The Status of Enterprise Agility In Comparison With Competitors

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***Abstract*—** *Due to the globalization, rapid changes and growth in technologies and business environment, an agile organization needs to identify and take advantages of opportunities in the market. Knowing the level of agility compare with the competitors or industry may help an organization improve its position. However, because of the multidimensionality and the ambiguity of the agility concept, attempts for identifying and quantifying agility metrics are required. In this paper three techniques for measuring enterprise agility metrics are developed in the way that could be applied to the whole enterprise. Lastly, by measuring the metrics of some enterprises in the technology industry, the metric utilization is shown.*

Keywords: *Agile organization, Agility metrics, Evaluation, Quantification*

1. Introduction

Due to the globalization, rapid changes and growth in technologies and business environment, an agile organization needs to identify and take advantages of opportunities in the market. Agility is a collection of capabilities and competencies that makes an organization survive and compete in business environment. Quick responds are the most critical needs of today's organization. For obtaining sustainable success, organizations should prepare a level of agility to increase change and complexity acceptance [1]. Given the current context of business world, organizations need to change their knowledge, attitude, practices, procedures and expected results [2]. Reference [3] argues that agile firms continually sense opportunities and respond to them rapidly. In other word agility encompasses both the exploration and exploitation of opportunities.

There are different definitions of agility, but the ideas such as speed and change are the same in most of them. According to [4] agility was defined as a never-ending journey toward continuous improvement. Dove by considering most aspects of agility concept defined it as the ability of an organization to prosper in an unpredictable and volatile business environment by managing knowledge and responding rapidly and efficiently to customer needs and opportunities without increasing the cost or decreasing the quality [5].

Agility is a route to competitive advantage and a key enabler to deal with uncertainty. Actually, knowing the level of agility is the first lead to help an organization improve its position. The question this paper is trying to answer is "what are the metrics of agility and how do we measure these metrics?" So, three techniques for measuring enterprise agility metrics proposed in [6] are developed in the way that could be applied to the whole enterprise. Finally, by measuring the metrics of some enterprises in the technology industry, the metric utilization is shown.

This paper is organized as follows. Section 2 reviews the related research. Section 3 discusses quantifying the metrics of agility and its usage in identifying the agility status of an enterprise and comparing it with competitors. And a practical case is presented to show the metrics utilization. Section 4 presents concluding remarks and suggestions.

2. Literature review

From the late 1980s to mid-1990s, various efforts and practices for identifying origins and influencing factors of the new systems of global business have been done following the widespread political and economic developments around the world. Facing with downturn in the business and especially in the production area, United States of America for the first time took the lead of this movement. Then, experts observed that the rate of changes in the business environment is faster than the capabilities of traditional manufacturing organizations to adapt and face it. These organizations were disable and could not take the advantages of the available opportunities, therefore this might cause their bankruptcy and failure in long-term. As a result, the concept of agility that was a new concept at the beginning of the 1990s, was generated in USA after lean manufacturing and flexible production concepts for dealing with the concern about losing competitiveness of the production industry [7].

As a matter of fact, roots of agility back to agile manufacturing. Agile manufacturing is the next step of lean and flexible concepts [8]. Flexible manufacturing is the ability of a production line to reconfigure and produce different products easily. Lean manufacturing means to remove all waste from the system and minimize the usage of resources. Accordingly, agile manufacturing is a strategy that combines lean and flexible manufacturing [21].

Furthermore, flexibility is required in organizations that changes are predictable and responding to them can be planned in advance. According to [9], flexibility is a predetermined response to predictable events and variety of defined customer requirements, but Agility is an innovative response to unpredictable changes. Attaining agility and its capability needs a long-term organizational planning. Agile organization continuously explore and exploit opportunities for gaining competitive advantage [10]. Although flexibility is an antecedent of agility [11].

Moreover, lean manufacturing is the response to the pressure of resource limitations, but agility is the response to the complexity of Continuous unpredictable changes. In other word, lean manufacturing reduces waste, improve organization performance to cope with changes and therefore attain agility [12]. In fact, lean manufacturing is an efficient production process concerned with minimization of waste in every part of organization [6]. But agility is the discovery of profitable opportunities in a competitive market [13].

Later, the characteristic of agile manufacturing was extended to all aspects of enterprise in response to the unreliable and unpredictable environment. Those features of agility that could be applied to the overall organization were flexibility, responsiveness, speed, high-quality, culture of change, integration, low complexity, customized products and competitive advantage. Actually, there were other solutions for constantly changing environment such as reengineering, virtual corporation, high performance organization, adaptive organization, agile enterprise, etc. However, all concepts had similar point that was the ability to respond to change [14].

As mentioned before, agility differs from agile manufacturing system, agility is a performance capability, while agile manufacturing system refers to a cluster of related practices. Agility, then, was used and generalized as a successful strategy for performance improvement [7]. According to [15] enterprise agility is a dynamic capability that enables a firm to create competitive advantages and enhance firm performance. Actually, by using this capability, a firm can sense customers' requirements, rivals' activities and cooperation opportunities and then respond to them quickly.

Although much has been said and written about agility, a same perspective on defining agility among experts is visionary. In literature many definitions have been proposed for agility, but none is conflicting with each other. Generally the idea of the speed and change in the business environment is common in these definitions. Accordingly, because of the novelty of the agility concept, a comprehensive definition approved by everyone has been yet impossible (see Table I).

TABLE 1: AGILITY DEFINITION

Source	Definition
[4]	Never-ending journey of continuous improvement
[16]	"A successful exploration of competitive bases (speed, flexibility, innovation proactivity, quality, and profitability) through the integration of reconfigurable resources and best practices in knowledge, rich environment to provide customer driven products and services in a fast changing market environment."
[1]	"Agility is predominantly used to describe an approach to organizing that provides for rapid system reconfiguration in the face of unforeseeable changes."
[17]	"A business-wide capability that embraces organizational structures, information systems, logistics processes and in particular, mindsets."
[18]	"Agility as constant changes in a team or organization as it evolves in its lifecycle. The changes are classified as related to: (1) teamwork, (2) requirements, (3) planning, (4) technical practices, (5) quality, (6) culture, and (7) knowledge creating."
[19]	"A persistent behavior or ability of a sensitive entity that exhibits flexibility to accommodate expected or unexpected changes rapidly, follows the shortest time span, uses economical, simple and quality instruments in a dynamic environment and applies updated prior knowledge and experience to learn from the internal and external environment."

Despite different perspectives are proposed for agile organizations, agility could be defined in terms such as sensing, responding, learning, adaptability, resilience, innovation, concurrency and efficiency [20]. As a matter of fact, study of Worley and Lawler shows that agility forms are different in every organization [21]. It is important to note that not all organizations define agility the same way and not all of them can or should be agile. Actually, organizations should focus on proper features, by considering internal capabilities, opportunities and industry.

In literature, there are diverse approaches in treating the agility issue which can be classified as four categories [20]: the identification of the capabilities of agility, the recognition of the agility levels, the proposition of conceptual framework and the measurement of agility. The following part deals with the fourth category and investigate methods and approaches of measuring agility. Indeed, knowing the degree of an organizational agility is vital in future planning and helps managers to understand to what extent their organization is required to be agile [22].

The dimensions of agility measured in researches are also different. Reference [20] points out that agility has three dimensions: operational agility (the ability to use business opportunities quickly, properly and cost-efficiently), customer agility (the ability to learn from customers as well as explore and exploit the new identified business opportunities) and partnership agility (the ability to strength business partner's competencies and knowledge). Also, it proposed a fuzzy logic based assessment model for measuring the Information System agility. In addition, According to [23], dimensions of business agility consists of market agility, network agility and operational agility. In this paper a six step measurement framework is proposed to quantifying the overall business agility of a company.

Because of different scopes of identifying the conceptual framework and dimensions of agility, developing comprehensive measurement metrics is still difficult due to the multidimensionality and ambiguity of agility concept [15]. However, researchers have been trying to quantify agility and identify its metrics. For example, Yauch developed a quantitative, objective metric of agility that could be applied to manufacturing organizations [24]. This approach was based on the definition of agility as being prosper in a competitive and constantly changing environment. Level of environmental turbulence and degree of organizational success are two dimensions of proposed model. Therefore, in a 2 × 2 conceptualized matrix, if an organization exhibit a high-level of turbulence and a high degree of success it will be considered an agile organization. Furthermore, for evaluating the agility level, the fuzzy methods are used by researches [25]. For instance, by using Multi Grade Fuzzy and Fuzzy logic approach an agility assessment was done and the purpose was benchmark this approach

in a manufacturing organization [26].

Recently another measurement model is proposed by Aravindraj and Vinodh that is a comprehensive 40-criteria agility measurement model. Implemented in an Indian manufacturing organization, the model is used for measuring agility level [27].

Actually, different definitions of agility may result in different perspectives of agility assessment. Therefore, practitioners first must decide what Agility means to them and then try to assess it [28].

3. Quantification of Agility Metric

Agility measurement methods generally have the lack of attention to the level of agility required by the enterprise to evaluate and compare with competitors. In fact, in evaluating the agility, two matters should be considered: first, the required level of agility regarding the intensity of environmental changes and changes in customer needs and second, the status of the enterprise compared with its competitors and industry.

This paper improved quantification techniques of certain metrics that are critical in assessing an enterprise agility regarding the industry and competitors. These techniques were proposed in [6], but in this paper each technique has been changed so that it could be more practical. Actually, these changes provide the opportunity for enterprises to compare themselves with best practices or competitors. Three agility metrics proposed in this paper can be computed using financial data of the enterprise and data available in the internet and websites from competitors and industry. In the following section three metrics are discussed.

A. Market Share Metric

Measuring the growth of market share of an enterprise is the first and most important action. The first focus of any enterprise is to capture as much as market share to increase the profit. According to [29], Overall market share is "the company's sales expressed as a percentage of total market sales". In other words, the market share can be defined as the percentage of market's total sales that is earned by an enterprise over a specified time period. Market share is calculated by taking the enterprise's sales over the period and dividing it by the total sales of the industry over the same period [30]. Some parameters that may affect the market share of an enterprise are the quality and quantity of responses to customer demands. As a result, according to [6] adapting to customer demands and responding properly to them increases market share. Therefore, the growth of the market share is a good indicator of agility because it shows better responding to environment changes and customer needs. So, it makes it possible to compare the firm's growth of market share with that of its competitors.

Reference [6] for measuring this metric used the division of market share of one product in period (n) to the market share of that product in period (1) and these numbers are replaced with the total sale of one product in period (n) to the total sale of that product in period (1). Here, as in (1), we can calculate the growth of market share as an agile metric for the whole enterprise (the formula is denoted as AG(Ms)):

$$AG(MS) = \frac{\text{Total sale of an enterprise in period n}}{\text{Total sale of an enterprise in period 1}} \quad (1)$$

The value greater than 1 is preferred. This metric provides the ability to compare any two types of firms without them having to have the similar products.

B. Responsiveness Metric

An agile enterprise tries to satisfy its customers and employees in a volatile and unpredictable business condition. Therefore, Agility is a vital capability, especially when defined as the ability of an enterprise to respond rapidly to changes of customer and market demands [15]. There have been many discussions about change and there is nothing new about it. Nevertheless, change occurs faster than before and makes some enterprises to fail in the turbulent environment. According to [31] each enterprise faces various changes, but the general areas of change can be categorized as: change in customer demands [32], market volatility, intense

competition, accelerating technological changes and finally change in social factors.

Accordingly, agile enterprises should make appropriate responses to prosper in the volatile and unpredictable market. Such enterprises, therefore, should have responsiveness element which means the ability to sense/identify changes and to respond reactively or proactively in a shortest possible time [33].

The ability to respond to uncertain changes is the most important element of being agile. Enterprise that responds to uncertain changes more efficiently and effectively, will gain more market share and naturally get prospered. The utility curve for responsiveness can be assumed as the shape in "Figure 1".

It should be mentioned that acceptable range of response time is not the same among industries. So, in quantifying responsiveness metric, it should be kept in mind to compare the enterprise with competitors or industry. As shown in "Figure 2", Enterprise A has a quicker response time and a shorter new product development cycle than of the industry.

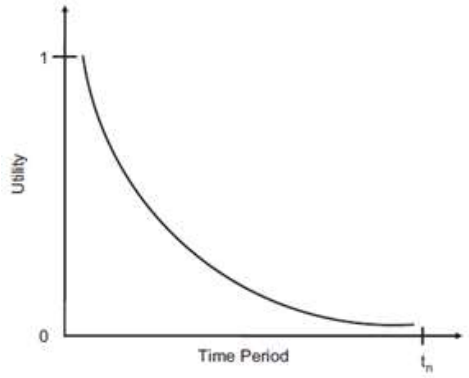

Fig. 1: Utility curve for responsiveness [34]

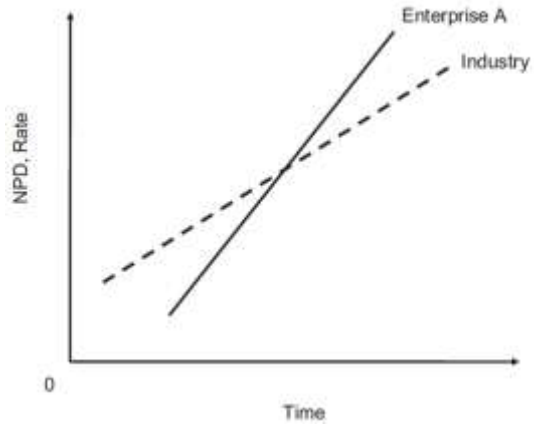

Fig. 2: New product development cycle for enterprise a versus industry development cycle [34]

The responsiveness metric is shown as in (2).

$$AG(\mathrm{Re}) = \frac{\text{Average time for introducing new products for industry}}{\text{Average time for introducing new products for measured enterprise}} \tag{2}$$

A value much larger than 1 is more desired. The formula is given in detail in (3). It is obvious that number of the enterprises should not be less than two.

$$AG(\mathrm{Re}) = \frac{\dfrac{\text{Number of new prducts for the enterprise within a specified period}}{\text{Number of new products of the enterprise and its competitors within a specified period}}}{\text{Number of the enterprises}} \tag{3}$$

C. Cost-effectiveness Metric

Cost-effectiveness metric checks the efficiencies of allocation of investments [35]. The enterprise might be changed with the changing environment, but in an effective way. Because it is not possible to find the costs and sales of every product, and finding a common product in the enterprise and its competitors or industry to compare is not always available, we can use total costs and total sales to calculate this metric. There are two popular ways to find cost-effectiveness metric, as

$$\text{Cost - effectiven ess} = \frac{Cost}{Sale} \tag{4}$$

$$\text{Operating Expense Ratio} = \frac{\text{Operating Expenses}}{\text{Revenue}} \tag{5}$$

The cost-effectiveness metric proposed in this paper is shown in (6). The value should be equal or greater than 1 (preferably greater than 1 for agile enterprise).

$$\text{AG (Ce)} = \frac{\dfrac{\text{Industry total cost}}{\text{Industry total sale}}}{\dfrac{\text{Enterprise total cost}}{\text{Enterprise total sale}}} \tag{6}$$

4. Calculating Adobe system Inc. agility metrics

Given that many works have been done on agility in computer and information technology [8], [3], [15] and as technology sector is in the most agile categories, some enterprises of technology sector are selected to show how to use the proposed metrics and associated formulas. For measuring an enterprise agility metrics by proposed metrics it is necessary to collect data from competitors or industry either. For example, for calculating Adobe Systems Incorporation's agility metrics, which is in the application software industry, data is also gathered from its competitors such as salesforce.com, Microsoft Corporation, Oracle Corporation, Red Hat, Inc., etc. These enterprises are in S&P 500 and data has been collected between the years 2007 to 2011. It's necessary to mention that the gathered data might be incomplete and imprecise. The following section will be divided in four brief sections, the first three sections deal with the use of agility metrics and the last section presents the analyses of the results.

A. Market Share Metric

As mentioned before, it is required to have the total sale of two periods (period n and period 1). Adobe System Incorporation's total sale in 2011 and 2007 equals 4216.26 and 3158 respectively. All financial data should be multiplied by 1,000,000. So, according to "(2)", market share metric is simply calculated as:

$$AG(Ms) = \frac{4216.26}{3158} = 1.34$$

B. Responsiveness Metric

According to (3), AG(Re) of Adobe System Inc. can be obtained. The number of new products, launches or releases of this incorporation between the years 2007 and 2011 was 14 ("Adobe Systems," 2013), while the total sum of new products for industry for the same years was 85 for seven enterprises (detailed information is shown in Table 1).

$$AG(\text{Re}) = \frac{14}{\dfrac{85}{7}} = 1.15$$

C. Cost-effectiveness Metric

By using (6), cost-effectiveness metric only for the year 2011 is calculated. So, total cost and total sale of Adobe System Inc. respectively equals 438 and 4216.26 for year 2011 and sum of total costs and total sales of all seven enterprises for 2011 equals 32684 and 124494.26.

$$AG(Ce) = \frac{\frac{32684}{124494.26}}{\frac{438}{4216.26}} = 2.53$$

D. Analyzing the Status of Adobe Compared to Competitors

All metrics calculated for six other companies in application software industry are shown in Table 2.

TABLE 2: AGILITY METRICS FOR ADOBE SYSTEM INC. AND ITS COMPETITORS

Company Name	Total Sale 2011	Total sale 2007	Total cost 2011	Number of Launches (2007-2011)	AG (Ms)	AG (Re)	AG (Ce)
Adobe Systems Inc.	4216.26	3158	438	14	1.34	1.15	2.53
BMC Software Inc.	2065	1580	484	7	1.31	0.58	1.12
Salesforce.com	1657	497	324	13	3.33	1.07	1.34
Microsoft Corporation	69943	51122	15575	13	1.37	1.07	1.18
Oracle Corporation	35622	17996	8398	12	1.98	0.99	1.11
Red Hat, Inc.	909	401	150	16	2.28	1.32	1.59
Automatic Data Processing, Inc.	10082	10038	7315	10	1.004	0.82	0.36
Sum	124494.26		32684	85			

The data provided in Table 2 shows that the status of Adobe System Inc. compared with its competitors is satisfying. The growth of market share between 2007 and 2011 is convincing. However, some competitors such as Salesforce.com, Microsoft Corporation and Red Hat, Inc. obtain a better number in this metric. Therefore, Adobe needs to investigate in some strategies to achieve bigger market share. Adobe has an acceptable situation in responsiveness metric and the best position in the cost-effectiveness metric between competitors.

5. Conclusion

The research conducted in this paper dealt with the problem of assessing the agility metrics of an enterprise. The technique represented here is useful for identifying the status and improving the agility level of an enterprise and comparing it with competitors. Three proposed metrics of agility are calculated for some application software enterprises and results are discussed. The techniques proposed here are useful in any market and industry. Therefore, future research in different market sectors can demonstrate the utility of methodologies and metrics.

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