

REQUIREMENT ANALYSIS METHOD OF E-COMMERCE WEBSITES DEVELOPMENT FOR SMALL-MEDIUM ENTERPRISES, CASE STUDY: INDONESIA

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ABSTRACT

Along with the growth of the Internet, the trend shows that e-commerce have been growing significantly in the last several years. This means business opportunities for small-medium enterprises (SMEs), which are recognized as the backbone of the economy. SMEs may develop and run small to medium size of particular e-commerce websites as the solution of specific business opportunities. Certainly, the websites should be developed accordingly to support business success. In developing the websites, key elements of e-commerce business model that are necessary to ensure the success should be resolved at the requirement stage of the development. In this paper, we propose an enhancement of requirement analysis method found in literatures such that it includes activities to resolve the key elements. The method has been applied in three case studies based on Indonesia situations and we conclude that it is suitable to be adopted by SMEs.

KEYWORDS

Software Requirements Analysis, E-Commerce Website Development, Resolving Key Elements of E-Commerce Business Model

1. INTRODUCTION

It is well recognized that small-medium enterprises (SMEs) are significant to the worldwide socio-economic development. It is even viewed that SMEs are the backbone of the economy. SMEs have also contributed significantly in higher growth of employment, output, promotion of exports, and fostering entrepreneurship [5, 7]. In Indonesia, SMEs have been growing such that they contribute to 56 percent of GDP and absorb around 97 percent of the manpower [22].

Along with the growth of the Internet, it is noted that since e-commerce was born in 1995 both the B2C (business to consumer) and B2B (business to business) e-commerce have been growing exponentially [8]. The proliferation happens not only in the developed countries, but also in developing countries. The B2C sale in Asia-Pacific region in 2011 was 27.9% of world-wide sales, and is predicted to grow up to 39.7% by 2016. In China, e-commerce has grown by 120% per year since 2003. It is also predicted that e-commerce in China, India and Indonesia will grow the fastest in 2013 [7].

The growth of e-commerce means business opportunities for SMEs. SMEs may develop and operate small to medium size of B2B, B2C or C2C (consumer to consumer) e-commerce systems. SMEs may start up new e-commerce business. Those who already run “off-line” business can go online to access new markets and overcome distances. As going online require management changes, the SMEs have the advantage of implementing strategic and organizational changes

much more quickly and at lower cost than large companies [16]. In Indonesia, the SMEs opportunities to set up e-commerce systems are backed up by this fact: In the last several years the Internet users have been increasing exponentially. While the number of users in 2012 was 55 million [20], in 2013 it has reached 60-70 million and it is predicted that in 2015 it will be 100 million [24].

As a type of computer-based information system, e-commerce systems include people, procedures, computer networks, software and database. This research focuses on the software component, which is website. There are several approaches of software development, such as water-fall, prototyping, spiral, agile, and so on [2]. Each of these will basically include stages of requirement, system analysis, design, implementation, testing, deployment and maintenance. Among these stages, it is recognized that requirement is a complex and risky task [13; 4] such that broad spectrum of tasks and techniques that lead to an understanding of requirements, which is called requirements engineering, have been developed [18].

In the context of SMEs who will set up new e-commerce businesses, the required websites that will be developed should significantly support their success. We find that the eight key elements of e-commerce business model defined in [8] as the success keys must be resolved at the requirement stage. Unfortunately, we have not found research results that specifically include these elements in analyzing requirements of e-commerce websites. Hence, we intend to contribute in designing a requirement analysis method that resolves these key elements. After studying some literatures, we find that [18] has discussed broad methods of analyzing requirements. We enhance the early activities formulated in [18] such that the key elements are resolved accordingly.

Research methods: We first study literatures related to software development, requirement, and e-commerce website development. We then design the proposed enhanced requirement analysis method, apply the method to three case studies based on Indonesia environment (the requirements resulting from the applying the method are then used in developing website prototypes), and evaluate the method.

This paper is organized as the following: Introduction, literature study (software requirement, development of e-commerce website and key elements of e-commerce business model), proposed methods, case studies, method evaluation, and conclusion. In the appendix we include detailed results of two case studies.

2. LITERATURE STUDY

2.1. Software Requirement

Requirement engineering and analysis: Brief discussion of software requirement engineering and analysis that are related to the proposed method are as follows [13]: The broad spectrum of tasks and techniques that lead to an understanding of requirements is called requirements engineering. Requirements engineering, which is a major process in software engineering, provides the appropriate mechanism for understanding what the customer wants, analyzing need, assessing feasibility, specifying the solution unambiguously, and so on. It encompasses seven distinct tasks, which are inception, elicitation, elaboration, negotiation, specification, validation, and management. Some of these tasks occur in parallel and all are adapted to the needs of the project. At project inception, among other things, system analysts establish a basic understanding of the problem, the people who want a solution and the nature of the solution that is desired. The activity includes establishing product vision and project scope [18]. At the requirement elicitation, activities are performed to formulate the objectives for the system, what is to be

accomplished, how the system or product fits into the needs of the business, and how the system is to be used. Requirements elicitation (also called requirements gathering) combines elements of problem solving, elaboration, negotiation, and specification. Requirements analysis is the activity of elaborating basic requirements established during the inception, elicitation and negotiation tasks. Requirements analysis results in the software specification detailing the operational characteristics, interface with other system elements, and constraints that the software must meet.

Requirements: Based on their functions, requirements can be classified into: (a) Functional requirements, which describe system functionalities or services; (b) Non-functional requirements, which define system properties and constraints (e.g. reliability, response time and storage requirements). The functional and non-functional requirements can further be classified into few types and have relationship as shown in Figure 1 [18]. As this research mainly concerns with business requirements that will be used in designing user requirements and the business rules that will be included in the use-case document, brief descriptions are provided for the three as follows:

- (a) Business requirements: Represent high-level objectives of the organization or customer who requests the system. They describe why the organization is implementing the system (the objectives the organization hopes to achieve).
- (b) User requirements: Describe user goals or tasks that the users must be able to perform with the product.
- (c) Business rules: The rules in the organization that affect the system, which include corporate policies, government regulations, industry standards, accounting practices, and computational algorithms.

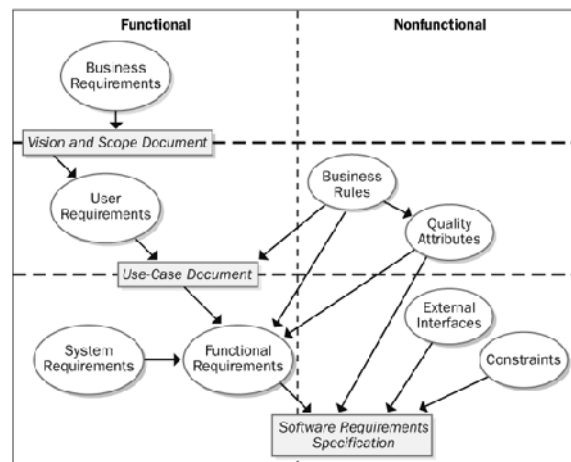


Figure 1. Relationship of requirements [18].

As depicted in Figure 1, the vision and scope document collects the business requirements into a single document that sets the stage for the subsequent development work. It typically contains:

- (a) Business requirements, which includes background, business opportunity, business objectives and success criteria, customer or market needs and business risks;
- (b) Vision of the solution, which includes vision statement, major features, assumptions and dependencies;
- (c) Scope and limitations, which includes scope of initial release, scope of subsequent releases, limitations and exclusions;

- (d) Business context, which includes stakeholder profiles, project priorities, operating environment.

Requirement elicitation techniques: Requirements elicitation is generally performed using certain techniques, such as interview, questionnaires, observation, document analysis, studying similar companies/systems, and prototyping. The applicability of the five techniques excerpted from [2, 9, 10] are presented in Table 1.

Table 1. Techniques of requirement elicitation and applicability.

| Technique | Applicability |
|----------------------------|---|
| Interview | Can be used when the users are known and can be contacted directly. It is a helpful technique for establishing and verifying information or procedures. |
| Questionnaires | Used when similar types of data or information need to be obtained from a large number of respondents or from remote locations (such as Internet users); |
| Observation | Can be used when the observed objects (such as organizations, working system or activities) can be visited or observed remotely. It gives a useful insight into problems, work conditions, bottlenecks and methods of work. |
| Studying similar companies | Suitable to get information about the competitors' facts related to the system development. |
| Prototyping | Used where there is a great deal of uncertainty about the requirements, or where early feedback from stakeholders/users is required, or where users (public) features preferences can not be determined precisely in advance; |

2.2. Development of e-Commerce Website Methods

E-commerce needs special web-based software, which is usually known as e-commerce website. [8] outlines major steps of Systems Development Life Cycle (SDLC) of e-commerce website, which are systems analysis/planning, design, building the system, testing and implementation. In the stage of system analysis/planning, the following are formulated:

- (a) Business objectives, which list the capabilities of the website;
- (b) System functionalities, which list the information system capabilities needed to achieve the business objectives;
- (c) Information requirements, which list the information elements that the system must produce in order to achieve business objectives.

The emphasizes in the stage analysis/planning are defining business objectives then “formulating” system functionalities and information requirements based on those objectives. Unlike [18] that defines the role of business rules in analyzing requirements, however, [8] does not specifically discuss this role.

2.3. Eight Key Elements of e-Commerce Business Model

Business model is defined as a set of planned activities designed to result profits in a marketplace. In e-commerce, there are generally three major of business model, which are business-to-business (B2B), business-to-consumer (B2C) and consumer-to-consuming (C2C). To achieve business success, in developing B2B, B2C, and C2C e-commerce systems, there are eight key elements of business model that should be resolved, which are [8]:

- (a) Value proposition: Analysis of why customers will purchase products/services from the enterprise.

- (b) Revenue model: Model of how the enterprise will earn revenue or generate profits. Major types of e-commerce revenue model are: Advertising, subscription, transaction fee, sales and affiliation.
- (c) Market opportunity: The market space selected, where market space is an area of actual or potential commercial value in which company intends to operate.
- (d) Competitive environment: Direct and indirect competitors who sells/produces similar products in the same market space.
- (e) Competitive advantage: The special advantages delivered by the enterprise to the market space (compared to its competitors).
- (f) Market strategy: Plans of how the firm intends to enter market and attract customers.
- (g) Organizational development: The organizational structures and work organization that will carry out the business plan.
- (h) Management team: Team member qualification and how the team will be developed to build strong management team.

3. PROPOSED METHOD

Our main idea is to enhance the methods of requirement analysis, specifically at the early stage of analysis, presented in [8] and [18] such that the enhanced method is suitable to be adopted by SMEs who intend to start e-commerce business and need to develop an e-commerce website. Those existing methods need to be enhanced due to the following reasons:

- (a) As presented in Subsection 2.2, the stage analysis/planning presented in [8] does not discuss how the business objectives are defined in detailed. It assumes that the e-commerce business model has been formulated previously.
- (b) In the context of e-commerce website development for SMEs, although the requirement analysis method resulting the Vision and Scope document has been discussed in [18], we find that it lacks activities of resolving the eight key elements e-commerce business model (see Section 2.3).

In this research, we focus in designing systematic activities in the early stage of requirement analysis (at the inception and preliminary elicitation stages), which we name it as “initial requirement analysis”, that lead to produce the first document of requirements (in Figure 1, it is named as “Vision and Scope Document”). Once the document has been produced, the rest activities for detailing requirements should be the same with the ones that have been presented in detailed in [18].

3.1. Modification of Requirements Relationship

By interviewing and observing local e-commerce entrepreneurs and prospective entrepreneurs, we find that some of them have not established enterprises and organizations when they find the opportunities that can be materialized into e-commerce business. On the other hand, some SMEs who have been running traditional business (such as retailers and distributors), who want to enhance their business and go online, do not have sufficient knowledge in developing organizations suitable to run the chosen e-commerce business model.

The SME organization, which is a component of the e-commerce key elements (see Subsection 2.3), can be developed accordingly only after the business objective along with the specific e-commerce business model has been formulated. Then, once the organization has been designed, the business rules can be formulated with respect to the organization. The business rules themselves will affect the user requirements (i.e. major features will be affected by the SME

policies defined, for instance, payment system selected – bank transfer or stored value, will define the website payment feature).

Based on the above findings, we propose a minor modification towards some part of the requirements relationship that is depicted in Figure 1. The result of the modification is presented in Figure 2 (we draw the modified part only, the rest of the requirements and their relationships remain unchanged). Here, we define that the the first requirement document, namely *Organization, Vision and Scope* document, also contains SME organizations and business rules formulated.

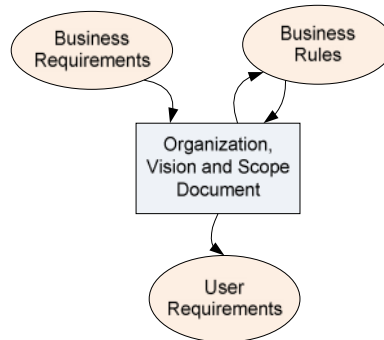


Figure 2. The modification on some part of the requirements information relationship.

3.2. Initial Requirement Analysis Method

In order to produce the *Organization, Vision and Scope* document, we propose a method consisting of a series of activities that is ordered in certain way as shown in Figure 3. In the method, there are activities for resolving the e-commerce key elements discussed in Subsection 2.3 to ensure that the developed e-commerce website will lead to business success. The rationales of the proposed method are as follows:

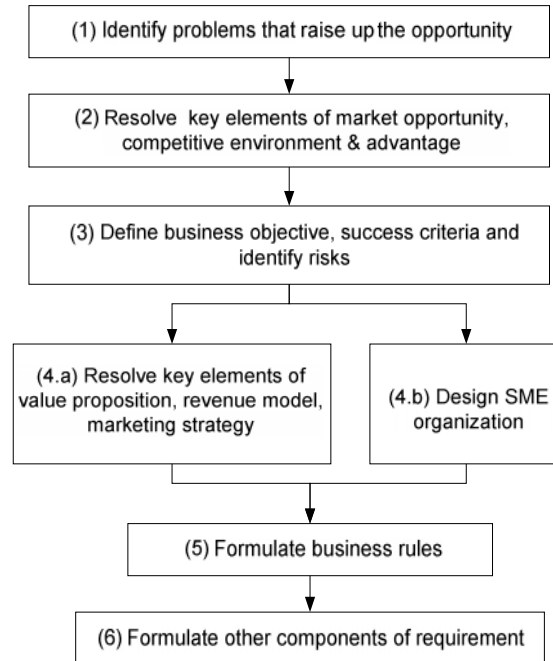


Figure 3. Proposed method of initial requirement analysis.

After identifying the e-commerce business opportunities, the key elements of market opportunity, competitive environment and advantage will need to be resolved first. Based on the results, then the business objective, success criteria and risks can be formulated. More specific business requirements is then defined by resolving value proposition, revenue model and marketing strategy elements, which can be comprised as the solution model of the e-commerce website. In conjunction with this activity, based on the results of resolving the first 3 key elements the SME organization can also be designed. The business rules, which include the SME policies, are then formulated accordingly. The results of these activities along with other components of requirements are then documented in the *Organization, Vision and Scope* document. More discussions of each activity/step in the proposed method are as follows:

(1) Identifying problems that raise up the opportunity to set up an e-commerce system: The problems can be identified by observing incidents occurred at the local environment, analyzing individual life experiences including in using existing e-commerce websites, analyzing news published in periodicals, daily operational of existing traditional organizations, and so on. The problems that will be solved should have relatively small scope such that the e-commerce system formulated as the solution can be materialized by the SMEs.

(2) Resolving the market opportunity, competitive environment and competitive advantage:
 The SMEs must convince themselves that the opportunity identified from the previous stage will indeed be resolvable and that a “unique website” for the targeted market/users (later on defined as the value proposition of the website) can be formulated. To achieve this goal, the techniques adopted (see Table 1) is studying similar companies and questionnaires, which are described as the following:

(a) Surveying and analyzing similar e-commerce websites: The purpose of these activities is to learn/analyze the competitors and the results are then used to formulate the key elements of competitive environment and advantages. The survey includes tasks such as analyzing the

targeted website users, web features that annoy as well as impress users, completeness and interestingness of the information, the user interfacing (pages lay out, navigation between pages, ease of use, guidance, etc.), the transaction procedures, and customers relationship management (CRM) features (for instance, contacts, review/comments, personalization of messages and content). Here, the e-commerce website criteria (can be found in [8]) can be used as references in analyzing the website. The strengths and weaknesses of the websites can also be analyzed. All of the findings will “declare” the competitive environment. Then, by regarding the competitors’ weaknesses found and the SMEs strengths, the competitive advantages can be formulated. (Later on, the weaknesses and strengths of the competitors along with the findings of the survey below are used in defining the website value proposition.)

(b) Performing surveys to respondents of potential users: The core goal is to formulate the market space, thus, the characteristics of the respondents, respondents’ interests and un-interests related to the products/services that will be offered online, willingness to use the planned website and readiness in conducting online transactions need to be gathered. If necessary, the respondents’ experiences in using similar websites (including their satisfaction and dissatisfaction) are assessed. By analyzing the evidences found, the market space and the market opportunity can then be formulated.

(3) Defining the business objective, success criteria and identifying risks: Based on the results of step (2), the SME can define the business objective and success criteria. Risks must also be identified such that activities can be designed accordingly (at the next stage) to overcome the risks.

(4.a) Defining the solution model of the e-commerce website: The value proposition, revenue model and marketing strategy will significantly define the features of the website, therefore we define the website model consisting of these three elements. The reasons are as follows: The value proposition defined will later be transformed or translated into the unique features provided for the targeted users, the website must also provide features for generating revenue and marketing itself if online marketing techniques are chosen as part of the strategies. The market opportunity, competitive environment and competitive advantage formulated in the previous stage are used in defining the value proposition, revenue model and marketing strategy elements. Depending on the opportunities, more survey (by applying questionnaires or interview technique depicted in Table 1) may need to be performed to gather more facts in order to sharpen the value proposition and revenue model that are suitable to the local conditions.

(4.b) Designing the SME organization: The organization structure and roles of each division in the organization must be designed appropriately such that the “back-end” business management needed to run the business and operate/maintain the e-commerce website can perform as expected.

(5) Formulating the business rules: The SME must also design the policies and rules needed to run the e-commerce business at the early stage (before the enterprise is formed and run) as some of these will later affect or translated into the website features.

(6) Formulating other components of requirements: The methods depicted in [18] can be adopted accordingly. One of the components is the major features of the website, which are designed based on the results of the previously discussed activities.

4. CASE STUDIES

The method proposed will be adopted in three case studies with the aim to clarify the method implementation in different business opportunities as well as to test whether the method is suitable to be adopted in analyzing requirements of a variety of e-commerce websites. The cases discussed are online pets advertiser, e-distributor of motorcycle spare parts and mobile marketing system, where the business opportunities are identified based on the situation in Indonesia and in the year of 2012. To be brief, only the highlights of the results that are specific to e-commerce website are presented (hence, scoping, stakeholder profiles, project priorities and so on, which must present in general software requirements, are not presented).

Case-1: Online Pets Advertiser

The sample of the requirements is excerpted from our research that has been presented in [15] and the following are the discussion:

(1) Problems that rise up the opportunity:

In Indonesia, there are lots of people who like to keep pets. The popular pets are dogs, cats, fish, and so on. There are pet-shops in shopping mall that are crowded by shoppers. In newspaper, we can also find many pet ads. This shows that pets are needed. Furthermore, we find that the pet advertisers are not only companies producing pets but also individuals or households who keep pets. Certainly, the Internet can be used to provide easy method of advertising pets. However, currently only limited websites offering services to advertise pets are currently available. This rises an opportunity of running a profitable pet advertiser website.

(2) Formulations of market opportunity, competitive environment and competitive advantage:

(a) Surveying and analyzing similar e-commerce websites:

There are 3 websites that are analyzed, for anonymity, we name them as Website A, B and C. The following are the excerpts of the results:

- *Website A*: Strengths: (1) It has quite a lot of visitors and ads displayed; (2) Search feature works fine. Weakness: (1) It advertise dogs only; (2) Poor page layout and display, too many ads banners; (3) Complex or uneasy procedure for registering ads; (4) No feature to label 'sold' to ads and arrange the order of ads; (5) Poor CRM services; (6) Only provide one method of payments, which is bank transfer.
- *Website B*: Strength: It has many usable features (sold label, categorizing dog ads, edit ads, two payment methods). Weakness: (1) Only for advertising dogs; (2) No search and recommendation features.
- *Website C*: Strength: (1) It has few usable features; (2) Free service (no charge for posting ads). Weakness: (1) The content is rarely updated; (2) Low quality of ads; (3) Only few ads displayed.

Conclusion: Despite the strengths, the existing websites possess serious weaknesses. This amplifies the opportunity to run pets advertisers website.

(b) Surveying potential users including pets' advertisers:

The respondents were pets keepers in West Java (30 people), Central of Java (6), East java (2), Borneo (1) and Sumatera (1). They filled questionnaires sent via email and posted in a survey website. The excerpts of the survey results: (1) 74% of the respondents have visited pet advertiser websites, while 26% have never done it; (2) For those who have never visited, the reasons are: like to visit pet stores (50%), do not know that such website is available (33%), others (17%); (3) For those who do not know that pet advertiser website exists, when asked if they are interested in

using it, 75% say yes, 25% say no; (4) For those who have visited, the reasons are more choices (38%), more interesting (23%), follow friends (14%), others (25%); (5) The sources of knowing the pet ads website: other website (49%), friends (21%), others (30%); (6) Satisfied in using the websites: Yes (54%), no (46%).

(7) The reason that users do not like the websites: too many ads banner (72%), poor layout and display (61%), too many pop ups ads (33%), other (17%); (8) For respondents who have posted pets in websites: (a) 100% say that their pet sales are increased; (b) Their ad budget for each pet: less than IDR 20.000 (54%), IDR 20.000-50.000 (23%), greater than IDR 50.000 (23%).

From the survey results it can be concluded that: (a) Pets keepers are interested in posting ads in websites as it raise benefits; (b) In general, users are not satisfied with the existing websites; (c) Pets keepers are willing to pay some fee for advertising their pets.

Based on the surveys, the following are the formulation of the three key elements of e-commerce:

- *Market opportunity*: Individual pet owners as well as pet retailers who are willing to pay to advertise their pets to gain wider markets, who are pet keepers living in all area of Indonesia.
- *Competitive environment*: Currently there are only three pet advertiser websites, which still have serious weaknesses. Other competitors are traditional advertisers (newspaper, radio, television, and so on).
- *Competitive advantage*: The SME can develop a pet advertiser website that outperform the existing websites, by providing better website features and services that satisfied users (resolving the weaknesses of the competitors).

(3) Business objective, success criteria and risks:

Business objective and Success Criteria: BO-1: Manage online pets ads posted by pets retailers and pets owners; BO-2: Generate gross revenue from the ads fee; SC-1: Within 6 months the new posted ads are 600 ads/month and in one year they increase to 900 ads/month; SC-2: Within 6 months gross revenue is IDR 12 million/month and within one year it is IDR 16 million/month. *Business Risks*: Risk-1: Too view visitors (pet owners and pet retailers) will access the website; Risk -2: New website competitors with better services and fee will emerge; Risk -3: Pets advertisers may refuse to pay fee and prefer to use free ads website.

(4.a) Formulations of value proposition, revenue model, marketing strategy:

Additional surveys were conducted, where the respondents are sample of prospectus visitors from West Java (36 people), Central of Java (7), East java (2), Borneo (1) and Sumatera (1). The following are the excerpts of the results: (1) Pets that purchased and kept: Fish (72%), dogs (36%), birds (32%), cats (23%), reptile (23%), others (30%); (2) The expected information about pets in websites: Health condition (91%), price (89%), physical descriptions (81%), specific type of the pets (74%), location of the sellers (72%), age (66%), parents description (49%), date of birth (49%), certificate (38%), video (26%), sound (17%), "achievements" (13%), and other (4%); (3) Causes of dissatisfying when purchasing pets: None (36%), pets are sick (36%), pets are not as advertised (19%) and others (8%); (4) Features expected in websites by pet seekers: Search pets (96%), report bad sellers (81%), give rating to sellers (73%) and contact sellers (58%); (5) Troubles encountered in searching and purchasing pets: Difficult to find the wanted pets in near area (45%), find pets within budget (43%), find good pets (30%), find the wanted pets anywhere (21%), have no problem in finding pets (13%), other (17%); (6) Website features wanted by pet advertisers: Labeling "sold" (92%) and arranging the ads order (77%); (7) Budget allocated for advertising a pet: less than IDR 20.000 (54%), IDR 20.000-50.000 (23%), greater than IDR 50.000 (23%); (8) Payment system wanted: Transfer via bank ATM (88%), top up to

stored value accounts (15%), credit cards (4%) and other (12%). Note: Indonesian people tend to be careful in using credit cards for online payments.

Based on the survey results, the following are the formulations of the three elements that define the website business model:

- *Value proposition*: The website will advertise popular pets in Indonesia, which are dogs, cats and fishes. It will provide information and features that are most needed by visitors (as indicated from the survey results). The website will save time and cost (compared to using traditional ads) for pet owners and retailers who need to advertise their pets, the public will easily and speedily search the desired pets based on specific criteria.
- *Revenue model*: Advertising fee where the amount will be calculated carefully such that it will be accepted by pet advertisers. The revenue will also come from sponsored ads (posted by pet food and pet caring tools producers).
- *Marketing strategy*: Announcing the website to the pet owners and pet shops via forum, social network as well as direct marketing (by joining pet owner clubs and promote the website to the clubs members). In the first three months, the services will be free of charge, the next two months, the fee will be discounted. Then the results will be evaluated, if the time is right then the normal fee will be applied. Viral marketing will also be adopted. Users who bring other users to post ads will be rewarded with vouchers.

(4.b) SME organization:

At the beginning, the organization will be slim and simple. The owner of the SME will also act as the director having 3 staff having role of administrator, operator and marketing. The job descriptions are: (1) Administrator: Managing memberships and pet ads, validating payments, and managing stored value account; (2) Operator: Managing incoming comments and reviews, conducting e-CRM activities, managing website layout and news; (3) Marketing: Performing marketing management and CRM activities.

(5) Business rules:

The following are some examples of the business rules, which are policies and major business rules:

Policies: The payment system that will be adopted will be cash, bank transfer and stored value with top up balance via bank transfer. This website will manage free membership where the members will get special benefits (i.e. have stored value accounts and access specific features such as edit and arrange ads).

Major Business Rules: BR-1. Ads can be submitted by members and non-members; member can pay the fee by cash or bank transfer where as member can pay by deducting their stored value account; BR-2. In order to have stored value accounts, visitors must become members; BR-3. Administrator accepts ads transaction off-line (the ads can be delivered in person, via email or fax) and accepts cash as well as bank transfer; BR-4. The period of advertising of ads is at most two weeks with the fee of IDR 20.000; fee discounts will be applied in specific time, which will be decided by the management.

(6) Major features of the website:

After defining the website solution and SME organization, the major features of the website for each of the users involved are provided in Table 2. It can be seen that the solution of e-commerce key elements and organizations are translated into the major features.

Table 2. Users and their major features

| No | User | Major Features |
|-------|-----------------------|--|
| FE-1 | Public (pets seekers) | Browse and search specific pets; contact the SME, get pets recommendation based on their search patterns, write comments/reviews |
| FE-2 | Advertisers | Post ads via simple procedure, manage stored-value account (for members), edit and arrange ads |
| FE-3 | Administrator | Validate ads, payments, and view various required reports |
| FE-4 | Operator | Validate comments/reviews, answering email/messages from customer |
| FE-5 | Operator | Manage post website ads to social networks |
| FE-6 | Advertisers | Produce reports of transactions in requested period |
| FE-7 | Operator | List of comments and review for every ad as well as user |
| FE-8 | Administrator | List of sorted ads and their hits; list of members and their transaction in requested period; manage viral marketing (for advertisers) |
| FE-9 | Administrator | Analyzing ads and clicks data using data mining techniques to obtain useful patterns that can be used in marketing, via email/messaging and personalized web content |
| FE-10 | Advertisers | Get personalized email and web content |

Based on those core requirements we have successfully built a functional pet advertiser website prototype that can be evaluated by an SME. This prototype design and implementation is documented in [15].

Case-2: e-Distributor for Motorcycle Spare Parts

This case study aims to show and clarify the method implementation in the case where an SME running traditional business (distributing motorcycles spare parts to retailers) intend to enhance their market and services by going online. The requirements are excerpted from our research that has been documented in [6]. The discussion is presented in Appendix A.

Case-3: e-Commerce Mobile Marketing System

This case study is intended to show and clarify the method implementation in the case of mobile commerce system. It is based on our previous research where the results (requirements, system analysis, design and prototype) have been published in [11] and [12]. Some highlights of the requirements are presented in Appendix B.

5. METHOD EVALUATION

In evaluating the proposed methods, we find the following facts:

- (a) One of the techniques that can be adopted in evaluating the proposed method is by measuring the success of the operational systems (that have been developed by applying the proposed method) using several appropriate variables. In an e-commerce system, however, the success of the system also depends on the management or organizational factors of the enterprise

running the business (as defined in the key elements). Therefore, the launching of a website fulfilling the requirements may not lead to business success if the SME management is poor.

- (b) This research has produced e-commerce system prototypes that have not been launched yet.

By considering these facts, we define that the evaluation of our proposed method is by assessing the proposed method with concepts/theories defined in literatures and evaluating the case studies that have been presented.

The evaluation results can be summarized as the following:

- (a) As discussed in Section 3, we propose systematic activities resolving the eight key elements e-commerce business model to produce the first requirement document defined in [18]. The proposed activities do not conflict with activities defined in [18] but only customize/enhance them based on specific purpose (for developing e-commerce websites for SMEs).
- (b) The proposed method is designed to include activities such that the e-commerce key elements are resolved at the analysis/planning stage defined in [8]. Thus, the proposed method only elaborates the one discussed in [8] and does not conflict with it.
- (c) The proposed requirement analysis method (having the sequences of identifying business opportunities, resolving the market opportunities, competitive environment and advantage, and then formulating the business model consisting of the value proposition, revenue model and marketing strategy) is inline with the standard methods applied in developing general start-up enterprises as discussed in [19] and [3]. Therefore, while developing a new enterprise or enhancing an enterprise, an SME can perform activities to define the website requirements, which are inline with the activities related to the enterprise development.
- (d) In the discussion of three case studies (see Section 4), it has been shown that by following the proposed method, the major content of *Organization, Vision and Scope* document suitable for SME can be produced accordingly.

6. CONCLUSION

In analyzing requirements of e-commerce websites for SMEs, the key elements of e-commerce business model must be resolved to significantly support the business success. This can be materialized at the early stage of requirement analysis, by designing an appropriate sequence of activities. After identifying business opportunities that can be worked out or caught by SMEs, the activities are: Resolving the market opportunities, competitive environment and advantage, then formulating the business objectives, resolving value proposition, revenue model and marketing strategy, as well as designing the organizations and business rules. After these have been formulated, major features of the website can be designed accordingly which can be referenced in the next development activities.

The opportunities that can be worked out by SMEs to start e-commerce business include opportunities that lead to pure online business as well as enhancing of off-line (traditional) business currently running by SMEs. The proposed method can be adopted in analyzing requirements of e-commerce website for resolving both types of opportunities as discussed in the case studies.

Future works: Our proposed method is mainly applicable for developing new e-commerce websites for SMEs. For SMEs that already run e-commerce systems, a new approach will be needed, where the legacy systems should be used as the inputs of the requirements elicitation. A model of IS development that uses the artifacts of the existing systems has been proposed in

literatures, such as the one depicted in [1]. Our proposed method can be enhanced by adopting the model presented in [1] and other related research results such that it will be suitable for SMEs.

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APPENDIX A. Requirement Analysis of Website of e-Distributor for Motorcycle Spare Parts

(1) Problems that rise up the opportunity:

In Indonesia more and more people have turned to ride motorcycles for various reasons. Motorcycles' sales have been up in the last decade and currently there are millions of motorcycles are ridden by people with mostly middle to low income. Motorcycles need spare parts replacement from time to time and the middle to low income people seek cheap or second grade of spare parts (not produced by major motorcycle factories, i.e. Honda, Suzuki, Yamaha but by other vendors), which are known as "after market spare parts".

Currently, a motorcycle after market spare parts, which is Distributor X, has been running its business "off-line" or traditionally. It promotes spare parts to retailers all over area of Sumatera and Java by sending salesmen, or with "door to door" method. The retailers order the spare parts via the salesmen or phone or fax and pay by credits or cash (as agreed by both parties). This method of management has been identified as inefficient and prone to errors. Expanding the market by acquiring new retailers is also costly. "Going click" (from "brick" only), by developing B2B e-commerce system, appear to solve the problems.

(2) Formulations of market opportunity, competitive environment and advantage:

The following is the excerpts of the activities.

(a) Surveying and analyzing similar e-commerce websites:

Fortunately, we have not found any website associating with after market spare parts business in Indonesia. We can only find websites that offer memberships where each member can sell or buy products from the website.

(b) Surveying the spare part retailers:

We conduct survey to sample of retailers, five respondents, in Padang – Sumatera in October – November 2012 by having discussions related to where they order spare parts, criteria in ordering spare parts, their problems, and expectations. The excerpts of the results are as follows: (1) They order parts to distributors in Medan and Bandung; (2) The top criteria in selecting parts are brand and price (by knowing the brand, they can predict the parts quality); (3) They build good relationship with distributors by routine communications and pay the bills on time; (4) Top problems they encountered are: (i) the salesmen do not always show up every month such that they must order parts by phone, which very often hard to connect; (ii) the salesmen come in the "wrong time" (then the retailer is busy) such that the retailers make orders in a hurry without good plan; (iii) the retailers have no clue whether their ordered parts are "in stock"; (iv) sometime there is discrepancy between the ordered with goods shipped; (5) They expect that the distributors can be reached or contacted any time and they are very welcome if the parts can be ordered online via the Internet as long as they are trained in using the website.

The following are the formulations of the three key elements, which are based on survey results:

- *Market Opportunity*: The retailers of after market spare parts who need to order parts at any time from any where in order to meet the demand of motorcycles riders in Indonesia.
- *Competitive Environment*: Fortunately, currently there is no e-commerce B2B system specializing in after market spare parts. By going first, Distributor X can lead.

- *Competitive Advantage:* Distributor X has been successful in selling after market spare parts to retailers. It also has lots of loyal retailers spreading in Sumatera and Java. Therefore, when it goes online it can start with the existing customers (who will be happy to get better services by using the website). It will also need to spend less cost in acquiring new customers (no need to visit one by one) as it can advertise the parts in the Internet as well.

(3) Business objective, success criteria and risks:

Business objective and Success Criteria: BO-1: Reduce operating cost of selling spare parts by 20% with in one year which can be achieved by replacing manual with online order transactions; BO-2: Increase gross revenue by 15% with in one year which can be achieved by acquiring more retailers and increasing spare parts sales; SC-1: Have 70% of retailers who currently order spare parts manually use the website to order spare parts with in one year; SC-2: Achieve an increase in the average rating on the quarterly retailers' satisfaction survey of 0.5 within 3 months following website launching and 1.0 within 12 months following the launching.

Business Risks: Some examples of the risks are as follows: Ri-1: Retailers refuse to order online due to lack of skill in using the Internet; Ri-2: New competitors will emerge with better prices and services.

(4.a) Formulations of value proposition, revenue model, marketing strategy:

Based on the results of the previous steps, the following are the formulations of the 3 other key elements:

- *Value Proposition:* For retailers: Efficiencies in searching and purchasing spare parts, also obtaining better services through simple transaction procedures.
- For distributors: Extending market with less cost, better transaction management (reducing human error in recording parts ordered) and real time sales reports.
- *Revenue Model:* There is no modification of the revenue model. The revenue will come from sale transactions.
- *Marketing Strategy:* Distributor X will train the current off-line customers (retailers) to use the website to view, search products as well as to conduct transactions online. For expanding market, the salesmen will visit new retailers and introduce the website and its benefits. The website will be also registered in major search engines.

(4.b) SME Organizations:

At the beginning, the existing organization structure (Sales, Purchasing, Marketing, Inventory division) should function as it was except that now the staff should handle transaction electronically. However, there is a need to add one division, which is IT division that is responsible to maintain the website, hardware and the network used by all of the staff.

(5) Business Rules:

Policy: Except that now parts order can be conducted online (by member retailers), basically there is no other major policy changes. The minimum order is still IDR 500.000 and payment can be with cash as well as via bank transfer. Later on, if the system has been functioned well, an electronic payment system module will be added to automate the parts purchasing.

Major Rules: Basically there is no change to the existing rules. However, some additional rules are needed, for instance: BR-1: Sales person should make the spare parts order directly on to the website while visiting the retailers.

(6) Major Features of the Website:

The website major features formulated based on the previous activity results are depicted in Table A.1

Table A.1. Users and their major features

| No | User | Major Features |
|-------|------------|---|
| FE-1 | Retailers | Browse and search spare parts based on specific conditions, |
| FE-2 | Retailers | Contact the distributor (via email and chat) |
| FE-3 | Retailers | Order spare parts and track order statuses |
| FE-4 | Retailers | Post comments and reviews for specific parts or parts producers |
| FE-5 | Retailers | Get personalized email and web pages |
| FE-6 | Sale Reps | Verify order payment, manage order statuses and parts delivery |
| FE-7 | Sale Reps | Produce sales reports for requested period |
| FE-8 | Purchasing | Generate order spare parts to supplier, validate incoming spare parts and return unwanted spare parts |
| FE-9 | Purchasing | Produce purchasing reports for requested period |
| FE-10 | Inventory | Manage incoming and outgoing spare parts |
| FE-11 | Inventory | Produce stock reports for requested period |
| FE-12 | Marketing | Produce visitor hits reports (for each spare parts and page) and comments reports |
| FE-13 | Marketing | Analyze data using data mining techniques to obtain useful patterns that can be used in marketing, via email/messaging and personalized web content |
| FE-14 | Marketing | Post ads to search engine and social networks |
| FE-15 | Owner | Produce analytical reports of sales, order, stock and visitor hits |

APPENDIX B. Requirement Analysis of e-Commerce Mobile Marketing System**(1) Identifying problems that rise up the opportunity:**

Mobile devices (such as smart phones and tablet computers) have been very popular and the users keep on growing in the last several years. Almost half of the Internet users in Indonesia utilize mobile devices to access it [22]. To effectively target these users in marketing their products, merchants should be facilitated with tools that can be accessed and used easily. As mobile devices are personal tools that are brought by the owners wherever they go, mobile services are should be designed based on personalization, ubiquity and location specificity [13]. These facts create an opportunity to develop a mobile marketing system, where merchants can be the members and pay some fee in posting their ads and deals, and mobile device users can receive personalized and location aware ads as well as take/claim deals offered.

(2) Resolving market opportunity, competitive environment and competitive advantage

The following is the excerpts of the activities.

Market opportunity: Millions of SMEs in Indonesia [20], where some parts of them are merchants that need to market their products to mobile users.

Competitive environment: Currently there is no provider in Indonesia offering the services of personalized and location aware ads and deals for mobile devices users. There are, however, big ads/deals providers providing many kinds of deals for Internet users in general.

Competitive and advantage: By providing personalized and location aware ads and deals services, the mobile marketing system designed will excel the competitors.

(3) Business objective, success criteria and risks:

Business objective and Success Criteria: BO-1: Manage personalized and location aware online ads and deals (posted by merchants) for mobile device users; BO-2: Generate revenue from the merchants' membership fees; SC-1: With in 6 months the new posted ads are 1200 ads/month and in one year they increase to 2000 ads/month; SC-2: The gross revenue with in one year it is IDR 15 million/month and increase to DR 20 million/month with in two year.

Business Risks: Risk-1: It will be difficult to acquire merchants (to become members); Risk-2: Too view mobile device users will use the system; Risk -3: Merchants will refuse to pay membership fees.

(4.a, b, 5, 6) Formulations of other key elements, organization and features:

The discussions can be found in quite detailed in [10] and [11]. Due to space limitation, here, we highlight the value proposition only.

Value Proposition: A mobile marketing system used by member of merchants to market their products to mobile device users. Merchants can easily access the system to manage ads and deals. Mobile users will get valuable information of ads and deals as they will receive personalized ads/deals from the current nearby merchants only. Mobile users then can claim the deals in the merchant stores.