APPLYING AGILE METHODOLOGIES FOR B2C APPLICATIONS DEVELOPMENT

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ABSTRACT

The advent of the internet has brought about new developments and trends of new classes of software application, particularly in the development and design of online business systems (e-business). By definition, Electronic Business (e-Business) can be described as a way in which an organisation conduct its business activity across the internet infrastructure or open network [1]. It is not only selling or buying goods and services, but it also involves operating automated, efficient internal business processes servicing customers and collaborating with the third party [2]. The purpose of this paper is to review strategic choice for e-business, and different types of agile approaches concerned specifically with methodologies that can be applied in Business-to-Consumer (B2C) applications development.

Index Terms— E-Business, agile methodologies

1. INTRODUCTION

The advent of the internet has brought about new developments and trends of new classes of software application, particularly in the development and design of online business systems (e-business). By definition, Electronic Business (e-Business) can be described as a way in which an organisation conduct its business activity across the internet infrastructure or open network [1]. It is not only selling or buying goods and services, but it also involves operating automated, efficient internal business processes servicing customers and collaborating with the third party [2]. The rapid growth of e-business in the competitive context is driving the need for business to build e-business application [3] by using efficient methodologies that would be rapid and flexible. As a result, it is a serious challenge for any e-business application developer to seek new methodologies that can be adapted in the development of e-business application [4].

Today, agile methodologies have emerged as the choice for high speed of internet and web software development [5], and becoming more and more popular as a method [6] among software developers. The most important features of agile methodologies are that they focus on fast cycles, embracing change, pair programming, and simple design [7].

Due to the growing significance of e-business, reinforced by customer expectations associated with e-business services, e-business systems must apply new methodologies that need to be rapid and flexible in order to sustain customer service and meet customer expectations. Using traditional software approaches may not be effective in this regard. In considering the traits of agile methodologies, it raises the questions of how e-business strategic choice can be aligned in the development of e-business application by agile methodologies. The purpose of this paper is to review strategic choice for e-business, and different types of agile approaches concerned specifically with methodologies that can be applied in Business-to-Consumer (B2C) applications development.

2. E-BUSIENSS STRATEGIES

Due to the high demand for online products and services, and the changes in technological environments, demands are made on companies to develop a strategy that focuses on time to market and customer service [8]. E-business strategy represents the long-term plan of a company to win over its competitors in the market via e-business [8]. Miles and Snow [9] propose a useful typology to identify the characteristics of strategic choice that can be applied in the e-business context. The following presents a brief description of each:

- ***Defender***. This organisation focuses on a narrow range of product/market domain. It tends to prevent competition by offering high quality products and services with lower cost. They are technology based. This type of organisation does not tend to search outside its market for new opportunities, and rarely makes major adjustments in it's structure or technology [9]

- ***Prospector.*** An organisation with this strategy typically seeks for new product and market opportunities. Concerning the area of opportunities, it intends to invest heavily in research and development. This organisation always deals with change and uncertainty in the market. In recognition of this, it invests in leading-edge technology in order to gain advantage over it's competitors [9]
- ***Analyser.*** This strategy shares characteristics of between Defender and Prospector. This organisation attempts to minimise risk while maximising the opportunity for growth. In delivering new products/or services, this type of organisation carefully observes the action of its competitors. At the same time, it produces limited range of products, and it does not invest in new technologies [9]
- ***Reactor.*** This type of, an organisation does not have clear strategy or plan in dealing with its competitors in the market. They perceive market opportunities and change but are unable to adapt effectively [9].

The core strength of Miles and Snow strategic orientation is that it perceives and addresses a complex set of environment and organisation's processes which includes organisational structure, management, market, technology, and product characteristics [10].

3. E-BUSINESS APPLICATION

3.1. What is an e-business application?

E-business applications can be defined as application programs that run on the internet or on intranets and extranets [4], and that support business at all types of business level [8]. According to Aber [11], the key drivers of e-business applications are based upon three underlying aspects, that is, a desire to provide superior customer service, to become more successful in dealing with partners, and to achieve cost savings.

3.2. E-business application classifications

E-business applications fall into three distinct groups, that are: Business-to-Employee (B2E), Business-to-Consumer (B2C), and Business-to-Business (B2B) [8, 12]. The following provides brief description of each:

- ***Business-to-Employee (B2E).*** This application involves the internal business activities such as purchasing and ordering process between the organisation and its business units. An example of this application is Enterprise Resource Planning (ERP) [8]
- ***Business-to-Customer (B2C).*** This application is a commerce application that provides both internal and external users with the ability to interact with business transactions. The most common examples of a B2C application are online-purchasing and web advertising [8].
- ***Business-to-Business (B2B).*** This application uses internet technologies to improve the market activities between an organisation and its trading partners. An example of this application is Supply Chain Management (SCM) [8].

The literature on e-business shows that the potential benefits in using e-business application for the organisation include: enhanced customer service, market expansion cost reduction, customer retention/loyalty, and streamlining of the sales cycle.

Based on the classification of e-business applications in section 3.2, this paper centres on B2C applications as early adoption of e-business by many companies in order to enhance their market activities was based on B2C. In addition, customer expectations associated with the possibilities in delivering the quality of products and services [13] through B2C application have been heightened by the rapid growth of B2C and recent changes in the internet technology. Taylor and Terhune [14] state that the escalating of customer expectations toward B2C applications derive from four different needs: (1) the need for simplicity, (2) the need for immediacy, (3) the need for transparency, and (4) the need for relevancy. Addressing these expectations, requires greater efficiency and effectiveness of B2C applications to sustain customer service and meet customer's expectations and needs. The following section describes new methodologies that can be applied by organisation in developing B2C e-applications.

3. AGILE METHODOLOGIES

The concept of agile methods is outlined by the Agile Manifesto [15]. The word 'agile' is selected to combine the methods and techniques that would share the values and principles of agile software development. According to the Agile Manifesto [15], the four values of agile methods are:

- *Individuals and interactions over processes and tools*
- *Working software over comprehensive documentation*
- *Customer collaboration over contact negotiation*
- *Responding to change over following a plan*

3.1. Characteristics of agile processes vs. traditional process

The literature on software development methods use two terms to distinguish software development processes: *lightweight* processes, which are now called agile processes, and *heavyweight* process, which refers to traditional processes. With the traditional process, there is a strong emphasis on the plan and processes, and there are numerous of rules involved, whereas agile methods focus on short iteration cycles. Table 1 presents a comparison of agile methods versus traditional processes

	Agile	Traditional
Requirements	Uncertain and will change	Well known and will not change
Design	Informal and iterative	Formal and upfront
User involvement	Throughout the project	At the beginning and at the end of the project
Documentation	Minimal	Formal documentation
Communication	Done informally	Relies mainly on documents
Process complexity	Low	High
Overhead	Low	High

Table 1: a comparison of agile methods versus traditional processes [16]

3.1. Sample of Agile software development approaches

There are six major types of agile methodologies currently available in the market, including: Extreme Programming (XP), Scrum, Adaptive Software Development (ASD), Crystal Clear, Dynamic Systems Development Method (DSDM), Feature Driven Development (FDD). This paper focuses on the first two methodologies, XP and Scrum as they are cited as the most popular methods [17].

3.1.1. Extreme Programming (XP)

XP is a discipline for software development. It focuses on four core values: communication, simplicity, feedback, and courage [18]. Each of these values is described as follows:

- *Communication*. This value refers to the ability to develop effective face-to-face communication among people involved in the project
- *Simplicity*. This refers to the ability to keep all tasks and development processes as simple as possible in order to meets the customer's requirements
- *Feedback*. This value is the ability to obtain and value feedback from the customer in order to prevent any possible issues that may occur during the development process
- *Courage*. This is the ability of the team to encourage individuals to try new approaches

These four values of XP drive the software development team in making decisions and taking actions on how they deal with daily programming and planning activity [19]. XP involves the use of twelves practices, (e.g. test-driven development, pair programming, and small release,) which support the important features of highly iterative, small team development, and customer involved.

3.1.1.1. Advantages and Disadvantages

One of the great advantages of XP is that it focuses on activities rather than on products. However, the limitations of XP are it code-centred rather than design-centred, and a development process relies heavily on testing rather than producing quality products [20]. This focuses on code may be detrimental to the development of B2C applications, where the design and look of the application is an important factor in customer acceptance.

3.1.2. Scrum

Scrum is a management and maintenance methodology that can be used in a wide variety of projects. The key concept of Scrum is based on the theory of empirical process control that applies the idea of flexibility, adaptability, and productivity [21]. Scrum defines the process of development into three levels [22]. *The first* level is Sprint, which requires the development period to be not longer than 30 days. *The* second is Release level, which refers to a group 6 to 9 Sprints. The *final* level is Products, which are a series of Releases. The key characteristics of Scrum can be summarised as follows [21]:

- *Flexible deliverable*. The content of the product is identified by the environment variables such as time and cost
- *Flexible schedule*. The deliverable may be required sooner or later than initially planned
- *Small working teams*. There can be multiple teams within a project

- *Frequent reviews*. There is frequent reviews of team progress
- *Partitioning* of work and team assignments into clean, low coupling partitions or packets
- *Collaboration*, intra and inter collaboration is expected during the project
- *Object-Oriented*. Each team will address a set of related objects, with clear interfaces and behaviour.

3.1.2.1 Advantages and Disadvantages

The advantages of Scrum are that it delivers working code regularly, it provides a managerial layer that can be used in conjunction with other agile methods, and it increases knowledge sharing between developers due to small working team [21]. On the other hand, Scrum also has some drawback that is it would not work well with a large team and project. This may be an issue in some large B2C applications.

4. APPLYING AGILE METHODOLOGIES FOR B2C APPLICATIONS DEVELOPMENT

In order to build a sustainable B2C application, and constantly reflect on competitive action, there are three possible scenarios for a better outcome in the development of B2C application using particular methods such agile methodologies.

The *first* is there is a need to develop a solid strategy for e-business. With regard to Miles and Snow strategic orientation, each strategy has its actual goals of applying to the chosen market and/or the organisation structure and processes. By comparing the four forms of strategy, it can be seen that a *Defender* strategy consistently focuses on cost competitive rather than responses to change in the market, whilst a *Prospector* strategy tries to reduce uncertainty and gaining agility in the market. An *Analyser* strategy, on the other hand, it is cost oriented and at the same time it offers limited range of product to the market. However, a *Reactors* strategy does not have a clear strategy in relation to all situations. Given this comparison, the choice of strategy then becomes one of whether to choose *Defenders, Prospectors, Analysers, or Reactors* strategy for B2C firms.

In a B2C environment, the organisation has made a strategic commitment to sell products and services directly to consumers over the internet network. Recognising the potential of online activities, B2C firms should be aware of products and services, which compete in a certain market because there is a liable to be more competitors within the same or related market. Therefore, a strategic choice for B2C firms has to characterise approaches that help the organisation to capture a customer based and to assist them to stay very competitive. A study by Kearns [23] investigates the alignment of business strategy with e-business strategy and its impact on organisational profit. The results of study indicate that strategy in the group of *Analysers* is the most profitable for e-business companies. Moreover, the result of the study reveals that when companies align business object with e-business strategy, the most profitable companies fall in the group of *Prospectors* and *Analysers*. Therefore, based on the results of the study by Kearns [23], it is conceivable that an *Analyser* strategy is the most appropriate strategy for B2C firms to apply.

The *second* scenario addresses the need to choose an appropriate methodology for building B2C applications. Since internet technology is involved in B2C transactions, customer expectations of B2C application in relation to quality of services have rapidly increased due to their familiarity with the internet. In order to fulfil these expectations, the quality of B2C application must be assured and the approaches for building B2C application need to be more effective and efficiency. Regrading the choice of existing methodologies available, agile methodologies can be a viable option for B2C companies to build applications as they enable companies to focus on their core competencies and meet customer expectations. According to Porter [20, p.71] ... *in previous generations of information technology application development was often complex, arduous, time consuming, and hugely expensive. These traits made it harder to gain an IT advantage, but they also made it difficult for competitors to imitate information systems. The openness of the internet combined with advances in software architecture, development tools, and modularity, makes it much, easier for companies to design and implement applications.* The choice of appropriate methodology is an important success factor in the development of B2C applications. As each agile methodology has different scope and scale, therefore, in order to select the most suitable agile approaches, Schuh [19] suggests four possibilities that should take into consideration. *Firstly,* survey the approaches and obtain a recommendation from a book. *Secondly,* adopt a modified or partial implementation by adjusting the selected agile process to the current project environment before implementing. *Thirdly,* embed the XP approach within another agile method, if this is appropriate. *Finally,* mixing and matching in which one or two agile method can be adopted in a certain situations and the best practice in that situation will be selected.

For the *last* scenario, the long-terms successful in the development of B2C application require the e-business strategy to be aligned with the organisation's IT strategy. IT strategy refers to an outlining of the vision of how an

organisation's demand for information and systems will be supported by technology [24]. The terms of alignment can be defined as the process in applying IT in harmony with business strategy [25]. Henderson and Venkatraman [26] propose a strategic business-IT alignment model (SAM) (see Figure 1). The major concept of this model is to represent the relationships and interactions between IT and business.

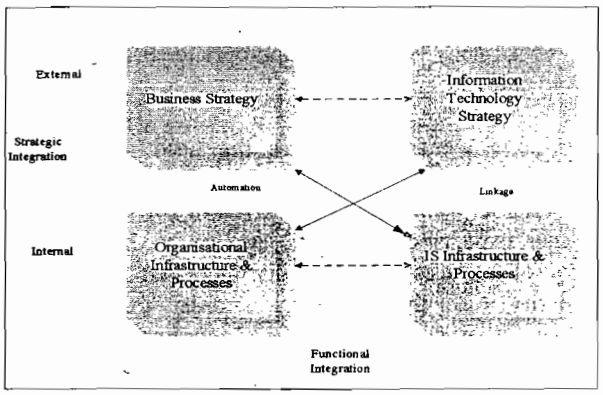

Figure 1: Business and IT/IS alignment model [26]

According to Figure 1, each domain can identify three aspects per quadrant that need to be addressed when aligning e-business strategy with IT. The relationship and interactions between each domain presents as following:

- ***Business strategy - IT strategy - IT infrastructure***. With this perspective, business strategy is a driver of IT strategy which influences IT infrastructure
- ***Business strategy - business infrastructure- IT infrastructure***. This perspective views business strategy as a driver of business infrastructure which influences IT infrastructure
- ***IT strategy - business strategy - business infrastructure***. This perspective views IT strategy as a driver of business strategy which influences business infrastructure
- ***IT strategy - IT infrastructure - business structure***. This perspective views IT strategy as a driver of IT infrastructure which influences business structure.

The key idea in requiring B2C firms to align e-business strategy with an organisation's IT strategy is to ensure that B2C firms take action in maximising the value of their IT investment, and to ensure that business needs are being satisfied. As B2C firms are still involved in customer service, B2C application must enable firms to survive and prosper in the competitive market. The capability to use the appropriate agile methods available is a cornerstone for B2C firms to achieve their business goals and sustain competitive advantage. In order to achieve this, it is a vital for B2C firms to put the concept of business-IT alignment into action. A lack of alignment in organisations with both e-business strategy and IT strategy can lead to a loss of customers and an inability to maximise competitive advantage. The literature on strategy highlight the key benefits of business and IT strategy alignment as including maximising return on IT investment to organisations, helping organisations to gain competitive advantage through IT, and providing direction and flexibility for organisations to react to new opportunities[27].

5. CONCLUSION

It should be noted that in turbulent competitive environments, B2C firms need to define their e-business strategies in order to position themselves in the market. The current practice in B2C applications development is complex, and the choice of appropriate methodologies is an important success factor in the development of e-business applications. Each of the agile methodologies describe in section 3.1 has its own strengths and weaknesses. However, none is clearly best for B2C applications development. Therefore, in order to build B2C applications, it is important for B2C firms to find out which methodology works for their organisation. In addition, in order to achieve a better outcome in developing B2C applications, B2C firms should align their e-business strategy with their IT strategy.

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