# Expert validation on a reference model for e-auctions that conform to Islamic trading principles

Mohammed Al-aaidroos *, Norleyza Jailani, Muriati Mukhtar

*Research Center for Software Technology and Management (Softam), Faculty of Information Science and Technology (FTSM), Universiti Kebangsaan Malaysia (UKM), Bangi, Malaysia*

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## ABSTRACT

E-auction is considered as one of the most successful e-commerce applications where there are millions of items auctioned in thousands of auction sites. Despite its unrivaled success, e-auction faces significant doubts from an Islamic perspective with regards to the legitimacy to Islamic trading principles. The in-depth investigations on the conventional e-auction systems and methods reveal several incompliant features such as the existence of usury, gambling, and fraud. For instance, payment through credit cards, setting of un-prescribed service charges, imposes non-refundable bidding fees, impersonation, fraudulence, ambiguity, and inflation all are not in alignment with Islamic teachings and thus necessitate the refinement of the e-auction business process. This paper utilizes the conceptual modeling approach to propose a reference model e-auction that Conforms to Islamic Trading Principles. The model forms a tight relation between ICT, Business, and Islamic acts in a way that business makes use of ICT whilst governed by the Islamic rules. In order to evaluate the proposed model from different perspectives, this paper follows a qualitative approach by surveying six experts specialized in business, Islamic jurists, and information technology (two in each field). This is to support the robustness of the proposed model and examine the extent of consensus the model able to gain from a different perspective. The results obtained show a promising acceptance of the proposed model where the overall score average of the experts' responses achieves 4.47 out of a maximum score five. The average rating of the Islamic jurist's experts, Business experts, and IT experts are 4.49, 4.36, and 4.56 respectively.
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## 1. Introduction

The last two decades have witnessed a tremendous growth of the Islamic financial industry. The statistics enumerate over seventy-five countries which operate Islamic financial institutions with total assets about USD1.6 trillion (Imam and Kpodar, 2015). These specifics reflect the significance and promise of the Muslim market. Nevertheless, the size of Muslims' potential market is still to be exploited since Muslims made up of about 28% of the total world population where most of them are in developed countries

(Awang et al., 2014). However, in order to gain success in the Muslim's market, business industry vendors should be aware of its distinctive features especially in the adherence to the Islamic trading principles. This is because Muslims exhibit a higher sensitivity towards their religious teachings which must be obeyed by all (Souiden and Rani, 2015).

Islamic trading principles form the legal framework that regulates commercial transactions such as sale, lease, agency, debt, safekeeping, and partnership (Saleem, 2012). In Islamic etymology, the legal trading framework of Islam that governs the business practice is known as 'Fiqh Almu'amalat' which can be translated as Islamic trading principles (Standke, 2008). Those are set of provisions and acts elicited from the authentic Islamic resources to form the Islamic financial system based on fair profit while preserving moral behavior (Ayub, 2009). Therefore, gaining access and success in the Muslim market segment could not be achieved unless services and products offered are in compliance with Islamic principles.

With the proliferation of the Internet, online commerce services achieve unrivaled success and become a prominent milestone

* Corresponding author.
    *E-mail addresses:* maidoos@gmail.com (M. Al-aaidroos), njailani@ukm.edu.my (N. Jailani), muriti@ukm.edu.my (M. Mukhtar).
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which signifies the effective use of information and communication technology to enable reasonable business practice. In particular, e-auction is considered as one of the most successful e-commerce applications where there are millions of items auctioned in thousands of e-auction houses in the world (Haruvy and Leszczyc, 2010). An indicator of e-auction success is the number of auction sites which reached 2600 according to (Lin et al., 2011). In addition, the explosive growth of e-auction sites like eBay which reached to 160 million active buyers in the year 2015 with total gross merchandise volume (GMV) of $81.7 billion dollars (eBay, 2015).

According to (Turban et al., 2015) e-auction is defined as "an electronic space where sellers and buyers meet and conduct a competitive dynamic bidding process". There are numerous advantages brought by the electronic form of auction. For instance, e-auction spectacularly bypasses physical barriers to reach large group of bidders everywhere and anytime (Hubbard and Paarsch, 2016). In addition, e-auction had cut the listing cost since there is no geographical auction house, gave more flexibility on listing and bidding, increased the variety of goods and services, and expanded the ways auction is conducted by leveraging unprecedented mechanisms (Bajari and Hortacsu, 2004). By contrast, harder item(s) inspection and higher fraud risk due to its anonymous nature are amongst the inhibitors (Li et al., 2009).

In order to cater for the Muslim users, it becomes necessary that online transactions such as e-auction are conducted in accordance with Shariah business directives (Muhammad et al., 2013a,b; Rashid et al., 2014, Zainul et al., 2004). In fact, the Muslims' perception of the compliance of online transactions raised significant doubts where there were several deviations reported. These are exposure to usury (*riba*), gambling (*maisir*), uncertainty (*gharar*), and price inflation (*najash*) (Jamalludin et al., 2011, Zainul et al., 2004). With regard to e-auction, issues such as fraudulence, identity impersonation, deceptive ads, bidding fees, and unclear rules in determining winners, payment through un-Islamic credit cards, or setting of dynamic service charges have been considered prohibited practices in which must be eliminated.

Consequently, this paper is an attempt to address the afore-said deviations and lay down the infrastructure required to construct online transactions in accordance to Islamic primitives. Focusing on the case of e-auction and by using the conceptual modeling approach, we construct an e-auction reference model which forms a tight relation between Islamic trading principles, ICT and business. The model has been developed to assist computer scientists as well as technology vendors to lay down the basic infrastructure needed for designing and implementing e-auction systems that conform to Islamic trading principles.

The rest of the paper is divided into three sections. Firstly, we conduct a literature review on e-auction from the Islamic perspective. Then the proposed model is introduced with brief descriptions of its contents. Lastly, we present the result obtained from surveying six experts specialized in Islamic jurists, Business and IT experts in order to evaluate the proposed model from different perspectives.

## 2. Related works

Research on Islamic financial services has dominated the literature since the 1970s where there are several kinds of Islamic-based products extensively explored (Obaidullah, 2005). For instance, Islamic banking, *Murabahah*, *Musharakah*, *Sukuk* (Islamic bonds), *Qardul Hassan* (benevolent loan), Takaful (Islamic insurance), and *Wadiah* (safekeeping) has been dominated the literature of Islamic finance. In contrast, online business transactions such as online marketing, shopping, retailing, and auction have been given a con-

siderably less attention even though it is increasingly gaining popularity in the Islamic world (Amin, 2015).

Basically, Islam clearly declared the permissibility of trade since the Holy Quran which is the most authentic Shariah resource state:

> "*Those who devour usury will not stand except as stand one whom the Evil one by his touch Hath driven to madness. That is because they say: "Trade is like usury," but Allah hath permitted trade and forbidden usury*" (2:275).

[(Yusuf, 2000)]

Thus, contemporary jurists raise no argument about online business practice from Islamic perspectives but at the same time emphasize on the full commitment of Islamic trading principles (Abdul Rahman, 2011, Zainul et al., 2004). In fact, in the early 2000s the legality of online transaction has raised some doubts amongst Islamic jurists since classic Islamic jurists require the hand-to-hand delivery and the unified meeting place in order to validate any kind of online sale contract (Abdul Rahman, 2011, Alzaagy, 2007). Yet, Alzaagy (2007) has explored the nature of the contractual meeting place in online transactions and conduct a comparison between virtual and physical meeting places. He concluded that the communication over cyber channels can be regarded as a meeting place in the same way as offline transactions. Similarly, (Muhammad et al., 2013a,b) when explore Amazon.com concluded that the online contract is considered as valid transactions in the same way as the conventional offline sale contract.

Dali et al. (2003) therefore foresaw the emergence of Islamic e-business and defined it as "business organizations, which operate it business under the Islamic law". Similarly, Amin (2015) defines Islamic based e-business as "the practice of critical business processes through the extensive use of ICT technologies that reflects the Islamic point of view". In addition, Amin stated four distinguishable features of the Islamic online business including: (i) trading only permissible (Halal) goods and service, (ii) provide a constant connectivity of the transacting parties in order to eliminate any doubt, (iii) ensure the physical existence of the business (i.e. having real shop) in order to convince customers, and (iv) ensure the delivery of the product at the promise date.

An in-depth study has been conducted in Zainul et al. (2004)) which could be regarded as legal resolution for online transactions as said in Shamim (2010). According to their perception, the validity of online contract is tightly dependent on the elimination of usury, gambling, deceit, duress or any kind of fraud. In addition, Muslims should truly exemplify Islamic moral injunctions such as truthfulness, sincerity and honesty. However, in order to ensure the legitimacy of e-commerce, the author demanded several conditions which ought to be maintained. First, the clarity in the bargain procedures, the product, the price, and the specifications must exist. Secondly, all of the involved parties must conform to the agreement and satisfaction. Thus, buyers should initiate a clear indication of his intent to buy the product and the seller should send clear acceptance to complete the contract. Lastly, there must be continuity in the communication and message transmission between the involved parties. Similarly, Dali et al. (2003) and Amin (2015) call for legitimized Islamic e-business through the elimination of usury, gambling, and fraud. In addition, they emphasize on the product permissibility as Muslims are prohibited from trading unlawful products such as wine and liquor, dog and pork meats, impure things, and dead animals.

With the superlative success of e-auction, Islamic jurists raise significant questions about the legality of its practice according to Islamic principles. In particular, Jamalludin et al. (2011) utilize four rounds of Delphi technique with a panel of experts from Universiti Kebangsaan Malaysia (UKM) to identified eight

e-auction' functions that are to some extent inconsistent with Islamic trading principles. Forms of prohibited procedures such as prices inflation, usury, gambling, have been identified. Due to the fake identity or multiple user accounts, auction frauds might occur in a form of bid shielding or bid shilling. From Islamic point of view bid shielding or bid shilling is contained under the category of prohibited Najash in which violates the harmlessness rule since the former harms the buyer(s) while the later harms the seller. In addition, fake identity might lead to misrepresentation in which selling an item not owned or buying under no authorization. Misrepresentation is unlawful in Islam and leads to invalid contracts hence invalid auction process. The authors suggest adhering strong identity verification mechanisms for both involved parties.

In addition, payment method especially using credit and debit cards has been considered a significant issue since it might involve usury (Amboala et al., 2015). Due to the un-prescribed charges and the bank interest profit taken in late payment, most of the Islamic jurists prohibit the use of conventional debit/credit cards. However, currently many Islamic banks in Malaysia and others in the Islamic world issue Islamic compliant credit and debit cards in which takes into account Islamic principles. Therefore, Muhammad et al. (2013a,b) reported that trading through amazon.com is only valid if using Shariah-compliant e-payment method.

Aiming to effectively leverages the technology in the western societies, halalfinder.com launched in March 2012 for auctioning halal products only. When exploring the site broadly, it seems almost closer to conventional sites with no major differences. There is no emphasis given to validate transaction from an Islamic point of view and even no control over fraud as stated in their terms of service. However, the site is a strong indicator that Muslims worldwide are in need for Shariah-compliant auctioning systems.

## 3. The reference model for Shariah-based e-auction

It has become evident from previous researchers that the conventional e-auction systems lacking the compliance to the Islamic trading principles as prescribed in the authentic Islamic resources. That is because studies reveal several features which do not comply with Islamic business rules such as the existence of usury (*riba*), gambling (*maiser*), uncertainty (*gharar*), and price inflation (*najash*). However, developing a system billed as Islamic compliant or at least not contradicting Islamic principles is further complex without a model function as a point of reference for the development of such kind of auction solutions. This is increasingly assured especially with the diverse forms of e-auction and the variety and frequency of violations.

Accordingly and by utilizing the conceptual modeling approach, a reference model for e-auction based on Islamic trading principles is proposed as depicted in Fig. 1. The proposed model aims to assist computer scientists and technology vendors to lay down the basic infrastructure needed for designing and implementing e-auction systems based on the Islamic trading principles. The model forms a tied-relation between ICT, Business, and Islamic principles in a way that auction business activities makes use of ICT whilst governed by the Islamic acts.

Reference modeling is well-known approach in the development of information systems that share certain characteristics or application-specific details (Thomas, 2009, Vom Brocke and Buddendick, 2006). It is considered the fundamental start point of abstracting a real-world system or a category of application (Thomas, 2006). According to (Fettke et al., 2006) a reference model is referred to "the conceptual framework that can be used as a blueprint for information system construction". The basic principle behind the reference modeling is to preserve the modeling knowledge with the aim of reuse in different application scenarios (Thomas, 2006). This imperatively makes the reference model designed generic and abstract in order to be reusable in similar scenarios (Vom Brocke and Buddendick, 2006). Modeling with the aim of reusing found inspired and time-saving for developing similar Shariah-based online system models. This is because with little reformation this proposed model is foreseeably applicable in other forms of e-commerce bargains such as fixed price or one-to-one negotiation price which adhere to Shariah principles.

As shown in Fig. 1, the proposed reference model is depicted as three concentric layers which are the Islamic Business Directives layer, the Auction Business Activities layer and the Supporting Technologies layer.

### 3.1. Layer I: Islamic business directives

Islamic business directives form unprecedented financial system based on fair and legitimate profit as well as preserving moral behavior. In Islamic terminology, business directives are known as "Fiqh Almuamalat", which represents a significant branch of the Islamic jurisprudence (*al-Fiqh*). Usually, Islamic jurists elicited those directives from the known Islamic resources including *al-Quran*, *al-Sunnah* (prophetic narrations), *Qiyas* (jurists analogical reasoning) and *Ijma* (consensus).

Typically, auction in the known jurist's books is classified as part of sale (*albay*) provisions since the difference is only in the bargaining conduct. Broadly, the generic frame for the selling directives can be encapsulated into three distinct groups namely: prerequisite requirements, prohibited features, and business ethics that are portrayed in the model as a separate ring wrapped around the center.

In reference to the model, the first inner ring allocated for the prerequisite requirements which embodies participant's possession, eligibility, and product permissibility. Those requirements are considered significant for any commercial transaction and will result in the violation in the case of absence. Participant's possession meant by ensuring ownership of the product in order to avoid ambiguity that might lead to conflict between seller and buyer. For instance, selling a stolen car or bird in flight are all illegal according to Islam. The most obvious dispossession example in e-auction practice is re-selling of a product while it is not yet owned. By eligibility, we allow only qualified and adequate participants from auction practice and hence disallow minors and any people with diminished capabilities in order to protect them from being exploited. Lastly, permissibility refers to disallowing auctioning of prohibited or non–halal products. For instance, wine, pork, imagery, impure things and dead animals are prohibited. Nowadays Halal institutions worldwide play a significant role in verifying permissible products by attaching Halal logos. In fact, the grand development of ICT supposedly assists in providing autonomous halal verification methods and issuance of electronic halal certificates.

The next outer ring is assigned for prohibited features that comprised of certain unlawful issues which when persisted will lead to a violation of the Islamic rules. In fact, those types of transactions were very popular during pre-Islamic era (Ignorance era or *Jahiliyya*) and when Islam emerged, it urged their avoidance due to their harmful consequences to the community. Fundamentally, jurists emphasize on three common prohibited features in selling which are usury (*riba*), gambling (*maisir*), and uncertainty (*gharar*).

Literally, the word "riba" in Arabic means "excess or increase" which indicates the forbidden revenue gained from usury transactions. Jurists define *Riba* as "surplus value without counterpart" (Kia, 2006). That is applied to varied monetary transaction that involves excess such as loans or exchange of certain items in unequal quantities. In e-auction, the most common usurious trans-
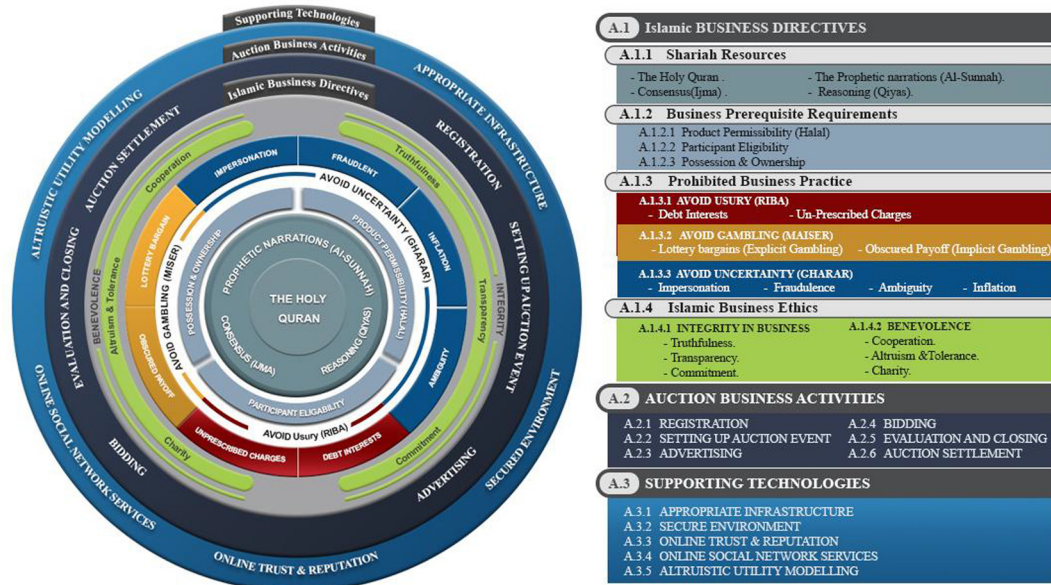
**Fig. 1.** The proposed reference model for Shariah-based e-auction.

actions occur in two ways including debt interests and un-prescribed charges. The former influences the payment through credit cards since cardholders are able to surpass their balances (Amboala et al., 2015). The later in the paid service fees, especially in defining auction fees, bidding fees and shipping fees. The most suitable solution is to use accurate and prescribed fees and limit payment only through valid Islamic Debt Cards, direct money deposit, Islamic online banking, and Cash on Delivery (CoD).

According to (Ayub, 2009) gambling expresses any kind of surplus obtained through a game of chance or wining by chance. The wisdom behind the denial of gambling is because it allows the consumption of another person's money unlawfully without any effort (Saleem, 2012). In Islam, the prohibition of gambling is not only attached to games, but jurists stretched the conception to any type of contracts even though commercial transactions that involve some kind of raffle (al-Qaradawi, 2013). With regards to auction, penny auction is considered a kind of explicit gambling and obscured payoffs including bidding fees is a form of implicit gambling which ought to be eliminated in e-auction. That is because, the International Islamic Fiqh Council in (al-Saloos, 2002) state that non-refundable bidding fees are considered as part of prohibited gambling.

*Gharar* is an Arabic word literally equivalent to "deceive", "trick", or "cheat" (Kamali, 1999). However, El-Gamal (2001) prefer to translate the term 'gharar' as 'trading at risk' while (Elfakhani and Sidani, 2015) prefer the terms 'uncertainty'. According to al-Zarqa' (1994), gharar can be defined as "the sale of probable items whose existence or characteristics are not certain". As anticipated, online transactions are more exposed to risks when compared to conventional transactions due to the numerous security concerns. Consequently, there are four concerns attached to uncertainty including uncertainty in users, in the product, in the price, and in the transaction.

Lastly, the outer ring of business directives layer (see Fig. 1) is associated with the business ethics. In particular, there are two ethical acts namely benevolence and integrity. Integrity is opposite to hypocrisy and can be defined as "a concept of consistency of actions, values, methods, measures, principles, expectations, and outcomes" (Williams et al., 2012). On the other side, benevolence is defined as a magnanimous act which benefits persons other than those from whom the act precedes without any obligation

(Muhammad et al., 2013a,b). Benevolence embodies altruism, charity, and cooperation while integrity contained truthfulness, transparency, and commitment.

## 3.2. Layer II: Auction business activities

This layer (refer to A.2 in Fig. 1) identifies the activities attached with the e-auction business process. As can be seen in Fig. 1, this layer is sketched as a plain ring wrapped around the Islamic Business Directive's layer to indicate the importance of the governing rules in every auction activity. Basically, researchers identify six activities that successful auctioning must uphold which include registration, setting up an auction event, advertising, bidding, evaluation, and settlement (Tietze, 2012). Fig. 2 shows the sequence flow of auction business activities and its arrangement to trade an item. Each of those activities can be introduced as follows:

### 3.2.1. Registration
This stage exists in order for both sellers and prospective bidders to declare their online presence and identity. Recalling the eligibility constraint afore-stated, registration has to satisfy that requirement. Moreover, since Islam stimulates truthfulness and transparency, auction participants are advised to declare their true identity. In addition, strong verification procedures are required for sellers and bidders alike to avoid impersonation.

### 3.2.2. Setting up an auction event
Auctioning is a complex process which requires careful preparation of the product, auction rules and some other preferences. In reference to Islamic business directives presented, a seller should provide more details as compared to typical e-auction systems. Firstly, he is obligated to ensure listing only Halal products. Secondly, in addition to the meaningful and comprehensive product description, seller is ethically called to self-declare any imperfections or deficiencies to increase bidders satisfaction. Thirdly, auction rules must be evident and clearly defined for all prospective bidders in order to eliminate any future doubts of fraud.

### 3.2.3. Advertising
It is a phenomenal feature of e-auction and a significant success factor. Typically, auction systems provide web-based online cata-
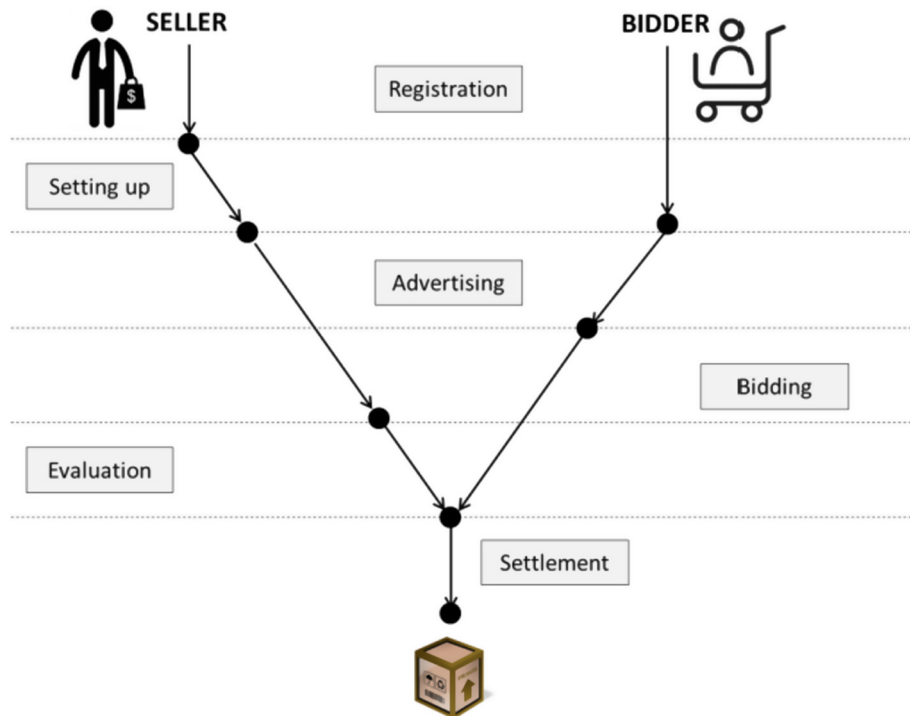
**Fig. 2.** The sequence flow of e-auction business activities.

log that displays a list of active auction in which bidders are invoked to choose their preferred auction. There is no doubt that advertising and propagating ads are considered lawful unless there is some intension for fraud or misrepresentation. Unfortunately, some sellers fall into the habit of using excessive temptation through false or unrealistic media and misleading information just to attract bidders. This is considered abhorrent as it contradicts the basic directives of truthfulness and transparency.

### 3.2.4. Bidding

This is the activity performed during an auction run to gain the item by disclosing prices regularly. According to the auction rule, bids might be submitted ascending or descending, open or sealed. Many e-auction websites offer free bidding; others impose fees while some others impose fees only in certain listing categories. Islamic principles have no constraints on either ascending bids or descending sealed or open. Bidding fees are considered prohibited and are considered as a kind of implicit gambling unless two rules are applied. Firstly, bid fees are defined fixed and previously known and secondly, bid fees must be refundable to those who lose the auction and it should be deducted from the final price for the one who wins the auction. In addition, during the auction run, both seller and bidder are extremely encouraged to behave in accordance with Islamic ethics.

### 3.2.5. Evaluation and closing

Mostly, e-auction sessions are conducted based on a time limit in which bids can only be received before a prescribed time threshold. After the auction ends, bids are evaluated according to the perceived auction rules and then the winner is announced.

### 3.3. Layer III: Supporting technologies

The outermost layer (refer to A.3 in Fig. 1) which is labeled Supporting Technologies consists of five indispensable and supporting

technologies which play significant roles in the e-auction systems. The layer consists of five portions including:

### 3.3.1. Appropriate ICT infrastructure

Information and communication technology (ICT) infrastructure is the corner stone for providing end-to-end connectivity in a meaningful and reliable manner. This warrants the setting up of a reliable combination of hardware and software components inside the enterprise that assist in establishing the link to the end customer with the best possible quality. Nevertheless, the utilized components and architecture might vary according to the complexity and size of the running business, which might require more or less sophisticated technologies.

### 3.3.2. Secure environment

Security consideration is a must because Islam prohibits harming others in any way and thus protecting participants from being harmed becomes an utmost important duty. In fact, the remote nature of e-transactions is considered highly risky in terms of fraudulence, ambiguity, and impersonation, which have been stated. Nevertheless, there are a number of techniques that can be used to prevent or at least reduce auction fraud including authentication through credit cards, feedback forms, insurance, and escrow services (Peng et al., 2003). Therefore, Islamic compliant e-auction systems must apply strong policy against scammers and should spend their efforts to prevent fraud as much as possible.

### 3.3.3. Online trust & reputation

Reputation systems form a very essential and indispensable feature in most e-auction sites which effectively stimulates trust and reduces risk. It can be seen as sign of trust computed based on performance history deduced from the participant ratings. However, cloning the conventional e-Reputation systems might not be completely suitable to Islamic based e-auction because the basic crite-

ria upon which the model relies on should be altered in order to really express Muslim characteristics.

### 3.3.4. Online social network services

This revolution is brought by Web 2.0 that makes it possible for people to form online communities. Aiming to leverage its collaborative capabilities, most of the major auction sites such as eBay and Amazon incorporate basic social capabilities to ease the advertisement of a specific auction. The collaborative nature of online sociality is expected to serve e-auction in many ways. For instance, Halal certification could be promoted with social collaboration among Muslims especially in non-Islamic societies. In addition, social based reviews, ratings, and recommendations could be implemented to stimulate trust between participants as well as esteeming business integrity. Moreover, social linkage and friendship could be leveraged to exemplify leniency in bidding with the help of altruistic decision-making.

### 3.3.5. Altruistic utility modeling

The conventional utility model has played a significant role in modeling individual's preferences. Computer scientists found the utility model to be a great tool to introduce intelligent software capabilities. For instance, proxy bidders demonstrate such tools that rely on the utilitarian model in order to simulate bidding behavior. Islamic economists reveal some shortcomings of the utilitarian model that deviate from Islamic principles; for example, issues such as selfish encouragement, maximized and non-satiated utility, and continuous preference are amongst the major conflicts. Muslims' dealings are derived from merciful Quranic acts where altruism and benevolence are indispensable. Thus, as said in Dali et al. (2003), Islamic based business applications must rely on altruistic utility model which promote Islamic ethics.

## 4. Model assessment and validation

Validating a model is "the process of ensuring that the model is sufficiently accurate for the purpose at hand or whether the right model is being built up" (Kappelman, 2014). Consequently, the proposed model is passed through an assessment process in which several experts are surveyed to assess the proposed model from different perspectives. This is to support the robustness of the proposed model and examine the extent of consensus the model able to gain from different perspective.

Using a purposive sampling approach (Patton, 2002), experts are chosen from a population of experienced researchers specialized in Islamic law, business, and IT. Because the proposed model concerned primarily with adherence to the Islamic rules, the surveyed experts on business and IT are required to have the basic understanding on Islamic law in addition to their primary field of study. In general, the panel was formed based on three criteria including the academic qualification, the years of experience, and knowledge of Islam. Each expert selected was at least holding a PhD degree in the relevant field with at least fifteen years of expe-

rience. As shown in Table 1, there are total of six experts interviewed and involved in the model validation process. The two Islamic jurists interviewed are specialized in Islamic trading principles known as 'Fiqh Almu'amalat' and one of them is known scholar in Malaysia and a member of the Malaysian Fatwa council (i.e. a religious authority for Islamic jurists). As have been pledged above, the interviewed business experts are specialized in Islamic finance and banking and working for more than fifteen years in the field. The IT experts are of the academic staff of two public universities in Malaysia.

The validation process is performed using interviews assisted by a semi-structured questionnaire. For each item in the questionnaire, the responses are measured on a 5 point Likert scale ranging from 1 (total disagreement) to 5 (complete agreement). The interview sessions have been conducted starting from January 2015 until the end of May 2015. Through, the evaluation booklet is delivered to the corresponding expert in which contains the proposed model design, invitation message, a comprehensive model description, and the validation questionnaire. After that, the expert is asked to answer the enclosed questionnaire in order to rate their views on every aspect pertaining to the proposed model. Because the proposed model comprised of aspects that needs some careful attention, most (five of six) of the surveyed experts prefer not to give immediate answers and keeps for a while the validation questionnaire.

Each validation questionnaire comprised of three sections. The first section gathers four basic information about the surveyed expert including name, place of work, email and telephone in order to identify the expert's profile information for further reference. The validation questions are categorized into two groups namely detailed perspective and broad perspective respectively. There are fourteen questions asked in order to measure the experts' satisfaction with every portion of the model. With the aim of assessing the model broadly from general standpoint, there are seven questions asked in the last part of the validation questionnaire. The validation questions are presented in Table 3. The following Sections is going to discuss the assessment result obtained from each group of questions.

### 4.1. The assessment result from the detailed perspective

The overall assessment result obtained shows a satisfactory consent on the experts' detailed perception on the model. That is because in the fourteen questions asked, all experts' rating are positively ranked and the overall average score was (4. 47/5). As illustrated in Table 2, the overall average scores for Islamic jurists, business, and IT experts are 4.49, 4.36, and 4.56 respectively. In particular, the Shariah experts E1 and E2 gave total average score of 4.66 and 4.32 respectively. Similarly, the two business experts namely E3 and E4 gave average score of 4.26 and 4.47 and in the same way the IT experts E5 and E6 gave 5.00 and 4.12. This is too large extent reflects a great approbation from different perspectives.

**Table 1**
Profiles of the validation experts.

| Ref. | Field | Experience | Description |
|------|-------|-----------|-------------|
| E1 | Shariah | +40 years | A well-known Islamic scholar in Malaysia and the Chairman of the Fatwa council. |
| E2 | Shariah | +20 years | Head of the department of Shariah department in a Malaysian public University. |
| E3 | Business | +15 years | Visiting doctor on the Islamic finance department of a Malaysian public University. |
| E4 | Business | +20 years | Head of the department of the Islamic finance department of a Malaysian public University |
| E5 | IT | +25 years | A professor on the faculty of information technology in Malaysian University who authors many books in IT and have good knowledge on Shariah as well |
| E6 | IT | +15 years | Academic Staff on the faculty of information technology of Malaysian University. |

**Table 2**
The validation result summary from detailed perspective.

| | Islamic jurists | | Business Experts | | IT Experts | | AVG |
|---|---|---|---|---|---|---|---|
| | E1 | E2 | E3 | E4 | E5 | E6 | |
| Layer A.1 Score AVG | 4.49 | 4.44 | 4.58 | 4.64 | 5 | 4.36 | 4.58 |
| | 4.46 | | 4.61 | | 4.68 | | |
| Layer A.2 Score AVG | 4.50 | 4.33 | 4 | 4.17 | 5.00 | 4.00 | 4.33 |
| | 4.42 | | 4.08 | | 4.50 | | |
| Layer A.3 Score AVG | 5 | 4.2 | 4.2 | 4.6 | 5 | 4 | 4.5 |
| | 4.60 | | 4.40 | | 4.50 | | |
| Overall Layers Score AVG | 4.66 | 4.32 | 4.26 | 4.47 | 5.00 | 4.12 | 4.47 |
| | 4.49 | | 4.36 | | 4.56 | | |
| Total score AVG | 4.47 | | | | | | |

## 4.2. Validation result from broad perspective

With the aim of assessing the model broadly from general standpoint, there are seven questions asked. For instance, in Q15 experts are asked if they agree that the model able to accomplish the objective. Mostly, experts agreed the model is able to lay down the required infrastructure for Islamic based e-auction. The score average of experts' responses as can be seen in Table 3 achieves score of 4.0/5 (agree). The only exception is E2 who is neutrally satisfied. Similarly, in Q16, experts are generally satisfied with the model since most experts (five of six) respond with score 4 (satisfied) and also E6 gave a score of 5 which indicates to very satisfied. This result reflects average score of 4.17 which indicates for a satisfactory approbation on the model from the experts surveyed.

In terms of the model design, experts are asked in Q17 about their satisfaction on the concentric layer structure, the arrangement of layers, the significance of terms and concepts used, and the relation defined. In general, experts raise no objection on either of the matters foretasted and the overall average score is 4 (satisfied). However, E3 and E4 are neutral about the indication of terms and concepts used in the model. Later E3, stated in the open question that terms have to be more simplified. Nevertheless, other experts raise no objections and accordingly we choose not to change either of the terms used because in most it is popularly found in the literature.

In order to ensure that the model is able to accommodate the requirements of Islamic principles, embodies reliable business practice, and recruiting the suited technology, Q18 raised this wondering. All experts agreed that the model is able to accommodate Islamic requirements and embodies reliable business practice. The average score of those two are 4.17 and 4.33 respectively. Moreover, E3, E4, E5, and E6 are agreed the model is able to recruit the suited technology. Yet, this is not the case for Islamic jurists (E1 and E2) whom are neutral about the listed technologies in the model. In fact, this is not surprising because those experts are experienced in Islamic trading principles and they might less attracted by technology matters.

In Q19, a question about the model usefulness has been asked. This question mainly measures the significance of the model for the Muslim individuals, Muslim Community, Governments in Muslim Countries, and the Cross-culture enterprises. In particular, all surveyed experts agreed that the model is beneficial for Muslim individuals and communities as well. As shown in Table 3, the average score achieved for the usefulness of the model to Muslim individuals is 4.50 and 4.67 for the Muslim community. Similarly, most of the surveyed experts think that the model is beneficial to the governments in Muslim countries except E1 who is neutral (rate with score of 3). However, the responses for the usefulness of the model for cross-culture and multinational enterprises are to some extent are neutral since half of the surveyed experts (3 of 6) rate with score of 3 (neutral). In particular, those are the Islamic jurists E1 and E2, and also the IT expert E6. In the other side,

business experts think that the model will be beneficial for cross-culture and multinational enterprises together with IT expert E5 who is rate with 5 (very beneficial).

Because the model is built with the intension to deliver an Islamic legitimated applications, Q20 raised a question which validates the experts' confidence on the model to produce such applications. In this regard, there are three levels of Shariah compliance raised in this question. The highest level is the level of perfectness in which the model is fully compliant to Islamic trading principles. The next level down is when the applications delivered acceptable from Islamic perspective and not contradicting any of its principles but it could not be considered fully compliant with Islamic principles. Lastly the third level is when the model delivers applications which partially conforming Islamic principles but still violating some other Shariah principles. The result obtained show that most experts are more confident with the second level which achieved average score of 4.17. All experts state their confidence in deliver application that at least not contradicting Shariah. Moreover, on the fully Islamic compliant level, experts express their confidence on 4 of six responses and the other two gave moderate confidence. In fact, the responses at this level reflect the higher extent of confidence on the model since no less or no confidence responses received.

One of the significant features of reference models is the reusability which means the ability of the model to function in similar business models. In Q21 experts are asked if they agree that this model can suit fixed price or negotiated price business models which to some extent similar to the auction. Four of six experts agree with a score average of 3.6 while the other two is neutral. In particular, Shariah and IT experts are agreed while business experts are neutral. Accordingly, this result can be considered as an indicator for the applicability of the model to be reused in similar online business scenarios. This is hoped to be discussed in details in the future.

## 5. Conclusion and future work

Through this paper, an investigation of e-auction services from Islamic perspective has been introduced. With the violations in Islamic trading principles reported in the literature, it becomes necessary to propose a reference model for Islamic based e-auction services. The proposed model is constructed in order to lay down the infrastructure needed for computer scientists to develop e-auction that do not contradict Islamic trading principles. In addition, the model is evaluated with the help of three experts from Islamic law, business, and IT. The evaluation results showed a promising consent on the model and its content. The future work will be carried out by implementing an e-auction system which demonstrates the applicability of the model. In the other hand, the model reusability in other e-commerce services such as fixed or negotiation prices that comply to Shariah can be regarded as foreseeable direction in the future.

**Table 3**
Summary of the overall experts' assessment.

| No. | Question | Shariah Experts | | Business Experts | | IT Experts | | AVG | |
|-----|----------|------|------|------|------|------|------|------|------|
| | | E1 | E2 | E3 | E4 | E5 | E6 | | |
| Q1 | **Basically, the model made up of three concentric layers which signify the broad dimensions that e-auction process depends on. To what extent are you satisfied with each of them?** | | | | | | | | |
| | a) Islamic Business Directives | 4 | 5 | 4 | 4 | 5 | 3 | 4.17 | 4.17 |
| | b) Auction Business Activities | 4 | 4 | 4 | 4 | 5 | 3 | 4.00 | |
| | c) Supporting Technology | 4 | 5 | 5 | 4 | 5 | 3 | 4.33 | |
| Q2 | At the center of the model, Islamic resources are depicted as a prominent circle. This signifies the prestigious position it represents to the rest of the model. To what extent do you agree with that? | 5 | 4 | 5 | 5 | 5 | 4 | 4.67 | 5 |
| Q3 | **The model list four authentic Islamic resources considered to be the most significant for the inspiration of Shariah business directives. How important do you think each of them?** | | | | | | | | |
| | a) The Holy Quran | 5 | 5 | 5 | 5 | 5 | 5 | 5.00 | 4.84 |
| | b) Prophetic Narrations | 5 | 5 | 5 | 5 | 5 | 5 | 5.00 | |
| | c) Consensus | 5 | 5 | 4 | 5 | 5 | 4 | 4.67 | |
| | d) Analogical Reasoning | 5 | 5 | 4 | 5 | 5 | 4 | 4.67 | |
| Q4 | **The first main Layer labeled 'Islamic Business Directives' is made up of three concentric circles where each of them corresponds to a different level of requirements that e-auction ought to preserve. How satisfied are you with each?** | | | | | | | | |
| | a) Maintaining Prerequisite | 4 | 4 | 4 | 4 | 5 | 3 | 4.00 | 4.06 |
| | b) Avoiding Prohibited Features | 4 | 4 | 5 | 4 | 5 | 3 | 4.17 | |
| | c) Exemplify Shariah Business Ethics | 4 | 4 | 4 | 4 | 5 | 3 | 4.00 | |
| Q5 | **Prior to initiating the auction contract, Shariah rules demand the preservation of the following prerequisites. How important do you think each of them is to the e-auction contract?** | | | | | | | | |
| | a) Product Permissibility (Halal) | 5 | 5 | 5 | 5 | 5 | 5 | 5.00 | 4.83 |
| | b) Product Possession & Ownership | 5 | 5 | 5 | 4 | 5 | 5 | 4.83 | |
| | c) Participant Eligibility | 5 | 4 | 5 | 5 | 5 | 4 | 4.67 | |
| Q6 | **Avoiding prohibitions is another supplemental requirement in order to ensure Islamic legitimacy. To what extent do you agree that each of the following is considered Shariah prohibited?** | | | | | | | | |
| | a) Usury (Riba) | 5 | 5 | 5 | 5 | 5 | 5 | 5.00 | 4.94 |
| | b) Gambling (Miser) | 5 | 5 | 5 | 5 | 5 | 5 | 5.00 | |
| | c) Avoid Uncertainty (Gharar) | 5 | 5 | 5 | 5 | 5 | 4 | 4.83 | |
| Q7 | **Riba in Islam is considered as a form of forbidden revenue gained from usurious transactions. The following are two common practices commonly found in e-auction. To what extent do you agree that each of them is prohibited?** | | | | | | | | |
| | a) Debt Interests | 3 | 4 | 5 | 5 | 5 | 4 | 4.33 | 4.42 |
| | b) Un-prescribed Charges | 3 | 4 | 5 | 5 | 5 | 5 | 4.50 | |
| Q8 | **Practicing Gambling (Miser) is a major sin in Islam. Islam prohibits any type of contracts that involve some kind of raffle to protect the Muslim society from its harmful effects. The Model list two common practices commonly found in e-auction. To what extent do you agree that each of them is prohibited?** | | | | | | | | |
| | a) Lottery Bargains | 3 | 5 | 3 | 5 | 5 | 5 | 4.33 | 4.17 |
| | b) Obscured Payoff | 3 | 3 | 3 | 5 | 5 | 5 | 4.00 | |
| Q9 | **Prohibited uncertainty (Gharar) is the sale of probable items whose existence or characteristics are not certain due to its risky nature. The following are four concerns attached with uncertainty in typical E-auction systems. To what extent do you agree that each is considered prohibited Gharar?** | | | | | | | | |
| | a) Impersonation | 5 | 4 | 4 | 5 | 5 | 5 | 4.67 | 4.63 |
| | b) Fraudulence | 5 | 3 | 4 | 5 | 5 | 5 | 4.50 | |
| | c) Ambiguity | 5 | 5 | 5 | 5 | 5 | 4 | 4.83 | |
| | d) Inflation (Najash) | 5 | 4 | 5 | 5 | 5 | 3 | 4.50 | |
| Q10 | **Business and ethics are inseparable in Islam since most if not all primitives related to business is ethical in the first place. In particular, the model list two moral injunctions which are considered very significant for the exactness of the transaction. How important do you think each is to e-auction?** | | | | | | | | |
| | a) Integrity | 5 | 5 | 4 | 5 | 5 | 5 | 4.83 | 4.75 |
| | b) Benevolence | 5 | 5 | 4 | 4 | 5 | 5 | 4.67 | |
| Q11 | Muslim's Integrity is attached to the following three characters. How important do you think to incorporate each of them into the model? | | | | | | | | |
| | a) Truthfulness | 5 | 5 | 5 | 5 | 5 | 5 | 5.00 | 4.94 |
| | b) Transparency | 5 | 5 | 5 | 4 | 5 | 5 | 4.83 | |
| | c) Commitment | 5 | 5 | 5 | 5 | 5 | 5 | 5.00 | |

**Table 3** (*continued*)

| No. | Question | Shariah Experts | | Business Experts | | IT Experts | | AVG | |
|---|---|---|---|---|---|---|---|---|---|
| | | E1 | E2 | E3 | E4 | E5 | E6 | | |
| Q12 | **The model list three benevolent practices that auction participants ought to exemplify How important do you think incorporating each of them is in the model?** | | | | | | | | |
| | a) Cooperation | 5 | 5 | 5 | 4 | 5 | 5 | 4.83 | 4.72 |
| | b) Altruism & Tolerance | 5 | 4 | 5 | 4 | 5 | 5 | 4.67 | |
| | c) Charity | 5 | 4 | 5 | 4 | 5 | 5 | 4.67 | |
| Q13 | **The second main layer is labeled "Auction Business Activities" and it is made up of six auction activities that are usually present e-auction. To what extent do you agree that those activities suit Shariah-based e-auction?** | | | | | | | | |
| | a) Registrations | 5 | 4 | 4 | 4 | 5 | 4 | 4.33 | 4.33 |
| | b) Setting Auction | 5 | 4 | 4 | 4 | 5 | 4 | 4.33 | |
| | c) Advertising | 4 | 4 | 4 | 4 | 5 | 4 | 4.17 | |
| | d) Bidding | 4 | 5 | 4 | 4 | 5 | 4 | 4.33 | |
| | e) Evaluation | 5 | 5 | 4 | 4 | 5 | 4 | 4.50 | |
| | f) Settlement | 4 | 4 | 4 | 5 | 5 | 4 | 4.33 | |
| Q14 | **The outermost layer is labeled "Supporting technology". It is made up of five significant technologies that are related to e-auction. To what extent do you agree that each is essential for e-auction?** | | | | | | | | |
| | a) Appropriate Infrastructure | 5 | 3 | 5 | 5 | 5 | 4 | 4.50 | 4.50 |
| | b) Secure Environment | 5 | 5 | 5 | 5 | 5 | 4 | 4.83 | |
| | c) Trust & Reputation Techniques | 5 | 5 | 5 | 5 | 5 | 4 | 4.83 | |
| | d) Online Social Network Services | 5 | 4 | 3 | 4 | 5 | 4 | 4.17 | |
| | e) Altruistic Utility Modeling | 5 | 4 | 3 | 4 | 5 | 4 | 4.17 | |
| Q15 | **Is the model accomplishing its objective to set infrastructure for Islamic Based e-auctions?** | 4 | 3 | 4 | 4 | 4 | 5 | 4.00 | 4.00 |
| Q16 | **General Satisfaction with the model?** | 4 | 4 | 4 | 4 | 4 | 5 | 4.17 | 4.17 |
| Q17 | **How satisfied are you with the model design with regard to** | | | | | | | | |
| | a) Concentric Layer structure | 4 | 5 | 4 | 4 | 4 | 4 | 4.17 | 4.00 |
| | b) Arrangements of layers and concepts | 4 | 4 | 4 | 4 | 4 | 4 | 4.00 | |
| | c) Significance of terms and concepts | 4 | 4 | 3 | 3 | 4 | 4 | 3.67 | |
| | d) Relations and priorities defined | 4 | 5 | 4 | 4 | 4 | 4 | 4.17 | |
| Q18 | **To what level do you agree that this model is able to:** | | | | | | | | |
| | a) Accommodate requirement of Islamic trading principles | 4 | 4 | 4 | 4 | 4 | 5 | 4.17 | 4.11 |
| | b) Embodies reliable business practice | 4 | 4 | 4 | 4 | 5 | 5 | 4.33 | |
| | c) Optimum recruitment of technology | 3 | 3 | 4 | 4 | 4 | 5 | 3.83 | |
| Q19 | **How beneficial do you think this model is going to be for?** | | | | | | | | |
| | a) Individuals | 4 | 4 | 5 | 5 | 5 | 4 | 4.50 | 4.29 |
| | b) Community | 4 | 5 | 4 | 5 | 5 | 5 | 4.67 | |
| | c) Government | 3 | 5 | 4 | 4 | 5 | 5 | 4.33 | |
| | d) Multinational enterprises | 3 | 3 | 4 | 4 | 5 | 3 | 3.67 | |
| Q20 | **To what extent are you confident that this model able to deliver applications that?** | | | | | | | | |
| | a) Compliant to Islamic trading principles | 3 | 4 | 3 | 4 | 4 | 5 | 3.83 | 3.94 |
| | b) Acceptable but at least not contradict Islam | 4 | 4 | 4 | 4 | 4 | 5 | 4.17 | |
| | c) Only partially conform Shariah principles | 4 | 4 | 4 | 4 | 4 | 3 | 3.83 | |
| Q21 | **With the constant evolution of technology this model tries to maintain a high level of abstraction. To what level do you agree that this model able to suit other e-business models such as fixed price and negotiated price commercial models?** | 4 | 4 | 3 | 3 | 4 | 4 | 3.67 | 3.67 |

## Acknowledgement

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