

# Journal of Theoretical and Applied Information Technology



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<b>Title:</b>	ENHANCEMENT OF AES ALGORITHM BASED ON CHAOTIC MAPS AND SHIFT OPERATION FOR IMAGE ENCRYPTION
<b>Author:</b>	ALI ABDULGADER, MAHAMOD ISMAIL, NASHARUDDIN ZAINAL, TARIK IDBEAA
<b>Abstract:</b>	With the rapid development of the Internet and communication networks, the confidentiality of digital images transmitted over public networks must be preserved by using encryption techniques. Advanced Encryption Standard (AES) is one of the most commonly used encryption algorithms at present. Although AES has several advantages, such as security in data encryption, it also has a number of drawbacks, such as high computations, pattern problems when used for encrypting images, and fixed S-box weak points. This paper proposes a method that overcomes the fixed S-box weak points and improves the performance of AES when used for encrypting images, particularly when the image data are large. In addition, the MixColumn stage is replaced by chaotic mapping and XOR operation to reduce the high computations in MixColumn transform. The proposed method is tested on several images, and the results show that the proposed method efficiently generated cipher images with very low correlation coefficients of adjacent pixels and provided better encryption speed and high security as a result of the dependence of the S-box on the key characteristics of the chaotic system.
<b>Keywords:</b>	AES, S-Box, Cyclic Shifting Operation, Inverse S-Box, Round Key, Chaotic Map.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 10 <sup>th</sup> January 2015 -- Vol. 71. No. 1 -- 2015

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<b>Title:</b>	HIGH PERFORMANCE GAMELAN ANALYZER USING ADAPTIVE WAVEFORM PATTERN MATCHING
<b>Author:</b>	YOYON K. SUPRAPTO, VINCENTIUS E. PRADHANA
<b>Abstract:</b>	Exploration of the eastern music such as gamelan is very rare, so its development is far lagged to western music. Estimation of fundamental frequencies and estimation of the envelope are needed to determine the performance of traditional music instrument. We applied Waveform Adaptive Pattern Matching (WAPM) to estimate fundamental frequency which is detected with limited frequency band. The fundamental frequency is estimated by very short recorded gamelan music signal of 45 ms, with accuracy of 0.25 Hz. Besides the fundamental frequency estimation, the invention is useful gamelan tuning the signal envelope. This method is implemented in Android applications to analyze a signal gamelan, thus enhance the portability of the application.
<b>Keywords:</b>	Gamelan Music, Fundamental Frequency, Waveform Adaptive Pattern Matching, Minimum Absolute Error, Android.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 10 <sup>th</sup> January 2015 -- Vol. 71. No. 1 -- 2015

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<b>Title:</b>	SECURITY POLICIES MATCHING THROUGH ONTOLOGIES ALIGNMENT TO SUPPORT SECURITY EXPERTS
<b>Author:</b>	OTHMAN BENAMMAR, HICHAM ELASRI, MOSTAFA JEBBAR and ABDERRAHIM SEKKAKI
<b>Abstract:</b>	The management of security policies has become increasingly difficult for the security expert given the number of domains to manage their extent and their complexity. A security expert has to deal with a variety of frameworks, with different language specifications, formalization and aspect used in domains that may belong to any Cloud Computing or Distributed Systems. This wealth of frameworks and languages make the management task and the interpretation of the security policies so hardly difficult. Each approach provides its own conflict management method or tool, the security expert will be forced to manage all these tools, which makes the field maintenance and time consuming expensive. In order to hide this complexity and to facilitate and automate some security expert's tasks, we propose a security policies aligning based on ontologies process; this process enables to detect and resolve security policies conflicts and to support security experts in managing tasks.
<b>Keywords:</b>	Security-Based Policy; Security Management; Ontology Alignment; Ontology Enrichment; Conflicts Resolution Method.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology

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<b>Title:</b>	A COMPREHENSIVE REVIEW OF THE MULTI-SENSOR DATA FUSION ARCHITECTURES
<b>Author:</b>	EHSAN AZIMIRAD, JAVAD HADDADNIA, ALI IZADIPOUR
<b>Abstract:</b>	With the development of computer science and hardware implementation instrumentation in various areas of industry, more and more diverse data have become available. Multi-sensor Data fusion is a technology that contains the combining and analysis of data and information from multiple sensors in order to form a more accurate situation awareness and determine how to respond to it. Data fusion technologies emerged in various military and non-military applications such as battlefield surveillance, guidance and control of autonomous vehicles, monitoring of complex machinery, medical diagnosis, and smart buildings. Applications for multi-sensor data fusion are widespread, thus a common (universal or unique) data fusion implementation framework isn't possible and unique data fusion architecture don't recommended in diverse areas of applications. This paper present a comprehensive review of data fusion architecture, and exploring its conceptualizations, benefits, and challenging aspects, as well as existing architectures.
<b>Keywords:</b>	Fusing data, target tracking, data fusion architectures, data fusion framework
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 10 <sup>th</sup> January 2015 -- Vol. 71. No. 1 -- 2015

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<b>Title:</b>	VISUALLY LOSSLESS LEVEL VIDEO QUALITY ASSESSMENT: NRDPF-VQA
<b>Author:</b>	SUBRAHMANYAM.CH, Dr.D.VENKATA RAO, Dr. N.USHA RANI
<b>Abstract:</b>	In this paper, we proposed No-Reference subjective video quality assessment based on NRDPF-VQA metric and classification based metric are tested using MPEG-2, H.264/AVC, wireless, IP. We plot the Spearman's Rank Order Correlation Coefficient (SROCC) between each of these features and human DMOS from the LIVE VQA database to ascertain how well the features correlate with human judgement quality especially for H.264. The results of 2-Alternative Forced Choice (2-AFC) are verified with reference to visually lossless level at a bit rate of 0.5 Mbps, 0.62 Mbps, 0.77 Mbps, 0.95 Mbps, 1.18 Mbps, 1.46 Mbps, 1.81 Mbps, 1.46 Mbps, 1.81Mbps and 2.25 Mbps. The videos are recorded in YUV420 format.
<b>Keywords:</b>	No Reference, NRDPF-VQA, H.264, SROCC, DMO, YUV420
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 10 <sup>th</sup> January 2015 -- Vol. 71. No. 1 -- 2015

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<b>Title:</b>	APPLYING ISHIKAWA APPROACH FOR MODELING ERP RISKS-EFFECTS
<b>Author:</b>	ZAITAR YOUSSEF, OUZARF MOHAMED
<b>Abstract:</b>	Implementation of Enterprise Resource Planning systems (ERP) presents many risks and often severe effects, which must be identified and analyzed. This work shows how Ishikawa approach can be used to model risk factors and their effects on ERP projects, on the one hand and on the organization, on the other. A real case study regarding three large companies and involving a panel of experts and practitioners is presented to illustrate application of the method. We can present this research according to the following general question: What are the probable risks of ERP projects and their effects on the project and on the organization?
<b>Keywords:</b>	ERP, Risks Management, Risks Assessment, Effects, Ishikawa
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 10 <sup>th</sup> January 2015 -- Vol. 71. No. 1 -- 2015

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<b>Title:</b>	SUPPLIER RELATIONSHIP MANAGEMENT MODEL FOR SME'S E-COMMERCE TRANSACTION BROKER CASE STUDY: HOTEL ROOMS PROVIDER
<b>Author:</b>	NIKO IBRAHIM, VERONICA S. MOERTINI, VERLIYANTINA
<b>Abstract:</b>	As market intermediaries, e-commerce transaction broker firms need to strongly collaborate with suppliers in order to develop brands seek by customers. Developing suitable electronic Supplier Relationship Management (e-SRM) system is the solution to this need. In this paper, we propose our concept of e-SRM for transaction brokers owned by small medium enterprises (SMEs), which includes the integrated e-SRM and e-CRM architecture, as well as the e-SRM applications and their features. We then discuss the customization and implementation of the proposed e-SRM model in a specific transaction broker selling hotel rooms, which owned by an SME, KlikHotel.com. The implementation of the e-SRM in KlikHotel.com has been successfully boosting the number of suppliers (hotel members) and hotel room sales.
<b>Keywords:</b>	e-CRM, e-SRM, SME, Transaction Broker

<b>Source:</b>	Journal of Theoretical and Applied Information Technology 10 <sup>th</sup> January 2015 -- Vol. 71. No. 1 -- 2015
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<b>Title:</b>	TOWARDS A MULTI-AGENTS SYSTEMS APPLICATION BASED ON THE EAS-SGR FRAMEWORK
<b>Author:</b>	HAJAR IGUER, HICHAM MEDROMI, ADIL SAYOUTI, SOUKAINA ELHASNAOUI, SOPHIA FARIS
<b>Abstract:</b>	Information has always been in the heart of every organization. During its exchange this information can be altered or modified. It is also considered as a key element for the development of many businesses. In this context, we have the obligation to protect it and secure it. In fact, it can't be protected without the use of frameworks and effective tools for risk management. Many industrial companies have chosen to put out in the market solutions that feed the need of IT managers. Our proposed framework EAS-SGR (EQUIPE Architecture des Systèmes- Systèmes de Gestion de Risque) was created to use the advantages of the panel of solutions that exists in the marketplace and designs a new system by using multi-agents system which will bring the intelligence to our application and to address risks from different angles and in different departments of the organization.
<b>Keywords:</b>	Multi-agent system, EAS-SGR Model, Risk Management, IT Governance, ISO 27005.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 10 <sup>th</sup> January 2015 -- Vol. 71. No. 1 -- 2015
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<b>Title:</b>	COMPARISON OF IMAGE CLASSIFICATION TECHNIQUES USING CALTECH 101 DATASET
<b>Author:</b>	NUR SHAZWANI KAMARUDIN, MOKHAIRI MAKHTAR, , SYED ABDULLAH FADZLI, MUMTAZIMAH MOHAMAD, FATMA SUSILAWATI MOHAMAD, MOHD FADZIL ABDUL KADIR
<b>Abstract:</b>	This paper presents the technique for the classification of single object images. First, this paper aims to introduce the efficient technique in order to classify single object image. Second, each single methods uses in order to propose the techniques were elaborated in this paper. It start from image segmentation, object identification, feature extraction, feature selection and classification. Finally, the best classifier that can provide the best results were identified. The efficiency of the proposed method is define by comparing the result of classification using two different datasets from author's previous paper. The obligation for development of image classification has been improved due to remarkable growth in volume of images, as well as the widespread application in multiple fields. This paper explores the process of classifying images by the categories of object in the case of a large number of object categories. The use of a set of features to describe 2D shapes in low-level images has been proposed. The proposed technique aims a short and simple way to extract shape description before classifying the image. Using the Caltech 101 object recognition benchmark, classification was tested using four different classifiers; BayesNet, NaiveBayesUpdateable, Random Tree and IBk. Estimated accuracy was in the range from 58% to 99% (using 10-cross validation). By comparing with Amazon data, it is proved that the proposed model is more suitable for single object image. Amazon images give higher accuracy with the range from 80% to 99.48%.
<b>Keywords:</b>	Image Classification, Feature Extraction, Feature Selection, Classifier.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 10 <sup>th</sup> January 2015 -- Vol. 71. No. 1 -- 2015
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<b>Title:</b>	IMAGE SEGMENTATION METHODS AND EDGE DETECTION: AN APPLICATION TO KNEE JOINT ARTICULAR CARTILAGE EDGE DETECTION
<b>Author:</b>	NADEEM MAHMOOD, ASADULLAH SHAH, AHMAD WAQAS, ADAMU ABUBAKAR, SHAFIA KAMRAN, SYED BAQAR ZAIDI
<b>Abstract:</b>	Image segmentation is the process of partitioning a digital image into multiple segments and regions for further processing. Edge detection methods are widely used in the area of image processing for feature detection and extraction. In this paper we use human's Knee MRI (Magnetic resonance imaging) images of patients and applied various image segmentation and edge detection methods for knee cartilage visualization. Also this paper focuses on providing an overview of important concepts, methods and algorithms commonly used for image segmentation and edge detection with focus on knee joint articular cartilage image segmentation and visualization.
<b>Keywords:</b>	Image Segmentation, Feature Deduction, Feature Extraction, Edge Detection, Cartilage Visualization
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<b>Title:</b>	HIGH PERFORMANCE IMPLEMENTATION OF RSSI BASED WI-FI LOCATION TRACKER FOR ANDROID APPLICATIONS
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<b>Author:</b>	S.A. YUVARAJ, and Dr.L.C.SIDDANNA GOWD
<b>Abstract:</b>	Wi-Fi-based positioning system (WPS) is used where GPS is inadequate due to various causes including multipath and signal blockage indoors. Such systems include indoor positioning systems. The advantage of choosing Wi-Fi for a location based service is its high compatibility and frequency of availability. The majority of today's smart phones also have Wi-Fi connectivity. Newer revisions of Wi-Fi broadcast at the 2.4 GHz frequency, allowing for signals to more easily travel through obstructions like doors and walls. Unlike other wireless technologies such as Bluetooth, Wi-Fi incorporates signal strength functions into all the firmware drivers and Application Programming Interfaces (APIs) which are defined by the manufacturers and backed by IEEE.2 This feature will provide a large benefit when using Wi-Fi to determine a location based on signal strength triangulation. The localization technique used for positioning with wireless access points is based on measuring the intensity of the received signal strength (RSSI). Typical parameters useful to geo-locating the Wi-Fi hotspot or wireless access point include the SSID and the MAC address of the access point. The accuracy depends on the number of positions that have been entered into the database. The possible signal fluctuations that may occur can increase errors and inaccuracies in the path of the user. To minimize fluctuations in the received signal, there are certain techniques that can be applied to filter the noise. The Mobile Nodes will have featured Wi-Fi capabilities and the processing power to deliver accurate results. The Nodes will scan all known access points that in range and determine the signal strength in dBm (or dBmW) and get their respective MAC address. The access point's MAC address is compared against a database of known access point locations. All of the quantified location coordinates are saved and the location of the each Node is obtained. The more available access points, the more accurate the location reading will be. We are using only 3 access points to obtain the (x,y) coordinate values/location of the mobile device. The calculated position will be displayed in graphical format.
<b>Keywords:</b>	Wi-Fi based positioning Systems, IEEE.2, Wi-Fi, API
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 10 <sup>th</sup> January 2015 -- Vol. 71. No. 1 -- 2015

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<b>Title:</b>	QUALITY ANALYSIS OF LOCAL GOVERNMENT WEBSITES IN INDONESIA
<b>Author:</b>	TB. M. YUSUF KHUDRI, DWI MARTANI, TEGUH I. MAULANA
<b>Abstract:</b>	This research aims to analyze design quality of local government's website and its statistics. Design quality is determined by several prior studies and this research employed population data of local government websites in Indonesia based on direct observation during May 2013. Analysis was done descriptively and inferentially which shown that there are some variations among local governments in Indonesia regarded its website's quality. But in general, unsatisfaction results are found in most of websites. In other hand, low visit to the websites indicates that any possibility of low awareness from users of information about condition and governmental activities in their area. Moreover we found that own local revenue as well as governmental size are among important factors that influencing design quality of local government's website in Indonesia.
<b>Keywords:</b>	Local, Government, Website Design, Indonesia, Website Quality
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 10 <sup>th</sup> January 2015 -- Vol. 71. No. 1 -- 2015

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<b>Title:</b>	RECOGNITION OF HUMAN ACTIVITIES FROM STILL IMAGE USING NOVEL CLASSIFIER
<b>Author:</b>	GHAZALI SULONG , AMMAR MOHAMMEDALI
<b>Abstract:</b>	The quest for recognizing human activities and categorizing their features from still images using efficient and accurate classifier is never ending. This is more challenging than extracting information from video due to the absence of any prior knowledge resembling frames stream. Human Activities Recognition (HAR) refers to computer identification of specific activities to aid understanding of human behaviors in diversified applications such as surveillance cameras, security systems and automotive industry. We developed a novel model for classifier and used it in three main stages including preprocessing (foreground extraction), segmentation (background subtraction) to extract useful features from object and sort out these features by the classifier (classification). The model is further simulated using MATLAB programming. Our new classifier generates slightly different results for still image based on dataset INRIA and KTH for 780 images of (64*128) pixels format obtained from literature. The recognition rate of 86.2% for five activities such as running, walking, jumping, standing and sitting achieved by us is highly promising compared to the existing one of 85% over last decade.
<b>Keywords:</b>	Human Activities Recognition, Still Image, Segmentation, Features Extraction.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 10 <sup>th</sup> January 2015 -- Vol. 71. No. 1 -- 2015

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<b>Title:</b>	IT GOVERNANCE SELF ASSESSMENT APPLICATION FOR E-GOVERNMENT IMPLEMENTATION IN INDONESIA
<b>Author:</b>	



<b>Author:</b>	JOHAN J.C. TAMBOTOH, RUDI LATUPERISSA
<b>Abstract:</b>	Information Technology (IT) implementation in the government sector in Indonesia continues to increase every year. However, this increase has not been followed by good governance due to the lack of attention to good IT management. Measurement of IT governance is therefore required as a basis for the continuous improvement of the IT services to government agencies. This study is aimed at producing an application to measure the maturity level of IT governance in government institutions, thus facilitating the process of improvement of IT services. The application developed is based on COBIT 4.1 framework and the design used is Unified Modeling Language. Through stages of information systems development, this research results in an applications for measuring the maturity level of IT governance that can be used by government agencies in assessing existing IT governance.
<b>Keywords:</b>	Information Technology Governance, IT Governance Maturity Level, COBIT 4.1
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 10 <sup>th</sup> January 2015 -- Vol. 71. No. 1 -- 2015

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<b>Title:</b>	A MULTI-SWARM PARTICLE SWARM OPTIMIZATION WITH LOCAL SEARCH ON MULTI-ROBOT SEARCH SYSTEM
<b>Author:</b>	BAHAREH NAKISA, MOHAMMAD NAIM RASTGOO, MOHAMMAD FAIDZUL NASRUDIN, MOHD ZAKREE AHMAD NAZRI
<b>Abstract:</b>	This paper proposes a method based on the Multi-Swarm Particle Swarm Optimization (PSO) with Local Search on the multi-robot search system to find a given target in a Complex environment that contains static obstacles. This method by applying Multi-Swarm with Multi-Best particles on the multi-robot system can overcome the premature convergence problem, which is one of the main problems of Basic PSO. As the time progress the global searching of the algorithm decrease and therefore the robots tend to get group together in the small-explored region that called Premature Convergence and cannot reach the target. By combining the Local Search method with Multi-Swarm, We can guarantee the global convergence of this proposed algorithm and the robots can reach the target. The Experimental results obtained in a simulated environment show that biological and sociological inspiration could be useful to meet the challenges of robotic applications that can be described as optimization problems.
<b>Keywords:</b>	Particle Swarm Optimization; Multi-Swarm And Multi-Best PSO; Premature Convergence, Exploration And Exploitation.
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<b>Title:</b>	PATTERN-BASED SYSTEM TO DETECT THE ADVERSE DRUG EFFECT SENTENCES IN MEDICAL CASE REPORTS
<b>Author:</b>	SAFAA ELTYEB, NAOMIE SALIM
<b>Abstract:</b>	The detection of adverse drug effect sentences in medical text reduces the efforts required for the manual task of drug safety monitoring by decreasing the number of reports which need to be investigated by drug safety experts. Moreover it helps in compiling a highly accurate and machine-understandable drug related adverse effects knowledge bases which can support pharmacovigilance research and aids computational approaches for drugs repurposing. In this study, we proposed a pattern-based method to detect the sentences containing drug-adverse effect causal relation from medical case reports. A set of 500 full abstracts from Medline medical case reports containing 988 adverse drug effect sentences from ADE corpus were used to evaluate the sentences detection task. Our method combined an outcome of a concept recognition system with a method for automatic generation of numerous patterns. Our method achieved recall of 72.8, precision of 93.6 and F-Score of 81.7 % in the adverse drug effect sentences detection task . The results of this study can help database curators in compiling medical databases and researchers to digest the huge amount of textual information which is growing rapidly. Moreover, the mining algorithms developed in this study can be employed to detect sentences contain new associations between other medical entities in medical text.
<b>Keywords:</b>	Drug, Adverse effect, pattern-based, Relation extraction, Medical case reports
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 10 <sup>th</sup> January 2015 -- Vol. 71. No. 1 -- 2015

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<b>Title:</b>	DOES EFFICIENT FUZZY KOHONEN CLUSTERING NETWORK ALGORITHM REALLY IMPROVES CLUSTERING DATA RESULT?
<b>Author:</b>	EDY IRWANSYAH, MUHAMMAD FAISAL, ANNISAA PRIMADINI
<b>Abstract:</b>	In this research, Fuzzy Kohonen Clustering Network (FKCN) algorithm is compared to Efficient Fuzzy Kohonen Clustering Network (EFKCN) algorithm. This research is conducted to see if EFKCN is really efficient and could do a better clustering analysis than original FKCN. We do empirical testing and

simulations to compare both algorithms, by using an expanded Fisher's Iris Data. The result showed the accuracy of EFKCN is not yet better algorithm rather than FKN.

**Keywords:** Artificial Neural Network, Clustering Analysis, Fuzzy Kohonen Clustering Network, Kohonen Network, Self-organizing Map,

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## SUPPLIER RELATIONSHIP MANAGEMENT MODEL FOR SME'S E-COMMERCE TRANSACTION BROKER CASE STUDY: HOTEL ROOMS PROVIDER

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### ABSTRACT

As market intermediaries, e-commerce transaction broker firms need to strongly collaborate with suppliers in order to develop brands seek by customers. Developing suitable electronic Supplier Relationship Management (e-SRM) system is the solution to this need. In this paper, we propose our concept of e-SRM for transaction brokers owned by small medium enterprises (SMEs), which includes the integrated e-SRM and e-CRM architecture, as well as the e-SRM applications and their features. We then discuss the customization and implementation of the proposed e-SRM model in a specific transaction broker selling hotel rooms, which owned by an SME, KlikHotel.com. The implementation of the e-SRM in KlikHotel.com has been successfully boosting the number of suppliers (hotel members) and hotel room sales.

**Keywords:** *e-CRM, e-SRM, SME, Transaction Broker*

### 1. INTRODUCTION

One of the opportunities that can be worked out by Small Medium Enterprises (SMEs), which are recognized as the backbone of economy in many countries, in conducting online business is running transaction broker e-commerce that acts as intermediary between buyers and sellers. Intermediary firms have specific functions in marketing products, which are matching buyers and sellers, facilitating transactions and providing business infrastructure [1]. As intermediaries, transaction brokers should be able to successfully sell supplier's products to customers. It is known that customers often seek fine brands in fulfilling their needs. Hence, transaction brokers should build brands in order to sell products/services successfully in the market. It is recognized that factors shaping brand include quality, reliability, consistency, trust, affection, loyalty and reputation [2]. As intermediaries, transaction could not develop brands by themselves and should strongly collaborate with suppliers to resolve those factors.

In our research we find that in order to build strong relationships with suppliers, transaction brokers must develop electronic Supplier Relationship Management (e-SRM) system. Unlike customer relationship management (CRM) that has been matured, e-SRM is a relatively new concept

that has not been discussed very much in literatures. The existing concept of e-SRM that we find in literature [3][4] is intended for manufacture firms and become part of supply chain management systems. Other discussion related to SRM that we found are as follows: (1) A report summary of 170 paper published in 2000-2010 and highlight the techniques used in analyzing organizational data to support supplier selection decisions [5]; many approaches are adopted, among them are analytic hierarchy process (AHP), artificial intelligence (cluster analysis, neural network, decision trees, etc.), statistics, fuzzy set, and so on; (2) A method for finding key suppliers from a large database of shipment. The method employs association rule algorithms [6]; (3) A technique used to identify potential suppliers by employing association rules algorithm, which analyzes shipment transaction data [7]; (4) A real time business intelligent (BI) model that pulls together large quantities of real time information from disparate heterogeneous systems and distills them into focused views of the business [8]. The real-time BI has the capabilities of enabling companies to work directly with customers.

However, despite its benefits, the cost of deploying a large data warehouse to support a BI system is still high for many organizations. Thus, we have not found specific e-SRM model designed





for transaction brokers, specifically run by SMEs with their specific organization constraints. Hence, we intend to contribute in proposing this model.

In this paper, we propose the integrated e-SRM and e-CRM architecture, the e-SRM applications and functions that resolve brand factors. We also discuss the customization, implementation of proposed e-SRM model in an SME transaction brokers selling hotel rooms and show that the e-SRM has been successfully promote brands in our transaction broker case study. Finally, we discuss the conclusion and further research needed.

## 2. LITERATURE STUDY

### 2.1. The Market Intermediaries and Transaction Broker Roles

Markets (electronic or otherwise) serve three main functions, which are matching buyers and sellers, facilitation of transactions and institutional infrastructure. The role of intermediaries for every function and its sub-functions, and the electronic market influence that must be considered by intermediaries is depicted in Table 1 [1]. Hence, electronic intermediaries should manage and provide services such that those influences can be optimized in their e-commerce websites.

Table 1: The Electronic Market Influence of Intermediaries.

Market Function	Sub-Functions	The Role of Intermediaries	Electronic Market Influence
Matching buyers and sellers	Determination of product offerings	Monitoring, alerting	Personalization of products, aggregation, disaggregation
	Searching	Reducing search costs	Lower search costs, more complex search requirements, lower barriers to entry
	Price discovery	Facilitating (but increasing price)	Redistribution of mechanisms, new markets
Facilitation of transactions	Logistics	Shipping, distribution, warehousing	Lower logistical costs, economies of scale
	Settlement	Facilitating, monitoring	New cost structures, new payment mechanisms
	Trust	Rating, guaranteeing	Increased protection requirements

Market Function	Sub-Functions	The Role of Intermediaries	Electronic Market Influence
Institutional infrastructure	Legal & Regulatory	Monitoring, protecting	Institutional support for electronic markets

In general, intermediaries can be categorized into four groups, which are consultant, broker, mediator and resource provider. The brokers possess the following characteristics [1]:

1. They act as creators and/or acquirers of sought after knowledge and/or technology. Brokers can also perform an integration role bringing multiple parties together into a collaboration 'deal'. Roles may involve assistance in negotiating contracts, purchases, or sales.
2. They perform as agencies, parties acting for either buyers or sellers of knowledge (rarely both) on the basis of their capacity to meet needs through their networks and ability to initiate and negotiate deals. An example would be a technology broker, acting on behalf of a client, who identifies/seeks out a technology and works towards creating a deal. Brokers are typically paid a commission on the value of a transaction or a success fee.

The B2C (business to consumers) e-commerce business model that acts as market intermediary is known as transaction broker. Industries that widely using this model include financial services, travel services and job placement services [2]. These e-commerce systems should or usually provide functions and sub-functions depicted in Table 1.

### 2.2. Supplier Relationship Management (SRM)

SRM is a relatively new concept that is enhanced from Customer Relationship Management (CRM) concept [9]. Similar to the CRM, SRM objectives are: Attract and acquire suppliers, develop suppliers and maintain/promote their loyalties. SRM should focus on helping key suppliers improve quality, cost, and performance as well as integrating key suppliers into the organization [3].

The benefits of implementing SRM include [10][9]: (a) Optimize the relationships between the organization and suppliers by treating each supplier in different ways depending on the characteristic of the supplier; (b) Create competitive advantage and drive revenue by jointly bringing new, better and more customer-centric solutions to market; (c)





Lengthen and strengthen critical supplier relationships; (e) Increase satisfaction of goods and services purchased.

There are few techniques in developing relationships with suppliers [4], which are: (a) Segment the entire suppliers into several strata based on needed criteria; (b) Develop programs that are appropriate to each of those segments; (c) Apply tools which recognize the most strategic set of suppliers.

In developing SRM system, it is suggested that [3] [4]: (a) It should combine both qualitative feedback and quantitative data and offer various means to analyze and report on that information; the system should produce an accurate overall score for each supplier which can be compared with other suppliers and tracked over time; (b) Clients and suppliers must share information and jointly collaborate on effective result oriented strategies, which need the support of technological horsepower; (c) By closing any delay between data capture and reporting, suppliers can be engaged more quickly to improve the working.

### 2.3. E-CRM Applications in e-Commerce Systems

Whereas SRM has not been discussed very much in literatures, CRM has been widely known and implemented. Specifically for with e-commerce systems, the electronic CRM applications that are integrated with e-commerce systems are [11]:

1. Customer-facing applications (CFA): Include features where customers interact with the company such as call centers, sales automation and field service automation;
2. Customer-touching applications (CTA): Include features where customers interact directly with the applications such as personalized web pages, self-service activities, FAQs, campaign management and general-purpose e-commerce applications;
3. Customer-centric intelligence applications (CCIA): Include features where intelligent systems (using data warehouse, data mining and so on) are used to provide personal services or recommendations.
4. Online networking applications (ONA): Online networking refers to methods that provide the opportunity to build personal relationships with a wide range of people. These include chat rooms, blogs, wikis, and discussion lists.

### 2.4. Brand Development

Marketing seeks to create unique, highly differentiated products or services that are produced or supplied by one trusted firm [2]. In developing differentiated products, firms should not only sell core and actual products, but augmented products that include additional benefits such as after-sales support and other services. This is the basis for building the product's brand. Brand can be viewed as expectations consumers have when consuming, or thinking about consuming a specific product. The most important expectations include: (a) quality, (b) reliability, (c) consistency, (d) trust, (e) affection, (f) loyalty and (g) reputation.

### 3. PROPOSED E-SRM MODEL

#### 3.1. Transaction Broker Integrated SRM and CRM Architecture

As intermediary firms, transaction brokers conduct business with suppliers and buyers. The buyers as well as the supplier could be organizations or individuals. In order to build products' brand (see Section 2.4) that will be marketed successfully, they should build strong relationships with suppliers through SRM (see Section 2.2) to help suppliers in developing brands that satisfy customers and develop relationship with customers through CRM. Therefore, integrated SRM and CRM are needed.

We propose an architecture of integrated SRM and CRM by adopting the CRM systems for e-commerce (depicted in Section 2.3) as shown in Figure 1 with the following descriptions:

1. For supplier convenient and speedy services, they must have access to Supplier-Touching Applications (STA) having modules of self service supports, e-commerce features (needed to manage products, company profiles, and so on) and campaign management application needed to manage their product promotions. They should also be able to contact specialized staff, having the skills and knowledge of suppliers' business, where the staffs use Supplier-Facing Applications (SFA).
2. The CRM side is adopted from the work of Turban and King with no modification [11].
3. Both SFA and STA in SRM and CRM systems should be supported by the intelligence obtained from analyzing the related data (owned by the transaction brokers) in the Customer-Supplier-Centric-Intelligent (CSCI). CSCI should have



functions for analyzing business data stored in databases as well as data warehouse using traditional techniques (statistical computations) and data mining technologies.

Based on the survey, we found that SMEs running e-commerce businesses could not afford powerful IT infrastructures needed to run CSCI in Business Intelligence (BI) system (that includes data warehouse, OLAP server and data mining technologies). Hence, in the first years, SMEs can focus with functions that analyze data stored in databases. SMEs can then also subscribe cloud services from BI providers and obtain on-demand services for conducting more intelligent analysis.

As intermediaries having the market functions and roles as depicted in Section 2.1, transaction broker SMEs must build strong relationships with suppliers before they can sell fine brands. Thus, in the first years SMEs should prioritize the development of suitable SRM systems while gradually also develop CRM for customers.

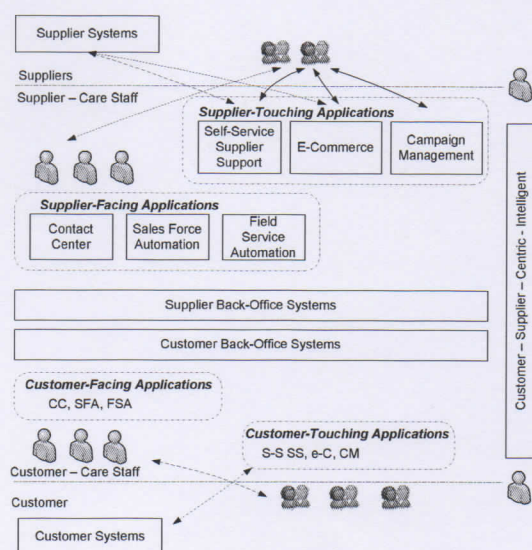


Figure 1: The Transaction Broker E-SRM and E-CRM Applications Architecture

### 3.2. Transaction Broker e-SRM

Transaction broker SMEs (TB SMEs) do not produce their own products. They only act as intermediaries who sell suppliers' products and perform their specific functions and roles. On the other hand, as discussed in Subsection II.D, in order to be success in selling their products/services, the SMEs should also take roles in developing their

brand. Here, we present our analysis results of how TB SMEs can develop their brands by collaborating with suppliers as depicted in Table 2.

Table 2: The Role of Suppliers and Transaction Broker Firms in Building Brand

Variable Defining Brand	Supplier Role	Website Features Needed by Supplier	Transaction Broker Role
Quality	Produce satisfying or excellence products and share complete products features with the TBs selling them.	Catalog information management; notifications (reminder for updating catalog)	Evaluate the catalog and give feed backs to suppliers; provide website features: intelligent search engine, online catalogs displaying complete product features; Consult or negotiate with suppliers to give "the best prices" for their products.
Reliability	Produce reliable products and provide post-purchase services (such as warranties).	Purchasing transactions reports; communicating with TB firms; customer review	Provide website features to support reliable purchase transactions and post-purchase services.
Consistency	Guarantee to sell products with specifications as displayed in online catalogs.	Purchasing transactions reports; communicating with TB firms;	By collaborating with suppliers, provide correct and interesting information of online catalogs.
Trust	Provide satisfying post-purchase services (warranty, etc.) by collaborating with the TBs	Purchasing transactions reports; communicating with TB firms; customer review	Provide useful and easy-to-use website purchasing features, including secure electronic payment systems; Provide fine post-purchase services (product reviews, user evaluations); collaborating with suppliers to provide warranty.
Affection, loyalty	Support TBs in providing personal and satisfying services to	Knowledge of customers and their preferences; campaign management; communicating	Provide personal services (including online promotions/campaigns, lotteries, discounts);





Variable Defining Brand	Supplier Role	Website Features Needed by Supplier	Transaction Broker Role
	customers.	g with TB firms;	collaborating with suppliers to provide post-purchase (newsletters, customer email, online updates, targeted email with personal promotions).
Reputation	Produce satisfying or excellence products and collaborating with the TBs to provide post-purchase services (warranty, etc.).	Purchasing transactions reports; customer review	By collaborating with suppliers, provide post-purchase services, such as warranty and gather customers feedback (product reviews, user evaluations); inform customers feedback to suppliers; Provide suggestion or recommendation to improve and design new products.

As can be seen in Table 2, transaction broker firms should highly communicate and collaborate with suppliers in order to create product brands. Hence, SRM should also be intended to promote brands sold by TB firms. Other than those, as in CRM, the SRM of TB SMEs should also have the objectives of: (1) Promoting suppliers loyalty; (2) Promoting suppliers value, such as by designing specific promotions (event promotions) where suppliers can join the promo event to sell more products; (3) Preventing valuable suppliers from churning.

Based on the SRM objectives, the concept of SRM depicted in Section 2.2, role of suppliers and TB firms in building brand (Table 2), the application features of e-SRM can be defined as the following.

#### 1) Supplier Facing Applications (SFA)

As SFA users are supplier-care staff, the SFA should provide features to support the staff in managing and developing relationships with suppliers through "traditional" techniques (by phone, fax, in person). Therefore SFA should provide features as follows:

- SFA-1. Contact center: phone, messaging, email, and so on;

- SFA-2. Sales force and field service automation: products and inventory management, promotions/campaign management, reminder/notifications for updating products information (catalog), campaign, product stocks, transaction payments;
- SFA-3. Field Service Automation: Reports of inventory, purchasing transactions, campaigns, and so on;
- SFA-4. Knowledge obtained from data: supplier segmentations, monitoring and predicting suppliers who tend to churn, knowledge of customers review, knowledge of customer behavior in purchasing products and using websites.

#### 2) Supplier Touching Applications (STA)

As STA is used by the suppliers, it should provide features to help suppliers in performing their roles defined in Table 2, which are:

- STA-1. Self-service supplier support and e-commerce features: products and inventory management, promotions/campaign management (create, update, change status, etc.), transaction payments management;
- STA-2. E-commerce: Personalized reports and dash boards of inventory, transactions, sales, campaigns, customers review and competitors information (such as prices);
- STA-3. Campaign management: Presenting knowledge obtained from each supplier data: segments of customers and products purchased by each segment, products purchased together, valuable information analyzed from customer's review/comments, reasons why customers churn, and so on.

For obtaining knowledge from data, the application can employ statistical computations (of data stored in the databases) and business intelligent (BI) system, which includes data warehouse, data mart, OLAP functions, data mining techniques and dashboards. The knowledge includes: (a) Customer segments based on demographic, value and propensity (used to personalized services); (b) Favorite products and deals; (c) Product purchased together; (d) Effect of campaigns/deal/ads to segmented customers; (e) Valuable information analyzed obtained from customer review and comments of products and supplier; (f) Suppliers segments based on demographic, value and propensity (used to personalized services); (g) Competitors products and prices. As SMEs may not be able to afford their own BI system, in the first years they can





employ the traditional techniques, which are statistical computations, whereas buy on-demand BI functions from cloud services providers.

#### 4. CASE STUDY: SRM OF HOTEL ROOMS PROVIDER

##### 4.1. Markets of Travel Services in Indonesia

One of the business opportunities that can be "caught" by SMEs in Indonesia is running an e-commerce transaction broker selling hotel rooms. The opportunity is backed up by the following facts.

In 2013, there is 72.7 million of Internet users (29% of total population) in Indonesian. However, at this time only 8% (5.6 million) of users are involved in internet transaction [12]. Hence, there is still ample of opportunities for growing. The demographic profiles of the largest users are [13]: age between 15 to 54 (87%), living in cities (53%), having high school education or more (72%). Indonesian middle class is expected to grow from 74 million in 2012 to roughly 141 million people by 2020 [14]. Among them, spending continues to rise with increase of wealth in travel and restaurant dining and online spending for tickets for trips or shows is the third largest compared to other goods. No wonder that the largest market segment of hotel rooms in Indonesia is budget accommodations, such as 3 and 4 star of hotels, that grow fast to meet this demand [15]. Concerning their behavior of online shopping, this middle class have specific characteristics [16], which are more than 60% enjoy searching for discounts/promotions and 88% of them want to experiment with brands. It is also reported that 69% of customers like branded websites.

##### 4.2. Implementation of the e-SRM Model in a Case-Study SME

In implementing the model, which is applicable to various types of business area, an SME should design a system having features in line with its vision-mission, which is also resolving specific issues and problems related to its business area. The SME should also define priorities, which applications features should be implemented first by considering their capability, resources and the most important issues to be addressed.

In responding to travel services market survey results depicted in Section 4.1, here, we propose the implementation of the e-SRM model for a transaction broker SME of our case study that sells hotel rooms.

##### 4.2.1. The SME of transaction broker case study

The case study SME is a transaction broker selling hotel rooms, KlikHotel.com, which was founded in 2010. It sells hotel rooms both to individual customers (via B2C e-commerce model), travel agent and tour operators (via B2B e-commerce model) by collaborating with hotels as suppliers (as of April 2014, the SME manages more than 1600 suppliers). Based on market survey as depicted in Section 4.1, the SME targets the middle class Indonesians and focus on budget hotels. The SME generates revenue from room transaction fees.

In order to build brand (having excellent reputation, affection, trust, consistency and quality) recognized by customers, KlikHotel.com prioritize in strengthening relationships with suppliers such that it can provide precise information for each of the hotel rooms, handle booking transactions easily and correctly and innovate attractive campaign/promotions for the middle class.

##### 4.2.2. KlikHotel.com issues and objective in managing suppliers

In managing and maintaining suppliers, the main issues faced are:

1. Acquiring new suppliers is costly as the marketing staff must meet and negotiate with the right person in hotel's management. The average cost of acquiring a supplier is more than IDR 200.000.
2. While room availability must be precise at any time and rates must be maintained competitively, up to date and correctly, many hotels reluctant to maintain the information by themselves (especially if they find that their rooms have not been sold well by the website).
3. Although lots of small hotels eager to join as room suppliers, they lack of skilled human resources for maintaining hotel rooms information in the website.
4. Despite the fact that middle class in Indonesia like to search bargains, lots of hotels lack the capability of designing innovative and creative campaigns/promotions/deals for customers.
5. In attempt to gain more profit, several days before every peak season (week end or holiday), hotels want to sell their rooms by themselves (hence, do not provide rooms to be sold by KlikHotel.com)
6. The periods in setting room rates and room stock vary from hotels to others (the period could be monthly or quarterly or yearly).





Hence, in the first 5 years KlikHotel.com prioritizes and emphasizes the following e-SRM objectives:

1. Obj-1. Highly providing helps needed by hotels (specifically the small ones) in maintaining their room information and process the booking transactions such that the hotels staff just need to proceed with check in procedures.
2. Obj-2. Maintaining rooms availability and the attractive yet correct room rates at any time by applying specific strategies (such as by negotiating with hotels to sell rooms with competitive tariff to customers long before the peak season come);
3. Obj-3. Increasing room sales by designing creative campaigns/deals suitable middle class segment and ask hotels to join the campaigns/deals;
4. Obj-4. Evaluating the hotels performance (high selling, maintaining up to date hotel information, creating campaigns, etc.) and rewarding those having high performance with special bonuses

#### 4.2.3. e-SRM application features

Based on the objectives and priorities of KlikHotel.com, we have designed, customized and implemented the proposed features of SFA, STA and SCIA for the SME of case study. It is depicted in Table 3.

Table 3: The Features of SFA, STA and SCIA Resolving The Issues

Objective	Supplier Role	Website Features Needed by Supplier
Obj-1	SFA-1	Contact center: phone, email, fax, chat, Skype
Obj-1	SFA-2	Sales force automation: Order management
Obj-3	SFA-2	Campaign management: promotion tools supplier, search hotel news, hot deal generator, search special deal, KlikHotel.com sale, auto renewal in joining certain promotions
Obj-1, -2	SFA-2, SFA-3	Field service automation: low inventory stock notification, email broadcasts, customer order notification, payment notification, cancellation notification, check-in reminder, review notification, reminder to maintain information in the extranet
Obj-3	SFA-2	Marketing: Online ads, newsletter, collaborating with other third parties for providing specific deals (for example, restaurant bills can be exchanged with certain rooms vouchers)
Obj-1	STA-1	Personalized web pages: Features for

Objective	Supplier Role	Website Features Needed by Supplier
		chained hotel differ to non-chained hotel (i.e. for chain hotel, a user account can be used to manage all of hotels in the chain)
Obj-1, -2	STA-1	Self service activities: room allotment update, hotel profile update, photo gallery update, user management setting
Obj-1, -2	STA-1, STA-2	Inventory automation: auto renewal promo, low inventory notification
Obj-1, -2	STA-1, STA-2	Field service automation: order notifications, payment notifications, cancellation notifications, check-in reminders, review notifications, reminder of maintaining rooms information (extranet)
Obj-3	STA-1, STA-2	Campaign management: Managing promotions (such as special price, early bird or long stay promotion), last minute sales, special deal and mystery deal (opaque selling)
Obj-1	STA-1	FAQ: Manual guide, newsletter
Obj-4	SFA-4	Searching/filtering hotels based on their performance (measured by certain criteria)
Obj-4	SFA-4	Segmenting and ranking hotels based on specific variables and computation
Obj-4	SFA-4	General statistical reports needed to evaluate hotels

#### 4.2.4. Examples of SFA and STA features

As features for managing creative campaigns/promotions is very important (to respond to the need of middle-class customers who are "bargain-hunters"), here, we mainly discuss the campaign management features in SFA and STA.

##### 1) SFA-2 Sales Force Automation

We have designed and implemented functions for:

1. Creating and managing innovative-attractive campaigns (via hot deal campaign), such as the ones called mystery deal. It offers very low room-rate without explicitly inform the hotel name (it gives some hints only). Customer should "buy/take" the deal in order to find out the real hotel rooms.
2. Creating and managing discount campaigns, called cash-back promotions. Cash-back promotion is chosen manually by klikhotel.com's promotion team to any hotels to increase competitiveness, compared to other online travel agents.
3. Searching, monitoring, evaluating and approving hotels' campaigns. The function can be used to check and approve campaigns proposed by hotels. It can also check/monitor hotels that have joined



campaigned created/offered by  
KlikHotel.com.

Figure 2 depicts the user interface of this campaign features.

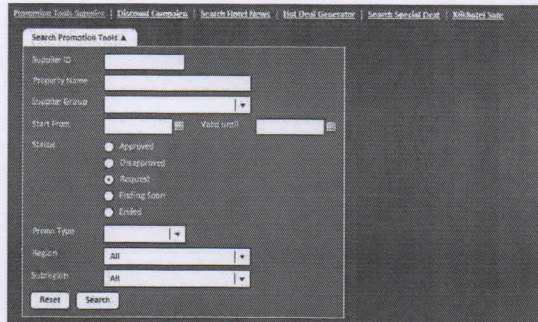


Figure 2: The Menu of Campaign Management in SFA Used by The Supplier-Care Staff

## 2) STA Campaign management feature

We have designed, customized and implemented functions for facilitating each hotel to create and manage its own campaign. The options are special price, early bird booking, and last minute deals/promotions that can be applied for specific rooms for certain period of time. Figure 3 depicts user interface of the features.

## 3) SFA-2 and STA-2 Room availability search feature

One of the most important information needed by customers is room availability. We designed a feature for quickly searching room availability based on certain price, room type, hotel name, hotel group, region and period. The users can then inform the search results to customers.

## 4) STA-1 Self-service hotel information management feature

Features are provided for hotels to manage their information (such as to update rooms information facilities, price, and their amenities).

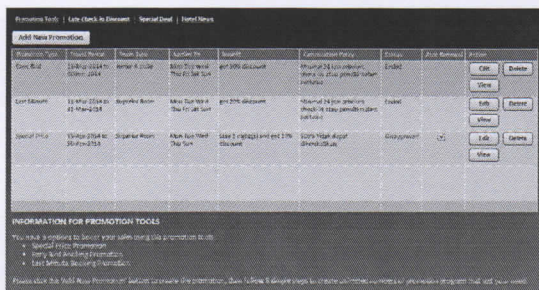


Figure 3: Promotion/Campaign Management Tools Used by Hotels

As KlikHotel.com could not afford yet to provide BI systems, we designed and implemented analytical functions using statistical computations for processing data stored in database. These functions are for measuring and reporting hotels performance, and sorting hotels based on specific computed measure.

## 5) SFA Measuring and reporting hotels performance features

The important variables used to measure hotels performance is depicted in Table 4. The hotel performance is computed using the formula of

$$HotelPerformance = \sum_i w_i v_i \quad (1)$$

where  $w$  is the weight of the variable (value: 0-100%) and  $v$  is the variable.

The total of all weights must be equal to 100%. If a weight of a variable is set to 0%, the corresponding variable is not included in computing the performance. We design a user interface that accommodates flexibility in selecting weights and variables for computing performance (see Figure 4). This function provides the capability to detect hotels that "need special attention" such as hotels having high discrepancy between number of visits with total bookings, which indicates problems (customers may like the rooms but price may be too expensive). If total of paid transactions is low, the hotels should also be checked. If the discrepancy between week day and week-end rates is high, the hotels should also be consulted.

Table 4: The Variables Used in Analyzing Hotels.

No	Criteria	Descriptions
1	View and order	Number of users visiting hotel's page and total of customers who make booking
2	Set rates	The update status of room rates (value: Yes/No)
3	Availability	Stocks (allotment) of rooms (specifically during certain weekends)
4	Production	Total of paid customer booking order transactions
5	Price	The discrepancy between weekday and weekend rates
6	Show	The status of room information visibility to users (value: Show/No show)
7	Rating	The average of hotel rating review given by customers (0-10 scale). There are three priorities category for hotel's rating review: high (<4), medium (4-6) and low (>6).



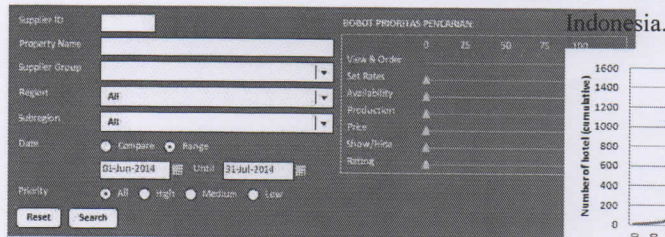


Figure 4: The User Interface for "Filtering"/Searching Hotels Using The Variables Depicted in Table 4

#### 6) SFA-4 Segmenting hotels based on their value

We design a function for computing "hotel value" using the following needed variables: room (total rooms allocated in the last one week), promotions point (30 point is rewarded to a promotion), room sales, customer review and commissions percentage given by hotels. The performance is also computed using the formula

$$\text{HotelPerformance} = \sum_i w_i v_i \quad (2)$$

where  $w$  is weight of the variable that can be adjusted and  $v$  is variable.

Hotels can then be sorted based on their value and KlikHotel.com can take appropriate business actions in managing hotels, such as giving bonus to high value hotels and penalties to hotels provided bad services to customers.

#### 7) SFA General statistical report

General business reports are also generated, such as: (a) Reports of hotel distributions in a region/province; (b) Reports of top ten hotels (based on their sales) in top five cities; (c) Reports of daily, monthly, yearly of booking transactions, which can be used to compute room sales growth; (d) Analytical reports of "last production" per hotel, per hotel-group, per region for certain period of time.

### 5. EVALUATION/RESULTS

So far we have adopted and implemented the proposed e-SRM model only in our case study SME, KlikHotel.com. Hence, we can discuss the implementation results based on it. The e-SRM implemented in KlikHotel.com e-commerce system have successfully increase the number of hotels (suppliers) joined in the system in the last more than three years (see Figure 5). By having more hotels offered and strong relationships with the hotel members, KlikHotel.com's brand has been also promoted as can be proven by the all time increased total order (see Figure 6). KlikHotel.com is now one of the most popular websites offering hotel rooms in

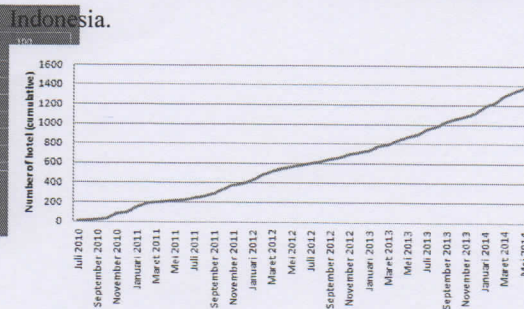


Figure 5: Hotel Members Growth

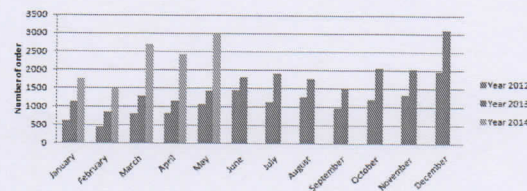


Figure 6: Total Order Growth

### 6. CONCLUSION AND FUTURE WORKS

By developing e-SRM, brands of e-commerce transaction brokers can be promoted that leads to sales increase. By adopting e-SRM, strong relationship and collaboration between transaction broker firms and suppliers can also be achieved, which is beneficial to both parties as they can conduct business activities more efficiently. In adopting the model for certain transaction broker with specific business area, local issues must be identified and then resolved by designing functions accordingly.

So far we have customized and implemented the proposed e-SRM in a SME case study providing hotel rooms only. More research is needed to customize it for other transaction brokers with different business area. The e-SRM with its functions that we propose is specifically suitable for transaction brokers. Hence, e-SRM models for other types of e-commerce system need to be developed.

### ACKNOWLEDGMENT

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