Perceived significance of information security governance to predict the information security service quality in software service industry

An empirical analysis

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Abstract

Purpose – Information security is a growing concern in society, across businesses and government. As the offshore IT services market continues to grow providing numerous benefits, there are also perceived risks with respect to the quality of information security delivered in the supply chain. This paper aims to examine, as a case, the perceptions of Indian software services provider (service provider) employees with respect to information security governance and its impact on information security service quality that is delivered to customers.

Design/methodology/approach – The paper provides a framework built upon the existing dimensions and instruments for total quality management and service quality, suitably modified to reflect the context of information security. SmartPLS, a structural equation modelling technique, has been used to analyse field survey data collected from across various Indian cities and companies.

Findings – Significant finding is that information security governance in an IT outsourcing company providing software services has a highly significant impact on the information security service quality, which can be predicted. The paper also establishes that there is a positive relationship collectively between elements of information security governance and information security service quality.

Research limitations/implications – Since data used in this study were taken solely from the responses of employees of outsourced service companies in India, it does not show if this translates into service improvements as perceived by the customer.

Practical implications – Information security governance should be made an integral part of corporate governance and is an effective strategic technique, if software outsourcing business enterprises want to achieve a competitive edge, provide client satisfaction and create trust.

Originality/value – The paper presents empirical data validation of the connection between information security governance and quality of service.

Keywords Corporate governance, Supply chain, TQM, IT outsourcing, Information security governance, Information security service quality, Indian software service providers

Paper type Research paper

Introduction

With the increase of IT systems and networks across the globe, there is an increasing demand for software services, which can be broken down into their constituent parts and traded (UNCTAD, 2004), which leads to and is fuelling the unstoppable growth of IT outsourcing business (Gonzalez *et al.*, 2009). The increasing complexity of IT systems and networks is also presenting a mounting information security challenge for both the providers and users. At present, in terms of world ranking, India is at the top the global IT outsourcing supply chain (Bahl *et al.*, 2011). Information security assurance along with corporate governance, risk management, quality and other factors are essential parameters in selecting an IT outsourcing partner and they are a necessity to establish India as a trusted hub for software services outsourcing (Bahl *et al.*, 2011). It is evident that there are various factors that determine the success of an outsourcing relationship. Corporate governance and quality are essential factors while information security poses challenges. In this study we investigate whether information security governance as part of corporate governance has an impact on information security service quality as part of quality from the software services industry (service provider) perspective.

Theoretical background

Outsourcing

Today pervasive use of technology has resulted in businesses being critically dependent on information technology (IT) and more so in the knowledge based economy. The advances in information and communication technology have increased the velocity of globalization while bringing about new opportunities and issues to be addressed. Milberg and Schöller (2008) in their paper note that a new wave of globalization not previously witnessed has international trade, investments and technology linked inseparably within global supply chains. Services (including IT services) which are becoming crucial and critical from a competitive advantage perspective are taking a centre stage, in the context of the knowledge economy (Bahl *et al.*, 2011). There is a vast body of existing knowledge regarding outsourcing ranging from benefits and implications of outsourcing, key risks and their management during outsourcing, process view to security frameworks for outsourcing (Agarwal *et al.*, 2005; Aris *et al.*, 2008; Benvenuto *et al.*, 2005; Fink, 1994; Gonzalez *et al.*, 2006, 2009; Ilie and Parikh, 2004; Jorek *et al.*, 2009; Khan *et al.*, 2003; Lacity *et al.*, 1996; Raisinghani *et al.*, 2008; Rajkumar and Mani, 2001; Saitta and Fjermestad, 2005; Tafti, 2011).

It is documented in prior research that information systems outsourcing is a strategic management practice and is currently going through an unstoppable growth stage (Gonzalez *et al.*, 2009; Klepper and Jones, 1998). Milberg and Schöller (2008) note that it would be unthinkable to offshore without low-cost IT "and IT would not be as low cost if not for the effective extension of global supply chains into low-wage countries." This means that the developed and developing nations are dependent on each other. Outsourcing software services is one of the dominant strategies followed by a majority of business enterprises in the developed nations to achieve a competitive edge.

Quality a part of corporate governance

For business enterprises wanting to achieve a competitive edge, quality is considered as an effective strategic technique (Omachonu and Ross, 2004). Quality is essential for the economic health of an organization and hence is a part of the corporate governance of

business enterprises. The corporate governance code for Romania (Gregory, 2002), clearly mentions that the essential information to be put at the board's disposal should include complaints regarding reliability of products manufactured or quality of services performed, amongst other items as part of the board information flow, materials and presentations. One of the key roles of corporate governance is to manage risks, including quality risks, for all the stakeholders in an appropriate manner. Managing quality risks should be the standard way for the enterprise to do its business else it could have an impact on either the producer or the customer or the stakeholders (Bertin, 2005). The probability of the quality defect type determines who would be impacted and (Bertin, 2005) points out that there are three quality defect types evident. This can be clearly understood through Table I (Bertin, 2005) in terms of how operational performance of an organisation can impact customers, markets, producers and the shareholders.

Corporate governance is one of the critical factors that influences corporate performance and competitiveness (Mayer, 2002). IT was treated as a support service and there is a need for companies to understand how IT can create a substantial and sustainable competitive advantage (Porter and Millar, 1985). Lodahl and Redditt (2009) point out that "most companies still manage IT to minimize its cost rather than to maximize its contribution" and in their work they found that the IT "contribution measure accounts for half the variance ($R^2 = 0.52$) in company profit margins normalized by industry". This reinforces the significant role of IT governance as part of corporate governance. The same is brought out in much detail with respect to the difficulty and criticality of this crucial operational area to be a part of corporate governance (Trautman and Altenbaumer-Price, 2011). It is seen that IT and thereby information continues to increase in organizations in their quest to be competitive, continue creating value and thereby economic wealth in the global economy. Increasingly information is handled, processed, transported or stored in IT systems including in the supply chain. This makes information a pervasive critical asset for an organization and its survival. Hence this critical asset, information, needs to be safeguarded and protected.

Information security a part of quality
Over the past few years, many organizations have suffered severe losses, failures and extinction due to the inadequate security, privacy and governance of this critical asset. It is for this reason that corporate, IT and security governance need to be aligned and

Quality risk		Delivers promise to customer	
		Yes	No
Know what customer really needs		Service delivered is competitive	Type I defect: fails to deliver design
	True	Managed risk	Producer's risk
		Type II defect: design fails need	Type III defect: service delivered is not competitive
	False	Consumer's risk	Shareholder risk

Notes: α quality risk – probability of type I defect; β quality risk – probability of type II defect; γ quality risk – probability of type III defect
Source: Adapted from Bertin (2005)

Table I.
Quality risks

that security is not only a technology issue and hence not just contained within IT governance (Commonwealth of Australia, 2006). COBIT, for example, is an IT governance framework, helps in auditing the deployment of IT resources and the production processes. It focuses on operational IT systems. von Solms (2001) makes a clear case for information security to be an integral part of corporate governance. The need for cybersecurity, disaster recovery and business continuity planning is also discussed in detail by Trautman and Altenbaumer-Price (2011) from a corporate governance perspective.

The code of practice BS7799 for information security, accepted by the ISO in the ISO/IEC 27000 family and also aligned with ISO 9000 (quality management), focuses on the management of information security by defining it as the preservation of confidentiality, integrity, and availability of information (ISO/IEC 27001, 2009; Saint-Germain, 2005). This code of practice considers security to be a part of quality as it is based on the continuous improvement "plan-do-check-act" cycle which is used for quality (ISO 9000) and is also known as the Deming cycle or PDCA. Woody (2005) mentions that security is a quality area, a shared responsibility across the organization, is an emergent property and does not have absolute requirements. A failure to recognise poor system/security quality is an organizational risk leading to organizational liability (Woody, 2005). It is estimated that the security and reliability faults causing breakdowns and repairs in software, cost the economy US$59.5 billion annually (Mead *et al.*, 2005). The return on investment ranges from 12 to 21 per cent when security engineering practices and requirements are introduced early in the software development cycle by organizations (Mead *et al.*, 2005).

Firesmith (2003) has shown how quality can be decomposed into its relevant component factors (attributes or characteristics) and subfactors (parts) while establishing clearly that security along with safety and survivability are quality factors. Information security has been identified as a dimension of information quality and further characterized as dependable information for service quality (Kahn *et al.*, 2002). The roots of information quality have been traced to total quality management (TQM), through which the requirements and expectations of the customer and the objectives of the business enterprises are fulfilled in an efficient and cost-effective way (Levis *et al.*, 2007).

Total quality management and service quality
There is a rich literature available for TQM and various quality specialists such as Deming, Taguchi, Juran, Feigenbaum, Crosby, Shingo, Taylor and Ishikawa have contributed to its theory and concepts over the years (Ghobadian *et al.*, 2007; Gupta *et al.*, 2005; Narasimhan and Kannan, 2011). It is well established in literature that TQM, comprising of both technical (hard) and social (soft) dimensions, improves competitiveness of business enterprises. There are various documented approaches in literature for implementing, awarding and benchmarking the overall TQM practices of an organisation to achieve business excellence. Malcolm Baldrige National Quality Award (MBNQA) and European Foundation for Quality Management (EFQM) are the dominant approach examples in literature which have been established as TQM frameworks across industry categories (Bou-Llusar *et al.*, 2009; Ford and Evans, 2000; Meyer and Collier, 2001; Fotopoulos and Psomas, 2009). There are seven key strategic components of TQM, based on the MBNQA – leadership; strategic planning; customer and market focus; human resource/workforce focus; process management;

measurement, analysis and knowledge management; and results (Baldrige National Quality Program, 2008, 2011-2012; Samson and Terziovski, 1999) as shown in Figure 1.

The MBNQA determinants have been empirically tested by Curkovic *et al.* (2000) using structural equation modelling (SEM) and found to match the definitions of TQM. Researchers have also provided survey instruments that they have used in their research and contribution to TQM (Samson and Terziovs, 1999; Black and Porter, 1996; Cook and Verma, 2002).

To be competitive and a market leader, organisations need to deliver superior customer value by focusing on all three value disciplines (operational excellence, product/service leadership, customer intimacy) wherein they meet industry standards in two of them and excel in the third (Michael and Fred, 1993). To deliver scalable services which are emphasised by reliability and efficiency while being produced and delivered at competitive/lowest cost is a specific strategic approach for achieving operational excellence (Michael and Fred, 1993). To achieve operational excellence organisations need to focus on their internal processes and controls. The focus thus is on governance/TQM and service quality. The trade of outsourcing software services between customers and the service providers providing software services is a service encounter. This service encounter, where the customer interacts with the service providers front layer employees, is the key in determining customer satisfaction, building customer trust, building service providers brand identity and increasing customer loyalty (Bahl *et al.*, 2011). Service quality (providing high quality and value added information systems services in the best interest of the customers) of the service provider is important for outsourcing success along with partnership elements like trust (Grover *et al.*, 1996). Extensive research has been carried out in the area of service quality over the years. Services tend to be intangible, the customer is involved in their creation,
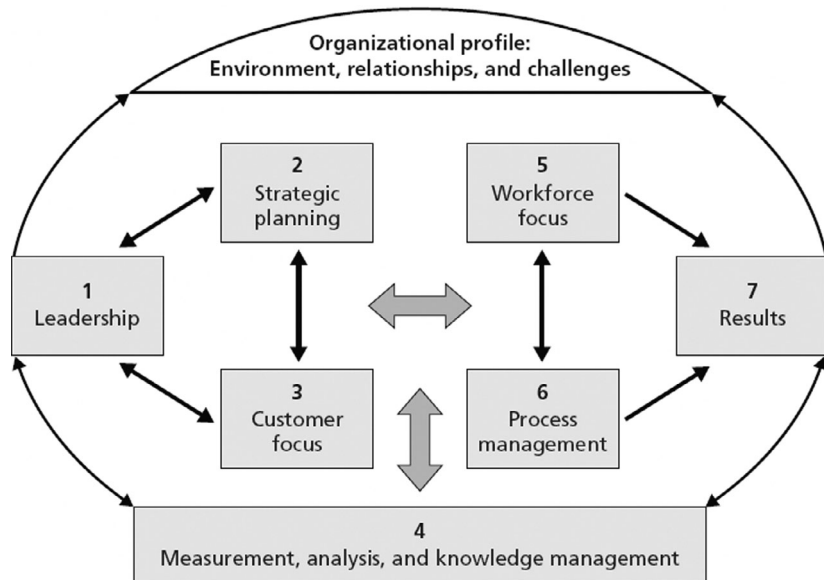

Figure 1.
Strategic components of TQM

Source: Baldrige National Quality Program (2008, 2011-2012)

they are processes and also dependent on the behaviour of the service provider thus making them difficult to evaluate as compared to goods/products (Grover *et al.*, 1996). The most widely accepted and cited service quality model in research is the GAP model from Parasuraman, Zeithaml, and Berry (Seth *et al.*, 2005; Urban, 2009). With respect to this model, service quality is widely defined in published research as the gap or difference or comparison between the service expectation by customers from a service provider and actual service perceived to be delivered to the customer by the service provider. The conceptual framework from Parasuraman, Zeithaml, and Berry for service quality identifies five dimensions that customers consider in their assessment of service quality – reliability, responsiveness, assurance, empathy and tangibles (Parasuraman *et al.*, 1985; Samat *et al.*, 2006; Seth *et al.*, 2005; Asubonteng *et al.*, 1996). To assess the service quality, a 22 item instrument, popular in literature as SERVQUAL tool is available which helps to assess the gap between customers' perceptions and expectations and has been found to be appropriate for measuring information systems service quality (Parasuraman *et al.*, 1988, 1991; Samat *et al.*, 2006; Seth *et al.*, 2005; Asubonteng *et al.*, 1996; Watson *et al.*, 1998). The gaps between expectations which are customer driven and perceptions which are formed based on service providers services and behaviour can be studied using the service quality model. It is important to understand that information systems service quality is an ongoing commitment requiring action at strategic, tactical, and operational levels thus linking it to corporate strategy (Watson *et al.*, 1998).

Research model and hypothesis
Since information security is a part of governance and quality, it is also an integral part of TQM and service quality. Thus, there is a link between information security governance (based on MBNQA framework for TQM) and information security service quality (based on SERVQUAL). The results dimension of MBNQA framework is the final outcome based on its remaining six dimensions interaction with service quality. In our research we have considered the six dimensions of MBNQA and five dimensions of SERVQUAL. With respect to service quality, we have studied the perceptions from the employees perspective who are providing the services to customers. The motivation of this research paper is to build upon the existing dimensions and instruments for TQM and service quality and modify them to reflect the context of information security. In addition, this also helps us to ensure the control of measurement error. We have administered these instruments on employees at the Indian software service providers end to study:

- Their perception of information security governance that the Indian software service providers follow.
- The service quality that is followed at the Indian software service providers in terms of their perception of what the customer expects which is ideal and their perception of what they provide which translates to customer perception which is actual.

Our assumptions are that information security governance as part of corporate governance drives information security service quality based on policies, directions and monitoring in determining customer satisfaction, building customer trust, building service providers brand identity and increasing customer loyalty. Our hypothesis is that:

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H1. Governance of security services in an outsourcing company providing software services can predict the quality of security services.

H2. There is a positive relationship collectively between elements of security governance and security service quality.

Research design and methodology
Research design and sample
Our study uses survey methodology to gather the data. The survey respondents were security professionals in the Indian software service provider companies. We have received responses from 61 respondents from 22 companies which cover the following Indian cities – Bangalore, Chennai, Hyderabad, Delhi, Noida, Gurgaon, Lucknow, Bhubaneswar, Mumbai, Pune, giving an all India perspective where the outsourcing software services vendors are situated. The data was collected on a Likert scale, where 1 indicated minimum agreement and 7 indicated maximum agreement. The data demographics are as in Table II.

Measures of the construct
We have used measures that have been validated in previous research of TQM and SERQUAL to ensure the control of measurement errors. However, we have modified and constructed some measures to reflect the context of information security. Construct validity as well as structural coefficients are analyzed by SmartPLS (Ringle *et al.*, 2005), a software application for the design of structural equation models.

Data analysis and results – model testing and construct validity
Partial least square (PLS), a SEM technique has been used for modelling. The PLS procedure is a second-generation multivariate technique (Wold, 1989) which has been gaining interest and use among researchers specifically in computer science, management, accounting, marketing, operations management and psychology. It is a component based variance analysis method and determines the prediction relevance of latent variables; meaning how well a specific construct value can be predicted by another construct value (Jöreskog and Wold, 1982). Hence PLS is a prediction-oriented model.

	Percentage
Region	
North and East India	32.78
West India	19.67
South India	47.55
Age group	
25-30	29.5
31-40	34.43
Above 41	36.07
Service years	
1-5	29.5
6-10	29.5
11-15	24.6
16 and above	16.4

Table II.
Data demographics

PLS enables the specification of both the relationships among the constructs and the measures underlying each construct (Wold, 1989). PLS is similar to regression, but can assess the measurement model (i.e. relationships between a latent variable and its indicators) and structural model (i.e. theoretical relationships among latent variables) simultaneously in one operation.

PLS has been used because the primary concern is the prediction of dependent endogenous variables. PLS generates latent variable scores that can be used to predict a model, does not impose homogeneity or normality requirements on the data, can be used to analyze a model that incorporates reflective variables, and it is a powerful data analysis technique even when a sample size is small – recommendation of a minimum sample size of 40 may be sufficient, can be used for complex and simple models (Chin, 1988b; Chin *et al.*, 1996; Chin and Newsted, 1999; Goodhue *et al.*, 2006; Lehner and Haas, 2010).

In our research we have used the data collected for:

- security governance through 28 questions as follows: four for leadership, four for strategic planning, five for customer and market focus, six for human resource/workforce focus, five for process management and four for measurement, analysis and knowledge management; and

- security service quality through 22 questions for what the employees at the Indian software service providers perceive what the customer expects which is ideal and 22 questions for their perception of what they provide which translates to customer perception which is actual.

The break up for the 22 questions in service quality is as follows: four for tangibles, five for reliability, four for responsiveness, four for assurance and five for empathy. We have provided the results for service quality by taking the actual values and also by taking the ratio of actual to ideal values. The questions are attached in the Appendix. PLS technique has been used on the empirical data to carry out the following steps:

- testing the validity and reliability of each question/item;

- testing the internal consistency and validity of the measurement model;

- testing the structural model to find out if there is a positive relationship collectively between elements of security governance and security service quality;

- testing the structural model to find out if there is any impact between security governance and security service quality; and

- testing the proposed research model to find out if security governance can predict security service quality in an outsourcing organisation.

Testing of individual item
A construct has sufficient reliability if the value of Cronbach's α is more than 0.7. α should be greater or equal to 0.80 for a good scale, 0.70 for an acceptable scale, and 0.60 for a scale for exploratory purposes (Cronbach, 1951). The average variance extracted (AVE) by each construct should exceed 0.50 to have convergent validity or unidimensionality (Fornell and Larcker, 1981). It is observed in Tables III and IV that the criteria for α and AVE are met.

All the standardized loadings of the individual items (in the survey questions the 2P notation is used for service quality and 4P notation for governance) were over the acceptable cutoff level of 0.6 (Chin, 1998a) and significant as per the *t*-statistics.

	AVE	Cronbach's α
Analysis	0.692401	0.84924
Assurance	0.746683	0.886807
Cust and mkt focus	0.533709	0.786852
Empathy	0.592809	0.825288
HR focus	0.627724	0.882284
Leadership	0.65325	0.82316
Planning	0.703636	0.860738
Process	0.639036	0.857346
Reliability	0.596569	0.829956
Responsiveness	0.73194	0.87659
Tangibles	0.525433	0.698719

Table III.
Actual

	AVE	Cronbach's α
Analysis	0.695458	0.849240
Assurance	0.769987	0.900482
Cust and mkt focus	0.539878	0.786852
Empathy	0.643411	0.861207
HR focus	0.628389	0.882284
Leadership	0.641382	0.823160
Planning	0.703708	0.860738
Process	0.638737	0.857346
Reliability	0.576366	0.813923
Responsiveness	0.855353	0.942979
Tangibles	0.530499	0.715973

Table IV.
Ratio (actual to ideal)

Therefore, considering the α values, AVE and loading values (as per Table V), reliabilities of each item are acceptable.

Testing of overall model

Having established the validity and reliabilities of each individual item, we have proceeded to test the overall model. In the first stage the measurement model is evaluated or the assessment of the outer model is carried out and in the second stage the structural model is evaluated or the assessment of the inner model is carried out.

First stage.

Reliability. The internal consistency of the constructs used is assessed by composite reliability. The acceptable values for composite reliability would be the same as those for Cronbach's α (Chin, 1998b; Fornell and Larcker, 1981; Höck and Ringle, 2010). This is validated in Tables VI and VII.

Validity – convergent and discriminate validity. To establish convergent validity or unidimensionality, AVE is used. It reflects the average communality for each latent factor and in an adequate model, AVE should be greater than 0.50 (Fornell and Larcker, 1981) as confirmed in Tables VI and VII.

The discriminate validity at an indicator level is evaluated by the cross loading test. In this case the loading of each indicator is expected to be greater than all of its cross-loadings. The latent variable predicts each variable in its construct better than

	Original sample	*t*-statistics
2P1 ← tangibles	0.711595	4.508067
2P10 ← responsiveness	0.819070	22.820440
2P11 ← responsiveness	0.909306	38.821014
2P12 ← responsiveness	0.915367	40.598663
2P13 ← responsiveness	0.771366	13.085916
2P14 ← assurance	0.903626	47.181396
2P15 ← assurance	0.920434	51.774545
2P16 ← assurance	0.802724	16.997436
2P17 ← assurance	0.824628	25.030263
2P18 ← empathy	0.770116	14.869049
2P19 ← empathy	0.617683	4.368160
2P2 ← tangibles	0.766316	12.524096
2P20 ← empathy	0.815036	25.076755
2P21 ← empathy	0.871600	34.540906
2P22 ← empathy	0.750942	13.316180
2P3 ← tangibles	0.775072	5.797492
2P4 ← tangibles	0.636649	4.659796
2P5 ← reliability	0.729709	15.840081
2P6 ← reliability	0.763946	13.332301
2P7 ← reliability	0.874719	35.290294
2P8 ← reliability	0.763115	20.163630
2P9 ← reliability	0.715281	10.357237
4P1 ← leadership	0.820946	20.071421
4P10 ← cust and mkt focus	0.734888	11.265427
4P11 ← cust and mkt focus	0.699714	9.916139
4P12 ← cust and mkt Focus	0.723023	9.648537
4P13 ← cust and mkt Focus	0.655728	7.647381
4P14 ← analysis	0.671638	7.818585
4P15 ← analysis	0.935625	63.417075
4P16 ← analysis	0.802302	9.420242
4P17 ← analysis	0.893662	30.661010
4P18 ← HR focus	0.785732	14.850614
4P19 ← HR focus	0.833246	30.119004
4P2 ← leadership	0.797763	14.398064
4P20 ← HR focus	0.689852	9.964273
4P21 ← HR focus	0.820319	21.633616
4P22 ← HR focus	0.852116	21.490967
4P23 ← HR focus	0.762494	14.109818
4P24 ← process	0.809792	24.757479
4P25 ← process	0.718179	11.185515
4P26 ← process	0.857664	23.847066
4P27 ← process	0.834857	18.532827
4P28 ← process	0.768249	17.053738
4P3 ← leadership	0.793386	19.193371
4P4 ← leadership	0.820400	19.896873
4P5 ← planning	0.798780	16.591443
4P6 ← planning	0.912175	60.806513
4P7 ← planning	0.792430	17.082653
4P8 ← planning	0.846635	22.060815
4P9 ← cust and mkt focus	0.828517	25.650568

Table V.
Loading values

the other constructs when the correlations load is higher on the respective latent variables than other latent variables (Chin, 1998b). Within-construct item loadings should exceed the inter-construct cross loadings by at least 0.10 (Fornell and Larcker, 1981; Gefen and Straub, 2005) as seen in Tables VIII and IX.

The discriminate validity at a construct level is investigated by comparing the square root of the AVE with the correlations between the variables. The correlation between different variables should be lower than the square root of the AVE (Gefen and Straub, 2005) as confirmed in Tables X and XI.

	AVE	Composite reliability
Governance	0.771619	0.952932
Quality	0.749299	0.937206

Table VI.
Actual

	AVE	Composite reliability
Governance	0.770963	0.952728
Quality	0.869073	0.970746

Table VII.
Ratio (actual to ideal)

	Governance	Quality	t-statistics
A-assurance	0.485228	*0.884767*	34.358746
A-empathy	0.578021	*0.883954*	38.036846
A-reliability	0.504884	*0.860936*	22.476872
A-responsiveness	0.514757	*0.889169*	37.741185
A-tangibles	0.460725	*0.806520*	19.355049
Analysis	*0.879053*	0.431370	33.708849
Cust and mkt focus	*0.904556*	0.523427	53.685612
HR focus	*0.846883*	0.490874	30.280144
Leadership	*0.830723*	0.553273	29.947324
Planning	*0.882341*	0.536499	41.272529
Process	*0.923538*	0.553571	62.435607

Table VIII.
Actual

	Governance	Quality	t-statistics
Analysis	*0.897578*	0.426682	42.644853
Assurance	0.359324	*0.948382*	32.837001
Cust and mkt focus	*0.913001*	0.413774	52.952355
Empathy	0.422696	*0.936427*	32.295591
HR focus	*0.853753*	0.344969	27.025102
Leadership	*0.802000*	0.253604	19.074625
Planning	*0.876171*	0.311370	38.690896
Process	*0.920212*	0.311729	58.519667
Reliability	0.386706	*0.929564*	20.725785
Responsiveness	0.313240	*0.936630*	23.954954
Tangibles	0.373572	*0.909768*	24.825542

Table IX.
Ratio (actual to ideal)

Thus, sufficient reliability and validity of the outer model is established as part of the first stage.

Second stage. R^2 is the coefficient of determination used for assessing the proportion of variance in the dependent latent variable that can be accounted for by the independent latent variables. R^2 values should meet the 0.10 minimum limit (Hanlon, 2001; Santosa *et al.*, 2005). R^2 values of 0.67, 0.33, and 0.19 in PLS path models are substantial, moderate, and weak, respectively, (Chin, 1998b). The effect size of R^2 is classified into three categories (Kotrlik and Williams, 2003) – small (0.0196), medium (0.13), and large (0.26).

In our model, the value of R^2 is 0.348515 in the actual case and 0.161490 in the ratio case, which is statistically significant. In the actual case the effect size falls in the large category for quality, and in the ratio case the effect size falls in the medium category for quality as seen in Tables XII and XIII.

The path relationships were evaluated in terms of sign, magnitude and significance. A bootstrapping procedure using 5,000 sub samples was performed to evaluate the statistical significance of each path coefficient (Chin, 1998b; Henseler *et al.*, 2009). Critical *t*-values for a two-tailed test are 1.65 (significance level = 10 per cent), 1.96 (significance level = 5 per cent), and 2.58 (significance level = 1 per cent) (Gefen and Straub, 2005).

For the actual case, it clearly indicates that a 100 points change in governance will bring 59.0352 points change in quality. The values are positive and are at a significance level of 1 per cent which is highly significant, shown in Table XIV.

	Governance	Quality
Governance	0.878418	
Quality	0.590352	0.865621

Table X.
Actual

	Governance	Quality
Governance	0.878045	
Quality	0.401858	0.932241

Table XI.
Ratio (actual to ideal)

	R^2
Governance	
Quality	0.348515

Table XII.
Actual

	R^2
Governance	
Quality	0.161490

Table XIII.
Ratio (actual to ideal)

For the ratio case it indicates that a 100 points change in governance will bring 40.1858 points change in quality. The values are positive and are at a significance level of 1 per cent which is highly significant as seen in Table XV.

Thus, the hypothesis that there is a positive relationship collectively between elements of security governance and security service quality is validated.

Further it is validated that governance of security services in an outsourcing company providing software services has a highly significant impact on the quality of security services.

The Q^2 statistic measures the predictive relevance of the model (Geisser, 1974; Stone, 1974). A Q^2 greater than 0 means the model has predictive relevance. Values of 0.02, 0.15, and 0.35 signify small, medium, and large effects. Omission and estimation of data point depends on the chosen omission distance and it should be between five and ten (Hair *et al.*, 2011) (seven was selected). The cross-validated redundancy (instead of the cross-validated communality), should be used for the PLS path modelling approach (Hair *et al.*, 2011; Wold, 1982) for Q^2.

The Q^2 values are greater than 0, thus the model has predictive relevance as per Table XVI and XVII.

It can be seen that the values of Q^2 fall in the medium effect category for quality in the actual case (Table XVII) and in the small effect category for quality in the ratio case (Table XVII).

Thus, the hypothesis that governance of security services in an outsourcing company providing software services has a highly significant impact on the quality of security services and can be predicted is validated.

	Original sample	Sample mean	SD	SE	*t*-statistics
Governance → quality	0.590352	0.605186	0.101598	0.101598	5.810647

Table XIV.
Actual

	Original sample	Sample mean	SD	Standard error	*t*-statistics
Governance → quality	0.401858	0.435343	0.079425	0.079425	5.059590

Table XV.
Ratio (actual to ideal)

	1-SSE/SSO
Governance	0.671534
Quality	0.243573

Table XVI.
Actual

	1-SSE/SSO
Governance	0.650038
Quality	0.114569

Table XVII.
Ratio (actual to ideal)

In summary the empirical data validates our research model confirming that:

- the reliability of each question modified for information security and asked in the survey instrument is acceptable and highly significant;
- there is a positive relationship collectively between elements of security governance and security service quality; and
- security governance as part of corporate governance has a highly significant impact on security service quality and can be predicted.

Discussion and limitation

Our research shows that information security governance as part of corporate governance drives information security service. If the goal of the business leaders and managers of outsourcing business enterprises is to achieve a competitive edge, provide client satisfaction and create trust then as a strategy they need to make information security governance an integral part of corporate governance. This will help them manage information security risks:

- by understanding customer expectations and keeping their commitment to meet the customer expectation;
- by providing reliable service quality meeting the expectations of their customers; and
- reducing the service gap between customer perception and expectation.

This is turn shall help outsourcing business enterprises improve their economic health by providing scalable services to their customers, improve their return on information security investment and achieve operational excellence.

The limitation of this study is that it has only looked at the software outsourcing business enterprises in India. Future research should cover a larger sample from across more countries and also cover samples from other service industries from multiple countries. The survey data used in this study was taken solely from the responses of employees of outsourced service companies. The limitations of this data are that, while it clearly shows a link between information security governance and quality of service as perceived from within the service providers, it does not show how this may (or may not) translate into service improvements as perceived by the customer. Future research should be expanded with further studies comparing customer perceptions of outsourcers in which information security governance is internally perceived as strong (and contributing to total service quality) and those where it is perceived as weaker.

Given the growing importance of information security in today's connected world and more so in the future, we hope these findings would prove useful to other researchers and urge them to build upon our work in this field.

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Appendix. Survey instrument
Part 1
Directions. This survey deals with your opinion of the services that your organization provides to its customers specifically with respect to security. Based on your experience about the needs of customers, please think about the kind of organization that would deliver excellent quality of security service to its customers. Think about the kind of organization with which you would be pleased to be associated. Please show the extent to which you think such an organization would possess the security features described by each statement. If you strongly agree that the organization should possess a feature, mark/enter 7 in front of the statement. If you strongly disagree that the organization should possess a feature, mark/enter 1 in front of the statement. If your feeling is less strong, mark/enter one of the numbers between 1 and 7, i.e. 2, 3, 4, 5, or 6 in front of the statement. There is no right or wrong answers – all we are interested in is a number that truly reflects your expectations.

Part 2
Directions. This part deals with your feelings of the services that your organization provides to its customers specifically with respect to security. For each statement, please show the extent to which you believe your organization has the feature described by the statement. If you strongly agree that your organization has the feature, mark/enter 7 in front of the statement. If you strongly disagree, mark/enter 1 in front of the statement. If your feeling is less strong, mark/enter one of the numbers between 1 and 7, i.e. 2, 3, 4, 5, or 6 in front of the statement. There is no right or wrong answers – all we are interested in is a number that truly reflects your perceptions.

Strongly Disagree			Neither disagree nor agree			Strongly Agree
1	2	3	4	5	6	7

Please respond to ALL statements.

		Part 1	Part 2
1.	Organization has up to date technology and processes for security		
2.	The physical facilities are visually appealing and secure		
3.	The employees are well groomed, background checked and security aware		
4.	The security controls of physical facilities are in keeping with the kind of service provided		
5.	When the organization promises to do something (eg additional controls for security) by a certain time, they do so		
6.	When the customers have a problem (incident or security control related) the organization shows a sincere interest in solving it		
7.	The organization is dependable		

(*continued*)

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8.	They adhere to meeting security services (physical, network, application, people as required contractually) at the times they promise to do so		
9.	They provide error free security reports and records in a secure manner		
10.	They communicate to customers exactly when the security services will be performed		
11.	Employees/associates give prompt and secure services to customers		
12.	Employees/associates are always willing to help customers in matters relating to security		
13.	Employees/associates are never be too busy to respond to customers' requests on matters relating to security		
14.	The behavior of employees/associates consistently instills confidence in customers with respect to security		
15.	Customers feel safe in transacting business with the employees/associates		
16.	Employees/associates are consistently courteous and firm with respect to security processes, with customers		
17.	Employees/ associates have the requisite security domain knowledge to do their job well and keep their knowledge regularly updated		
18.	The organization gives each customer individual attention as warranted with respect to security		
19.	The organization does have operating hours as per the convenience of the customers in matters related to security		
20.	The organization has employees/associates who give personal attention to customers in matters related to security		
21.	The organization has customers best interests regarding security at heart		
22.	The employees/associates of the organization understand the specific security needs/regulatory requirements of their customers		

Part 4
Directions. Based on your experience in the organization/company, for each statement, please show the extent to which you believe your organization has the feature described by the statement. If you strongly agree that your organization has the feature, mark/enter 7 in front of the statement. If you strongly disagree, mark/enter 1 in front of the statement. If your feeling is less strong, mark/enter one of the numbers between 1 and 7, i.e. 2, 3, 4, 5, or 6 in front of the statement. There is no right or wrong answers – all we are interested in is a number that truly reflects your views.

	Strongly Disagree			Neither disagree nor agree			Strongly Agree
	1	2	3	4	5	6	7

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Please respond to all statements:

(1) Senior managers actively encourage change and implement a culture of trust, involvement, and commitment in moving towards security best practices.

(2) The company proactively pursues continuous security improvement rather than reacting to crisis' "firefighting".

(3) There is a high degree of unity of purpose when it comes to security throughout the company, and it has eliminated barriers between individuals and departments.

(4) Senior managers display security commitment through involvement in security activities and communication of security values.

(5) The company has a security vision and mission statement that has been communicated throughout the company and is supported by employees/associates.

(6) The company has a comprehensive and structured security planning process that regularly sets and reviews short and long term goals.

(7) The company considers its security operational capabilities, customer security requirements, and the community security needs when developing its plans, policies, and objectives.

(8) Security operations are effectively aligned with the overall business mission of the company.

(9) The company knows its customers' current and future security requirements so as to provide relevant and timely security service offerings/processes.

(10) The customer security requirements are communicated and understood throughout the work force.

(11) The company has a process for resolving customers' security related complaints.

(12) The company uses customer satisfaction as a method to initiate improvements in current security processes.

(13) The company regularly measures customer satisfaction in security.

(14) The company analyzes competitors security service offerings and processes to help improve its own service offerings and processes.

(15) The company collects data and information to support security performance improvement efforts.

(16) The company analyzes security related operational performance, cost and financial data to support the development of priorities for improvement.

(17) The company has procedures to ensure the reliability, consistency, and improvement of the data gathering process for security operations.

(18) The company has an organization wide security training and development process, including career path planning, for all employees/associates.

(19) The company has effective "top-down" and "bottom-up" security communication processes.

(20) Employee security satisfaction is formally and regularly measured in the company.

(21) All employees/associates in the company believe that security is their responsibility.

(22) Employees/associates in the company are recognized for their contribution to support security and performance objectives.

(23) The company's education and training programs are in line with this company's security and performance plans.

(24) The company has well-established methods to measure the security of its services.

(25) The company has standardized and documented security operating procedures.

(26) The company incorporates changing customer/market requirements into its security service offerings.

(27) The company incorporates new technologies into its security service offerings.

(28) The company's processes to deliver security service offerings meet internal and customer performance requirements.