Issues in the Development of Patent Discovery System for Islamic Finance and Banking

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Abstract

This paper reports on the issues related to our work on developing patent discovery system for Islamic Finance and Banking. We aimed to identify the gaps at each stage of our system development. These gaps expanded our scope of work beyond getting the ideal performance of our patent discovery system. We explored patents on Islamic Finance and Banking as indexed in major patent databases. Patent retrieval and analysis plays an important role in determining the phases of patents using TRIZ Trend. Our findings showed that research in text analysis for Islamic Finance and Banking were rarely conducted; and that patents in Islamic Finance and Banking were facing critical issues. We found that each of these issues calls for research-based solutions and for an appropriate organization of information and patent representations. We suggested that concepts in Islamic Finance and Banking must grow in number, be appropriately organized, and experience semantic harmonization.

Keywords: research gaps, TRIZ Trend, patent retrieval, patent analysis, Islamic Finance and Banking.

1. Introduction

Contemporary advances in the technological arena have facilitated the need for managing organizational knowledge scattered across diverse sources of information. This situation is much more challenging in cases of tacit and implicit knowledge, and worst in the absence of knowledge sharing culture and system. A key challenge for knowledge management systems is the effective discovery and utilization of the contents stored in knowledge bases.

Applying the same analogy to patents, it can be inferred that analyzing patents is essentially worthwhile to manage the complexities of searching and inter-relating patent information (Abbas et al., 2014). Patents are evidences of explicit knowledge, innovations and inventions. Universities are moving towards the direction of patenting intellectual products beyond publications and copyrights. Novelty search looks for patent information, and is now crucial for drafting research proposals and grants applications. With the ever-increasing volumes of patent information, the tasks of patent search and analysis have become vital from both legal and managerial perspectives (Abbas et al., 2014).

Islam promotes integrity, accountability, social inclusion and innovative solutions. In addition, Islam calls for compliance to Islamic Law and fulfillment of maqasid shari'ah. Islamic Finance and Banking is consistent with the principles of Islamic Law (shari'ah) and its practical application through the development of Islamic Economics. Products and services offered in the domain of Islamic Finance and Banking must serve as a mercy to humankind, particularly on the issues of poverty and integrity.

The generation of ideas within the Islamic Finance and Banking is expected to achieve positive social equation. This social equation requires that innovations in the domain are more than consumptions. Thus, to understand on the nature of the existing innovations, it is therefore important to develop a patent discovery system in Islamic Finance and Banking. Since research works in this domain are few in numbers, there are many issues when we were developing the patent discovery system. Thus, we have identified these issues and gaps.

This paper reports on the issues related to our work on developing patent discovery system for Islamic Finance and Banking. We aimed to identify the gaps at each stage of our system development. These gaps expanded our scope of work beyond getting the ideal performance of our patent discovery system. We explored patents on Islamic Finance and Banking as indexed in major patent databases. Patent retrieval and analysis plays an important role in determining the phases of patents using TRIZ Trend. WE employed a Subject-Action-Object (SAO) approach as one of the methods to discover the patents.

This paper is organized as follows: previous related works in patent discovery and analysis, issues and gaps during system development, recommendations, and conclusion.

2. Previous Works on Patent Analysis

Techniques applied for patent analysis include text mining and visualization-based approaches (Abbas et al., 2014). Patents are composed of a big size of structured and unstructured data; hence, text mining must deal with extraction of information from both kinds of data. In implementing patent analysis, Abbas et al (2014) also emphasized that text mining is employed based on NLP, property-function based approach, neural networks based approach, and semantic based approach.

Research works on patent analysis have been conducted for many purposes and methods. Yoon and Kim (2011) built a system to identify the rapidly evolving technological trends for R&D planning. This task was implemented by employing SAO-based semantic patent networks. SAO-based approach was also applied in the works carried out by Choi et al (2011), where SAO network analysis of patents is applied to identify technology trends on the patents. Their work was evaluated on polymer electrolyte membrane technology in proton exchange membrane fuel cells case study. In the same year, Park et al (2011) researched on patent infringement using SAO based on semantic technological similarities.

SAO-based approach integrated with TRIZ model was utilized by Park et al (2012) to conduct patent evaluation. A system called as PRAP (Patent Retrieval and Analysis Platform) was developed by Liu et al (2011) as an integrated system for retrieval and analysis of patents to help companies manage patent documents more effectively.

3. Issues and Gaps

There are many issues and gaps that we have identified while developing patent discovery system in Islamic Finance and Banking. The issues and gaps were related to patent retrieval, patent template, patent component extraction, patent component parsing, and patent analysis.

3.1. Patent Retrieval

Patent retrieval is the first step in system development and requires a collection of patents. Patents can be retrieved from many sources. We used online patent databases for getting the patents in Islamic Finance and Banking. We searched for the patents in four popular online patent databases i.e. United

States Patent and Trademark Office (USPTO), Intellectual Property Corporation of Malaysia (MyIPO), World Intellectual Property Organization (WIPO), and European Patent Office (EPO).

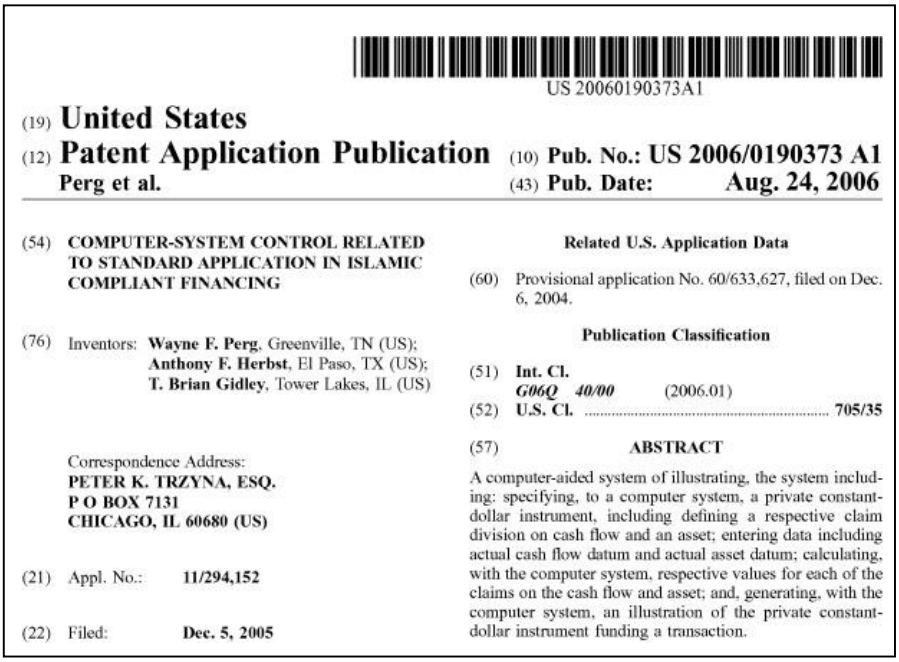
For the purpose of retrieval with high recall, we compiled an exhaustive list of keywords in Islamic Finance and Banking covering both products and services. As for the keywords, we used several strategies including phrases and concepts from our existing Islamic Finance and Banking ontology and taxonomy from Bank Negara Malaysia. We expected to retrieve 100 patents. Unfortunately, with the exhaustive list, we got 40 patents in Islamic Finance and Banking from 3 online patent databases, i.e. USPTO, MyIPO, and WIPO. None was retrieved from EPO online patent database.

This result shows that patents on Islamic Finance and Banking are not available in huge number in widely accessed online patent databases. The limited number of available patents can have a significant effect on system evaluation since small data could not representatively be a good sample of the data itself. Such a gap calls for a research that computes the ratio of publications and patents, and factors influencing the small number of patents in the domain. Our immediate recommendation was to identify patents under different dimension of concepts, such as interest free loan. This is acceptable based on maqasid shari'ah.

3.2 Patent Template

Even though all online patent databases do the same thing, which is return patents based on keywords, these databases have different requirements and standards with regards to how a patent document is written. This is then the cause for these patents to exist in different formats even in the same database. Furthermore, the difference is not only on the template, but also

with what components must be provided in the patent document. Figures 1-4 shows the samples of patents retrieved from the four online patent databases mentioned in section 3.1.



US 20060190373A1

(19) **United States**

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Perg et al. (43) **Pub. Date: Aug. 24, 2006**

(54) **COMPUTER-SYSTEM CONTROL RELATED TO STANDARD APPLICATION IN ISLAMIC COMPLIANT FINANCING**

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(21) Appl. No.: **11/294,152**

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(52) **U.S. Cl.** **705/35**

(57) **ABSTRACT**

A computer-aided system of illustrating, the system including: specifying, to a computer system, a private constant-dollar instrument, including defining a respective claim division on cash flow and an asset; entering data including actual cash flow datum and actual asset datum; calculating, with the computer system, respective values for each of the claims on the cash flow and asset; and, generating, with the computer system, an illustration of the private constant-dollar instrument funding a transaction.

Figure 1. A patent retrieved from United States Patent and Trademark Office (USPTO)

10/9/2015 United States Patent Application: 0040107152

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PATENT APPLICATION FULL TEXT AND IMAGE DATABASE

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Images

(15 of 17)

United States Patent Application	**20040107152**
Kind Code	**A1**
Marlowe-Noren, Joanne	**June 3, 2004**

Investment grade shari'ah (Islamic) compliant financial product

Abstract

A financial instrument formulated in accordance with the principles of the present invention comprises a traditional, rated, investment grade security in compliance with Shari'ah investment guidelines and Islamic law. This financial instrument can include an investment vehicle which is compatible and consistent with the operating morays and norms of the Western capital markets while complying with Shari'ah investment guidelines. The investment vehicle effectuates a passive or semi-passive investment by an individual or institution that observes Islamic law in the establishment of its investment criteria and the implementation of its investment practices. Further, the investment vehicle qualifies as a consistently formatted investment-grade, ratable security within a capital markets environment.

Inventors: **Marlowe-Noren, Joanne**; *(Wadsworth, IL)*

Figure 2. A patent retrieved from United States Patent and Trademark Office (USPTO) in a different format.

3/24/15 Trademark Search - View Details

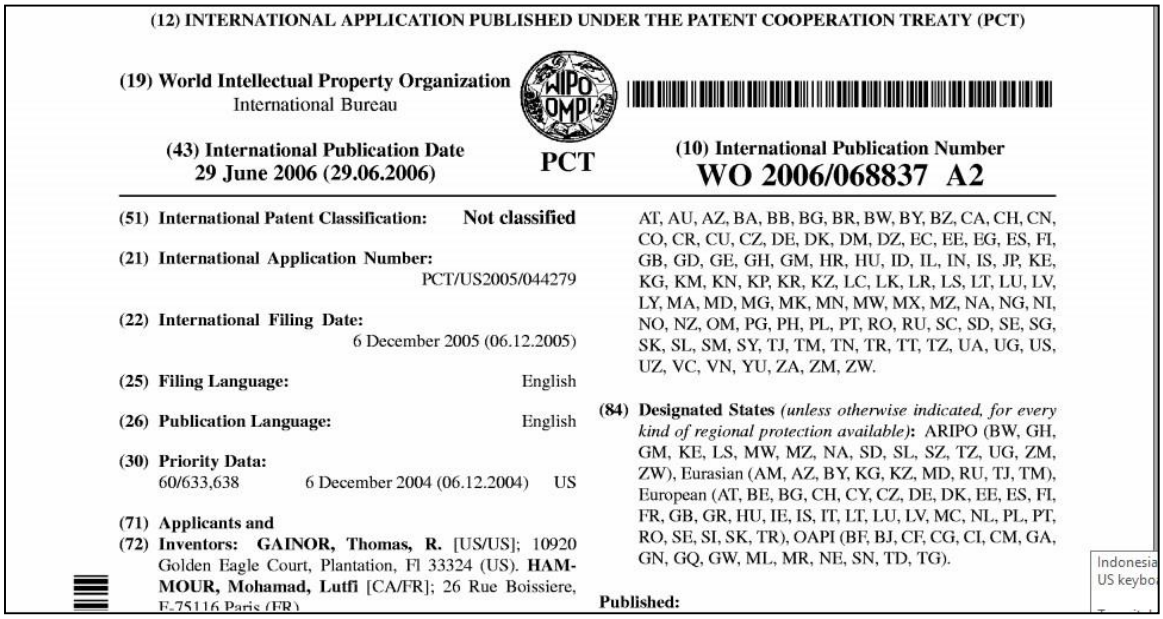
Perbadanan Harta Intelek Malaysia
Intellectual Property Corporation of Malaysia
(Diperbadankan)
Unit 1-7, Ground Floor, Menara UOA Bangsar, No 5 Jalan Bangsar Utama 1, 59000 Kuala Lumpur.
Tel: 603-2299 0400 | Reception: 2299 0594 | Fax: 603-2299 0809
Website: www.myipo.gov.my

MyIPO

Trademark Details

Application Number	: 2012015508
Mark	: ADVQIF Advanced Qualification in Islamic Finance
	ADVQIF
	Advanced Qualification in Islamic Finance
Type of Mark	: Stylish Verbal
Translation	:
Transliteration	:
Disclaimer / Condition	: Registration of this trade mark shall give no right to the exclusive use of the words "Advanced Qualification in Islamic Finance ".
Vienna Coding	: 270501 - Letters presenting a special form of writing 270530 - Miscellaneous letters and or numerals mark.
Filing/Application Date	: 12/09/2012
Legal Status	: Registered
Legal Status Date	: 12/11/2014
Advertise Date	: 31/07/2014
Grant/Registered Date	:

Figure 3. A patent retrieved from Intellectual Property Corporation of Malaysia (MyIPO)



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AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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Published:

Figure 4. A patent retrieved from World Intellectual Property Organization (WIPO)

As shown in Figure 2, a patent retrieved from USPTO was written in two vertical sections except for the header that exists in a horizontal form. Every structure in the patent is completed with relevance number. This kind of patent has an abstract representing a summary of the patent.

There is another format of patent fetched from USPTO. Figure 3 depicts another format of a patent retrieved from the same database, i.e. USPTO. Similar to the first format, this patent also has an abstract. However, differences were found at each field with no identity number. In addition, the content of the patent is displayed in one column.

In Figure 3, we show that a patent from MyIPO has a quite different format compared to USPTO patent. It presents all important information in the form of a label and there is an assigned value for each of them. However, it has no abstract and gives only Disclaimer/Condition and Specification of Goods/Services for explaining a patent value.

As shown in Figure 4, a patent from WIPO has a similar format with patent from USPTO. Both patents have content written in two vertical columns and each structure is enriched by an identity number. However, the identify number is applied on patent profile information only such as publication date, publication number, and filling date. The remaining content of the patent is described in one vertical column also with no identity number.

To handle this issue, we extracted only the relevant structure of a patent, i.e. abstract.

3.3 Patent Component Extraction

Before we conducted the patent analysis, we extracted the patent component where from it we aimed to get information on its patent technology. As mentioned in section 3.2, we used abstract as a patent component to be analyzed. It is shown in section 3.2 that patents are written in different templates. Because of this, the extraction process of patent suffers from identifying many distinguished templates and getting the correct value of abstract. We developed a program to extract information from different formats, and from other parts of the patent in cases where abstract is absent.

3.4 Patent Abstract Parsing

The objective of patent abstract parsing is to get the structure of an abstract sentence so that the SAO can be determined. In addition to the availability of patents in different template formats, the patent abstracts in Islamic Finance and Banking also have a complex and even awkward sentences. To deal with this, we used an Enju parser to get the structure of the abstract sentence in a form of parse tree. The parser would not deliver the parse tree for those abstract sentences that do not follow the correct grammar.

We also have cases of which parse trees that were successfully returned by the parser were not necessarily correct. This case happened because of the complexity of the abstract sentence. A sample of an ungrammatical and complex abstract sentence is given below in Figure 5 and Figure 6.

A computer-aided system of illustrating, the system including: specifying, to a computer system, a private constant-dollar instrument, including defining a respective claim division on cash flow and an asset; entering data including actual cash flow datum and actual asset datum; calculating, with the computer system, respective values for each of the claims on the cash flow and asset; and, generating, with the computer system, an illustration of the private constant-dollar instrument funding a transaction.

Figure 5. A sample of Ungrammatical Sentence

A computer system and computer-aided method for securing a Shariah-compliant credit enhancement, the method including the steps of: entering a property value and a property financing amount as input to a computer; computing, from the property value and a property financing amount, a quantity of mortgage insurance coverage required to satisfy a Shariah-compliant credit enhancement; and securing a mortgage insurer's commitment to an intermediary to insure a home financing contract, wherein the intermediary is not a lender or borrower. System-provided documentation is also included.

Figure 6. A sample of Complex Sentence

3.5 Patent Analysis

Patent analysis was conducted using TRIZ evolution trends. There are three phases defined by TRIZ methods, which are innovation, growth, and maturity. Each of these phases has trends and Reason for Jump (RFJ) between one phase and another. For Islamic Finance and Banking domain, we found no information and existing dataset of TRIZ trends, phases, and RFJ. In doing so, we defined the trends, phases, and RFJ from scratch and have them validated by three experts. Unfortunately, the dataset did not entirely help our system in carrying out patent analysis because there was a wide gap between the terminology used in the patent and created in both TRIZ trends and RFJ.

4. Recommendations

We came up with recommendations to those issues that we discovered in developing Patent Discovery System using TRIZ Trends.

We are developing a robust tool to extract patent components (such as abstract) since the patents exist in different formats or templates. This, so called patent extractor must be able to deal with other possible formats of patent components. A robust parser must support patent discovery system that uses SAO approach. This parser has to significantly deal with a complex sentence so that it can deliver a correct structure or parse tree.

In term of the unavailability of united resources in Islamic Finance and Banking, we have initiated the concepts approaching a standard TRIZ trends and RFJ. However, there is a need to expand this initial effort in order to confidently analyze patents in the domain. This expanded

standard datasets would be defined and validated by a consortium comprising academician, practitioners, and other stakeholders from Islamic Finance and Banking.

The wide gap between terminology used in the patents and the datasets would be solved through a knowledge base such as WordNet in Islamic Finance and Banking. The construction of a WordNet must involve experts and leaders in Islamic Finance and Banking.

5. Conclusion

Our findings showed that research in text analysis for Islamic Finance and Banking were rarely conducted; and that patents in Islamic Finance and Banking were facing critical issues. We found that each of these issues calls for research-based solutions and for an appropriate organization of information and patent representations. We suggested that concepts in Islamic Finance and Banking must grow in number, be appropriately organized and expanded, and experience semantic harmonization.

We concluded that more innovations should be introduced in Islamic Finance and Banking, in order to build a large collection of patents. With the small number of patents in Islamic Finance and Banking, and without a standard structure, there is a need to expand our techniques and tools to accommodate these issues.

We have presented issues and gaps identified during our development phases of a patent discovery system for Islamic Finance and Banking using TRIZ evolution trends. It is clearly understood that since research in the field has yet to grow in an enormous number, there should be many future works to appropriately address these issues.

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References

Abbas, A., Zhang, L., and Khan, S.U. (2014). A literature review on the state-of-the-art in patent analysis. World Patent Information, 37: 3-13.

Choi, S., Yoon, J., Kim, K., Lee, J.Y., and Kim, C-H. (2011). SAO network analysis of patents for technology trends identification: a case study of polymer electrolyte membrane technology in proton exchange membrane fuel cells. Scientometrics 88(3): 863-883.

Liu, S.H., Liao, H.L., Pi, S.M., and Hu, J.W. (2011). Development of a patent retrieval and analysis platform-a hybrid approach. Expert System with Applications, 38(6): 7864-7868.

Park, H., Yoon, J., and Kim, K. (2011). Identifying patent infringement using SAO based semantic technological similarities. Scientometrics, 90(2): 515-529.

Park, H., Ree, J.J., and Kim, K. (2012). An SAO-based approach to patent evaluation using TRIZ evolution trends. In Proceedings of the Management of Innovation and Technology (ICMIT), 2012 IEEE International Conference on. IEEE, 2012

Yoon, J., and Kim, K. (2011). Identifying rapidly evolving technological trends for R&D planning using SAO-based semantic patent networks. Scientometrics, 88(1): 213-228