowledge, including knowledge of humanity, culture and society, and the use of knowledge to devise new applications. The study by Hill-King and Pries & Guild [13, 12] on the

basis of intellectual property and the commercialization of university research outcomes have identified several types of intellectual property at universities including research publications such as books, journal articles, learning modules and new technical solutions which can be protected under copyright law or statutory declaration. However, Hua et al. [4] claims that IP protection awareness is relatively poor and commercialization of intellectual achievement was inadequate. This is most likely due to managers and technology management staff who do not fully understand the purpose and concept of IP and its related laws, regulations and policies. As a result, they resort to similar concepts with the legal system. In the technical field, most scientific researchers have very limited exposure and are quite vague about the type of technical achievements that can be applied as an IP. The researchers often make assumptions that the proprietary of the technology invented is automatically protected. Hence, an IP awareness session is critical during the early stages of the researcher's invention. In the IP awareness session, frequent talks are organized by the university innovation centers to disseminate the definition, types and IP protection, the role played by innovation centers as well as the procedures and processes involved in the IP application to researchers from various faculties. Various studies have indicated that there is a need to carry out IP awareness activities listed as follows [14, 15, 4, 11]:

a) Special training to teach the research project leader and researchers in general about the importance of IPR.

b) Open elective courses or lectures in educating people to understand and master the basic knowledge of IPR strategy.

c) Seminars and meetings organized by the university innovation centers to ensure the researchers receives latest developments with regard to IPR.

In conjunction to IP awareness, IP mining is another critical step in ensuring that the IP has value to technology and it is selected according to industrial standards [1]. In mining the IP, intellectual assets can be grouped into three areas which involves those focusing on commercialization, infrastructure and customer relations [16]. The IP mining process can lead to further harmonization after the products have been screened especially in ensuring that the selected potential IP adopts to new and novel technologies. Hanel [1] have suggested that in order to comply to industry standards, the mining of IP can be done

through a rating-ranking system or using tools and technology for the mining purpose. Gassmann et. al [6] also further supports the suggestion by proposing the use of IT for IP management namely for all administrative, screening, and mining or valuation purpose. Consequently, IP Screening is another stage that involves a careful determination of inventorship or ownership in the process for obtaining valid patent rights [11]. A study by Hanel [1] have stated the importance of IP screening where potential products must be classified or screened according to certain criteria such as most valuable patents related to high growth business, patents that had no present or planned use but are still of value to others and patents that are unlikely to be used that should be rejected. IP screening is deemed as an important process as identifying the right product for potential IP is crucial and important for licensing. Therefore, Hanel [1] have also suggested that there should be an IP auditing or screening process in determining IP contribution to firm's added value and licensing patents. It is important to identify what is crucial for the organization's core business. IP organizations such as SAFE Corporation [17] have identified a mechanism which consists of processes for IP screening involving pervasive IP screening and competitive IP screening. Pervasive IP Screening involves checking if IP appears anywhere online and screening the key content such as screening the scripts or codes for software products. Competitive IP screening involves comparing the product with any specific competition and check if it was copied partly or fully. However, this mechanism has its difficulties in terms of time and costs as it involves registering and obtaining IP scores. In resolving this issue, Gassmann et. al [6] suggests that using IT tools to evaluate or screen patent portfolios is critical in order to use this information to identify products of commercialized value which can create new business opportunities. University innovation centers are involved in a variety of IP knowledge management process chain such as identifying the type of university research outcomes, the level of coverage of an IP type, IP awareness programs and cultivate a culture of entrepreneurial thinking among academic researchers. Furthermore, knowledge acquisition strategy consists of methods and techniques such as IP mining program for collecting and identifying potential research outcomes and IP screening program that further examines the commercially potential research outcomes.

3. CASE STUDY

The IP management team of UKM's Centre for Collaborative Innovation (PIK) has an important role to create a diversified portfolio through IP mining and strategically manage all UKM's IP. Among the services provided are advice and assistance to researchers in the IP disclosure, IP protection process and coordination with patent attorney, creating IP databases, IP campaign, IP audit, IP valuation and disseminating knowledge of new technologies. At present, there is one IP manager and four (4) IP executives responsible for the management and monitoring of IP. For the purpose of research, the current IP management and monitoring processes and procedural knowledge implemented by the IP management team which govern the affairs of IP in UKM will be studied. Current process of the IP monitoring and management was chosen as a case study for the purpose of designing an IP management and monitoring system prototype. The efficient and orderly mechanism of management, monitoring and report generation is PIK's goal in solving current IP management issues. Data was collected through documents, websites, seminars, workshops and semi-structured face to face interviews with identified respondents. The population in the case study involves the executive and non-executive staff in PIK. The study has identified four major problems as a result of the interview response. Analysis of the problem is formulated and accompanied by a recommendation as presented in Table 1 below:

Table 1: Summary of problems and proposed solutions

Problems summary	Proposed solutions
i. Issues with the current manual and conventional IP management processes in terms of storing, updating and managing data relevant to IP applications such as:	A new approach to the IP management and monitoring system namely:
▪ There is no central repository for storing, collecting and generating reports from IP application records.	▪ The use of a database that can store and collect records on the research outcome. Preliminary research outcome data obtained from several sources, such as UKM's personnel information system and Centre for Research and Instrumentation management (CRIM) can be added to the database.
▪ Actions taken by the PIK IP executive on any IP management activities are not recorded in a structured and organized manner.	▪ The introduction of a dashboard system features which have data editing function and IP information displayed namely actions taken by the responsible IP executive.
▪ IP application information are updated separately and not on a regular basis by IP executive after information is amended in the IP application activities.	▪ Records of the IP data can be updated systematically and in a central repository, where the latest data is always stored in the same database.
ii Existing IP management process monitoring of is not carried out effectively on every IP application phase or program.	Warning functions or alert incorporated in the new IP management and monitoring system.
▪ The monitoring method at each IP application phase or program was conducted manually and on ad-hoc basis upon request and needs from the PIK top management.	▪ Every IP management activities of IP awareness, IP mining and IP screening programs have updates and automatic reminders mechanism to enable IP executives to monitor the IP application's current status. For example, once an IP mining session ends, a reminder e-mail will be sent to researchers after three (3) days, seven (7) days and thirty days (30 days) after which the researchers have yet to make the IP application. One month after the date of the IP mining program, if the researchers had not made any IP application, PIK considers that the researchers are not interested in continuing to apply the IP and their research outcome record will be disposed from the screen display.
▪ PIK's IP staff need to allocate extra time to hold a meeting to collect and consolidate data to monitor the current status of the researcher's IP application.	▪ Monitoring features in the IP application system can save IP executives time from an unnecessary meetings and focus on other tasks that are more important. In addition, a comprehensive report that displays the IP application's current status and research information can be generated by the new system.
iii. Communication between researchers and IP executives from the commencement until the end of the IP application phase conventionally using phone and individual e-mail takes a long time.	▪ Announcement on IP awareness sessions via e-mail invitation to researchers in bulk can be sent electronically. The systematic notification at every phase of the IP monitoring can prompt researchers to refine the IP application process more quickly and efficiently.
iv. Management and monitoring mechanism on each IP application program is lacking and yet there is still no commercial IP system management and monitoring for IP pre-application activities.	▪ Develop an IP management and monitoring system for the governance of IP pre-application activities by UKM researchers.

System prototype development for this study has been implemented based on the synthesis of the existing IP management and monitoring process sequence phases, through literature review analysis as well as case study of the university innovation center.

4. IP MANAGEMENT AND MONITORING FRAMEWORK

The proposed IP management and monitoring framework has been refined taking into account the IP due diligence conducted by PIK with cooperation of UKM TECHNOLOGY before research outcomes' IPR is obtained. Literature review analysis have identified the gaps between phases in the existing IP application process on the manual work practices that needs to be addressed in each phase to manage and monitor IP applications effectively. In order to obtain a descriptive and consistent picture on the effectiveness of the IP management and monitoring, research outcomes information management components, IP awareness management, IP mining management and IP screening management has been identified for the provision of good IP management methods. Further findings from the analysis of interviews and related documents of IP management was also used to develop the IP management and monitoring framework. Figure 1 illustrates the proposed IP management and monitoring conceptual framework.
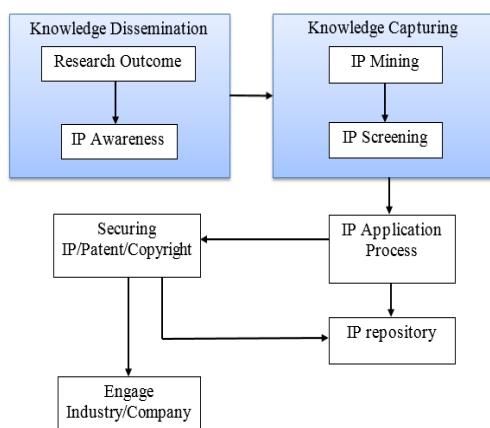

Figure 1: IP Management and Monitoring Conceptual Framework

Results of the analysis identified elements for each IP management phases that could affect the success of the management and monitoring of an IPR application. Since this is a single case study, exploratory opinions and experiences of each individual leads to a deep understanding of the particular case and the phenomenon under review in a particular setting. The findings provide information-rich data and understanding related to the case study. However, the findings may not be generalized to the larger context of population study [18].

5. METHODOLOGY

The methodology used in the study is divided into six phases. The first phase is the literature review phase which analyzing the issues and problems related to the IP management and monitoring. Case study at the UKM's Center for Collaborative Innovation (PIK), which is the second phase of the study involves semi-structured interviews and observations about the current program and activities of IP management and monitoring to identify user needs and existing problems. The results of the literature review and case study are used to design an IP management and monitoring framework development. The third phase is the development of system architecture design. The fourth phase is the prototype system development which is implemented for the purpose of IP management and monitoring system framework validation. The concept of IP knowledge acquisition and dissemination were incorporated into the system framework and verified using the construct being measured by prototype validation. The fifth phase is the prototype system testing and evaluation for measuring each identified construct in the system framework and user assessment. The sixth phase contains a discussion on the objectives that has been accomplished as per identified in the beginning of the study.

This study aims to explore the previous research and literature of a specific context. A qualitative method is considered suitable to be applied in this study due to the nature of studying a new phenomenon, experienced by a certain population using new innovation in a particular context. Qualitative research is deemed suitable for studies that require the understanding of people, the social and cultural context of their environment [19]. Hence, this research adopts the qualitative approach in view of exploring the research problem through the point of view of respondents describing their issues and problems with the management and monitoring of IP. As such, a qualitative method which includes interviews, documents review and observations of researchers to the identified context was applied [20]. A case study approach was also adopted in this study as it allows researchers to

obtain an insider view of the department selected, thus allowing a better understanding of the current organizational status directly from respondents within the organization [21, 22]. This provides greater depth to the phenomenon understudy [21,23]. The interviews were aimed to obtain a perspective on how the IP is being managed and implemented at the university. Based on the interviews, reviews of relevant documents and findings from previous research, the actual design of the IP monitoring and management framework is finalized. The framework will confirm or eliminate previously identified concepts by the conceptual model. The framework was also used to identify areas of knowledge dissemination and acquisition, which will serve as a basic guideline to the development of the IP monitoring and management system. Qualitative method was also used for the evaluation of the prototype through a *think aloud* technique. The results of the user evaluation and feedback proved that the proposed IP management and monitoring system was able to structure the current IP management processes and increase work productivity.

6. SYSTEM ARCHITECTURE

The IP management and monitoring system architecture was designed based on the results of interviews, document analysis and findings from previous studies. A system prototype is usually an incomplete system that does not provide signifiant details of the system. Nevertheless, the goal of the prototype is to provide a small-scaled system with the overall basic functionalities.

6.1 Development Tools and Software

Hardware and software development tools is a kind of application that can be used to build, operate and maintain a web portal system when system prototype development process is underway. The tools are not only used to test the system but also to build the code, interfaces and other system functions. The selected software for the prototype development includes PHP, WAMP Server, Adobe Photoshop and phpMyAdmin. PHP is an open source scripting language to build web sites that requires a database for data storage and manipulation. The web based IP management and monitoring system's interface was built using PHP web programming language. In addition, PHP also consists of available source codes that can be used for learning purposes and supports many related functions. For the purpose of an integrated system development, the server *WAMP* server will be used as it can run on most *WINDOWS* operating systems. Other components on this server includes *Apache, PHP,* and *MySQL*. *MySQL* is a multi-user *SQL* server and relational database. It is based on a structured query language (*SQL*) used to add, remove and modify information in the database. In addition, the common *SQL* commands such as *ADD, DROP, INSERT, UPDATE* can be used with *MySQL*. *phpMyAdmin* is a program which is intended to handle the administration of *MySQL*-based for Web applications. Basic operations that are often used to manage databases, tables, columns, relationships, indexes, users, permissions and others can be done through the user interface, in addition to having the ability to directly execute any SQL statement.

6.2 System Architecture

System architecture is a set of rules and standards used in the technical framework of computer systems, in addition to user requirements and specifications in order to design or integrate various components of the system. IP management and monitoring system's prototype was built based on a web application that can be accessed online, store and process IP related data through the database provided. Figure 2 displays the architecture of a system prototype that encompasses key components such as user, user interface, alert function, four (4) IP management and monitoring processing functions which are research outcomes, IP awareness, IP mining, IP screening, database and reports.
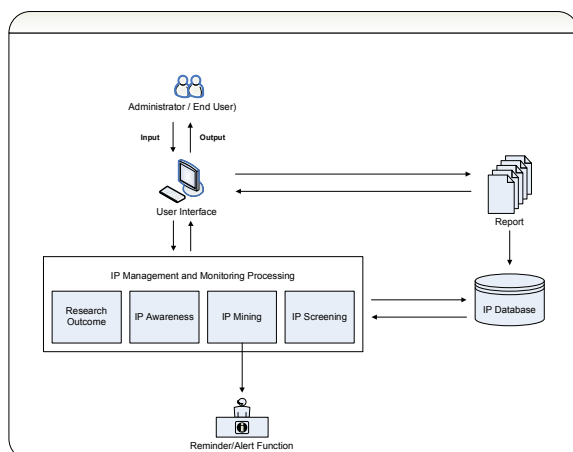
Figure 2: IP Management and Monitoring System Prototype Architecture

The components of the IP management and monitoring system prototype illustrated in Figure 2 are detailed as follows:

a. User

User component refers to the user or end user systems that interact with the system via an interface to gain benefits from the system functions. System users are classified as administrator and end user to control access to functions and information. As a system that will be used for daily work practices, the system administrator will have full access over every available function in the system. On the other hand, end user have limited access to the system functions and information which is considered confidential and is only relevant to the top management, such as the executive summary report. The users access the system's functions through the menu provided as well as by typing the related input. User input is an interaction between the user and the system in which data and detailed information on the research project is inserted to the system database for recording and processing. On this page, detailed information on the project that contains several important attributes such as researcher's name, faculty, project code, project title, research niche area, project outcomes as well as a description of the project will be included in the system. Output view to the user will depend on the processing results of four (4) major phases of the system prototype which are research outcomes records, IP awareness process, IP mining process and IP screening process.

b. User Interface

User interface components is the boundary where the system communicate or interact with user through the interface. The user interface is designed to be easy to use for receiving input in the form of IP record keeping from users. Furthermore, the system will be processing and using that information to display the final output to the end user in the form of status view and reports for each of the IP application records. Interaction style that is applied in the user interface consists of a navigation menu selection, admission date functions, text and email, sorting function, drop-down button, attachment and multi-functional tabs.

c. Processing of IP management and monitoring data.

This section will be the main processes in the IP management and monitoring system architecture containing four (4) processing functions such as research outcomes, IP awareness, IP mining and IP screening as described in Figure 3 below:
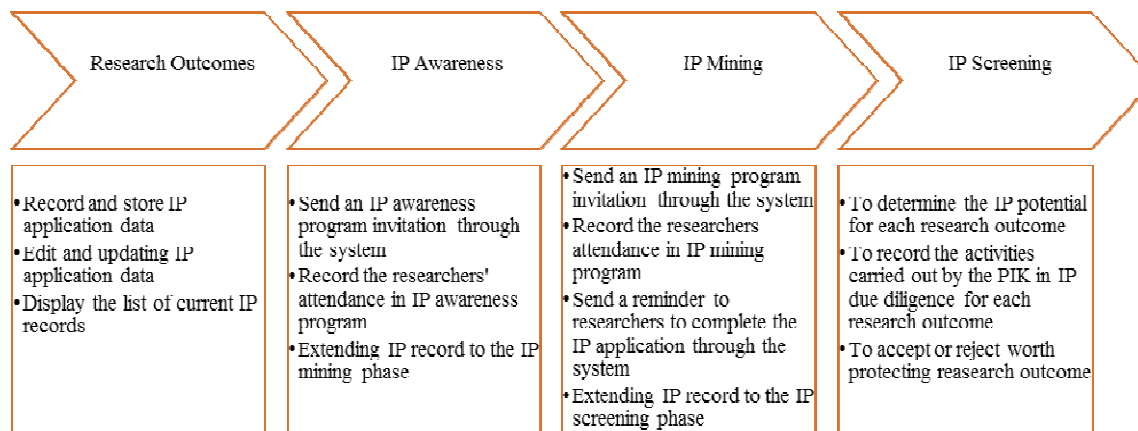

Figure 3: Four Functions in The IP Management and Monitoring System Main Process

d. Alerts function

This section is a system control mechanism which functions to alert researchers in order to complete the IP application within the time period that has been set for 30 days after the IP mining program. Three (3) e-mail alerts will be sent to researchers automatically by the system in the interval of 3 days, 4 days later and 21 days later than the date of IP mining program. IP record will be marked with a red color code after 30 days to indicate that the researchers are not keen to continue with the IP application.

e. IP Database

IP database is the main data repository which is easily accessible and maintained in the IP management and monitoring system. IP data related such as researchers' name, research title, research code and date of program are stored in this database. IP management and monitoring process also uses the data retrieved from the same database.

f. IP Information Search

IP information search executed through IP column or records attribute. Users have a search option based on project code, researchers name, faculty or research institute. Search will refer to the sequence of records in the system database and produces a detailed view of IP records as required by the user.

g. IP Report

This section consists of reports function generated by the system according to end user requirements. The first report will display the latest status on each of the IP application record. The second report will display the percentage of data according to the attributes selected by the user.

i) IP status monitoring report

The prototype system will generate a current status for every IP applications' record. Information view is in a table-based layout that contains information such as *Name, Academic / Non Academic, Faculty, Project Code, Project Title, Research Niches*. IP awareness and IP mining attributes are the participants' attendance information to the IP awareness talks and *ROOW* program to be marked with a "*Y / N*". IP screening attribute indicates the status on PIK's decision ('Pending' / 'Accepted' / 'Rejected') in the IP screening to accept or reject the research outcomes for the purpose of IPR protection. *Walk In* attribute points to whether participants attended as a walk-in participant or through a personal invitation from PIK. *Discontinued Records (Not Interested)* attribute is the researcher's record who do not intend to continue an IP application on e-IPR system within the stated time frame. The *Person In*

Charge (PIK) attribute indicates the name of the executive who manages IP record for certain researchers. The *Remarks* attribute are notes or information written by the user during the IP screening activities session.

ii) IP annual percentage report

The system prototype will generate a report on the recorded IP annual percentage that have been processed by the PIK in the respective phases of the IP management and monitoring. Percentage on IP awareness program, percentage on IP mining program, percentage of IP records accepted and the percentage of IP records rejected can be generated by the system based on the available functions or the following options:

- Selection by academic staff / non-academic
- The number of sessions (select year)
- The number of UKM employees

7. TESTING AND PROTOTYPE VALIDATION

Testing and evaluation is a validation phase for the IP management and monitoring framework by measuring the effectiveness and functionality of the system prototype to meet the system user's needs in order to manage and monitor the IP application properly and effectively. A qualitative approach is implemented on user interviews using the *think aloud*. *Think aloud* technique is selected based on the advantage of the protocol in providing fast, high quality and user feedback qualitatively. Data are available from various sources such as direct observation of what the subject is doing and hear what the subject wanted to or tried to do. If the subject is having difficulties, the researcher will have the opportunity to assist. There are a series of procedures to be conducted in recording the data produced from *think aloud* interviews. This is aimed at obtaining sufficient responds from the subject matter experts that will be interpreted and analyzed accurately [24]. These procedures involve subject matters verbalizing their knowledge, beliefs and attitudes on the IP management area. Hence, to execute these procedures, focus groups are used as a form of research instrument. The research instrument validates the concepts within an IP management and monitoring framework through the effectiveness of IP management and monitoring system prototype testing as implemented by Ismail [25]. Respondents first tested the system prototype and interviewed in groups. At the same time the researcher recorded the responses given by the system users in each step of the operation provided

in the prototype. Respondents were then asked to answer assessment questions related to the system functionalities and usability for managing and monitoring IP application records. System prototype assessment using 5 levels Likert scale measurement which are 1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure 4 = Agree and 5 = Strongly Agree. The questionnaire design procedure and system user interview consists of six main constructs a) Management of research outcomes; b) Management of IP awareness; c) Management of IP mining; d) Management of IP screening; e) Management of IP report; and f) Ease of use.

The system prototype testing was conducted on six respondents who were executives and top management of IP management unit in PIK. The questionnaire was attempted after the system prototype testing is completed. Focus group was chosen in this single case study due to the nature of qualitative research that works with small sample size [26]. The respondents consist of four (4) IP executive, a manager and a deputy director of PIK. All respondents chosen are those involved in the management and monitoring of IP application. Each respondent was tested by varieties of questions on the implementation of system prototype features and functions that coincides with each known IP management and monitoring process concepts. The 'Management of research outcomes' function's evaluation indicates that the system prototype supports the recording, editing, deletions, sharing and dissemination of research outcomes information to users quickly and effectively. While the 'Management of IP awareness' evaluation indicates that the majority of respondents agreed with the idea that the system prototype helps the efficient management of IP awareness compared to the manual methods. Most of the respondents were satisfied with the recording of researchers who attended the program without an appointment (walk in) and recorded information that can be edited when researchers have additional research information in future. Evaluation of the 'IP mining management' resulted to a positive response that automatic warning mechanism for researchers to complete the IP application is recognized to be effective in monitoring of the IP application progress assessment. Next, the evaluation of the 'IP screening management' have resulted to the possibility of functions duplication in the IP screening module between the developed prototype with the current e-IPR system. Therefore, the PIK user requirement needs to be analyzed further for future enhancements. The majority of respondents agreed that the system prototype do assist users to

obtain information about potential research outcomes to be rightly protected before being commercialized.

The evaluation continues with the 'Management of IP report' where the report generation formulates information and data related to each phase of IP management and monitoring was found to significantly assist users to obtain adequate information and current status of each IP application record. Finally the 'Ease of use' evaluation have resulted to users agreeing on the interface design, system functionality and information layout displayed through system prototype. The overall usage of the prototype system was found to be structured in an orderly manner, thus proves that the proposed IP management and monitoring system indeed does improve the existing IP management practices.

8. CONCLUSION

IP management and monitoring practices should be studied to address the weaknesses in information management. Potential IP information is crucial to identify new technology areas, new business opportunities and practicality of an innovation to be in line with the university's vision. This study focuses on the exploration of issues related to the current activities and procedures of IP management and monitoring. The framework is designed to enable information related to IP are acquired, stored, managed and used effectively based on the concepts of IP management. The developed system prototype is capable to increase efficiency in record keeping and accelerate the filtering process of research information. The system prototype which was validated by the IP executives have shown significant increase in resolving the existing IP management issues.

Managing IP assets is not just acquiring the formal IP rights through the university innovation office. Even though obtaining IP protection is a crucial first step, but effective IP management is more meaningful than just protecting the university research outcomes, trade mark, design or copyright. IP management also involves the university's capabilities to commercialize its research outcomes, brand marketing, joint venture, contractual agreements concerning IP and have an effective IPR monitoring and enforcement. Thus, an IT based IP management and monitoring tool is an effective strategy for producing capable IP products to attract partners, manufacturers or potential investors for commercial research and increase economic capital of the organization. Results of the study

demonstrate that the use of IP management and monitoring system that meet the IP management activities criteria have a significant impact towards improving the process of identifying and evaluating potential IP.

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