Evaluating the Performance and Quality of Web Services in Electronic Marketplaces

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Nath, A. & Singh, R. (2010). Evaluating the Performance and Quality of Web Services in Electronic Marketplaces. *E-Services Journal, 7 (1),* 43-59.

Abstract:

A Web service is a software interface that describes a collection of operations that can be accessed over the network through standardized messaging. Effective performance and quality measures of Web services on Web service electronic marketplaces should include both technical and business aspects and consider Web services as business services delivered through multiple channels. In this research, we integrate technical measures of e-service performance with established measures for evaluating service quality in a business. This integrated view of Web service performance is lacking in extant knowledge and is critically needed to evaluate the overall quality and performance of business environment where information services are delivered through Web services.

Keywords: web services | web service electronic marketplace | quality of service | multi-channel service | performance evaluations

Article:

Introduction

A Web Service is defined by the W3C as “a software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format. Other systems interact with the Web service in a manner prescribed by its description using messages that are conveyed using HTTP with an XML serialization in conjunction with other Web-related standards.” (W3C Web services Glossary, 2004). A Web Service Electronic Marketplace (WSEM) is a marketplace for Web services where Web service vendors can sell their services to clients, who buy web [End Page 43] services that are part of the electronic services that they deliver. Electronic Marketplaces have been successful in both B2C and B2B channels where transactions are product based. With the transition of e-business models towards Web services, Web service electronic marketplaces (WSEM) are becoming an increasingly prevalent mechanism to bring together vendors and clients of Web services and

facilitate their transactions. For example, since the beginning of 2007, StrikeIron, one of the most prominent WESMs, has added more than 575 new customers, doubling its total customer base to over 1,000 and grown its revenue by 350 percent compared to the same period in 2006 (Business-Wire, 2007). However, many organizations still do not adopt WSEMs to buy Web services due to the lack of adequate performance and quality information for Web services available on these electronic marketplaces (Bachlechner et al., 2006).

Effective performance and quality measures, as well as effective feedback mechanisms, are essential features for information service based environments such as WSEM (Bauer et. al., 2005). While extant research has examined the quality and performance measures of e-services (Collier and Bienstock, 2003; Parasuraman et. al.,2005; Wolfinbarger and Gilly, 2003), the scope of much of the research is limited to online shopping. More importantly, extant research does not provide the necessary measures to evaluate performance and quality of Web services. Web Services are essentially a special type of e-service. The existing performance and quality measures of Web services on WSEM fail to incorporate the view that when a client buys a service from a Web service vendor on a WSEM, they enter a B2B relationship and create an information value chain. Therefore, a Web service acquired on a WSEM is not merely a technical service; it is also a business service that a client buys from a Web service vendor and incorporates into the value-added services offered to its clients. In such service based B2B relationships, technical measures alone are not enough to evaluate the quality and performance of Web services received. Extant literature cites measures such as privacy (Urban et al., 2000), recovery (Fassnacht and Koese, 2006) and support (Parasuraman et al., 2005) as important criteria for the evaluation of the quality and performance of eservices. However, current WSEMs typically do not provide information on these aspects of a Web service (Bachlechner et al., 2006). A central assertion of this paper is that a comprehensive and effective measure of the performance and quality of Web services on WSEMs needs to include both technical and business aspects and consider Web services as business services delivered through multiple channels, including online as well as traditional channels of service delivery. This required comprehensive conceptualization of Web services' quality and performance as a business service is critically lacking in existing research. To address this gap, we propose that it is necessary to integrate technical measures of service performance with established measures of service quality. Such an integrated comprehensive view is critically needed to evaluate the overall quality and performance of business environments [End Page 44] where information services are delivered through Web services. To address this gap in the literature, in this research, we address the following research questions:

What factors should be considered in evaluating the quality and performance of a Web service on WSEM? How can we enhance the existing performance and quality metrics of Web services in Web service electronic marketplaces?

We conceptualize Web services in WSEMs as a multi-channel hierarchical business service. This conceptualization derives its theoretical foundation from the multi-channel Quality of Service framework (Sosua and Voss, 2006) and the hierarchical model of quality of e- services (Fassnacht and Koese, 2006). We synthesize the existing research in e-services and quality of service and propose Business Web Service Quality (BWSQ) metrics that include both technical and business dimensions of Web Services quality and performance. These BWSQ metrics include the necessary technical and business dimensions for a complete evaluation of Web services on WSEMSs as business services delivered through multiple channels. BWSQ metrics can be used to develop the much needed and critically missing feedback mechanism and reputation systems for WSEMs. In addition, we can use these metrics to identify areas of improvement in existing measures of quality and performance of Web services in WSEM. Our proposed metrics form the basis for developing a comprehensive reputation system for WSEMs.

The rest of this paper is organized as follows. In the next section we provide a brief literature review of the e-service quality and other related literature that paves the foundation of the theoretical development of BWSQ. We then utilize this theoretical foundation to present our integrated Business Web Services Quality (BWSQ) metrics needed to evaluate the quality and performance of Web services in WSEM. Based on the proposed BWSQ metrics, we describe our content analytic method for examining what quality and performance measures are used for Web service evaluation in popular WSEMs. We then report our findings on the measures included in our metrics yet ignored by these WSEMs. We identify the limitations of this study and present our future research plans and our conclusions.

Literature Review

While an effective feedback mechanism has been identified as a key feature in building a successful electronic marketplace (Pavlou and Gefen, 2004), the lack of effective mechanisms to provide feedback, performance measures and reputation systems have been identified by practitioners as significant issues in the adoption of Web service electronic marketplaces (Bachlechner et al., 2006). In an information service based environment, an effective mechanism that reports on the quality and performance of the information service is an essential feature (Bauer et. al., 2005). Since Web services are provided in information based service environments, it is important to evaluate their quality and performance [End Page 45] and to develop a feedback mechanism to provide adequate information for the client's decision making activities.

Maximilien and Singh (2002) proposed a conceptual model for Web service reputation, using which reputation information can be organized and shared and service selection can be facilitated and automated. Maximilien and Singh (2002) discuss the importance of considering key attributes of the Web services' performance and assigning them weights based on their relative contribution to their overall reputation in reputation systems in the business domain. Liu et al., (2005) present a conceptual model of performance driven Web service selection and highlight

the importance of determining the dimensions to measure the quality and performance of Web services. While Liu et al., (2005) address the technical requirement of such Web service selection mechanism, they do not specify the performance and quality dimensions of Web services that are necessary to inform this quality-driven Web service selection process. Our literature review reveals that while extant literature recognizes the importance of measuring the quality and performance of Web services, it does not provide metrics that take into account the technical and business dimensions of Web services in an electronic market place.

IBM defines Web services as a technology that allows applications to communicate with each other in a platform- and programming language-independent manner (New to SOA and Web services, 2009). In other words, a Web service is a software interface that describes a collection of operations that can be accessed over the network using standardized messaging protocols. A Web service is essentially a special type of electronic service. The literature stream in the quality and performance of electronic services is a relevant and useful literature stream to help define the quality and performance measures of a Web service. Zeithaml, et al., (2002), considered one of the early contributions to the field e-services quality, have proposed measures for the quality of e-services as a multidimensional construct. However, Zeithaml et al., (2002) assert that the various potential dimensions have to be investigated more systematically since no consensus on the relevant dimensions of this multidimensional construct has been reached.

Significant work has been done on the quality and performance measure of e-services (Collier and Bienstock, 2003, Parasuraman et. al., 2005, Wolfinbarger and Gilly, 2003). However, most of these studies focus on the domain of online shopping. While the measures developed in these studies are applicable to product-based online shopping, they do not address the Web service performance and quality issues on WSEMs adequately or appropriately. Table 1 summarizes selected research works on e- services quality.

More recently, Fassnacht & Koese (2006) suggest a hierarchical model for e-service quality and performance. Fassnacht & Koese (2006) emphasize that in order to assess the quality and performance of an e-service it is important to consider a complete view of the service. Fassnacht & Koese (2006) define the quality of an e-service as the degree to which the e- service is able to effectively and efficiently fulfill relevant customer needs. [End Page 46] They identify the importance of fulfillment of the service promise as a whole, including both technical and business aspects, in measuring the quality of e-services offered. Such comprehensive conceptualizations of e-services are applicable to Web services on WSEMs. Sosua and Voss (2006) also take a holistic view of services by incorporating that that a service may use more than one channel for delivery. For example, a service might have different components and they might get delivered using different channels such as Internet, telephone and face to face. Based on this view, Sosua and Voss (2006) emphasize that to measure the quality of service, it is important to take into account the quality of service in each individual service delivery channels as well as their integration. This hierarchical and multi-channel conceptualization of service

quality and performance provides the theoretical foundation for our conceptualization of Web service quality and performance as a Business service.

Table 1.

Selected research works on e-services quality

Study	Domain of Measure	Scope of Application
Collier and Bienstock,2003	Service Quality	Online shopping
Parasuraman et. al.,2005	Service quality	Online shopping
Wolfinbarger and Gilly ,2003	Service Quality	Online Shopping
Fassnacht & Koese, 2006,	Hierarchical service quality	Generic e-service
Sosua& Voss,2006	Multi-channel quality of service	Generic e-service

Our literature review identifies the lack of existing research on the performance and quality of Web service on WSEM as a business service that includes business and technical dimensions across multiple channels of delivery. However, in the existing literature, there are performance and quality measures for various services through different channels. Based on these measures, we use this existing research as a foundation to develop the required quality and performance metrics for Web services on WSEMs. We apply the lessons learned from measuring the quality of e-services to develop measures for the quality and performance of Web services, including the business and technical dimensions of Web services. In addition, we apply the framework from Sosua and Voss (2006) to develop measures of the overall quality and performance of a Web service on WSEM by taking into consideration the quality of service in multiple channels.

Theoretical Development of Business Web Service Qulity (BWSQ) Metrics

A comprehensive measure of the quality and performance of a Web service should consider the multiple channels that the service utilizes. An overview of different service channels involved in the Web service delivery is presented in Figure 1. A key feature of a service electronic marketplace is that once the service has been bought, the client company gets service and support from the provider company directly, without the intermediation of the [End Page 47] electronic marketplace. The marketplace essentially fulfills a matchmaking role and does not have any significant post-transaction participation after transaction arrangements are made between the client and vendor organizations. As shown in Figure 1, if the client needs technical support regarding the Web service, the vendor will typically use existing conventional support channels such as phone and e-mail to provide technical support. The quality of post-transactional support provided to the client organization is a very important aspect in the client's perceptions of the overall quality of the Web service. A significant reason for a client to buy a Web service is to reduce the burden of development and maintenance of the service on their internal IT. The client organization may not have enough technical resources or knowledge to solve problems related to

the Web services internally. Therefore, the quality and effectiveness of the support provided through multiple channels for purchased Web services is a very important dimension of the Web service's performance, together with the technical performance such as response time and availability. We propose that performance metrics for Web services on WSEMs has to serve two purposes:

i. Evaluate the performance and quality of a Web service considering both technical and business aspects of a Web service.

ii. Improve on current approaches by incorporating a broader view that considers Web services as a business service provided through multiple channels presenting a more comprehensive measure for evaluating the performance and quality of Web services.

In the following sections, we provide a discussion of the elements of the technical and business dimensions that are critical to provide an integrated mechanism to measure the performance and quality of a Web service

Performance and Quality of a Web service: Technical Dimensions

Existing literature has investigated the parameters needed to assess the technical aspect of the quality and performance of Service of e-services (Mani and Nagarajan 2002; Zeithaml et. al., 2000, 2002; Parasuraman et. al., 2005). To capture the technical quality and performance of Web services based on the dimensions e-service literature we suggest the following dimensions in our proposed metrics

i. Availability is the aspect of quality that measures whether a Web service is available or ready for immediate use. Availability is measured using the probability that the service is available. Larger values imply that the service is frequently ready to use, while smaller values indicate unpredictability of whether the service will be available at a particular time.

ii. Accessibility represents the degree a Web service is capable of serving a request(s). It may be expressed as a probability measure denoting the success rate or chance of a successful service instantiation at a point in time. There could be situations when [End Page 48] a Web service is available but not accessible because of heavy service requests. High accessibility of Web services can be achieved by building highly scalable systems. Throughput and latency are the other two sub- dimensions of technical performance of e-services in this context.

iii. Throughput represents the number of Web service requests served at a given time period; and

iv. Latency is the round-trip time between sending a request for a Web service and receiving the response.

These first order technical dimensions of quality and performance have quantitative measures that can be collected from the system using automated techniques.

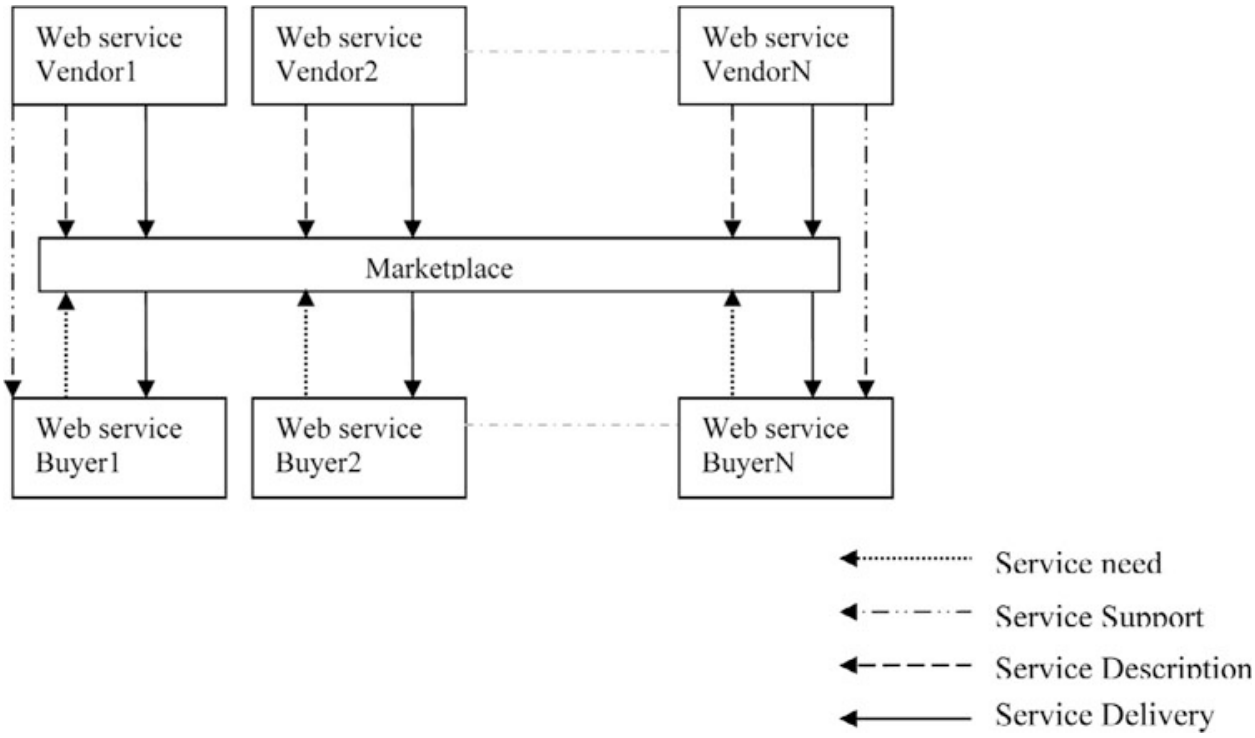

Figure 1.

Service delivery of a Web service bought on a marketplace

Environment and Information Quality

The next aspect of measuring performance also captures the technical quality and performance of the Web service. In addition, it reflects the technical quality and performance of Web service as perceived by the users such as the IT manager of the client organization. The first order dimensions of this aspect of performance are Environment quality and Information quality (Fassnacht & Koese, 2006).

Environment Quality refers to the quality of the interface provided by the Web service to the service consumer. Information quality covers the extent to which complete, accurate, and timely information is provided for the service consumer during the interaction process. When a company buys a Web service from a web service vendor, they create an information value chain (Singh et al., 2003). This makes the quality of the information [End Page 49] provided through the Web service a very important criteria in measuring the performance of a Web service.

Performance and Quality of a Web service: Non-Technical Business Dimensions

When a client organization buys a Web service from a vendor on the Web Service electronic marketplace, this essentially starts a B2B exchange relationship. It is very important for the Web service vendor to provide business aspects of the performance and quality of the Web service for the client organization. Using the existing literature on eservice quality, we identify four business aspects of service quality and performance that we believe should be considered in evaluating the business dimension of a Web service sold on a WSEM. These four aspects are:

i. Outcome quality,

ii. Customer support,

iii. Privacy, and

iv. Recovery.

Outcome Quality

Outcome quality is conceived as what the customer is left with after service delivery (Fassnacht & Koese, 2006). It has three first order sub dimensions: reliability, functional benefit, and emotional benefit. Outcome quality captures the perceived satisfaction level of the consumer's representatives, such as the IT managers of the client organization, after the use of the Web service and it is measured through the reliability, functional benefits and the emotional benefits of the Web service as perceived by the client.

Reliability is the extent to which the provider keeps service promises. It is important to note that this sub dimension does not refer to the reliable functioning of the provider's technical infrastructure during service delivery. Reliability in this context refers to the accuracy and timeliness with which the underlying service promise is fulfilled. It can therefore only be judged after service delivery, which makes it a facet of outcome quality.

Functional benefit is defined as the extent to which the service serves its actual purpose. In other words, it is a service's ability to provide the function it is designed for in different environments. For example, if a Web service has been designed for credit card verification then functional benefit refers to the extent to which the Web service is capable of verifying credit cards properly in different scenarios like credit card verification for domestic transactions and credit card verification for international transactions.

Emotional benefit which is the degree to which using the service arouses positive feelings by the consumer. At first glance, this dimension might seem a little out of context; "perceived value" suggested by Zeithaml (1988) may seem more applicable. Perceived [End Page 50] value is a consideration of the benefits and costs for the customer. However, after an in depth analysis of both these constructs, we believe that the "Emotional Benefit" dimension proposed by Fassnacht & Koese (2006) is more applicable since it captures the client's overall experience with the

service. This dimension takes a more holistic approach to representing the customers' feelings of benefit from a service, which is required in the context of Web services.

Support

Support is a critical business dimension of the Quality of Service offered by a Web service to the buyer (Sousa and Voss, 2006). Web services in general are IT services. For IT services, providing the necessary support is an important aspect. The rich stream of research on SERVQUAL (Parasuraman et al. 1985, 1988, 1991; Kettinger and Lee, 2005; van Dyke et al., 1997) captures the quality measures of service and support provided by the IT department. This research is applicable to measure the support provided by the Web service provider (Sosua and Voss, 2006). One of the biggest advantages of, and a driving force behind, buying Web services from a vendor is that it can reduce the work and time pressures on the internal IT department of the client organization. Once a Web service has been bought on the marketplace from a provider, it is very important that the vendor provide the necessary support related to that Web service. The quality of that support is an essential aspect of the overall quality and performance evaluation of a Web service. Five sub dimensions, including responsiveness, reliability, competence, empathy and training are used in measuring the quality of support (van Dyke et al., 1997). We adopt these standard definitions of SEVQUAL to the domain of Web services on WSEMs. Responsiveness is the willingness and speed with which the support staff of the Web service provider makes the initial response to inquiries from users. Reliability is the extent to which the support staffs of the Web service provider perform the promised service dependably, including providing the support in the promised timeframe. Competence measures the technical skills and expertise of the support staff of the Web service provider. Empathy implies the ability of the support staff of the Web service provider to understand the specific needs of the user. Training means the amount of instruction and support provided by the support staff of the Web service provider to make the best use of the provided service. The support that a Web service provider provides to its client is an important aspect of the performance and quality of the Web services provided.

Privacy

Privacy is considered a much needed business dimension of the quality of services, particularly in the e-business environment (Collier and Bienstock, 2006). For Web services, the privacy of data is a significant concern. To make use of Web services, such as CRM, it [End Page 51] is often necessary to expose the client's internal database to the Web service provider. These data are the client organization's property and they are not willing to share that with their competitor or any other company. Therefore, it is a very important that Web service providers keep the confidentiality of the data.

Preserving privacy requires adopting a suitable design for the virtual interface as well as the effective operation of the associated back office. Earning a reputation for keeping the

confidentiality of the data becomes critical for a Web service provider in this regard. Actual service users can provide feedback regarding maintaining the privacy of their data. This is going to be reflected on the BWSQ of the provided Web service (Wolfinbarger and Gilly, 2003).

Recovery

Existing research on e-service failures has identified that many customers feel injustice following a firm's recovery efforts (Holloway and Beatty 2003) and feel that the service provider has not put enough effort to recover the service promptly. Based on the justice research by Tax and Stephen (1998), Collier and Bienstock, 2006, claimed that the service recovery framework proposed by Tax and Stephen (1998) will also apply in an online context and that the existing literature in offline service recovery is highly relevant to online services. In the context of Web services, recovery is a related service quality measure that captures the customers' perception towards the recovery efforts of the Web service provider in case of a "non-functioning" Web service. The recovery of electronic services comprises three first-order dimensions- interactive fairness, procedural fairness and outcome fairness (Collier and Bienstock, 2006).

In the Web service context, interactive fairness refers to the customer's ability to locate and interact with technology support on a Web site. It also includes how the Web service provider company's employees treat the customer. The interactive fairness in service recovery is one of the most high-profile areas that can make a customer satisfied or dissatisfied during the transaction process (Collier and Bienstock, 2006). An examination of interactive fairness reveals that it is highly overlapped with the quality of service support dimension of the performance measure discussed earlier.

The second first-order dimension of the Web service recovery construct is procedural fairness. In general, procedural fairness refers to the policies, procedures, and responsiveness in the complaint process. Procedural fairness online refers to a company's return policy, the buyer's rights in the case of fraudulent charges and how quickly a problem can be resolved. This area has a high impact in the evaluation of service quality (Tax and Stephen, 1998). Since a Web service is a service provided by an organization, procedural fairness is an applicable dimension of service quality. In the context of Web services, [End Page 52] procedural fairness refers to the effectiveness of the activities that the vendor organization takes to address the complains and concerns raised by the client organization.

Outcome fairness includes such issues as monetary compensation, future free services or an apology. For example, outcome fairness in the Web service context could be an additional month of free service. In service recovery, the customer wants to be compensated equitably for any inconvenience (Goodwin and Ross, 1992). Overall Service recovery plays an active role in customer satisfaction, customer loyalty, profitability, and revenue of a company (Tax and Brown 1998).

Like any other business transaction, when a customer, a company or a person buys a Web service from a Web service provider they get into a business relationship. In general, business dimensions capture different aspects of performance and quality of a Web service provider when it gets into a business relationship and those aspects are not limited to only technical quality of the provided Web service.

Business Web service Quality (BWSQ) Metrics

We propose a comprehensive set of quality and performance metrics BWSQ to evaluate the quality and performance of Web services available on WSEMs. We have reviewed literature to identify the need for a holistic measure of the quality and performance of Web services that includes both technical and business dimensions of the Web services. We have extended the existing literature on quality and performance of services and electronic services to identify the measures that are applicable to Web services on WSEMs.

In our proposed BWSQ metrics, there are several items that relate to technical dimensions of Web service quality and can be obtained automatically from the system. In addition, there are multiple items, particularly in the business dimension that need to be provided by representative of the Web service client company. Most of the technical performance items of BWSQ can be filled in by the system automatically. On the other hand, the items on BWSQ measuring the business aspect of the performance and quality are required to be filled in by the representative(s) of the Web service Consumer Company. Based on the theoretical foundations developed in previous sections, it is our assertion that all the facets of the Web service performance and quality described in BWSQ metrics are necessary to effectively capture overall performance of a Web service acquired on WSEM.

Research Method

We used our proposed BWSQ metrics to develop an instrument (provided in Appendix A) to conduct a content analysis on existing WSEMs. Items on the instrument include performance and quality measure dimensions that we propose in BWSQ. We conducted a content analysis on the five prominent Web service marketplaces- xmethods.com, Amazon. com, remotemethods.com, strikeiron.com and esynaps.com. We used two criteria to select [End Page 53] these WSEMs. We identified the most referenced WSEM in trade publications on WSEM such as BusinessWire, BizYahoo. In addition, we went to the individual WSEM sites and identified the number of web services that are offered by that WSEM. This allowed us to identify the organizations that are most prominent in the marketplace and have a wide range of Web service offerings. Through our content analysis, we found out the extent to which the performance and quality measures we have proposed in BWSQ are available for the Web services on the WSEMs to help a potential customer in the selection of a Web service. We analyzed each WSEM and each service looking for the data corresponding to our BWSQ performance criteria to evaluate the existing performance measures and feedback mechanisms of those marketplaces. If information regarding

a certain dimension of the proposed BWSQ was available in the service description then that dimension has been checked on our proposed content analysis instrument indicating its availability in the service description and information. This allows us to assess the availability of the information needed to evaluate the available Web services on the prevalent WSEMs. Results of our content analysis are presented in the next section with implications of our findings.

Results and Discussion

Content analysis of these five WSEMs indicates that there is neither an appropriate feedback mechanism for Web services on marketplaces nor a well defined set of criteria to evaluate the quality and performance of the Web services on the WSEMs. The information provided on each of the Web services on prominent WSEMs only reflects the technical performance dimensions proposed in BWSQ metrics.

Non-technical performance and quality data for Web services are not usually provided on WSEMs. Even if it is provided, usually it is provided at a very superficial level in the current state of WSEMs,. Consequently, it becomes very difficult for a customer to make knowledgeable selection of a Web service that is offered by multiple vendors on a WSEM. For example, Figure 2 is a snapshot of the quality and performance data provided on StrikeIron.com for Web services. As we can see, this graphical representation of quality and performance of a Web service on StrikeIron.com contains only technical measures. The primary limitation of providing only the technical measures, such as response time and downtime, is that they fail to capture the experience of the users of a Web service as business service acquired on WSEM. Therefore, for a customer it becomes almost impossible to differentiate between similar Web services from different vendors on a WSEM and select the “better” Web Service based on quality and performance information available.

While esynaps.com and remotemethods.com solicit written feedback from users; however, they fail to provide a predefined standardized template and solicit freeform text based responses. Therefore, the written feedback can focus on any aspect of the service quality of a Web service. These reviews do not reflect the performance and quality of a [End Page 54]

	Dimension	Sub-dimension	Reference	Input
Technical	Availability		Mani and Nagarajan, 2002, Sosua and Voss,2006	System
	Accessibility		Mani and Nagarajan, 2002, Sosua and Voss,2006	
	Throughput		Mani and Nagarajan, 2002	
	Latency		Mani and Nagarajan, 2002	
	Environment Quality		Fassnacht & Koese, 2006	User/ Representative
	Information Quality		Fassnacht & Koese, 2006	
Non-technical Business	Privacy	Privacy/Security indicators	Urban et. al., 2000	
		As perceived by the users	Wolfinbarger and Gilly ,2003, Zeithaml et. al.,2000	
	Support	Responsiveness Reliability Empathy Competence Training	Parsuraman et. al,,1988 Van Dyke et. al.,2007	
	Recovery	Interactive fairness Procedural Fairness Outcome fairness	Fassnacht & Koese, 2006	
	Outcome Quality	Reliability Functional Benefit Perceived value/ Emotional Benefit	Collier and Bienstock, 2006	

Table 2.

Proposed BWSQ metrics

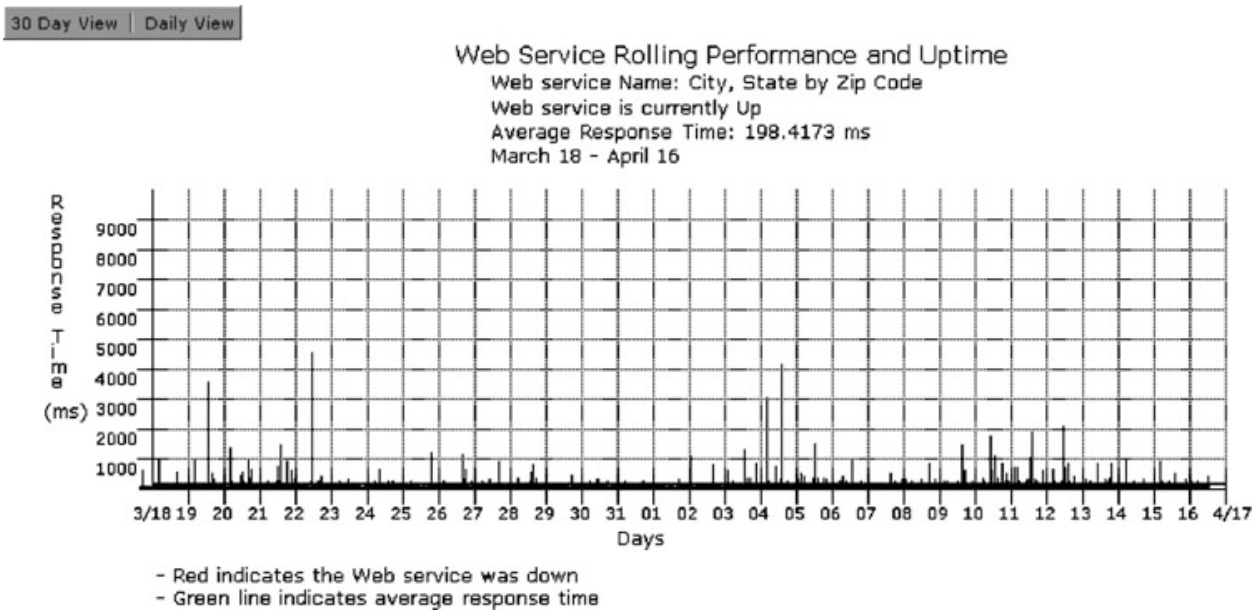

Figure 2.

Snapshot of the performance data provided on strikeiron.com

Web service in the required dimensions proposed in BWSQ metrics. Another WSEM-Amazon.com provides success stories of their clients. In our content analysis we found that in most cases, these success stories do not focus on aspects of the Web service quality and performance. Instead, these success stories concentrate on one or two successful aspects of a Web service instead of providing a complete evaluation of a Web service. Hence, these success stories essentially fail to capture the clients' feelings and satisfaction level in an objective comprehensive manner.

To summarize, our content analysis identifies the lack of appropriate performance and quality measures of Web services in the WSEMs. The existing feedback mechanisms and the performance and quality measures on the WSEMs fail to incorporate the view that whenever organizations buy a Web service from another company on a WSEM, they enter a B2B exchange relationship and create an information value chain. In such service based business relationship between clients and vendors, technical measures alone are not adequate to measure the quality and performance of Web services consumed by clients. For example, our content analysis reveals there is no information regarding the privacy, recovery or support of a Web service on WSEM even though they are very important aspects of overall performance of a Web service. The business aspects of performance and quality we have proposed in the BWSQ need to be included together with technical performance measures to develop an effective feedback mechanism for Web services on WSEMs.

Limitations and Future Research

The concept of Web services and Web service Electronic Marketplace are relatively new. Consequently, a comprehensive quality and performance metrics of the Web services as business services on WSEMs are missing in the extant literature. To address this gap in the literature, this paper provides comprehensive performance and quality measure metrics [End Page 56] to evaluate the performance and quality of Web services on WSEMs and takes an important first step toward building an effective feedback mechanism for Web services on WSEMs. However, while we have developed BWSQ metrics based on the theory based speculations, we have not validated its comprehensiveness through primary data from the actual users and buyers of the Web services. In future we intend to validate the proposed metrics by conducting focus group interviews with people who have experience of buying Web services for personal and/or company use.

The other limitation of our paper is that we have not tested the effectiveness of proposed quality and performance metrics in terms of improving decision quality of the buyers in choosing Web service on WSEMs. In future, we would like to extend our study to address this limitation. Despite these limitations, this paper takes a very important first step in developing a comprehensive quality and performance measure metrics of Web services on WSEMs. We believe these metrics can become the foundation of an effective feedback mechanism for Web services on WSEMs.

Conclusion

Efficient feedback mechanism is one of the most important features of building an effective online marketplace (Pavlou and Gefen, 2004). While the concept of Web services and Web service Electronic Marketplace are relatively new, they are receiving much attention from practitioners and academics. An effective reputation system and feedback mechanisms are required for WSEMs to be successful. To build such mechanism, a critical requirement is to develop a comprehensive quality and performance metrics for the Web services on the marketplace. This paper conceptualizes Web services on WSEMs as multi-channel business service and develops a comprehensive metrics to evaluate the performance and quality of Web service. This is an important step towards building an effective feedback mechanism for WSEMs.

The results of our content analysis demonstrate that current WSEMs lack these features, either partially or completely. This implies that existing WSEMs in their present state fail to fulfill the required characteristics of an effective marketplace. An effective reputation system and feedback mechanisms are required for WSEMs to be successful. This paper provides a comprehensive performance and quality metrics for Web services and provides guidance on how the current feedback mechanisms of WSEMs can be enhanced to provide a more comprehensive view of the reputation of Web services on WSEM, which is critically needed for their large scale adoption and diffusion.

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Appendix A

Performance metrics check sheet:

Technical measures:

From System:

Availability □ Accessibility □ Latency □ Throughput □

User input:

Environment Quality □

Information Quality □

Non-Technical Business measures:

User input:

Privacy:

Security and Privacy indicators □ As perceived by the users □

Support:

Responsiveness □ Reliability □ Competence □ Empathy □ Training □

Service Recovery:

Interactive fairness □ Procedural Fairness □ Outcome fairness □

Outcome quality:

Reliability □ Functional Quality □ Emotional benefit □ [End Page 59]