Evaluating website performance using formula and balanced scorecard methods

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Abstract

This paper proposes a new model to evaluate the effectiveness of websites using balanced scorecard (BSC) and weighted formula based methods.fisrt, we use BSC method to find out the cause-and-effect relationships between the measure and website activities, and our proposed model evaluates website performance from six perspectives: business value, operational excellence, customer value, website interface, management, maintenance, and learning and innovation. Next, we used formula-based approach to identify what makes website performance low by developing the evaluation formula through investigating website users; finally, case studies of two famous websites are given to show how our method can be used.

Our evaluation model can not only evaluate website performance but also suggest how to improve performance.

Keywords:

BSC, Formula-based method, evaluating website performance

1. Introduction

1.1Research background

WWW is becoming more and more important in that it offers a platform to apply marketing, SCM, public relation, while some companies have gained benefits from website, yet others are learning 'the hard way' [9]. Hence 'evaluating a web site's performance' is now of great importance.

The website effectiveness can be defined as various ways like the discipline of information system's effectiveness [10]. Here, we define the website effectiveness as how the website business goals are actually achieved.

1.2 Literature review & research motivation

Most research on web sit evaluation focuses on evaluation of design, contents, interface, specific function, and media characteristics of Internet [1, 2, 3, 4]. And popular methods are: user-centric approach, traffic-based approach, investigative approach, and quantitative evaluation.

Yet little research has evaluated the web site effectiveness and its contribution to the company value. Specifically, they cannot communicate goals and website strategies [5,6]. Or they can't capture an intangible return like corporate image improvement or enhancing public relation [7,8].

In order to resolve above problems, we develop website evaluation model by using balanced scorecard and formula-based methods, here, formula-based method is used in order to evaluate website more accurately and objectively, and it can serve as a complement to BSC method; our methods can not only evaluate website performance but also support website management process.

2 Research procedure

Figure1 shows our research procedure in this paper. We use two methods: BSC and formula-based method. BSC method consists of six steps beginning with developing website objective and followed by critical success factors, cause-and-effect relationship, evaluation model, measurements and interrelationships; in formula-based method, we use questionnaires survey to get the coefficient of index, and then develop formula to evaluate website performance. Finally, case studies of BSC and formula-based method are given to show how each method can be used.

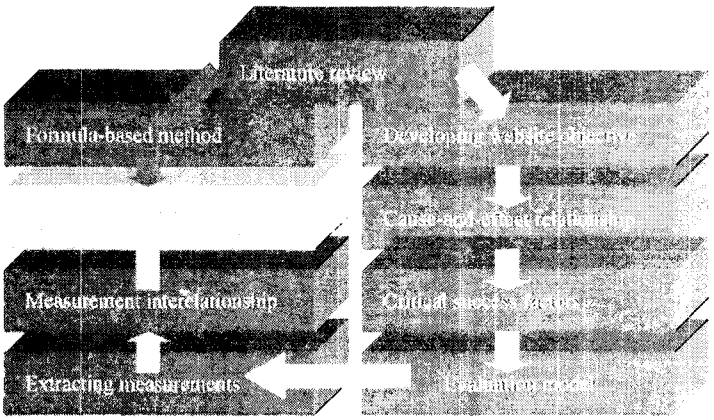

Figure 1-Research procedure

3. Balanced scorecard method

3.1Website Objectives

To develop a model of website effectiveness, we first identified the objectives of company website in Table 1.

Categories	Specific goals and objectives
Value adding	Create and enhance brand/corporate image
	Enhance public relations
	Benchmark by customer's view
Marketing & customer service	Build strong relationship with customers
	Advertising specific products and services
	Collect customer and market related data
	Increase customer's loyalty and reliability
Operational excellence Enhancement	Best fit to customer's trend, requirements
	Increase customer's loyalty and reliability
	Reduce operational costs
	Reduce time to market
Business partner Support	Improve business-to-business relationship
	Streamline corporate purchasing process
	Provide information to business partners

[Table 1] Goals and objectives of website

3.2 Cause-and-effect relationship among website's goals.

To develop a model that is internally consistent we identified interrelationships among different goals and critical success factors in Figure 2 on the right.

[Table 2] Critical success factors of web site

Perspective	Specific factors
Customer aspect	Product/service customization
	Improve customer service quality
	Understanding of customer needs
	Validity of shared data between customers
	Ease to gather customer's opinions
Management and maintenance	Cooperate with other departments
	Customer interaction and involvement
	Quick response to customers
	Benchmark and reflect customers analysis from experience
Technology	Improve internal communities
	Preparation for technical change
Web site interface	Overall site design
	Efficiency of navigation
	Security and customer protection
	Page download speed
Service innovation	New service/product initiation

Value to the customer can be added by service customization, additional information provision, and quality enhancement [11]. Effective management and maintenance is important to meet customer requirement. Many researchers stressed the integration of web activity with other departments [2, 12]. Website interfaces, such as design, navigation, and the quality of user interface affects customer's value perception. Technology is major enabler for constructing an effective website. Continuous innovation is important to gain a sustained competitive advantage from their website [6].

3.3 Critical Successful factors for website in BSC

Next, we gave the critical success factors in Table 2 on the left which enables us to focus on what is important and provides a basis for developing key measures [26].

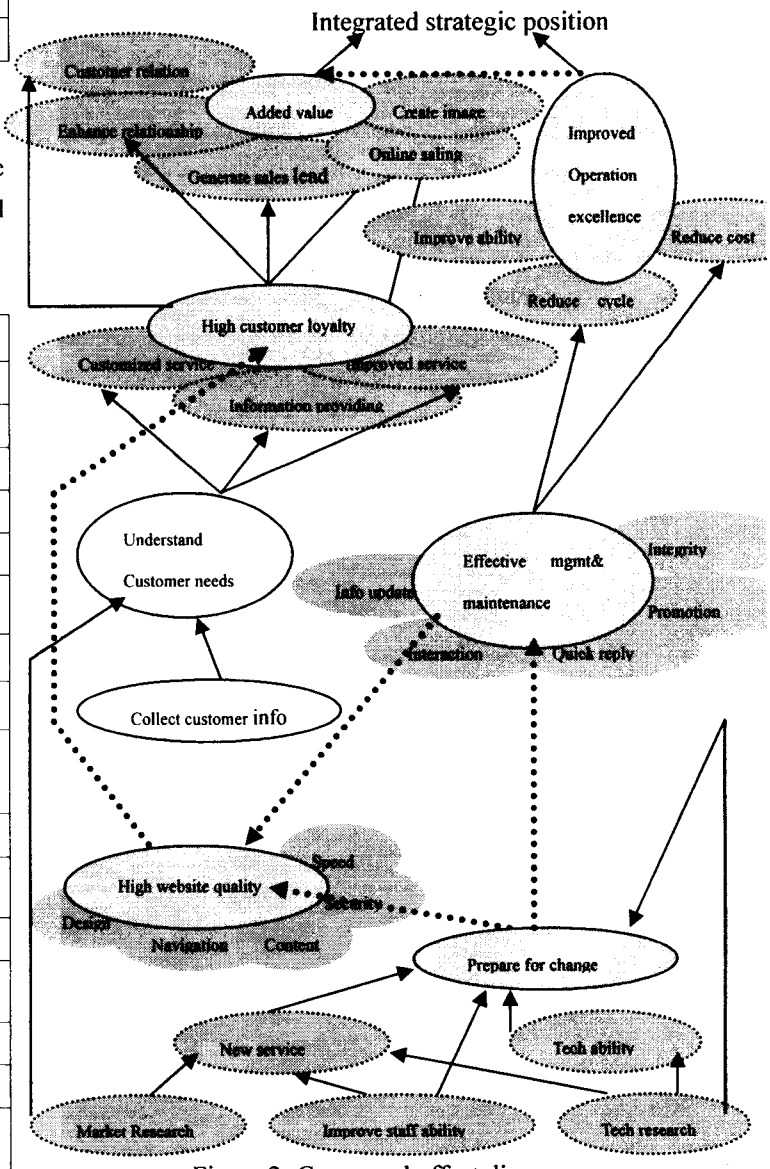

Figure 2- Cause-and-effect diagram

3.4 Evaluation model

Based on cause-and-effect diagram as figure 3, we developed a model to evaluate the website effectiveness. The model includes: business value, operational excellence, customer value, web site interface, management & maintenance, and learning & innovation.

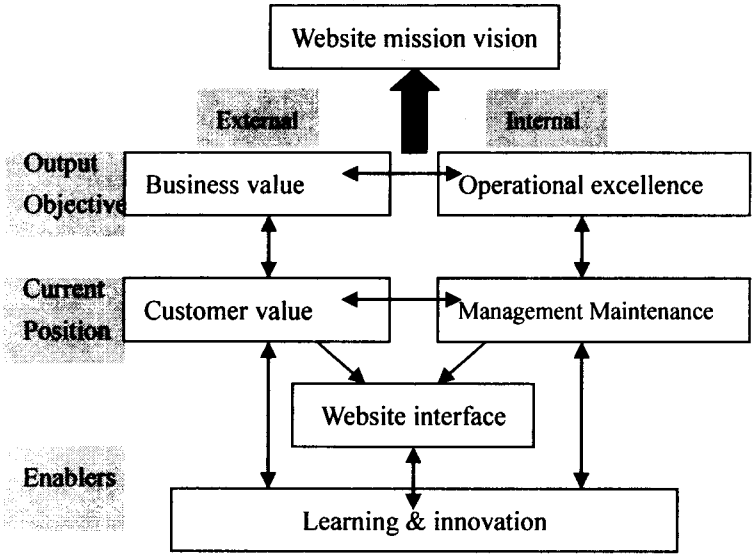

Figure 3-A model for evaluating website effectiveness

3.5Extracting evaluation measurements

In this section, we propose an application framework for website evaluating effectiveness; we show how six perspectives can be measured and how the result can be interpreted. Next, measures for each prospective are suggested as followings:

Management and maintenance measures	
Investment and assistance Total web related budget	**Information update** Update frequency
Interaction Customer require response time	**Integration with other dept** Communication frequency

[Table1] Measures for Business value measures

Operational excellence measures	
Impact on product cycle Reduced time to market	**Cost effectiveness** Reduced cost

[Table2] Measures for Operational excellence

Learning and innovation measures	
New service imitation Frequency of new service	**New technology research** Investment
Technological capacity Hardware, software	**Preparation for new tech** Amount of tech investment

[Table3] Measures for Learning and innovation measures

Website interface measures	
Quality of design User friendliness Anesthetics	**Navigational efficiency** Usability
Interaction :Customer require response time	

[Table4] Measures for Website interface

Business value measures	
Impact on existing sales Increased sales	**Impact on market share** Number of new customer
Direct selling Total revenue generated	**Customer retention** Number of returned customer

[Table5] Measures for business value

Customer value measures	
Customer royalty Ration of repeat customers	**Website traffic** Number of visit customer
Direct selling Total revenue generated	**Customer perceived value** Quality of content served

[Table6] Measures for Customer value

3.6 Inter-relationships among measures

In this section, we analyze inter-relationships to represent strategies and how to achieve better outcomes.

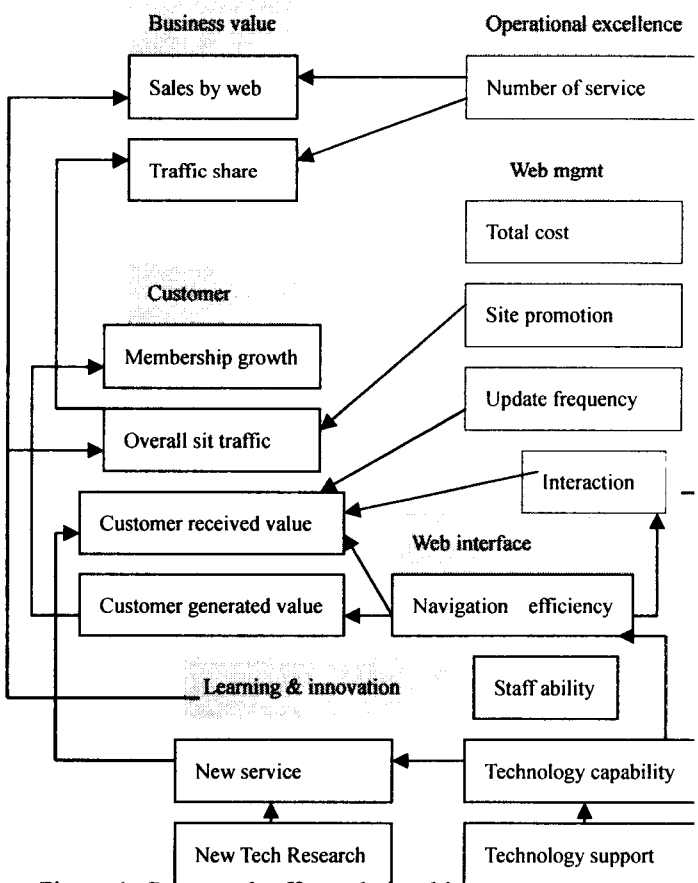

Figure 4- Cause-and- effect relationship among measures

4. Formula based approach

4.1 Formula-based approach

In addition to the BSC method, we developed the formula based approach to overcome the bias of subjective evaluation.

We used website measures (Appearance, function, structure, reliability, and technology) proposed by William [14] to develop our formula, we further developed index and related metric, and we use questionnaire to get the (weight) of each metric and index to determine their coefficient.

4.1.1 Appearance:

Attractive = Aesthetic aspect

Clarity =Clear

AD= (∑ Unexpected_AD number)/1000

Appearance =0.4857 * Attractive +0.5190 * Clarity – 0.4714*AD

Index	Metric	Unit
Attractive	Aesthetic aspect	Value from 0~1
Clarity	Clear	Value from 0~1
AD	AD number	Void

4.1.2 Function:

Value_adding=annual profit

Marketing=annual sales

Function =0.4831* Value_adding +0.4524* Marketing

Index	metric	Unit
Value_adding	Annual profit/1 billion	Value from 0~1
Marketing	Annual sales/1 billion	Value from 0~1

4.1.3 Structure:

Navigation= 0.5000*sitemap+0.3857*guide button

Usability=link availability ratio

User interactivity= Contact info

Structure =0.4810* Navigation +0.4905* Usability +0.4857* User interactivity

Index	metric	Unit
Navigation	Sitemap	Value from 0~1
	Guide button	Value from 0~1
Usability	Link availability	Ratio from 0~1
User interactivity	Contact info	Value from 0~1

4.1.4 Reliability:

Security=0.5238*Info protection +0.4413*antivirus

Info quality=0.4762*relevant+0.5048*timely+0.5476*accurate

Reliability =0.5333* Security +0.5048* Info quality

Index	metric	Unit
Security	Info protection	Value from 0~1
	Antivirus software	Value from 0~1
Info quality	Relevance	Value from 0~1
	Timely	Value from 0~1
	Accuracy	Value from 0~1

4.1.5 Technology:

Update = Update timeliness

Feedback speed= Reply timeliness

Maintainability=Structure reuse

Technology =0.4238* Update -0.4857* Feedback speed +0.4524* Maintainability

Index	metric	Unit
Feedback speed	Reply timeliness	Value from 0~1
Update	Update timeliness	Value from 0~1
Maintainability	Structure reuse	Value from 0~1

5. Case study

5.1 Case study by using BSC method

Case study for BSC was done with www.gmarket.com as shown in figure6. Rating elements (customer perceived value,) were drawn from questionnaires by 64 customers of gmarket.

5.2 Case study by using formula based method

We choose www.amazon.com and www.gmarket.com as examples to show how our method can be used.

Appearance = Appearance =0.4857 * Attractive +0.5190 * Clarity – 0.4714*AD=0.4857 * 0.6 +0.5190 *0.5 – 0.4714*0.4=0.36236
Function =0.4831* Value_adding +0.4524* Marketing =0.4831* 0.145 +0.4524* 0.1825=0.015261
Structure =0.4810* Navigation +0.4905* Usability +0.4857* User interactivity =0.4810* (0.5000*0.4+0.3857*0.7) +0.4905*0.7 +0.457*0.3=0.70651
Reliability =0.5333* Security +0.5048* Info quality =0.5333* (0.5238*0.6 +0.4413*0.7) +0.5048* (0.4762*0.6 +0.5048*0.7+0.5476*0.6) = 0.8208
Technology =0.4238* Update -0.4857* Feedback speed +0.4524* Maintainability=0.4238* 0.8 -0.4857*0.4+0.4524*0.5=0.37096

Case study for www.amazon.com is similar to www.gmarket.co.kr, so the data is omitted here. And Figure5 shows the comparison of the two website. The result shows that the structure, reliability of the two websites is the same, while the appearance, function and technology aspect of amazon are better than gmarket.

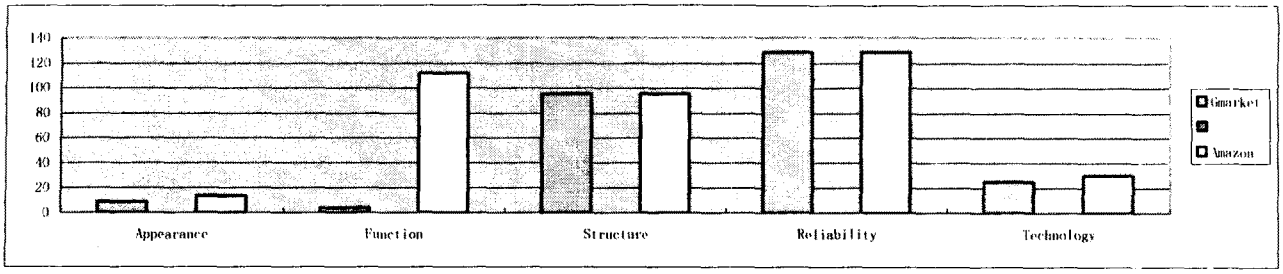

Figure5-Comparison of www.amazon.com and www.gmarket.com

Business Value		***Operational excellence***
Sales generated by web: 1 billion USA dollar		Product/service categories: 79
Traffic share of open market(C2C): 34.5%		
Customer Value		***Website interface***
Year 2005 membership growth :500%	Extent of customer needs meet: 3.50	Design:
Overall site traffic	Likelihood to revisit gmarket: 6.27	Attractiveness: 3.36
Numb of page review:130,000,000	Customer generated value	Unification:4.32
Numb of customer per day: 2,000,000	Meet customer favor: 3.44	Easy to acquire information: 5.47
Customer perceived value	Effective share of user-centric analysis: 2.3	Easy to present opinion:3.56
Overall satisfaction: 4.26	Increased customer reliability: 3.34	Navigation:
Perceived quality of contents :4.72		Easy to navigate:5.12
Perceived quality of service:5.84		Usefulness to help function :6.42
Management and maintenance		***Learning and innovation***
Average update frequency: 3.1 times/per day		Frequency of new service initiation :
Investment for site promotion/Total web cost=15.6%		1/per1.5 month
Ration of customer request fulfilled:86.2%		Preparation for technology change:
Average response time to request: 11.2 hours		Investment in new tech/ total cost=47.5%

Figure 6-Comparison of www.amazon.com and www.gmarket.com

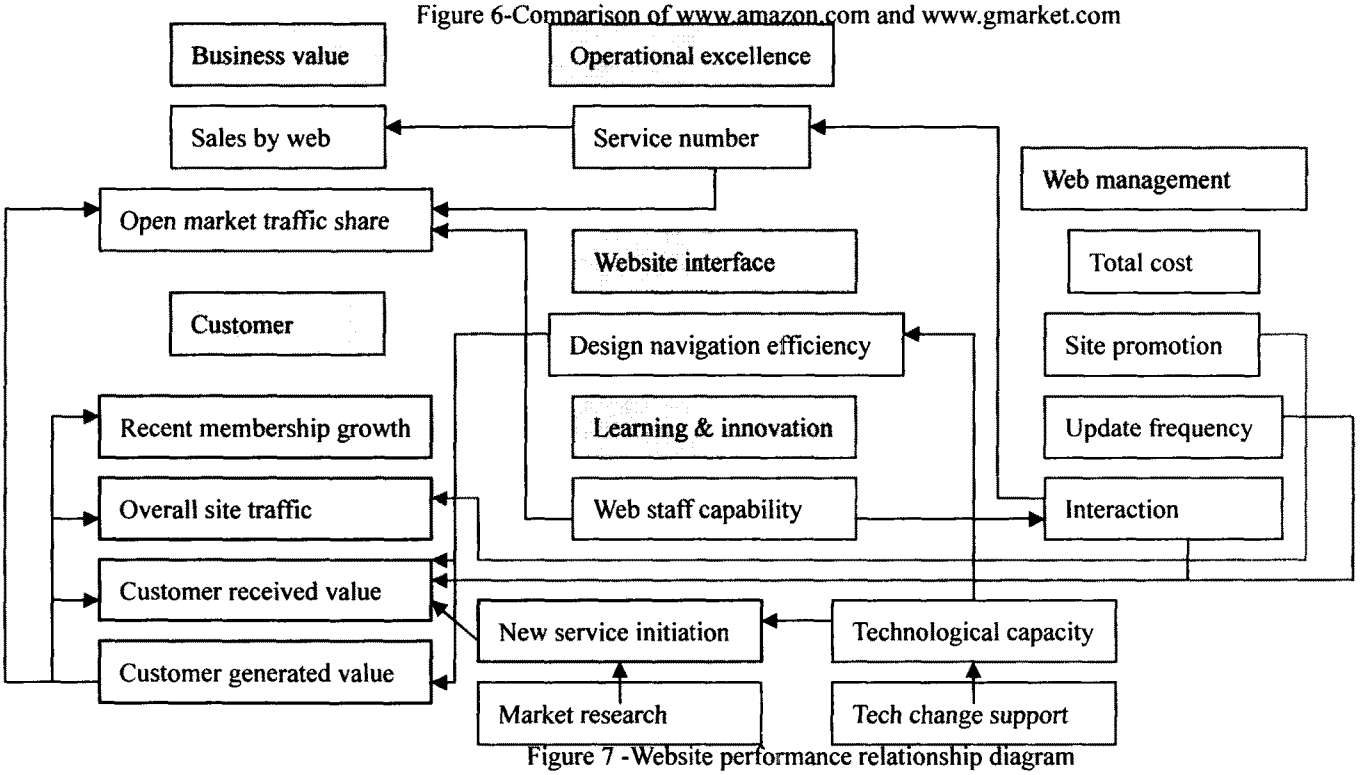

Figure 7 -Website performance relationship diagram

5.3 Result analysis and suggestions

For case study of BSC method, website performance relationship diagram is shown in Figure 7, there are specific relations between entities. So, as Specific preview of product from other experienced user is low, Customer generate value has problem. So to enhance customer generated value, design of navigation efficiency should be improved. By doing so, it can increase value from benchmark of customer's view that leads to business value.

For case study of formula based method, the result shows that the structure, reliability of gmarket and amazons are similar, which means that both of the two websites have a clear sitemap, guide button, customer protection mechanism, antivirus software. But the appearance, function and technology aspect of amazon are much better than gmarket the reason is that www.gmarket.com is weak in catching more customers than amazon.figure8 and figure 9 shows web interface of Amazon and Gmarket respectively. And gmarket is slow in replying to the customer's questions. So based on this, we suggest that gmarket should be more attention to enlarge its market share and try to improve customer service.

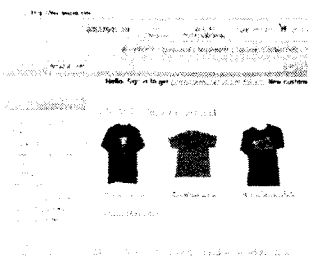

Figure 8-Web interface of Amazon

Figure 9-Web interface of Gmarket

6. Limitation and conclusion

This paper offers a new model to evaluate the performance of websites, which offers an evaluation and decision support tool for website managers. Our new model can not only evaluate website effectiveness but also give suggestions on how to improve the website performance.

Future research can be done by identifying more objective metrics which can give more exact result, and extra works are needed to the validate data from the website.

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