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Abstract

Global Islamic finance assets grew from \$200 billion to \$1.8 trillion (IMF 2015) and is growing faster than the conventional banking sector. A large number of conventional financial institutions, especially banks are moving to an Islamic financial model that's comply with the Shari'a Law with little change to current conventional practices (reverse engineer current business processes) to accommodate the new situation. In this study we will design and develop the business processes for the Islamic financial institutions' (IFIs) products by investigating and collecting information through Islamic literature, surveys and interviews of experts in Islamic jurisprudence, regulators, academic and Islamic finance and banking practitioners. Then we will assess and evaluate the findings by using a Qur'anic Financial Corpus and use computational and analytical approaches to mine the Qur'an (the Muslim Holy book) and the Hadith (actions and words of the prophet Muhammad peace be upon him) to uncover hidden knowledge on Islamic financial business processes. The knowledge acquired from this investigation will be translated into an Islamic financial process model to be adapted by Islamic and non-Islamic financial institutions. The outcome of this research will influence the future development, growth and diversification of Islamic Financial Services worldwide.

Keywords: Islamic Finance, Shari'a law, Islamic financial business processes, Qur'anic corpus, Murabaha

Introduction

Since its inception in the UAE in 1975, the Islamic banking assets has grown rapidly, from about US\$200 billion in 2003 to about US\$1.8 trillion at the end of 2013 (IMF 2015) and has evolved from being a niche offering into being part of the mainstream financial services landscape. The main driver of growth in Islamic banking is the increasing number of financial services institutions entering the market and as such the market has witnessed significant changes in recent years with strong competition among these institutions to develop and offer new sources of differentiation beyond compliance with Shari'a law with rules and principles to compete or remain successful in the future. In addition to the new Islamic banks that are being formed, there is an emerging trend among existing conventional banks to convert their operations to become Shari'a compliant. In addition, a number of Islamic banks in the Middle East have started to expand globally, with an initial focus on Asia and Africa. The increase in supply has two effects. First, with a greater number of players in the marketplace, public awareness of Shari'a-compliant products and services is heightened and the increased competition in the marketplace resulting from a larger number of providers will lead to improve product innovation and pricing (Vayanos et al. 2008).

According to Vayanos et al. (2008), the future sources of differentiation for Islamic banks will likely revolve around three areas: product development and innovation, distribution of the product or service to the client, and operational excellence. Islamic Financial Institutes (IFIs) are required to appoint Shari'a board (Advisor) for approval of any new products or services offering. Having a robust mechanism to secure

Shari'a advisor approval for new products or services is one of the most challenges problems that Islamic institutions are facing today (Vayanos et al. 2008).

In principle, IFIs are governed by the body of Islamic law. Shari'a law is cast from a combination of sources including the Qur'an (the Muslim Holy book), the Hadith (actions and words of the prophet Muhammad) and fatwas (the maxims of Islamic scholars). Islamic financial services institutions' products and services must be Shari'a compliant. But, Shari'a is interpreted differently in most countries and across most regions and sometimes even within the country even though Islam has no borders, depending on their individual Shari'a advisor and his interpretation of how a banking product can be offered to the consumer. Various bodies in several countries and regions are formed to address the creation of a coherent set of Islamic banking standards (standardization). Kuppusamy et al. (2009) indicated that the lack of Islamic financial standards will affect the ability of the banks to implement Islamic products and services."

Clients are becoming more aware about Islamic products and services and they are seeking convincing evidence of the Shari'a compliance of these products and services that the institute is offering. It is not convincing anymore to satisfy the clients by offering front-line staff with extensive training that covers the product features. Clients require the assurance that the Islamic banks processes, the entire life cycle of the product development, and the complete cycle of the transaction processing followed are entirely Shari'a-compliant (Kuppusamy et al. 2009). Islamic banks must adhere to both the policies and procedures set by the Shari'a advisor on the Islamic rules and principles of Shari'a (Archer et al. 1998). Shari'a prohibits riba (interest), gharar (uncertainty), and the trading of money, and it calls for alternative modes of trading where the underlying products are real tangible assets or services. A large percentage of capital providers – shareholders and investors – to IFIs are extremely concerned if their funds are invested in a Shari'a-compliant manner (Chapra and Ahmed, 2002). This puts more pressure by stakeholders on the managers of IFIs not only to maximize the value of their investments, but have a more compelling duty to achieve these objectives in a Shari'a-compliant manner (Archer et al. 1998).

Since, Islamic banks have inherently more complex operations than their conventional counterparts. Improving operational performance will help in having good margins and compete effectively with their rivals. A major component of operational excellence is a high-performance infrastructure and flexible IT systems to be integrated in the business processes of the enterprise. Thus, there's a need for modular IT solutions in which standard components can be individually combined to enable Islamic transactions (Vayanos et al. 2008).

Vayanos et al. (2008) recognized five key requirements for Islamic banks that need to be in place to establish a differentiated product development capability. The first is a market intelligence process that captures clients' needs; the second is a robust methodology for rapid development and deployment of products; the third is a mechanism to engage the Shari'a advisor early on to seek approval for the proposed product or service; the fourth is an automated monitoring and compliance tools that ensure compliance of increasingly complex products with the relevant fatwa, or religious ruling, in a cost effective manner; and finally a management information system to track performance and fine-tune the product or service as needed. These requirements will be achieved by introducing an integrated Islamic Shari'a model which must be built into the business processes of the enterprise. This required to coordinate and to structure business processes, infrastructure, and people in a manner that yields efficiencies and effectiveness across the entire organization.

The Shari'a compliant modular components of any IFI have to take care of products in the following areas:

Participatory (Partnership) Modes: Mudaraba, Musharaka, Diminishing Musharaka, Equity Participation in the form of shares in a corporate entity.

Trading Modes: Ijara or Ijara wa Iqtina, Murabaha, Musawama, Istijrar

Debt Based Modes: Qard, Others: Wakala, Assignment of Debt, Jua'la

Corporate and Commercial Banking: Trade Finance, Contract Finance, Capital Goods Financing, Asset Backed Financing, Working capital Financing

Investment Banking: Al Wadiyah (savings and current Accounts), Al Mudaraba, Al Ijara, Al Mudaraba, Sukuk (Islamic bonds) Issuance and distribution, Real Estate (residential and commercial property finance, property funds and investor acquisitions), Treasury (Sharia compliant treasury solutions including commodity Murabaha and hedging solutions).

Activities and Business Processes: General Ledger, Customer Information, Remittances, Telebanking, Internet / online Banking, ATM

Shari'a compliance has not been researched or investigated from business process management perspective and the current literature has shown lack of a well-defined methodology for integrating Shari'a compliance controls into Islamic Shari'a business processes. This research will attempt to develop a Qur'anic corpus of Islamic financial processes and use the findings to mine the Holy Qur'an and Hadith to extract hidden knowledge (hidden trends, relationships, patterns, coincidences, sequences and associations) to develop financial processes, models and controls. The initial processes related to principles of Islamic Law (Shari'a) we intend to investigate the following contracts: (Mudaraba, Murabaha, Ijara, etc.), Usury (Riba), privacy, trust, fraud and promise.

This research motivated us to involve computational and analytical approaches to not only study and demonstrate the importance of Islamic finance entities being compliant with Islamic law but also to provide a comprehensive framework that will run such a system in an effective and efficient manner. Such efficiency will help institutions to improve their control of their business processes and as a result they will utilize their resources effectively, minimize errors, enhance communications between internal and external entities, bring more transparency and improved governance, and give assurances to clients, government, and Shari'a boards that they are operating according to Islamic law.

The principal objective of this research is to develop an adaptive Islamic business process financial model to support IFIs and banks in their move towards Islamic Finance. Specifically, the study aims to:

- Identify, obtain and critically review published documents which focus on research and evaluation
- Examine the changes that occur in Islamic finance and banking institutes related to information business processes
- Develop and validate the Islamic Shari'a business processes related to Riba, Privacy, Contracts (Mudaraba, Murabaha, Ijara, etc.), Trust, Fraud and Promise
- Develop an evaluative Qur'anic Corpus devoted to Islamic finance and business processes

- Develop an Islamic financial knowledge memory using text mining of the Holy Qur'an and Hadith on some initial business processes: Riba, Privacy, Contracts, Trust, Fraud and Promise
- Formulate a methodology and controls for the development of Islamic financial information systems in banks

This research will provide a strategic plan for the IFI policy makers to develop the Islamic finance sector worldwide. The research is highly original in its interdisciplinary methodology, and in addressing important issues in Business and Finance as well as Computing and Text Mining. The results of the research will also be important and publishable to both research communities worldwide: this will be a unique, world-leading research resource. Islamic Finance is not only important in the region, but throughout the Muslim world and beyond; for example, in the UK, most banks strive to offer Islamic-compliant products and services for the growing UK Muslim market and many University business schools include Islamic Finance into their curricula.

The remainder of this paper is organized as follows. First, a research methodology and investigation process is given. Then, a discussion on the Murabaha and the design and development of the Murabaha business process based on the data collection is tackled. Next, analysis and text mining techniques of the Holy Qur'an and Hadith will be discussed. Then, our findings will be presented. Finally, remarks, recommendations and future directions are presented.

Research Methodology and Investigation Process

The team will start by investigating and collecting information on the problems facing the IFI and banks who opted for Islamic financial models and Islamic business processes. Exploratory studies are a valuable means of finding out ‘what is happening: to seek new insights: to ask questions and to assess phenomena in a new light’ (Robson, 2002). As part of the exploratory research, we will search the Islamic literature, conduct surveys and interview well known experts in Islamic jurisprudence, regulators, academic and Islamic finance and banking practitioners.

The findings of the data collecting and investigating from previous steps will lead into the classification of all activities across all functional areas in processing any IFI product. For the purpose of this study we will focus on Murabaha which is the most popular and most common mode of Islamic Financing. This step will lead into the development of the business process for Murabaha and to the research question for this study:

RQ: Is Murabaha business process that we developed using the previous steps (*search the Islamic literature, conduct surveys and interview well known experts in Islamic jurisprudence, regulators, academic and Islamic finance and banking practitioners*) is following the teaching of Islam?

To be able to answer the research question, we will identify the factors needed to take into account in our statistical analysis and text mining techniques of the Holy Qur'an and Hadith for Murabaha business process. These text mining analytics will follow the steps:

1. Annotation process: follows the principles of Arabic natural language processing by adding annotations at multiple levels of linguistic analysis to existing Qur'anic corpus (Alrabiah et al. 2013) to produce a corpus of financial business processes.

2. Information extraction: identification of explicitly stated facts by entity recognition, information extraction and event extraction (Qur'an and Hadith).
3. Summarization: process by which the salient aspects of one or more Qur'an's verses and/or chapters (ayats) and Hadith text is identified and presented succinctly and coherently.
4. Question Answering: on Qur'an and Hadith refers to the process of providing direct and precise answers to natural language questions.
5. Visualization and human analysis and evaluation in all the steps discussed so far. Results of text mining techniques of Qur'an and Hadith will be used to test and evaluate each other results.

These steps will be repeated incrementally and validated partial results will be added into the evolving knowledge memory (ontology) on Islam finance and business processes and contribute to the design of methodologies for the development of Islamic information systems.

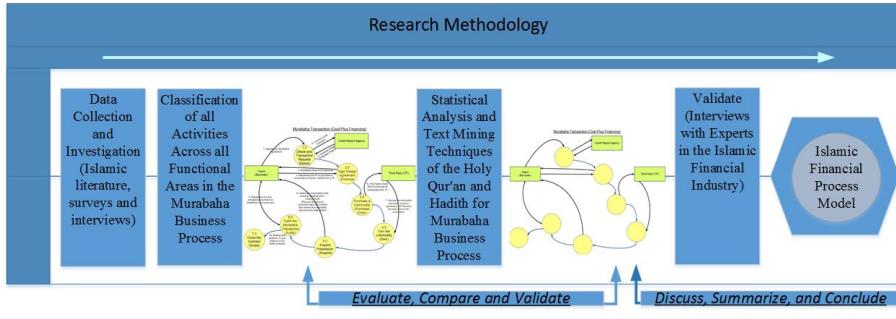


Figure 1: Research Methodology

The main goal of this step is to design Murabaha business process based on text mining which comply with the Shari'a law and then critically analyze and compare it with the Murabaha business process that we have developed based on the data collection. The outcome of this step will help in answering this research questions. We will be using 50 million words King Saud University Corpus of Classical Arabic (KSUCCA) (Alrabiah 2014; Alrabiah et al. 2013) which is installed in one of a leading corpus query tool, the Sketch Engine (Kilgarriff et al. 2004), where it is available for licensed users to investigate. KSUCCA is classified into 6 broad groupings, one of them is religion. The religion group contains 150 documents, 23,645,087 words, and covers 47% of the corpus. The religion group is further divided into 8 categories [Number of Documents, Code] covering most of the topics related to Shari'a law (The Holy Qur'an[1, aa1], Hadith[44, ab1-44], Exegesis of The Qur'an[13, ac1-13], Qur'anic Studies[29, ad1-29], Hadith Studies[10, ae1-10], Belief[23, af1-23], Jurisprudence[26, ag1-26], Principles of Jurisprudence[4, ah1-4]).

The final phase is to identify any variations and correlation between the Murabaha business process that we designed and developed using the data collections and the Murabaha business process that we designed and developed by text mining the religion portion of the KSUCCA corpus and discuss our findings.

Murabaha Business Process

Murabaha is a sale transaction based on profit or cost-plus mark-up basis financing. Technically it is a contract of sale between a client and an IFI. It involves the purchase of a certain commodities by the IFI as requested by its client. The commodities is sold to the client with a definite profit over the cost which is agreed in advance. The IFI is obliged to disclose to the client the cost of goods sold, the profit (mark-up), and the time of payment (usually in installments).

Figure 2, shows the system context diagram (SCD) for the Muranaha business process. It shows the external entities that may interact with the system and its inputs and outputs from/to external factors. The SCD focuses on external factors and events that should be considered in developing a complete set of systems requirements and constraints. The main external entities in the Murabaha business processs are respresented in rectangles.

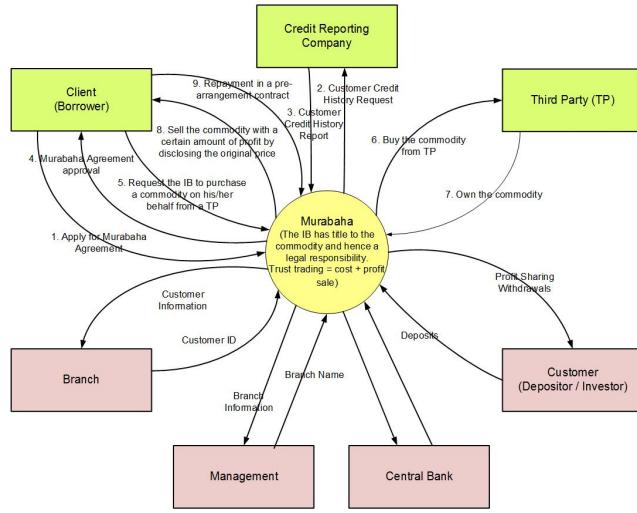


Figure 2: Murabaha Context Diagram

As a result of our methods of investigating and collecting information through Islamic literature, surveying and interviewing experts in Islamic jurisprudence, regulators, academic and Islamic finance and banking and after multiple iterations during the design, build and test we came up with the Murabaha business process as shown in Figure 3.

Murabaha business process consists of seven main processes (represented by the bubbles) to manage and control the flow of Murabaha components. The seven processes are: **Desire** (Desire and Transaction Request), **Promise** (Signed Pledge Agreement), **Purchase Order** (Purchase a commodity), **Owning** (IFI to Own the Commodity), **Acquire** (Acquiring Possession), **Fulfill** (Fulfill the Murabaha Transaction), and **Close** (Close the Murabaha Contract). These processes interact amongst themselves and with external entities (represented by the rectangles) at the same time. External entities are Clients (borrowers), Credit Rating/Report Company, and Third Party who provide and receive data inputs and outputs from and to the Islamic Information System. Such interactions are briefly described in Figure 3.

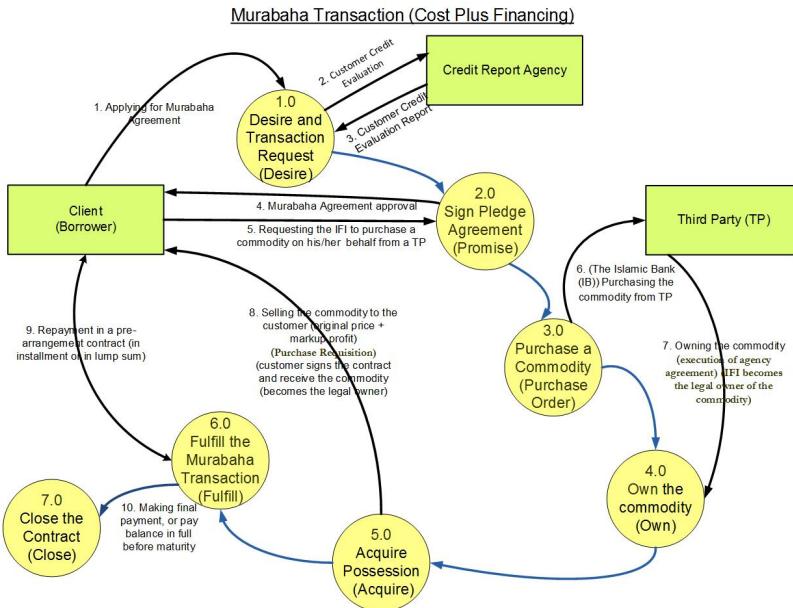


Figure 3: Murabaha Business Process

The Desire process (Desire and Transaction Request) is responsible of presenting the Client (Borrower) with an application form and provides assistance to complete the form. The IFI through this process requests a credit report from a credit report company. The second process is the **Promise process (Signing a Pledge Agreement)**. The Islamic bank is responsible for informing the client of the progress/approval of his/her application. In response, the client requests the IFI to buy the commodity. The next process is the **Purchase Order process (The IFI to Purchase the Commodity from the Third Party)**: It is responsible for buying the commodity after confirmed that everything is in order, and immediately sell it to the client at an agreed upon price (cost + markup). The number of years the client wishes to pay the IFI over and the amount of the first payment will be processed in the contract. This process will ensure that an approval from the client is obtained before the process can put a request to buy the commodity. The next process is the **Own process (IFI to Own the Commodity)**: This IFI will purchase the commodity in this process, register the commodity in the client name or in the name of a Trust, a Corporate (offshore & onshore), or a Partnership. The next is the **Acquire process (Acquire Possession)**: It will be invoked to record the sale between the client and the IFI in the Murabaha Contract. Client first payment to the IFI is made on the day of completion and is the initial contribution (down payment). Payments are fixed for the entire payment term. The next is the **Fulfill Process (Fulfill the Murabaha Transaction)**: This process will be activated monthly after almost one month after completion of the previous process. The monthly payments will be claimed by Direct Debit automatically from the client's current account. The final process is the **Close (Close the Murabaha Contract)**: This is the final process in the Murabaha transaction and it will take an effect when the IFI collects all the full Murabaha debts from the client.

It is necessary that all the conditions for valid Murabaha transactions as specified in the Shari'a rules and principles are adhered. It is also necessary that all the processes mentioned above are executed at the correct time to ensure that the transaction is a valid one. In order to ensure whether the correct procedures and rules

are adhered or not, the Murabaha business process must develop control points in these processes to identify key activity constraints in each process; defining triggers leading to activation of a process or activity within a process flow; identifying the time period over which activation will occur; highlight key points at which related processes or activities need to be synchronized; identifying the how specific process failures and problems are to be remedied; and defining of responsibility for the quality and effectiveness of the process or of activities within the process (IMA 2000).

Research Findings and Discussion

Mining the Holy Quran and Hadith

The next step is to validate the Murabaha business process (Figure 3) by text mining the Holy Qur'an, Hadith and exegesis of Quran. We started our investigation by identifying several keywords and phrases in each activity of the Murabaha business process as shown in Figure 4.

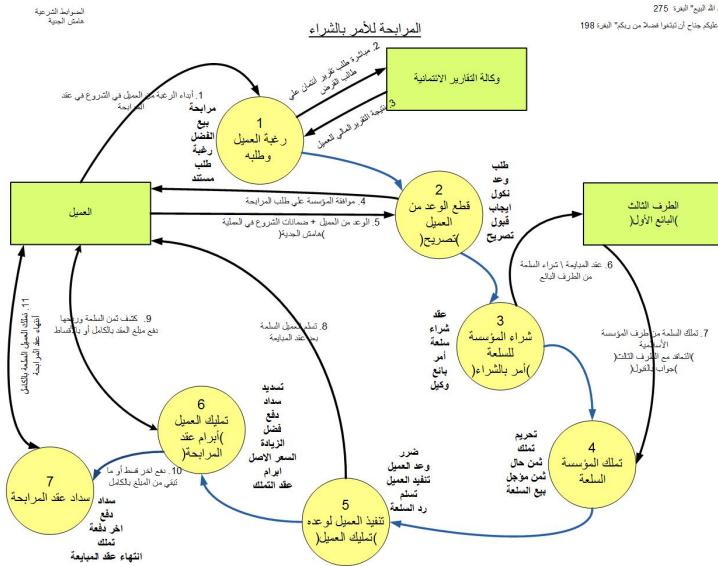


Figure 4: The Arabic version of the Murabaha Business Process and Several keywords in each activity

Then we use a simple concordance query to show the keyword as it is used in the religion group in the KSUCCA corpus. Figure 5 shows the query box, while Figure 6 shows its output. A simple search query for a word such as 汉语 (sell) searches for the lemma as well as the string; so, the strings 汉语+汉 (the + sell), 汉语+汉+汉 (like + the + sell), 汉语+汉+汉+汉 (sell + to + you), 汉语+汉+汉+汉+汉 (sell + by + all), etc., are all retrieved.

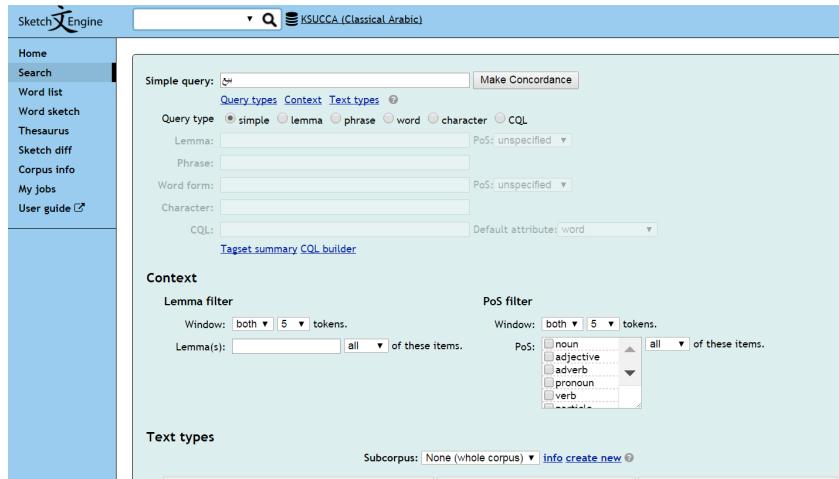


Figure 5: Simple concordance query for **البيع**

Result Type	Text Excerpt
AA1	أنفقو ما رزقتم من قبل أن ي يأتي يوم لا بيع فيه ولا خلة ولا شفاعة والكافرون هم المظالمون نخفض النطيط من المس ذلك بأيهم قلوا إنما البيع مثل الربا وأهل الله البيع وحرام الربا فمن يأكلوا إما النوع مثل الربا وأهل الله البيع وحرام الربا فمن جاءه موجة من ربه فاتني والقرآن ومن أويقنه به من الله فاستشروا ببيعهم الذي ياصمه بذلك هو الفوز العظيم للتلدين رزقتم سراً وعلانية من قبل أن يأتي يوم لا بيع فيه ولا يدخل الله الذي خلق السماوات والأرض ولولا دفع الله الناس بضمهم بعض أهديتكم بيع وطلبات ومساعدتك فيها اسم الله تكرا بالغدو والأشصل رجل لا يفهم تجارة ولا بيع عن نكر الله وأقام المصادة وإياده الرزاء من يوم الجمعة ناسوا إلى نكر الله وذرروا البيع ذلكم غير لكم إن لكم تعلمون فإذا قضيتم المصادة ؛ "يهر رسول الله صلى الله عليه وسلم عن البيع الولد وعن هذه" - حثثنا عبد الله بن الله صلى الله عليه وسلم : "كل يبيعن لا بيع يبيعن حتى يتفرقوا إلها بيع [ص : 139] [الخبر] - كل يبيعن لا بيع يبيعن حتى يتفرقوا إلها بيع رسول الله صلى الله عليه وسلم أنه يبغى في البيع فقال له رسول الله صلى الله عليه وسلم ثيروه ترثوا لآس : ما هوها عن آس أن النبي صلى الله عليه وسلم ثيروه ترثوا لآس : ما هوها الورق وخروا أثيوك ، فيبعوها بالذهب ، ثم بيعوا الذهب بالورق "فكان الذي اشتروا الأئمة لهم رسول الله صلى الله عليه وسلم عن سلف بيع الله عليه وسلم عن سلف بيع ، وعن شرطين في بيع ، وعن بيع ما ليس بذلك ، وعن شف ما لم يضمن بيع وسلم عن سلف بيع ، وعن شرطين في بيع ، وعن بيع ما ليس بذلك ، وعن شف ما لم يضمن " 425 - يعتدين في صفة ، وعن شف ما لم يضمن ، وعن بيع سلف " 427 - حدثنا علي ، ثنا إسحاق ، باب يطلق ، ولم يذكر يطلق قبل ذلك ، وقال بيع في ذلك وفي سيره شهرا : [الحضر الحبيب] قبيلة أشرها وقادتها ، ويحيط عضدهم في بعض البيع والشراء ، ويحيط عضدهم في بعض البيع ، فإذا
AB1	الله صلى الله عليه وسلم : "كل يبيعن لا بيع يبيعن حتى يتفرقوا إلها بيع [ص : 139] [الخبر] - كل يبيعن لا بيع يبيعن حتى يتفرقوا إلها بيع رسول الله صلى الله عليه وسلم أنه يبغى في البيع فقال له رسول الله صلى الله عليه وسلم ثيروه ترثوا لآس : ما هوها عن آس أن النبي صلى الله عليه وسلم ثيروه ترثوا لآس : ما هوها الورق وخروا أثيوك ، فيبعوها بالذهب ، ثم بيعوا الذهب بالورق "فكان الذي اشتروا الأئمة لهم رسول الله صلى الله عليه وسلم عن سلف بيع الله عليه وسلم عن سلف بيع ، وعن شرطين في بيع ، وعن بيع ما ليس بذلك ، وعن شف ما لم يضمن بيع وسلم عن سلف بيع ، وعن شرطين في بيع ، وعن بيع ما ليس بذلك ، وعن شف ما لم يضمن " 425 - يعتدين في صفة ، وعن شف ما لم يضمن ، وعن بيع سلف " 427 - حدثنا علي ، ثنا إسحاق ، باب يطلق ، ولم يذكر يطلق قبل ذلك ، وقال بيع في ذلك وفي سيره شهرا : [الحضر الحبيب] قبيلة أشرها وقادتها ، ويحيط عضدهم في بعض البيع والشراء ، ويحيط عضدهم في بعض البيع ، فإذا

Figure 6: The resulting concordance lines for **البيع**

Text mining techniques to analyze and identify patterns through given free text is well known in different domains like for instance medical science especially mining clinical records, biomedical texts, and medical

research paper. However, few text mining work on holly books reported in (McDonald, 2014) which used Self-Organizing Map (SOM) to extract and categorize noun and verb phrases from nine religious texts uncovering some interesting relationships. Other research studies have considered the Arabic text of Quran (Panju, 2014) mostly dealing with the translations of the meaning of the words of the holy Quran (Hikmat et al., 2013, Aliyu et al., 2013) or creating open source Quranic corpus (Kais, 2014),) using both Arabic words as well as translations of these words. The latest work on mining the Arabic version of the Holy Quran was limited to basic statistical information like finding out the most frequent words in different chapters (Surat) of the Quran (Alhawarat et al., 2015). In this research work we will present an innovative method of text mining that use recursive co-occurring words method to extract relevant words from the Holy Quran, Hadith, Quran and Hadith studies that could be used to compose and build an alternative Islamic finance business process.

Recursive Co-occurrence Method for developing alternative Islamic financial business processes.

Three basic types of approaches in text mining used for new discovery which have been prevalent several domains: rule-based or knowledge-based approaches, statistical or machine-learning-based approaches and co-occurrence approach (Bretonnel and Hunter, 2008). The most famous research has been on medical text using which include Dr. Swanson (Swanson, 1986) who used basic text mining approach based on terms co-occurrence and transitive relationship ($A \rightarrow B \rightarrow C$) between medical terms to discover a connection between dietary fish oil and Raynaud's disease, a circulatory disorder, which three years later was validated through clinical trials. Also, the recent research reported in (Hui et al., 2009) which aims at automatically identify the status of obesity and related co-morbidities in patients based on their clinical discharge summaries.

In line with these successful mining free texts, we are proposing in this paper a new approach that is not limited to transitive co-occurrence as reported in (Swanson, 1986) but goes beyond that to recursive co-occurrence of finance related terms. We selected the recursive approach so we can extract as much as possible of inter related terms to build a tree of key word terms that reflect a particular business process like for instance Murabha business process shown in Figure 3. Furthermore, this recursive co-occurrence will be applied to KSUCCA. The proposed algorithm for this recursive co-occurrence of keyword terms is as follows:

Recursive-Co-Occurrence Algorithm:

1. Gather all the terms related to a particular business process into a set $T_{initial} = \{t_1, t_2, t_3, \dots, t_m\}$
2. Create a B-tree structure T_{bp} for a given business process and initiate its root,
3. Iteration = 0; # initialize the counter of recursive iterations
4. $T_{current} \leftarrow T_{initial}$
5. While (Iteration < n) # given n the number of recursive iteration;
 - For each term t_i of $T_{current}$ set Do
 - o Run the co-occurrence frequency process (word sketch) in Sketch Engine (lexical computing) to extract from KSUCCA corpus the other terms in $T_{current}$ co-occurring with terms t_i ,
 - o Append the extracted terms at the right node of the B-tree T_{bp} ,
 - o Select manually new discovered relevant terms into a new set named $T_{observed}$,
 - o Append all sentences related to the extracted co-occurring terms into a new sub-corpus named C_r ,
- End
- $T_{current} \leftarrow T_{observed} \cap T_{initial}$;
- $T_{initial} \leftarrow T_{observed} \cup T_{initial}$;
- $T_{observed} \leftarrow \emptyset$;
- Iteration < iteration +1;
- If ($T_{current} == \emptyset$) then go to step 6;

Else Go step 5

End while

6. *Text mine all the sentences contained in the C_t sub- corpus based on the hierarchical relationships contained in the B-tree T_{bp}*
 7. *Use the result of text mining process, produce an ordered list of terms that could be used to compose the alternative actions in the original business process*

Running the recursive co-occurrence Algorithm

Gathering all the terms (keywords) related to Murabaha business process

In this step we browse through **Murabaha** business process presented in Figure 3 to collect terms that defines tasks or action of the business process. We extracted in the initial terms from the business process as $T_{initial} = \{ \square\square\square\square\square\square\square \text{ (Murabaha); } \square\square\square \text{ (Sale); } \square\square\square\square \text{ (Purchase); } \square\square\square \text{ (Contract); etc.} \}$.

Extract from KSUCCA the other terms co-occurring with terms in T_{initial}

Then we used the process co-occurring terms (word sketch operation in the Sketch engine) to extract terms within $T_{initial}$ co-occurring together (shown inside red rectangles) and also manually collect the new observed terms (shown in blue rectangle) e.g. $T_{observed} = \{\square\square\square \text{ (mortgage)}; \square\square\square \text{ (loan), etc.}\}$ observed to be relevant to the business process in hand as shown in Figure 7 below. These new observed terms will be used to perform another recursive iteration to discover new relevant terms to the Murabaha business process.

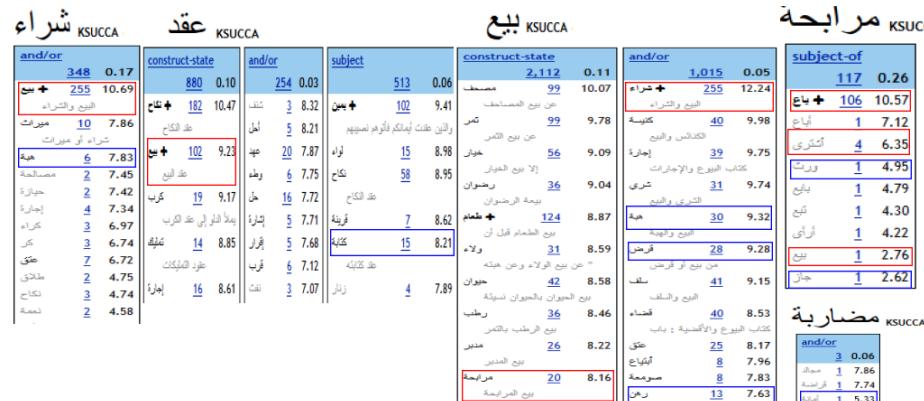


Figure 7: First iteration for extracting co-occurrence of Murabaha business process related terms

Create a B-tree structure T_{bp} for a given business process and initiate its root,

Based on the inter-relationship occurrence of a b-tree will be built to explicitly reflect this relationship and to be used at the same as an indexing scheme for accessing related sentences or verses of the Holy Quran or Hadith for further analysis. An example of this be B-Tree could be deduced from Figure 7 above.

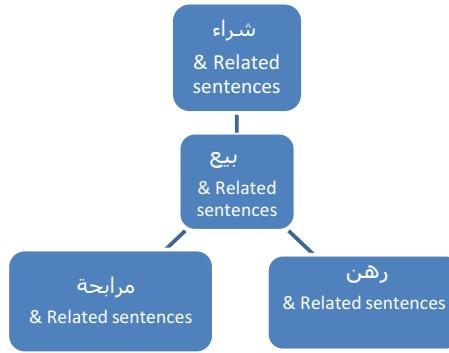


Figure 8: An instance of a B-Tree showing the relationship between terms

Append all sentences related to the extracted co-occurring terms into a new sub-corpus named C_t.

Using the hyper link of co-occurring terms shown in Figure 6, we drill down to the indexes of the related sentences containing the co-occurring terms like (□□□ (Sale); □□□ (Purchase)) and (□□□ (Sale) □□□□□ (Murabaha)) as shown in Figure 9. These indexes will help further down to download the discovered sentences and be saved into a new sub-corpus for further text analysis to find out more relationship that relevant to the Murabaha business process and more importantly in producing ordered lists of words that could be composed into an alternative Islamic business process that is built using the Holly Quran and Hadiths and also exegesis of Quran, Quranic and Hadiths studies.

Figure 9: Sample of co-occurring (□□□ (Sale); □□□□ (Purchase)) and (□□□ (Sale); □□□□□□ (Murabaha))

Further Analysis and Discussion

As shown through this study, Islamic banking principles have at the core social and ethical responsibility and are indeed compatible with Western ideas of ethical banking and social capital. Islamic finance principles are concerned with issues of fairness and justice rather than efficiency narrowly defined. These principles focus on the necessity of sharing risk in a fair and stable society, and upon problems of exploitation in markets where power is asymmetric this is the real riba issue. The Islamic approach emanates from a foundation set of ethical principles. Therefore, discussion of Islamic finance in connection with global financial practices introduces an ethical dimension that is welcome. Khan (1985), believes that Islamic finance potentially has appeal for the mainstream as well as Muslim consumers because of its ethical basis: "*Islam teaches us that money should be channeled toward the 'real' economy, the production of real goods and services and not the 'financial' economy such as hedge funds and derivatives,*" he argues, "*It keeps us in touch with the real economy and away from speculation and Islamic system of finance might create a more stable world financial market*"¹.

Putting aside the penetrating comment by Ahmad (1992), "*It's not clear to whom we are cheating...*" about hypocrisy in the current practice of Islamic banks, let us deal with the realm of the ideal. Consider an ideal situation in which Islamic principles of interest were adhered to by a substantial proportion of the world financial system. What they have in common is a prohibition of usury, or excessive interest rates. Could such an idealized system conceivably survive as a foundation of banking in a hyper-competitive global financial environment? Pure logic would dictate that this is not possible in a profit-maximizing world; that is if *excessive* includes interest rates that reflect high risk situations or situations of capital shortage both of which would require high interest rates that might be considered usurious. The recurrent crises in the financial sector, maladministration, deception and unethical behaviour lie at the root of many of these problems. Enron and WorldCom are just two examples.

During 1950s – 60s, Metzler (1950) of the University of Chicago proposed an alternative system in which contracts were based on equity rather than debt, and in which there was no guarantee of nominal values of liability since these were tied to the nominal values of assets. Metzler showed that such a system did not have the instability characteristics of the conventional banking system. Khan (1985), showed the affinity of Metzler's model to Islamic finance. Using Metzler's basic model, Khan demonstrated that this system produces a saddle point and is, therefore, more stable than the conventional system.

In the late 1970s early 1980s, it was shown, mostly by Minsky (1982), that conventional banking systems were inherently prone to instability because there would always be maturity mismatch

¹ Mark Tran Monday May 27, 2002; Guardian. UK.

between liabilities (short-term deposits) and assets (investment long-term). Because the nominal values of liabilities were guaranteed, but not the nominal value of assets, when the maturity mismatch became a problem, the banks would go into a liability management mode by offering higher interest rates to attract more deposits. There was always the possibility that this process could not be sustained resulting in erosion in confidence and bank runs. Such a system, therefore, needed a lender of last resort and bankruptcy procedures, restructuring processes, and debt workout procedures to mitigate contagion.

Perhaps new ways of being in the world will emerge: recognition of interdependence is a step towards realizing the need, at a practical as well as a spiritual level for compassion. We could cite a number of Quranic messages: that *God does not change the condition of a people until they change their own inner selves*" (Quran: 13:11); *Mankind was created as one nation, but they became divided because of differences among them*" (Quran: 10:19). We are reminded of *Al Fatih* and *al-rrahmani al- rraheemi*, most Gracious, most Merciful. *Illa an yashaa*, if God so wills (Quran, 18:24-25). Let's see.

Conclusions and Suggestions for Future Directions

This study aims to design and develop the business processes for the Islamic financial institutions' (IFIs) products by ensuring the compliant with the Islamic Shari'a Law by text mining the Holy Qur'an, Hadith and exegesis of Quran. This is done by initially investigating and collecting information through Islamic literature, surveys and interviews of experts in Islamic jurisprudence, regulators, academic and Islamic finance and banking practitioners. Assess and evaluate the findings by using a Qur'anic Financial Corpus and use computational and analytical approaches to mine the Qur'an and the Hadith to uncover hidden knowledge on Islamic financial business processes. One important result of this study is the development of an Islamic financial process model to be adapted by Islamic institutions. Another important result of this study is to influence the future development, growth and diversification of Islamic Financial Services worldwide. This study constitutes the first phase in a large project that aims at advancing the research in the field of Enterprise Islamic Information Systems and more specifically in exploring the text mining of the text of Islamic Law. Therefore, the results demonstrated in this paper represent a sample of what could be obtained from the analysis of the text of Islamic Law. More accurate results will be obtained if an efficient lexical semantic tools is used to conduct analysis of word meanings, word associations, word clustering, word classification, and other general relations between words. If such tools are developed, then further study on the text of Islamic Law will be carried out to extract knowledge and important information that is useful to design and develop Enterprise Islamic Information systems and its business processes.

Future work may include the development of methodologies, practices and controls which could be used when developing Information Systems in the Islamic finance and banking environment.

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