A QOS-Aware Software Selection Method Based On Service Credibility Evaluation

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Abstract-
In this paper there exist so many Softwares that share same or similar functional properties; so it is often a challenging effort to select credible and optimal software based on their various history QoS records. In view of this challenge, a novel QoS-aware software selection method based on service credibility evaluation is put forward, based on credibility evaluation associated with negotiated QoS dimensions. More specifically, the historical empirical data, execution logs and customer reviews of software, are used for evaluation purpose.

Keywords—Software selection, QOS, credibility evaluation

I.INTRODUCTION

There is a growing trend for IT systems to be integrated across organizational boundaries.There exist so many Software's that share same or similar functional properties; so it is often a challenging effort to select credible and optimal software based on their various history Quality of Service (QOS) records. In view of this challenge, a novel QOS-aware software selection method based on service credibility evaluation is put forward, based on credibility evaluation associated with negotiated QoS dimensions. More specifically, the historical empirical data, i.e., execution logs and customer reviews of software, are used for evaluation purpose.

In Service Oriented Architectures (SOA) complex business applications can be described as composed business processes constituted by a set of individual abstract Web services [4]. At run-time, SOA mechanisms select the best set of concrete Web services which support the given abstract descriptions in order to guarantee the fulfillment of Quality of Service (QOS) constraints.

To initiate a service-provisioning relationship, the client first identifies the service that it desires, then arranges the permissions required for the service to be delivered to the point at which it wishes to access it, typically the client's own interface to the Internet. This may mean entering into one or more service-provisioning relationships, possibly governed by formalized agreements.A client is exposed to two major risks when entering an electronic-service outsourcing relationship: First, the service may not meet some requirements necessary to deliver the value that the client expected to receive as a consequence of using the service. This will result in a cost to the client, either directly or in terms of lost revenue. Second, the client will usually have to make an initial investment to acquire or implement client software capable of using the service, or more generally to integrate the service into its IT infrastructure [8]. If the service ceases to work altogether within the expected period of service provisioning, degrades to the extent that it is no longer cost effective for the client to rely on the service, or if for any reason the service provider prematurely withdraws permission for the client to access the service, then the client will have lost some opportunity to recuperate those costs.

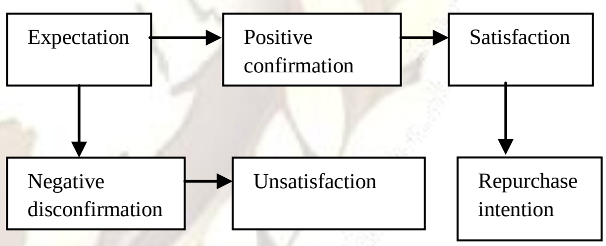

Fig.1. Customer Satisfaction Model

II.PROSPECTIVE AND LITERATURE WORKS

We consider five generic quality criteria for elementary services: (1) execution price, (2) execution duration, (3) reputation, (4) reliability, and (5) availability.

Execution price. Given an operation op of a service s, the execution price qpr(s; op) is the fee that a service requester has to pay for invoking the operation op. Web service providers either directly advertise the execution price of their operations, or they provide means for potential requesters to inquire about it [9].

Execution duration. Given an operation op of a service s, the execution duration qdu(s; op)measures the expected delay in seconds between the moment when a request is sent and the moment when the results are received. The execution duration is computed using the expression qdu(s; op) = T process(s; op) + Ttrans(s; op), meaning that the execution duration is the sum of the processing time T process(s; op) and the transmission time T trans(s; op). Services advertise their processing time or provide methods to inquire about it [1] [9]. The transmission time is estimated based on past executions of the service operations, i.e., T trans(s; op) = Pni=1 Ti(s;op)n , where Ti(s; op) is a past observation of the transmission time, and n is the number of execution times observed in the past.

Reliability. The reliability qrel(s) of a service s is the probability that a request is correctly responded within the maximum expected time frame indicated in the Web service description. Reliability is a measure related to hardware and/or software configuration of Web services and the network connections between the service requesters and providers. The value of the reliability is computed from data of past invocations using the expression qrel(s) = Nc(s)=K, where Nc(s) is the number of times that the service s has been successfully delivered within the maximum expected time frame, and K is the total number of invocation.

Availability. The availability qav(s) of a service s is the probability that the service is accessible. The value of the availability of a service s is computed using the following expression qav(s) =Ta(s)= , where Ta is the total amount of time (in seconds) in which service s is available during the last seconds (is a constant set by an administrator of the service community). The value of may vary depending on a particular application. For example, in applications where services are more frequently accessed (e.g., stock exchange), a small value of gives a more accurate approximation for the availability of services. If the service is less frequently accessed(e.g., online bookstore), using a larger value is more appropriate. Here, we assume that Web services send notifications to the system about their running states (i.e., available, unavailable).

Reputation. The reputation qrep(s) of a service s is a measure of its trustworthiness. It mainly depends on end user's experiences of using the service s. Different end users may have different opinions on the same service. The value of the reputation is defined as the average ranking given to the service by end users, i.e., qrep = Pni=1 Rin , where Ri is the end user's ranking on a service's reputation, n is the number of times the service has been graded. Usually, end users are given a range to rank Web services.

III.METHODOLOGY FOR A MARKET SCIENCE

In this section, we show how network performance, customer satisfaction and service profitability are related in market science research, and present our modeling methodology. A key driver of our approach is the well-established expectancy disconfirmation theory, which relates expectation, perceived quality and disconfirmation to customer satisfaction [1][6]. The perceived quality refers to the service utility a customer obtains from service usage, while expectation represents the expected utility a customer formulates before using the service .Disconfirmation is then the discrepancy between the expectation and the perceived quality. This theory in a customer satisfaction framework (Fig. 1).
They consider disconfirmation to have a positive and a negative component that are influenced by expectation and perceived quality. The customer satisfaction is then a function of perceived service quality and both components of disconfirmation [1]. The perceived quality is affected by expectation based on the observation: when the difference between expectation and perceived quality is small, customer tends to equate perception to expectation. Furthermore, the level of disconfirmation is pos-itively related to ease of evaluating quality. For network services, the ease of evaluating quality is high as service quality can be readily measured based on the network performance and the application requirements. Hence there is very little ambiguity in customer’s perception of quality, and we simplify away this factor in our customer satisfaction relationships. Furthermore, their claim that expectation influences perception is controversial as a number of important findings, supports the theory that perceived quality influences expectation via a dynamic update process.

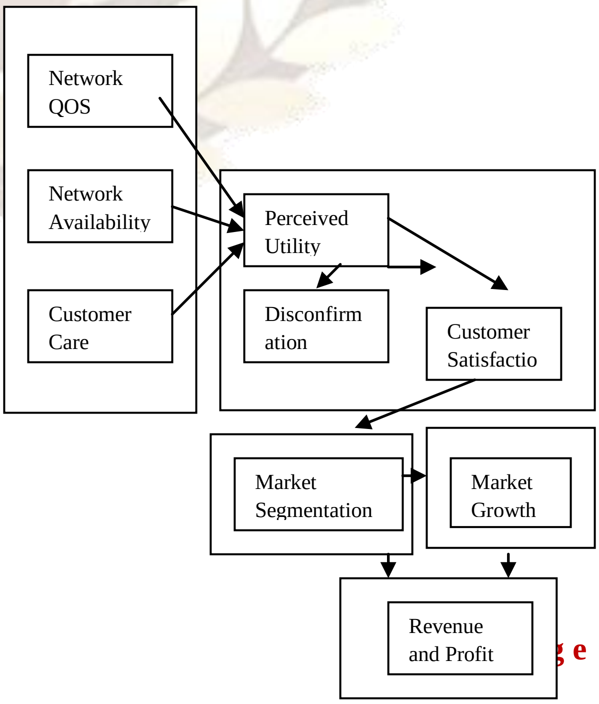

Fig.2. Profitability of Modelling Service

V.SIMULATION SETUP AND RESULTS

The QoS dimensions could be classified into the following two categories, i.e., negotiable dimensions and nonnegotiable dimensions.

--**Negotiable dimensions**. The value of a negotiable dimension may vary at runtime according to the service requestor's requirements.

--**Nonnegotiable dimensions**. The value of a nonnegotiable dimension of a service is determined by its historical execution records and cannot be modified by the provider.

For instance, price is a negotiable dimension, as a user may accept a higher price for higher quality of service, e.g., less execution time or higher availability. On the contrary, the successful execution rate and reputation of the service are nonnegotiable, as their values can not be determined by the service provider. Besides, from the perspective of a user, QoS dimensions can be classified into positive dimensions and negative dimensions. For positive dimensions, the higher the value is, the higher the quality is; while for negative dimensions, the higher the value is, the lower the quality is. TABLE III gives a simple description of five frequently-used standard QoS dimensions, as well as their categories and properties.

The credibility of nonnegotiable QoS dimensions

The credibility of nonnegotiable QoS dimensions is computed by (1) and the result is illustrated in TABLEI.Forexample,Cq2(S1)=(0.90+0.95+0.80+0.75+0.90+0.60+ 0.95+0.95+0.95)/8=0.85. As the constraint on successful rate in request RQ is [0.8,1] and 0.75∉[0.8,1], so service S3 is Abandoned.

The credibility of negotiable QoS dimensions

Then compute the credibility of negotiable QoS dimensions by formula (2)-(4), suppose α=0.3 and β=0.7. According to the description of PIS and NIS, PIS=(10,1,3) and NIS=(15,0.85,5). The intermediate result and the credibility of negotiable dimensions are proposed in TABLE II Take service S1 for example, the calculation processes is deduced as follows: execution log S1-2, S1-3, S1-5 and S1-7 cover the user's QoS constraints, so

Count1=4

C1=4/max{4,3}=1

AVG1(q3)=(15+12+15+12)/4=13.5

AVG1(q4)=(0.95+0.9+0.85+0.95)/4=0.9125

AVG1(q5)=(4.1+4.5+4.2+4.0)/4=4.2

DIST(AVG1, NIS)=0.651

DIST(AVG1, PIS)=1.091

Q1=DIST(AVG1,NIS)/[DIST(AVG1,NIS)+DIST(AVG1,PIS)]

= 0.651/(0.651+1.091)=0.374

Cneg (Si)=0.3×1.0+0.7×0.374=0.5618

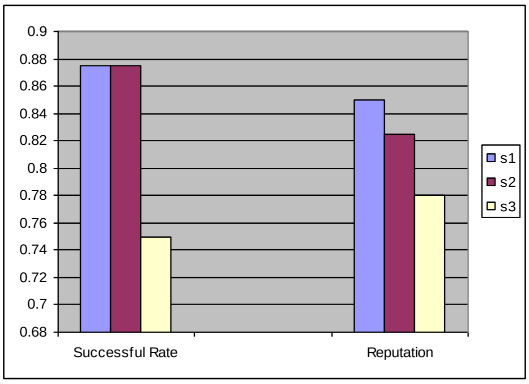

Fig 3. CREDIBILITY OF NONNEGOTIABLE QOS DIMENSION

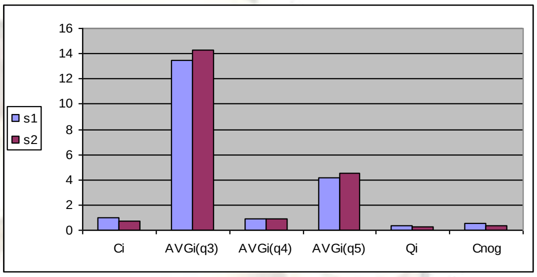

Fig 4.CREDIBILITY OF NEGOTIABLE QOS DIMENSIONS

TABLE I
CREDIBILITY OF NONNEGOTIABLE QOS DIMENSION

Service	Successful rate(Cq1)	Reputation(Cq2)
S1	0.875	0.85
S2	0.875	0.825
S3	0.75	0.78

TABLE II
CREDIBILITY OF NEGOTIABLE QOS DIMENSIONS

Service	Ci	AVGi (q3)	AVGi (q4)	AVGi (q5)	Qi	Cnog
S1	1.0	13.5	0.91	4.2	0.37	0.56
S2	0.75	14.3	0.90	4.5	0.25	0.39

TABLE III
CATEGORIES OF TYPICAL QOS DIMENSIONS

QoS Dimension	Category	Property
price	negotiable	negative

Execution time	negotiable	negative
Reputation	nonnegotiable	positive
Successful rate	nonnegotiable	positive
Availability	negotiable	positive

VI.CONCLUSION

In this paper, more specifically, the historical empirical data, execution logs and customer reviews of software, are used for evaluation purpose. Many types of Software that share same or similar functional properties; so it is often a challenging effort to select credible and optimal software based on their various history QoS records.

Trust is commonly assessed through reputation systems; however, existing systems rely on ratings provided by consumers. This raises numerous issues involving the subjectivity and unfairness of the service ratings.

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