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Components of service value in business-to-business Cloud Computing

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Abstract

Cloud computing services are used in many businesses. However, little is known about the components of service value in B2B cloud computing services from a customer perspective. In the B2C service literature, service value has four components: customer perceptions of the quality, equity, benefits, and sacrifices for the delivered service. The purpose of this research is to determine whether the components from an established B2C model applies to B2B cloud computing services. We followed a qualitative approach and interviewed twenty-one managers responsible for handling cloud computing services and for the decision to repurchase services. The interviews were then analysed to determine whether the existing model covers cloud computing services completely. We found broad support for the established service value components in a B2B cloud computing context. Importantly, we found evidence for a fifth component we called “cloud service governance”. A deeper understanding of service value perceptions among business users of cloud computing services means vendors can measure this for their customers. This is important because perceptions of service value directly influences customer satisfaction, impacting the buyer’s intention to repurchase the service. Similarly, this study will help buyers of B2B cloud computing services to assess the value extracted from their cloud computing service relationships. It will also help cloud providers and new competitors focus their efforts (e.g., into increasing technical reliability) to improve their customers’ perceptions of value obtained from their cloud computing services. This research advances the literature by extending the established B2C service value model to the context of B2B cloud computing, and providing the first evidence of an extra component in B2B services more generally.

Keywords: Service value; Cloud computing; Cloud service governance; Business-to-business; Service science; Service level agreements

Introduction

The “anytime, anywhere” [1] concept of access to large data storage spaces, increased processing power and convenience in computing growth, led to the development [2, 3] and adoption of technology [4, 5] for cloud computing [6]. In 2006, Amazon.com, a popular online retailer, started an organisation called Amazon Web Services (AWS), offering cloud computing services. During the early adoption of AWS, it was observed that the service consistencies of specific cloud computing services greatly impact the service experiences of the customer [7].

As far as the customer is concerned, cloud computing services are made possible through non-specialised devices

such as desktop computers, smartphones, tablets and other hardware devices capable of running a Web browser [8]. Further, cloud computing services are variously provided to individual customers (these are called B2C cloud-computing services) or to other business customers (which are called B2B cloud-computing services). In this paper, we focus on the latter business customers.

Three main types of service are offered to business customers of cloud providers [9, 10]. Firstly, *Software as a Service (SaaS)* enables a subscriber to utilise applications offered within the cloud infrastructure. Secondly, *Platform as a Service (PaaS)*, allows a subscriber to deploy and control applications within the cloud infrastructure. Thirdly, *Infrastructure as a Service (IaaS)* enables a customer to utilise the cloud infrastructure to deploy and run operating systems and numerous applications. A cloud provider

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is an organisation that provides any of these types of cloud services.

The basic problem may be succinctly stated: The service value of cloud computing in business-to-business context can and does fail where perceptions are ignored by service managers. Although the movement from published literature has been slow, subsequent empirical research has supported this broad claim [11] that there is a need to understand and measure service value for business generally. In order to have a well-rounded appreciation of service value for cloud computing business users we have obtained the perspectives of service managers who are responsible for cloud computing services in their organisations. This paper focuses more on the service value perceptions by business users of cloud computing rather than on objective technical measures, for example, 99.999 % assurance levels. Through the contribution of this research, we attempt to provide a richer understanding of the service value perceptions, and thus equipping service managers with a fully-rounded view as they integrate their understanding with technical measures.

Cloud providers recognise the importance of focusing efforts towards their customers [12]. A majority of these providers understand that competitive advantage will not stem from simply selling cloud services to other businesses but in the continued accumulation of value throughout the relationship with their business customers [13]. Understanding service value allows cloud providers and customers to better understand the costs and benefits of the service relationship [11, 14]. However, the determination of the components of the service value perceptions in business-to-business cloud computing in practise and theory, however, has been problematic. There is lack of knowledge regarding the relevant components of service value as appropriate in business-to-business context of cloud computing. This situation supports the findings of researchers involving the study of multiple components of service value that fail to precisely conceptualise the constructs [15]. The problem arises when conceptual models are used that were believed to apply in other service contexts. The detailed investigations by conducting empirical research (e.g., qualitative in-depth interviews) into the components, comprising a specific model, are then necessary. In order to determine the components of service value, we adopted and modified the Ruiz, Gremler, Washburn and Carrión [16] service value model. Their research recommended additional work to examine “service value differences across contexts” ([16], p.1289), wherein this paper addressed that call. The mentioned model describes the focus on the role of dissimilar components of service value that varies depending on the interpretation of the customer. As their service value model was developed and applied to a business-to-consumer setting, this paper

augmented the established service value model, and made it more appropriate in a business-to-business context of cloud computing. This paper therefore seeks to fill in that gap by addressing the following research question:

What are the components of service value in business-to-business cloud computing?

To answer the research question, we interviewed senior managers from 21 companies, each of whom are responsible for deciding whether to re-purchase existing B2B cloud computing services. The focus of this study is to determine the perceptions of service value from the standpoint of business customers using cloud computing services. Thus, there are limited discussions regarding technical aspects as the attention is on non-technical matters, which will be made apparent in the analysis and results section of this manuscript. The participants all had extensive expertise and experience in managing and deciding on any IT-related services, more specifically on cloud computing. In the interviews, we did explore how the established components of service value existing in the B2C context apply to a different (business-to-business) context. As such, we investigated how the various service value components have been perceived and articulated by customers, who are decision-makers within their respective organisations and are representing diverse industries, of cloud computing. We explored, and successfully obtained the customers’ perceptions. Apart from confirming that the established service value model in B2C do apply in a B2B context, we have uncovered an extra contextual component which did not fit the other components of the established model. This additional component called *cloud service governance* formed one of the service value components in the business context. The National Institute of Standards and Technology or NIST [9], a US-based organisation responsible for creating the most referred cloud computing definition, provided one of the general recommendations on governance. The term *IT governance* refers to “broader corporate governance principles...focusing on the management and use of IT in order to achieve corporate performance goals” ([17], p.4). This principle then refers to organisations aligning their IT-related actions, such as managing cloud computing services, in relation to the respective business objectives of the relevant decision makers. One of the management principles, as stated through the recommendations of NIST [9], is migrating data out of and into the cloud computing infrastructure.

The increasing prevalence of cloud computing services provided to business customers requires a better understanding of service value as perceived by customers. Indeed, the widespread use of cloud computing services has been increasingly compared to our consumption of public utilities. Also, while customers are using cloud

computing, they are utilising the respective services (e.g., data storage as part of the broader Infrastructure as a Service offering), which may be for personal use or as part of their organisational needs. The term “customer” in this paper refers to an organisational user, and does not refer to an individual who purchases and utilises a product or a service for individual consumption [18]. This paper proceeds as follows. First, we introduce the dimensions of service value, as found in the service marketing literature. Second, we describe the research design for the study. Third, we analyse the results of the interviews before concluding with the components of service value as it applies in B2B cloud computing services.

Service value

Rationale

Technology services, such as that provisioned from cloud computing, create interesting phenomena as it connects with numerous entities such as people and technology. As customers utilise any of the services provisioned from technology service providers, ICT practitioners and most especially researchers already have a myriad of questions such as what customer contexts are we referring to, how are the business customer perceptions generally different from that of individual customers, and how service value perceptions are measured within a specific industry context. While there are further discussions that we could engage with, the perceptions of service value by business customers, and the integrative perspective of service value are essential [19]. In the same way, this paper investigates the service value phenomenon in the specific services context of business-to-business cloud computing services.

Service providers have to be increasingly mindful of their service offerings towards customers. Information technology providers, particularly cloud service providers, recognise the importance of delivering value to their customers [20] whether at a consumer or business level. The mentioned creation of value has an impact on customer satisfaction and repurchase intentions [16], directly influenced by the perceptions of service value components such as service quality. Researchers further argue that value is co-created with customers, and is a source of competitive advantage [21–23]. Such advantage enables organisations to differentiate themselves from their competitors. Thus, there will be greater probability for increased customer satisfaction and intention to repurchase certain services. In addition, researchers claim that the reason service providers exist is for them to provide both value and satisfaction to their customers [24]. In relation to customer satisfaction, published literature advance discussions on satisfaction by claiming that perceived value is its antecedent [25, 26].

The study of the service value model provides an opportunity for researchers to explore the conceptual

richness of the construct [16]. The phrase *service value model* in this paper refers to “customer value in service contexts” ([16], p.1278) that is constructed with numerous components. There appears to be a lack of research regarding conceptualisation of the service value model. In light of this, academic-related discussions were initiated around the conceptualisation of its framework in relation to multidimensional or unidimensional approaches, formative or reflective measurements, B2B or B2C transactions, and qualitative or quantitative methods. In addition to this, researchers and IT practitioners have identified that the global economy is increasingly governed by services, and have requested that researchers prioritise relevant service-related topics [11]. Hence, this paper heeds their call to measure the value of service, and utilise “advanced service technologies” ([27], p.504) such as cloud computing.

Further rationale for pursuing the study of service value relates claims that there are vague conceptualisations relating to the purpose of the components of service value, which is partly due to inaccuracies in understanding and perception [28]. Specifically, there are assertions that service value is a unique attribute of service quality, while others have claimed that service value is an attribute completely different from service quality [29–31]. In addition, there are claims that value departs from the widely-held notion of a sequential model, and proceeds into more complex interaction of people [32, 33]. Indeed, value is created through interrelationships with customers rather than through transactions [34]. For example, key stakeholders from a cloud computing service provider such as the account manager and senior manager collaborate with their specific customers, and investigate if the latter are satisfied with their cloud services and further inquire for likely intention to purchase additional cloud services. Furthermore, Akaka et al. [33] claimed that customer involvement in B2B networks influence value co-creation and service innovation, which aligns with the motivation of this paper.

The authors of a recent study involving a major service provider of telecommunications equipments argued that organisations need to focus their attention on the value co-created within the service ecosystem [35]. A service ecosystem has been defined as a “spontaneously sensing and responding spatial and temporal structure of largely loosely-coupled, value-proposing social and economic actors interacting through institutions, technology, and language to co-produce service offerings, engage in mutual service provision, and co-create value” ([36], p.185). This paper responds to calls from researchers by addressing the much-needed request for value propositions in numerous service settings [35] such as that in a B2B context of cloud computing.

Conceptualisation

We would like to describe how researchers conceptualise the term *service value*. The word *service* provides some common notions of actions rendered by some service provider or personnel to their customers. For instance, a bellhop opens a door, a telephone company provisions Internet services, and a receptionist greets visitors. The Merriam-Webster Dictionary [37] defines service as “to provide (someone) with something that is needed or wanted.” This definition aligns with the mentioned examples as the staff, phone provider, and receptionist provides respective services to their current or even potential customers.

In reference to literature on services, the term *service* is described as having four key characteristics. First, researchers [38–42] claim that a service is *intangible*, not possible to sense through touch, sight, smell, and taste as opposed to goods [43]. Second is the *inseparability* of production and consumption, involving the simultaneous production and consumption of services. Inseparability is described as the customer or service purchaser allowing them to have an “intimate contact with the production process” ([44], p.8), and at the same time the same customer must be present during the production of respective services. Third is *heterogeneity* described as high differences in terms of service performance. For instance, the service quality of an Internet provider can vary among other service providers rendering the same type of service. In addition, the same Internet provider has varying degree of service levels as they are in contact with the same customer. This situation is then a concern as the expected services are not consistent. The final and fourth service characteristic is described as being *perishable*, that is, service cannot be stored. Thus, this last characteristic is also related to the *inseparability* characteristic, that services are to be produced and consumed simultaneously.

On the other hand, the term *value* is described as taking the perspective of an organisation’s customers by taking into account what the customers expect as they purchase and use a provider’s service [23]. Taking then the perspective of an organisation’s customers in reference to purchase and utilisation of services is described as customer value. There are further definitions as well stating that “value is the consumer’s overall assessment of the utility of a product based on perceptions of what is received and what is given” ([45], p.14). Also, the customers’ perceptions of value represent a “tradeoff between the quality or benefits they perceive in the product relative to the sacrifice they perceive by paying the price” ([46], p.46). While there are seemingly differences in meanings, the description of value has some commonalities. For example, we observe that value seems to frequently indicate the perceptions of the

customers, and not of the service providers. This aligns with literature describing customer value as “something perceived by customers rather than objectively determined by a seller” ([23], p. 141).

Furthermore, customer value is described as having multidimensional approaches that needed to be empirically investigated. Numerous researchers [47–58] have made this claim. However, among the numerous approaches to customer value, the most commonly used framework is that of Zeithaml’s [45] trade-off model [16]. This paper adopts her approach, and that of Ruiz et al.’s [16], conceptualising customer value in particular service contexts as comprising of various benefits and sacrifices.

While there is already extensive literature on customer value, research on services evolved into a more recent literature calling for increased service focus. Vargo and Lusch [59], who are responsible for influencing researchers’ mindset of ‘goods- or products-thinking’ into a more ‘service-oriented’ mindset, claimed that Ng & Smith’s [19] literature review on value is the most comprehensive as the literature contains historical, philosophical, management and modern conceptualisations. The comprehensive survey of the value literature were isolated into six themes, comprising utility, economic worth, perceived satisfaction, net benefit, means-end, and phenomenological experience [19]. Their extensive survey resulted in the proposal of an integrative framework that claimed to lead into the generation of business models. Similarly, as this paper adopts Ruiz et al.’s [16] service value concepts, this paper further utilises their generated model called the *service value model*. Eventually this paper augments that established service value model into a framework that is more appropriate in a business-to-business context of cloud computing.

At this stage, we have separately described the terms *service* and *value*, and are now to describe the term *service value* defined as follows ([16], p.1280):

“customer’s perception of the benefits he or she receives weighed against his or her sacrifices in the context of service delivery. The term service value describes the focus on the role of various service components in shaping customers’ perceptions of value.”

The mentioned service value perceptions of customers are described thoroughly using the literature based on Ruiz et al.’s [16] service value model. This will be described in detail in section 3.4, consisting of service quality, service equity, confidence benefits, perceived sacrifice, service value, repurchase intention, and customer satisfaction. Further description of service value refers to customer’s overall assessment of utility (value) in a services context [16]. Others claim that the meaning

of value is unclear in business-to-business contexts, therefore, they are requesting for greater clarity [60]. We will seek clarity as this paper explores the business-to-business context of cloud computing.

Based on the previous service value definition, the following is our description for service value in business-to-business cloud computing context:

“The term service value in business-to-business cloud computing describes the service value perceptions (i.e., service quality, service equity, confidence benefits, perceived sacrifice, service value, repurchase intention, and customer satisfaction) of cloud computing customers as they conduct internet-based purchases or repurchases of respective cloud computing services (i.e., PaaS, IaaS and SaaS) with a single or even multiple cloud computing service providers.”

From a customer's viewpoint, perceived value is a trade-off between what they secure, whether in the form of goods and/or services, and what they have to give up [45, 46]. Finally, many of the “value scholars”, especially in the areas of management, marketing, operations research, and service science, derive their definition and evolution thereof from Zeithaml's [45] means-end model – exploring customers' perceptions of price, quality and value [16, 28, 50, 61].

Model

A widely accepted definition of customer perceptions of value in commercial transactions is Zeithaml's ([45] p.14): “the consumer's overall assessment of the utility of a product based on perceptions of what is received and what is given.” This has been extended to services, in recognition that service dominate contemporary business, and customer perceptions of *service value* is defined as “customer's perception of the benefits he or she receives weighed against his or her sacrifices in the context of service delivery” ([14], p.1280). From a business customer's viewpoint, perceived value is a decision made between what they secure, whether in the form of goods and/or services, and what they have to give up [45, 46]. Many scholars studying the idea of value, especially in the areas of management, marketing, operations research, and service science, derive their definitions from Zeithaml's [45] means-end model – exploring customers' *perceptions* of price, quality and value [16, 50, 61]. Together, perceptions of these lead to overall understanding of customer value. In services, Ruiz et al. [16] is the most recent comprehensive summary of service value. Specifically, they define four components that comprise customer perceptions of service value: *service quality*, *service equity*, *confidence benefits*, and *perceived sacrifices*. These are covered below. However, before proceeding,

importantly customer perceptions of one dimension of service value, perceptions of service quality, and their intentions to repurchase services based on this should be distinguished from measurement of technical service quality. Any difference between customers perceptions of the quality of services and any measurement of technical service quality is important because ultimately, customers will repurchase based on their perceptions of service quality not on a technical assessment of service quality.

First, *service quality* measures customer perceptions of the quality of service delivered by the company providing the service. Clearly one would expect a customer's perceptions of service quality to impact on their perceptions of the value of that service. However, this should not be confused with the technical measures of service quality extant in cloud computing. Specifically, no matter how good the technical service quality, if a customer perceives the service as being of poor quality, the cloud provider will suffer customer loss.

Second, *service equity* concerns the image or brand equity as perceived by the customer. Brand image can engender a strong feeling of “proximity, affection and trust” ([14], p.1281) in the brand purchased. Brand equity, built up through customers sharing experiences of services delivered, is also important in the overall equity of the service. In cloud computing one would expect the image of the provider as perceived by the customer will impact on their perceptions of service value including trusting the brand of the provider [62].

Third, *confidence benefits* concerns customers of a business “having belief, trust, or faith in an organisation, its staff and services”([62], p.374) and is often built by a company going beyond the core service delivered. In cloud computing, this confidence is an important consideration [63] because of the company's dependence on the computing services provided (e.g., storage of data upon which the company depends). The higher the level of trust in the services delivered, the higher the value a customer would perceive they are receiving from the relationship.

Finally, *perceived sacrifice* measures customer perceptions of the costs, monetary and non-monetary (e.g., time, effort), they face by purchasing a service. Cloud services, like other services, incur monetary and other costs. These also influence the value customers perceive the provider gives them. In turn, this affects intentions to repurchase existing services from the provider.

Hitherto, service value has been studied in business to consumer contexts. Cloud services, in which we are interested, are provided to businesses. These business-to-business services have not been studied before. Further, there may be extra dimensions to service value than those already in the literature, or existing dimensions may not apply in this context. Finally, to effectively

measure the constructs in the extant service value literature there is a need to express the dimensions of service value in the language appropriate for cloud computing services. To achieve all these, an exploratory approach was taken.

Research design

There were twenty-one managers from twenty-one organisations who participated and provided their experiences in managing cloud computing services, comprising IaaS, PaaS and SaaS (see Table 1). The respective participants, referred to as “PAR#”, were selected based on their responsibility and accountability to decide on possible repurchase of existing cloud services, and capability to articulate on their cloud service experiences as business customers. These decision-makers represent numerous industries, and are utilising one or a combination of the cloud computing services. The twenty-one organisations were recruited through email solicitations, word-of-mouth, and referrals. While referrals from the interviewees did contribute, this recruitment manner was not sufficient

for the participants to buildup, and thus enable a so-called snowball sampling. The majority of the interviewees were approached through direct and unsolicited engagement. A list of relevant organisations was built-up based on researching through the public domain. The interview process discontinued when rich contextual samples were obtained. We argue that our sample is not representative of any particular business size or sector but rather a sampling meant to be generalised for a separate research approach such as a survey, which is not the scope of this paper.

Two out of the twenty-one interviewees belong to start-up organizations. One of them is a small company that was newly-established, and offered cloud computing services obtained from cloud providers. The start-up founder intended to cover a niche of the market, and not spread the company too thin. The other start-up is a medium-sized organization, whose founder, investor and director has been managing five business start-ups, servicing 50 % of their customers in the US, 25 % in Europe, and the remaining in Australia.

Table 1 Participants

Participant or PAR#	Position	Industry	Cloud Computing Services	Cloud Usage
1	Chief Information Officer	Research	Infrastructure	Virtual machine; Statistical Analysis software package
2	IT Director	Legal	Infrastructure	Data storage; Document Management System
3	Director	IT	Infrastructure	Data storage
4	Executive Director	Education	Infrastructure	Virtual machine; Customer Relationship Management
5	Director	Logistics	Infrastructure	Supply Chain Management
6	General Manager	Hospitality	Software and Platform	Survey tool; Database; Hotel applications; Payroll solutions
7	General Manager	Transport	Software	Customer Relationship Management; Email security
8	IT Manager	Not-for-profit	Infrastructure	Virtual machine; Network; Servers
9	Managing Director	Recruitment	Infrastructure and Software	Recruitment database; Data Storage
10	Director	Accounting services	Software	Bookkeeping
11	Investor	Startup	Infrastructure	Virtual machine
12	Director	Education	Infrastructure	Virtual machine; Data storage; Servers
13	Chief Technology Officer	IT	Infrastructure	Data storage; Virtual machine
14	Solutions Architect	Financial	Infrastructure	Data storage; Virtual machine
15	Founder	Startup	Infrastructure and Platform	Virtual machine; File service; Domain Name System
16	IT Director	Transportation	Infrastructure and Platform	Absence Management System; Payroll; Transportation Tracking System
17	Manager	IT	Infrastructure, Software and Platform	Recruitment system; Job Boards; Virtual machine
18	Partner	Accounting services	Infrastructure and Platform	Accounting software; Invoicing; Bookkeeping; Accounting
19	Manager	IT	Infrastructure and Platform	Data storage; Virtual machine; Domain Name System
20	Solution Adviser	IT	Infrastructure and Software	Enterprise Resource Planning system
21	Executive Director	IT	Infrastructure and Platform	Data storage; Servers

Evidently, most of the IT companies have been early adopters of cloud computing in comparison to other companies representing other industries. Admittedly, the spread of the industry representation was incidental to the invited and confirmed interview participants. Therefore, the corresponding respondents were selected not based on the research site but based on their decision-making capacity regarding the adoption and use of cloud computing services within their organisations. In order to ensure that the respondents were responsible for cloud purchasing, a Plain Language Statement, explicitly stating that they are able to evaluate cloud computing services provided to their particular organization, was sent to the participants prior to the interview and signing of the consent form.

The situation relating to the IT industry as the major research site of the interview participants merits future research. Specifically, some sectors with only one company represented would also be worth investigating. In this manner, we would have a better understanding of cloud service usage per industry. The purpose of this paper is obtain a context, and generalize the outcomes at a later stage through a survey. No other influencers, having different perceptions within each research site, have had an effect on the interpretation of service value. All influences have been captured through the various service value themes.

The interview structure comprised of an introduction, interview proper, and wrap-up. The introduction was an opportunity for the interviewer as well as the interviewee to engage in small talk and warm-up. This initial stage elicited numerous information from the interviewee such as their particular role in the organisation, cloud computing service used, and decision-making process. An interview schedule (see Table 2), inclusive of questions, has been prepared. The interview proper followed an exploratory semi-structured interview, conducted among Australian-based business customers who purchase cloud computing services. The majority of the interviews were held at the offices of participants. To comply with local ethics requirements, before the interview, participants were provided with a research project description and consent was obtained [64]. The interviews were semi-structured in that whilst there were topics that followed the four components of service value with questions falling under these topics, when a participant raised an issue worth pursuing, the interviewer followed that issue before returning to the broad topics to be covered. In the interview, the four components of service value [16] were explored: service quality, service equity, confidence benefits, and perceived sacrifice. We also explored overall service value. We did this because there may be aspects of the value derived from services not covered by the other components. The

Table 2 Interview Schedule

Introduction
1. Please tell me about your role in your organisation.
2. What types of cloud computing services does your organisation currently utilise?
3. Please tell me about the infrastructure services you get through the cloud.
4. Can you describe the decision-making process in selecting cloud computing service providers?
5. Were there other companies that you consider to offer the same service?
Interview proper
Service quality
6. What would you say are the important things to your company about the quality of the service delivered?
7. What does reliability mean to you for the service delivered?
8. How do you monitor the service delivery from your cloud provider?
Service equity
9. Does it make sense to buy this company's services compared to other cloud providers?
10. Even if other providers offer services as good as this cloud service provider's would you still prefer this provider?
11. What would you say is important when rating your experience with this provider?
Confidence benefits
12. What are the benefits from the service relationship?
13. What makes you confident about the service provider?
14. What makes you uncomfortable or nervous about the service provider?
15. Do you receive the expected service benefits from your cloud provider?
Perceived sacrifice
16. What would you say are the costs of the service relationship?
17. How did you determine that the costs charged were reasonable?
18. Are there technical costs you pay, such as bandwidth degradation, for having the service?
19. Are there other things that you lose by having this service?
20. In what way does this service relationship affect your job as a senior manager within the organisation?

wrap-up lasted for no more than five minutes, clarifying if there are questions to the interviewer.

The interviewer investigated three to five questions for each of the components of service value. As the interviews were semi-structured, the questions were built on Ruiz et al.'s [16] service value model, and modified to suit the business-to-business context of cloud computing services. In order to ensure that relevant information would be elicited, additional publications were consulted that relate to suitable wordings for the cloud computing-related [65, 66] questions used. However, the questions, whilst specific to cloud computing, and covering the topics from the extant

service value model, the questions were open-ended and allowed for elicitation of a range of responses. For example, when examining service quality the first question was open ended and allowed a great deal of scope for respondents: "What would you say are the important things to your company about the quality of the service delivered?" Thus, the questions evolved based on literature and modified accordingly that is most suitable in the cloud computing context. These set of questions would then elicit such information immediately if another researcher repeats the project. The descriptions for each of the service value components were investigated to see how each applies to the business context of cloud computing. For discussions that did not fit any of the established service value components and relate to matters on governance, these were combined under the broad theme of cloud service governance. The interviewees were allowed to freely provide their experiences and perspectives based on the questions, and the researcher was able to explore unexpected research avenues as well. Data collection ceased when saturation [67] was reached in that no new information was forthcoming from new interviews. The researcher collected the information through audio recordings and field notes.

The interviews conducted among the twenty-one managers generated 186 pages of written transcript. The data elicited was more than sufficient to investigate the extent that the service value model of Ruiz et al. [16] apply within business-to-business cloud computing context. The data provided rich contexts to each of the service value components, and generated an additional component. As the interview transcripts comprise 186 pages, the authors would make available any requested information as articulated by the interview participants. In this manner, others may be able to determine whether they agree with the assessment through the full interview transcript.

The paper broadly investigated the three primary cloud systems: Platform as a Service (PaaS), Software as a Service (SaaS) and Infrastructure as a Service (IaaS). As the contextual interviews explored whether the existing service value components in a B2C context applied in B2B cloud computing services, this paper also seeks to determine whether additional relevant components apply as well. While the general use of these cloud systems relate to data storage, platform hosting, and software provision, there are specific uses of these cloud systems. There are eleven distinct industries that the interview participants represented such as research, legal, IT, education, logistics, hospitality, transport, not-for-profit, recruitment, accounting services and IT startup. Of these industry representations such as accounting, a specific use of cloud computing relates to online accounting and payroll using a cloud-based

software called *Xero*. An interviewee belonging to a research company uses the cloud infrastructure to run statistical analysis package while a legal firm uses the data storage facilities for compliance, backup, and disaster recovery purposes. A startup company uses Amazon Web Services not only for development purposes but also for monitoring the dollar amount of invoices sent out during the day, where the metrics can go to a performance tool called *CloudWatch*. In this manner, the use and monitoring of cloud services provides a visibility into the customer's cloud use, which can provide business-related insights.

The specific prices of respective cloud computing services were mentioned by the participants but were not standard replies for all interviewees. As the standard pricing could be obtained generally from the particular cloud computing service provider's website information, the researchers were after the relative perceptions of the interviewed managers as they utilised the cloud services. As encountered during the interviews, a specific price may be too high for PAR#1 but would be reasonable for PAR#2, as an example. While price is a factor, it is not of high significance as there are other service value components, which will be discussed in detailed in the following section, to consider apart from costings.

Analysis and Results

The thematic process of analysis demonstrated how the analysis of the raw data from the interview transcripts advanced toward the determination of encompassing themes that represented the service value in business-to-business cloud computing phenomenon as articulated by the participants in the study. The approach for the qualitative study was deductive by using open codes, which were derived from the established service value model. We used three coding approaches based on Neuman's [68] qualitative data coding, Glaser and Strauss's [69] comparison methods and Miles and Huberman's [70] qualitative data analysis. We determined and categorised the articulations provided by the participants that pertained to their actual experiences in using cloud computing services in their respective organisational business context. We conducted this process through numerous iterations. First, we performed an initial pass through the collected data, and located themes and assigned initial codes in a broad attempt to reduce the mass of data transcription into categories. For appropriate lines or paragraphs, we provided labels to represent our initial coding. For example, one of the interview participants said, "An existing service relationship, sustained by trust, ethics and honesty, is extremely important (PAR#21)." This examination of the transcription data is an example of initial "analytic categories or codes" ([68], p.461), where the

researcher is relatively allowed to change the initially-assigned codes during the ensuing analysis.

Second, we started to distinguish themes made possible through the arrangement of the analytic categories, which was described through recurring resemblance and number of replies from the respective participants. The data transcripts were reread, and explored for commonly-occurring articulations that provided evidences of cloud computing participants' experiences. The expressions from respective participants were then categorised depending on various preliminary themes. For example, the previously-mentioned coding instance represents a theme, resulting from the open coding and made apparent to the surface from beneath the data, called *trust*. This theme, including *less anxiety* and *increased confidence*, describes *confidence benefits*, is one of the components of the established service value model. At this stage, we provided a greater focus on the themes rather than on the data. While additional ideas may emerge, our primary purpose at this process is to examine the themes. The next section of this paper describes the coding examples for the other components of service value.

Third, we examined the various themes to determine how they fit into the existing dimensions of the established service value model. Apart from ascertaining whether the emergent themes fit or not, we determined how these themes contributed to a greater understanding of the service value perceptions among cloud computing customers in business-to-business context. During this step, we asked questions such as: Does the information obtained from the data transcription confirm the established service value theory? Does the information offer additional perspectives into and about the respective decision-maker's interpretations of service value in business-to-business cloud computing? In addition to this step, we also thought about additional themes that could not fit into any of the pre-existing themes, which is the case of the additional components called *cloud service governance*. As a result of this process, we combined, renamed and created themes into five components of service value. After this procedure, we determined that the five components of service value adequately represent the responses provided by the cloud computing participants.

The transcripts were coded under the broad themes of *service quality*, *service equity*, *confidence benefits*, *perceived sacrifice* and overall *service value*. These reflected the four components of service value and overall idea of service value. Coding was at the multiple sentence level, and involved ascribing a reasonable interpretation of what the participant meant. The codes were more specific than the broad themes and reflected particular expression of the theme in the context. Over time, similar codes were grouped when they expressed the same specific manifestation of the broad theme. For example, the *reliability* of

computing services (e.g., from a specific code "up time") groups a number of similar codes expressing one aspect of the quality of cloud computing services. These are presented in the results following under each theme.

Some codes, we call emergent codes, did not fit under any pre-existing theme but still concerned the idea of service value overall (e.g., the use of "service level agreements" in managing services). Over time, the emergent codes were grouped under a consistent theme concerning how a service is managed by the business. We coined the theme "cloud-service governance" to cover this new theme. This new theme encompassed conversations around data security, migration, sovereignty and service level agreements. No other emergent themes concerning service value were found.

As the focus of the research relates to determining the perceptions of service value from the standpoint of business customers using cloud computing, the investigation of the themes of service value related only to the non-technical aspects. Thus, the coding process did not explore technical measurements such as assurance levels of 99.999 % as a measure of availability.

In the remainder of this section, we present the results of our analysis. Specifically, we cover each of the themes in the following sub-sections. We divide each sub-section into parts each one covering a cloud-computing-specific manifestation of the theme that emerged from our analysis. For example, *service quality* is expressed in cloud computing services as *reliability*, *consistency*, *accessibility* and *monitoring*. This will help in any future instrument development for measurement. We conclude this section with a discussion of cloud-computing service governance, the emergent theme we found.

1. Service Quality

The first main element of service value investigated in the qualitative study was the participants' perceptions of service quality of their cloud providers. *Reliability*, *consistency*, *accessibility* and *monitoring* appeared to be important issues for all interviewees as the element of service quality was explored. These issues were investigated as we conducted an enquiry by drawing out from the following lines: what would you say are the important things to your company about the quality of service delivered; what does reliability mean to you for the service delivered; and, how do you monitor the service delivery from your cloud provider.

Reliability: Reliability was perceived as having a certain amount of uptime, "service working to specification for the maximum amount of service hours or percentage of service hours" (PAR#19). In ensuring the service uptime of the provider, the customer collaborates as well through due diligence of their infrastructure. In terms of the service disruptions, these have to be "ideally planned

and communicated" (PAR#19). Another perception by one of the participants regarding quality of service is around the maintenance of the computing environment. PAR#16 stated, "What is their maintenance regime in terms of how they maintain their servers and also looking at the quality of their data centre in terms of their exposure and risk such as like what are their cooling, power provision and maintenance times." This meant that the technical specifications of the hardware and software applications have to be maintained at a certain level and better yet beyond expectations.

Consistency: Quality of service meant consistency in the provisioning of the cloud services. As supported by PAR#19 regarding the quality of service delivered, "I think consistency is key." This situation is especially true if a business customer needs to manage their large data repository, representing terabytes of data storage or even greater. As the customer is managing huge amounts of information, the interviewee is expecting that the service quality provisioned by their cloud provider is stable. Another cloud customer (PAR#9) made a comment that their organisation "will become nervous if there is increased downtime, data changed or things moved, there is inconsistency..." (PAR#9).

Accessibility: Having virtual machines offline and inaccessibility to files resulting from the disruption are some of the manager's fears of using the cloud. As PAR#17 stated, "They're (cloud provider) not perfect and there is quite a few lapse...but one thing that they do very well is when they release a product, it works." The participants emphasised that accessibility is one of the key decision-making factors as their organisation adopted cloud computing. As testified by PAR#18, "Security, accessibility, bandwidth, and minimal risks" (PAR#18) are considered as factors in the decision-making. While the organisation took a long time to decide, the participant claimed that the process was all worth the time and effort. In addition, PAR#2 articulated that it is important to know, "where it is hosted, how they manage the data centre, how they manage security on the site, security down to the racks and servers, accessibility from the vendor to that information."

Monitoring: Essentially, the value of a monitoring tool is for the user to log easily into a performance dashboard, check if the virtual machines are running, and gain an understanding of what is running so far. PAR#3 stated, "They (cloud provider) issued a user cloud statistics, which essentially makes your applications, data and metrics into cloud watch. So, you have a performance tool that monitors your service, CPU, I/O and stuff...So, not only can you monitor what your applications are doing but you can also action things." The user would have to know what specific services are

impacted by the problem, and be able to drill down to fundamental information. As PAR#17 stated, "If something goes wrong with the monitoring service which can happen you know that you're not caught off guard when something does go wrong." Having a monitoring system enables the business customer to observe and act on system alarms, which increases the usefulness of the cloud services obtained from the provider. Knowing that the service is up and running well is a key thing that PAR#17 looks for in those reports. Further, the manager would have a concrete basis in the form of a reporting tool for feedback as well to top management. If something goes wrong, there are alerts to the customer. PAR#4 stated, "So, they give us a dashboard report of everything within their realm. We also monitor things like web performance...so things will automatically tell us when suddenly we've got off the air for any reason."

2. Service Equity

The second main element of service value explored in the qualitative study was the participants' perceptions of service equity of their cloud providers. *Reputation* and *provider preferences* appeared to be important issues for all interviewees as the element of service equity was explored. These issues were investigated as we conducted an enquiry by drawing out from the following lines: does it make sense to buy this company's services compared to other providers; even if other providers offer services as good as this cloud provider's would you still prefer this provider; and, what would you say is important when rating your experience with this provider.

Reputation: The majority of the respondents articulated that the cloud provider's reputation is important. The key driver in deciding the adoption of these providers is global reach. For instance, the perceived ability of these cloud providers to establish and maintain data centers, which are geographically located, and in close proximity to their customers is essential. While there are already numerous providers marketing their brands, they are still perceived as less mature with their offerings, thus are considered less interesting by the customers. Customers perceive that a large enough organisation comfortable with its own lifecycle and direction is seriously considered in the adoption process. PAR#19 stated, "I guess reputation and financial stability of those organisations. There are many other providers in the market place claiming to be delivering cloud services and some of them are less interesting to us as we assess them to be less mature, in that sort of technology or we feel that we are not moving to a large enough organisation comfortable with its own lifecycle and direction."

Provider Preferences: The decision-making process for PAR#7 was quite easy – “no one else in the market is doing it.” *Provider A and B* were perceived as leaders in that space for a number of years. As the selection of service providers capable of delivering a specific type of offering that is highly favored by certain customers is limited, customers give preference to whoever would deliver based on the business needs of customers. An interviewee perceives that, “It makes sense to buy this company’s services in comparison to other providers as the service is ‘working reasonably well’” (PAR#7).

3. Confidence Benefits

The third main element of service value explored in the qualitative study was the participants’ perceptions of confidence benefits as the business customers utilise cloud computing services. *Trustworthiness*, *less anxiety*, and *increased confidence* appeared to be important issues for all interviewees as the element of confidence benefits was explored. These issues were investigated as we conducted an enquiry by drawing out from the following lines: what are the benefits from the service relationship; what makes you confident about the service provider; what makes you uncomfortable or nervous about the service provider; and, do you receive the expected service benefits from your cloud provider.

Trustworthiness: “An existing service relationship, sustained by trust, ethics and honesty, is extremely important,” as stated by PAR#21. The participant further claimed that, “Mutual respect aims to foster a longer term strategic relationship.” This meant that the relationship is beneficial to the provider as well as they have a better understanding of the requirements of the customer. PAR#2 stated, “They (cloud providers) need to understand our business. They need to know who we are and what our pain points are...what we need.” In addition, the provider can propose a new service that is potentially needed, and the customer may purchase if they have a requirement that they are willing to pay for. Another participant (PAR#18) stated that once their organisation has been perceived as a “trusted business advisor”, it is a “huge plus because they value that.”

Less Anxiety: The customer gets nervous with the provider if the customer cannot easily get data out. As PAR#19 stated, “It should be a lot easier for me to make a backup of my data but ____ is not making that easy. So, in that sense, these people are more comfortable in having your data and they have less concern for you in getting your data out. So, that is my biggest concern.” This is a primary concern. Also, if *Provider A’s* business completely disappears, what are the risk mitigations to that. PAR#15 sums up “that these people are more comfortable in having your data and they have less concern for you in getting your data out. So, that is my biggest

concern.” An additional point raised by another participant (PAR#20) is that anxiety among business customers is impacted by connectivity. While bandwidth is primarily driven by the network connection provisioned by the telecommunications provider of the internet line, the signal attenuation or degradation still provides a negative impact to the customer. Another participant articulated a concern regarding lock-in contract periods. PAR#3 stated, “I spoke to a customer the other day and they are locked-in to a contract with ____ and it was costing them an arm and a leg. It was a 3-year contract.”

Increased Confidence: There is increased confidence as a provider has a number of availability zones responsible for hosting multiple locations globally. As PAR#3 stated, “Ah, but one of the things that they’re very good about is that you can’t rely on one availability zone being always available.” In addition, there is increased confidence due to the very good track record of the service provider. As PAR#7 stated, “The fact that they’ve got great history doing the same thing over and over again... very well.” This confidence view is also shared by PAR#18 claiming that, “Increasing the customer’s confidence is attributed to the provider understanding their customer’s business model.”

4. Perceived Sacrifices

The fourth main element of service value explored in the qualitative study was the participants’ perceived sacrifices as they make use of cloud computing services. *Cost* and *time* appeared to be important issues for all interviewees as the element of perceived sacrifices was explored. These issues were investigated as we conducted an enquiry by drawing from the following lines: what would you say are the costs of the service relationship; are there technical costs you pay for having this service; are there other things you lose by having this service; and, in what ways does this service relationship affect your job as a senior manager within the organisation.

Cost: Business customers of cloud computing can control the scale and price paid to acquire or maintain their respective cloud computing services. The customer perceptions of cost, based on the interviews, vary. While many of the interviewees perceived that cost is very important in their decision-making process, the financial component is not the sole factor and is not the most important of all considerations. While the focus of this paper relates to the perceptions of customers, the cloud service providers, on the other hand, are influenced by the service perceptions of their customers. Cloud providers are increasingly becoming aware that not only are they to provide a “better” service but they are also expected to provision an equivalent or better yet, lower operational cost (PAR#21), for example, a cloud provider may turn off unused computing resources in order to

save on power without affecting their cloud subscribers. During the interview process, one of the interviewees validated that “pricing is not everything” (PAR#17). While cost is important, the interview participant stated that a certain cloud service provider was decided based on two reasons: First, the participant had never experienced any service failures at all during the contract term, and second, the provider offered a 100 % assurance that there will be zero virus. The same participant further claimed that their service provider’s “environment is so resilient that downtime just doesn’t occur” (PAR#17).

Time: As stated by PAR#1, “There is a sense of disappointment as we deal with our service providers in different time zones.” Whenever there is a feedback needed from the provider, the reply usually arrives the next day. Therefore, there is delay in relaying information. Another perspective indicates the time to access the cloud service. As PAR#15 stated, “If we pick one place, that is the best place to give the lowest latency to most of our customers.”

For example, the most important thing for PAR#15’s organisation is to obtain the lowest latency to their US-based customers, which would mean obtaining the services from another region that is closest to the United States.

5. Cloud Service Governance

Cloud service governance emerged as a fifth element encompassing new service value issues comprising managing *data migration*, monitoring *data security*, ensuring *data sovereignty* and *service level agreements*. These issues became apparent as we went through the combination of questions in the service value elements. This component is a significant contribution of this research.

Data Migration: As earlier stated, data migration is under the theme of governance as the transfer of data into and out of the cloud computing infrastructure refers to the management of this specific transfer process. The data migration by cloud subscribers refers to resources used such as shared documents and email information. Depending on the situation of the customer, the movement of these data may be from the computing infrastructure of the customer to the computing resources of the cloud service provider. On the other hand, the situation may refer to data transfer from the provider back to the customer. Now, there is an “ease of data migration”, as stated by PAR#19, which is increasingly relevant if the customer needs to transfer a huge part of their data involving terabytes of storage and therefore is an important aspect of managing the relationship. This perceived ease of transfer impacts the decision-making of the customer whether to continue using the cloud services or discontinue. There are situations that a business customer may discontinue the services, and there

are challenges in relation to returning the data of the cloud subscribers. Case in point is a perception shared by an interviewee that cloud providers are returning the customer’s data through flat text files, which has no structured relationships and is difficult to modify. In addition, the participant perceives that the cloud service provider would make it difficult for the customer to migrate their data from the cloud and transfer to a competing cloud provider (PAR#7). The interviewee, who was the general manager of the organisation, emphasised that while there is a threshold in dealing with the change or pain in moving their data, the “impetus to change needs to be greater than the pain” (PAR#7).

Data Security: Any vulnerabilities in the cloud computing resources of the provider are negatively perceived by business customers. For example, PAR#2 stated, “A lot of people don’t understand...it is important where it is hosted, how they manage the data center, how they manage security on the site...security down to the racks and servers...” Data security is described as ensuring that the provision of cloud computing services are employing best practices for web browser security, using strong encryption procedures, and considering authentication tokens. These security procedures are relevant to the customers, who are decision-makers in their organisations, as the IT resources in the form of cloud computing services are intended to align with their organisational goals. PAR#18 stated, “So, security is very important to us.” As PAR#18 shared, the establishment and maintenance of data security is another contributing factor in deciding the adoption of new cloud services or the repurchase of similar services. The participant further articulated that they had to ensure the data security procedures of their cloud provider by regularly visiting the service provider’s premises. While there is no certainty that the data of a certain customer are located at a specific location of the cloud computing provider, the perceptions relating to data security increases once a customer realises that the data security procedures observed at a certain location are well managed. Further to the security practices employed at certain premises of the cloud provider, the cloud customers require backup and recovery procedures especially during cyber attacks. While many of the major cloud computing providers provide redundancy for the data centre sites in which they operate, the business customers also consider certain regional locations just in case of disruptions due to security attacks. PAR#8 shared, “...data security perspectives have not been fully explored.” For example, the participant shared a recent event in New Zealand, “They were doing some file-sharing or something in the cloud, and there were also other legitimate business in there. So, when they shut down, they lost their data.” These are risk considerations by the cloud customer when selecting and maintaining their provider.

Data Sovereignty: PAR#15 stated, “The hacker that we’ve put into place introduced some unreliability in our systems. I’m a little concerned about data sovereignty.” This category broadly refers to where the data is stored, and in what geographical location is the data hosted. One of the participants perceived the importance of proximity. PAR#3 stated, “We need someone local. We wanted someone close that we could go out to and physically touch...if something went wrong...that was part of the factor going into the cloud.” The relevance of the location determines the authority of a respective data centre to govern the customer data. For instance, the data of an Australian-based customer may be hosted at a US-based cloud service provider. The data, comprising of client records and other detailed information, may be looked at by US-based government officials under the USA Patriot Act. While there is confidentiality of these records, the officials can do this procedure which is within their jurisdiction. By contrast, if the data is hosted within the geographical location of the customer, the data of the cloud subscriber is protected. In terms of the perceived importance of data sovereignty, the respective authority of a cloud provider over their data is essential. PAR#19 stated that, “Other things that are important to us and guiding our ability include data sovereignty, and the ability to get out of a cloud provider as well as get in. Obviously in the online music business, we have a fairly large music repository. If you are above the common application of several gigabytes or even hundred gigabytes...several hundred terabytes and upwards, then you got to have a clear picture of how you get in or out that sort of data footprint.” Another participant claimed that, “Some customers whose data is hosted in the US... the Patriot Act doesn’t bother them. It is important where it is hosted...how they manage their data centre... You have to do your own due diligence. Make sure to cover your bases.” PAR#2. This participant underscored that reasonable processes should be employed in order for the customer to still have the authority over their data, and not be at the mercy of the cloud provider.

Service Level Agreements: Service levels and their measurement were important in on-going management of service relationships. For example, if the levels of service specified in Service Level Agreements (SLAs) drop, PAR#17 will then shift cloud providers. Also, if something went wrong and the customer could not get hold of any support staff, that would get the customer thinking of considering other providers. The customer is thinking that the lack of support and drop in service level will negatively influence their image. Others have viewed that clearly defined SLAs minimises risks (PAR#6). Still others perceive that SLAs are “useless” (PAR#11). PAR#11 stated, “I’ve worked with SLAs and really they’re subjective. It’s almost useless.” The

participant thinks that it would be up to the customer to plan for things, and for the provider to assist. If the system goes down, PAR#11 believes that “you’ve gone through the process of being able to restore the service with them rather than having an SLA.”

We now turn to discuss whether service governance is indeed a dimension of service value. Recall, the other dimensions are perceptions of: service quality, service equity, confidence benefits, and sacrifices. The question is whether governance is a part of service value or instead might be an orthogonal property. Service value, in consumer-oriented contexts, is where the formative construct has been previously tested. The question then is, does the perception customers have of governance form a component of service value. The argument is the value of a service perceived by a business customer will be in part because of mechanisms to govern the service. Specifically, without necessary processes and agreements it is more ‘hit and miss’ whether value is extracted for the service. Further, those companies paying attention to governance issues are likely to maximize the value received. Therefore, the presence of relevant governance mechanisms and practices are reflective of a dimension of service value rather than being a separate property of a service.

Measurement of Constructs

Having confirmed the general applicability of the existing four dimensions of service value and found evidence for a new dimension of service governance, we proceeded to conduct a factor analysis of the constructs. Specifically, we created measures for the constructs (Table 3) that were specific for cloud computing services and conducted a factor

Table 3 Loadings of measures against constructs

	CB	PS	SE	SQ	SG
CB1	0.73	−0.08	0.36	0.34	0.41
CB2	0.86	−0.07	0.59	0.49	0.62
CB3	0.83	−0.11	0.44	0.45	0.57
PS1	−0.08	0.94	−0.04	−0.10	−0.11
PS2	−0.10	0.70	0.01	−0.12	0.01
SE1	0.53	−0.08	0.88	0.62	0.52
SE2	0.52	0.01	0.90	0.45	0.56
SE3	0.45	0.02	0.79	0.35	0.51
SQ1	0.49	−0.13	0.49	0.92	0.40
SQ2	0.49	−0.15	0.51	0.94	0.43
SQ3	0.42	−0.09	0.47	0.89	0.40
SQ4	0.42	−0.04	0.50	0.76	0.44
SQ5	0.55	−0.14	0.53	0.93	0.45
SG1	0.41	0.03	0.52	0.20	0.63
SG2	0.65	−0.13	0.56	0.52	0.87
SG3	0.28	0.02	0.19	0.19	0.58

analysis to establish the validity of these measures. To this end we involved 328 participants in different industries who were using one or a combination of the cloud service models (i.e., IaaS, PaaS and SaaS). Participants were recruited from Australia, the United States, Europe and Asia. Out of the total 3,200 invitations sent, a total of 508 responses were received. After data cleaning (i.e., missing data, outliers), a total of 328 responses, representing around 10 % of the total invites, were used in our analysis. Since the research study focused on perceptions of cloud customers, we set up the online survey system to terminate as soon as the respondents indicated that they were not cloud computing users.

The measures applied are shown in Appendix 1–Measures. Each measure is shown according to the construct to which it relates. Specifically, the constructs are CB = Confidence benefits, PS = Perceived sacrifices, SE = Service equity, SQ = Service quality, and SG = Service governance. Further, each measure within a construct is numbered beyond the abbreviation. Thus, CB1 refers to the first measure of the construct CB (or Confidence benefits).

Figure 1 shows the same loadings for each measure (to three decimal points) with the relevant bootstrapped t-value showing that each measure is significant.

Thus, we can say the measures listed in Appendix 1 reflect their respective constructs.

Discussion

The purpose of this study is to determine the components of service value in the context of B2B cloud computing services. This section discusses the findings based on analysis of the interviews we conducted with managers responsible for repurchasing B2B cloud services. We review the components of service value explored during the study and note implications, limitations and future directions.

Components of Service Value in B2B Cloud Computing

We found evidence for five components, comprising four from the established service value model within the business-to-consumer context and one emergent component, of *service value* in business-to-business cloud computing. This section examines each of these components.

1. **Service Quality:** The first component involves *service quality* (i.e., reliability, consistency, accessibility and monitoring). If a cloud provider's service delivery relies on some core physical infrastructure (e.g., data storage, CPU processor and network bandwidth), the physical good's quality provides an increased perception of worth which corresponds with Rust and Oliver's [71] description of service quality as what this component actually means to the customer. This corresponds with Reichheld and

Sasser's [72] description of service quality as a basis for cloud providers to differentiate themselves and coincides with Parasuraman and Grewal's findings that this component would make it challenging for providers to emulate their competitor's service quality. For instance, a leading cloud computing provider is known to have a world-class data center, using top-of-the-line equipment and provides a high level of service, leading to an increased favorable perception unto their customers.

2. **Service Equity:** The second component is *service equity* (i.e., brand reputation and cloud provider preferences). Spohrer and Kwan [73] claim that there is a systemic perception of services, for instance, reputation and preferences, as customers and providers are in a network of interactions that increases value creation [74]. Cloud customers interact and participate in numerous service systems – from the moment they use their credit card to pay for the cloud service on a fixed or recurring payment scheme (i.e., financial service), as they send an online written message to business partners (i.e., email service), as they increase the data storage and memory to accommodate the business growth (i.e., cloud computing service such as Infrastructure-as-a-Service), to the moment they monitor their network bandwidth for faster downloading or uploading of files (i.e., internet service). Financial, internet, utility, and cloud providers are but a few of the extensive interactions occurring as cloud customers interact and eventually perceive their provider's service image [50]. The interview participants are saying that brand reputation is important. This is especially relevant to the leading cloud computing providers and the well-established IT organisations. The participants perceive that dealing with these firms, even if there are risks involved, provide a positive service relationship, which meant that issues will be addressed as these major organisations are believed to have the necessary resources to manage the problem.
3. **Confidence Benefits:** The third component, *confidence benefits* (i.e., trustworthiness, less anxiety and increased confidence), involves the customers' perceptions of trust and confidence [75] and the relationship of decreased anxiety with greater knowledge of the cloud provider's services [76]. The participants of this research study expressed an increased confidence benefit whenever the customers already perceive that their cloud provider has already attained a level of trustworthiness, and that the providers can by then be entrusted with the customer's sensitive data. In addition, the demonstrated good service record of the cloud

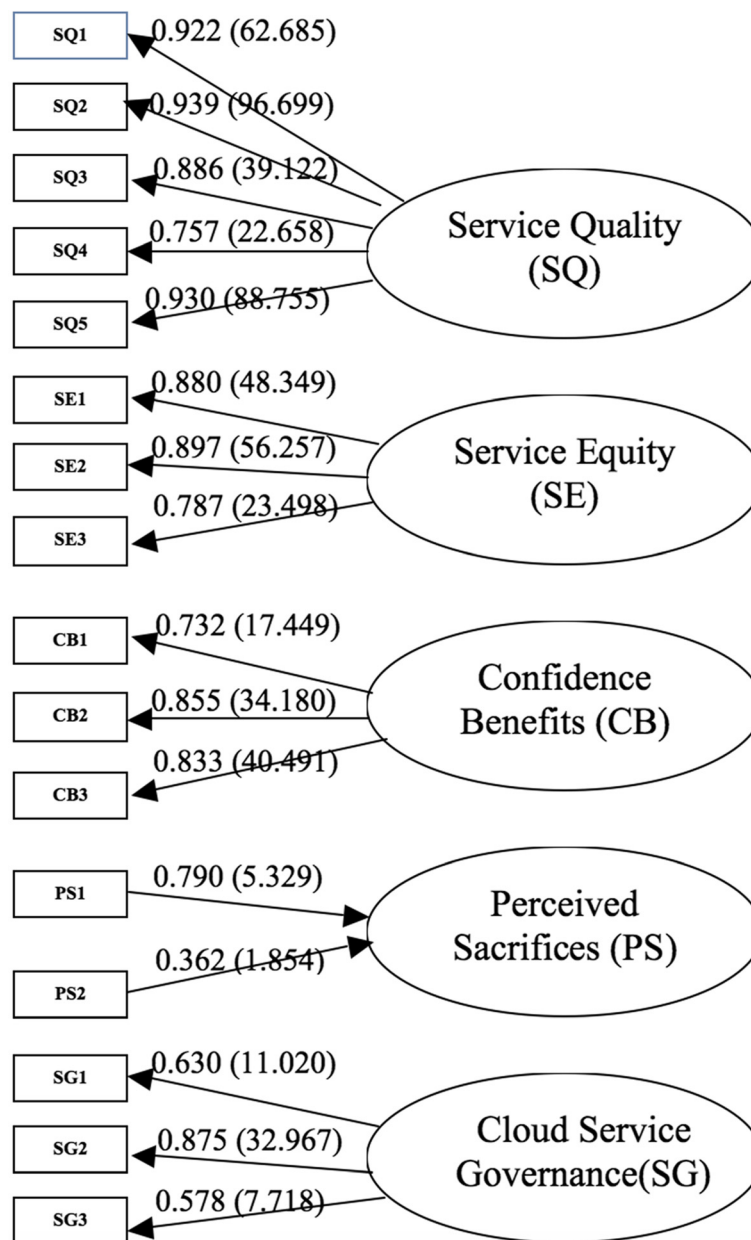


Fig. 1 Loadings and bootstrapped t-values for the measures

provider and the consistent good performance positively impacts the confidence levels. By contrast, this service value component decreases whenever the customer starts to worry and/or feel unsafe in relation to their precious data hosted by the provider. While a decrease in network bandwidth, which is primarily the telecommunications service provider's responsibility, does occur, the decrease in network speed contributes to the customer's negative perceptions of the cloud services.

4. Perceived Sacrifices: *Perceived sacrifices* (i.e., cost and time), the fourth component, encompassed both

monetary and nonmonetary costs to use any cloud service [16] wherein the latter might even be more essential than the former. The majority of the participants claimed that while cost-related matters are important in the availment of cloud services, pricing, as a direct cost, is not everything, and that time to achieve tasks is important. As an example, the founder and investor of an Australian-based startup company did not concern himself with paying for premium cloud services as the time spent in retrieving data, running his virtual machines, and expanding his computing resources were of high

significance. There is a negative relationship between the component of perceived sacrifices and service value—the lower the sacrifices needed by the cloud customers to use the cloud services; the higher is the service value perception.

5. Cloud Service Governance: Finally, the contextual interviews led to the emergence of a new component, which we term as *cloud service governance* (i.e., data migration, security, data sovereignty and service level agreements). We thought that the term is appropriate as the research study focuses on cloud computing services, and IT governance, comprising numerous processes around strategies, decision-making, accountability, risk management [77] and measurable performance and benefits [77, 78]. As cloud customers and potential cloud clients are increasingly perceiving the numerous benefits of cloud computing, there is a growing recognition that the management of these services is but a fundamental portion of a much broader part of organisational governance [77]. The majority if not all of the participants in this research study are decision makers in their respective organisations. As such, they are accountable to how the decision-making process works such as the adoption of cloud services, and the cloud provider's adherence to service level commitments. Most of the participants described that they were also answerable for risk management of these cloud services, that is, that they were responsible for ensuring that any needed data migration should be conducted with ease, disaster recovery plans are to be laid out by the provider, and data protection is followed based on best practices. All this requires ongoing monitoring and management, referring to governance. This component of *cloud service governance* is especially unique as it is not only an emergent theme but the component also underscores that the cloud providers are to measure their service provisioning as well.

In sum, the service value model within a B2B context of cloud computing includes five distinct components of service value: *service quality*, *service equity*, *confidence benefits*, *perceived sacrifices*, and *cloud service governance*. While each component in itself already provides valuable information, the measurement of service value, which includes these five components, is highly recommended for the next step of this research study. Over the long-term, relationships among the five components might become more apparent both for the benefit of the ICT practitioners and also contributing to theories related to service value in other B2B contexts (i.e., IT outsourcing) of IT services provisioning.

Implications

This study contributes to our understanding of the components associated with service value in the context of B2B cloud computing. This understanding is most important from the perspective of the business customers. In addition, this research underscores issues of significance to IT decision-makers responsible for creating, measuring and managing the service value perceptions of IT-related services (e.g., cloud computing services). This study also supports the idea that cloud computing service providers, providing cloud services to other businesses, can differentiate themselves and add value by having a greater understanding of what their business customers expect from the respective cloud services that they provision. In the current environment, that there are leading cloud providers and emerging competitors, the respective managers may now direct their efforts (e.g., marketing, product development and recruitment) towards increased service value that will enhance their organisation's market leadership. This new understanding of service value components helps business customers of cloud computing to evaluate the importance of specific components during the decision-making process of repurchasing or continuing on with the current cloud service. Customers would now have a better understanding that service quality of any cloud computing provider is most significant during the evaluation process. Furthermore, customers will be reminded that while the branding (i.e., service equity) of a respective provider is important, this specific component will have to be managed well. Finally, customers have been articulating the importance of data security, data sovereignty, and service level agreements, referring to the additional component on cloud service governance. Customers would increasingly ensure that the provision of cloud services from their respective providers would adhere to appropriate processes.

Service governance is important and interesting in business-to-business services. Specifically, prior work into measuring service value from a customer viewpoint has been focused on services delivered to individual consumers. Therefore, understanding how businesses perceive service value is novel. The emergence of service governance as a new dimension makes logical sense because there is evidence from the IT outsourcing literature that governance is a critical aspect of managing services [79]. Also, the value perceived by customers in an outsourcing relationship would therefore be expected to be impacted by the quality of governance relationships (ibid). This has been further argued in more recent service research [80]. We also expect that governance could be generalizable to all types of business-to-business services. This latter issue would need to be confirmed by further research.

Service providers can use these results in at least three ways. First, providers should measure customer perceptions of the components of service value. By measuring these, providers can understand what their existing customers perceive is the value they are receiving for services delivered. Some dimensions, such as service quality, may diverge from technical service quality. Therefore, where these differences arise, complementary work on service quality can be undertaken. For example, where technical service quality is good but perceptions are poor, work needs to be done to understand why customers have different perceptions from technical measurement. Second, providers can focus on-going relationships with customers on how to best govern services they provide for customers. This will differ according to customer needs. Nevertheless, recognizing service governance as an integral dimension of service value is important for cloud providers. Third, providers can monitor how their services are perceived in the market place by reputation or brand, perceived prices / costs, and in perceived benefits. Understanding each of these from customer viewpoints helps providers to recognize the position of their services in the market.

Limitations

The determination of the components of service value in business-to-business cloud computing have remained key issues among researchers and practitioners. The service value model is a key framework in conceptualising customer value in services contexts. However, empirical studies show that many organisations have experienced challenges identifying relevant service value components in theory and practise. Recent interest in information systems and services marketing has highlighted these problems.

Evidently, the issue of identifying relevant service value is an important one for business-to-business cloud computing, providing strong motivation for this research. In this paper, we have addressed the research question: *What are the components of service value in business-to-business cloud computing?*

In order to address this research question, the paper conducted contextual interviews. This approach involved qualitative in-depth interviews among twenty-one managers who are responsible for decisions in purchasing cloud computing services. The interviews provided a greater understanding of the key issues involved in determining the relevant components of service value in business-to-business cloud computing. The primary focus of these interviews was to gauge whether the themes that emerged were indeed applicable to business-to-business cloud computing context. The themes from the qualitative in-depth interviews were examined using Ruiz et al.'s [16] service value model, and helped

understand how the components of the model were suitable in different services context.

This paper makes several contributions to theory and practice. First, the existing understanding that service value components are not fully comprehensive has been confirmed. An important contribution of this paper is evidence of an extra component, which we called *cloud service governance*, applies and does not fit the existing four components of the established service value model. This situation required augmenting the established service value model with a new component. We have addressed our research question by determining that the components of service value in the business-to-business cloud computing context are service quality, service equity, confidence benefits, perceived sacrifices, and cloud service governance.

Second, we have found that the service value components of the established service value model proposed by Ruiz et al. [16] used in a business-to-consumer context also apply in a business-to-business context. Some specific language was required in all of the existing components to make the measurement of the components specific to the business-to-business cloud computing services context. The important contribution of the Ruiz et al. [16] service value model is that it supports the augmentation of a model appropriate in the business-to-business context of cloud computing, and captures the relationship of the components, which aids in our understanding.

Appendix 1 - Measures

Confidence Benefits (CB)

1. I have less anxiety when I receive alert notifications whenever there is a service outage.
2. I have less anxiety when I use the services of this cloud provider.
3. Even if something goes wrong, I am still confident of dealing with the current cloud provider.

Perceived Sacrifices (PS)

1. The total cost of securing this cloud service is high.
2. The time required to use my cloud provider's services is high.

Service Equity (SE)

1. Even if another cloud provider offers the same type of cloud service, I would still prefer this cloud provider.
2. If another provider offers cloud computing services as good as my provider, I would still prefer my current provider.

3. If another provider is not different from my current cloud provider in any way, it is still smarter to purchase my existing provider's services.

Service Quality (SQ)

1. This cloud provider's service is reliable.
2. This cloud provider's service is consistent.
3. When I need the cloud service, I can always access it.
4. My experiences of having a cloud service monitoring tool are always excellent.
5. Overall, I can rely on my cloud provider to deliver the expected services.

Service Governance (SG)

1. Even if my existing cloud provider's service levels drop, I would still prefer my current provider.
2. I can trust my data with this cloud provider.
3. It is easy to migrate my data to another cloud provider.

Abbreviations

AWS: Amazon Web Services; B2B: Business-to-Business; B2C: Business-to-Consumer; IaaS: Infrastructure as a Service; NIST: National Institute of Standards and Technology; PaaS: Platform as a Service; PAR: Participant; SaaS: Software as a Service; SLA: Service Level Agreement.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

RP carried out the contextual interviews and drafted the manuscript. SM participated in the design of the study and helped to draft the manuscript. LJ conceived of the study and participated in the manuscript draft. All authors read and approved the final manuscript.

Authors' information

RP received his PhD from the University of Melbourne in 2015. His research interests include service value models, cloud computing, IT service management and their application in business-to-business contexts. He was the previous convenor of the cloud computing group and board member at the Australian Computer Society. Currently, he is an academic at the Australian Centre for Cyber Security at the University of New South Wales, and is working with the Department of Defence of Australia.⁴ If a Disclaimer Statement could be placed somewhere that would be great. For example, "The opinion of ascertains contained herein are the private views of the authors and are not to be construed as official or reflecting the view of the Department of Defence. SM is an Associate Professor of Information Systems in the Department of Computing and Information Systems at the University of Melbourne. Simon is also Director of the Melbourne School of Information, where he encourages IT graduates to pursue a career in information systems and believes that business analytics, IT services and project management are topics worth exploring. His research interests include the implications of top-level ontological commitments in information systems modelling and the value of ontologies in organisations. His other interests include how IT is used and managed in organisations. LJ is a Professor of Marketing in the Swinburne Business School at Swinburne University of Technology. He was previously Professor of Marketing at Melbourne Business School of the University of Melbourne, Graduate School of Business at the University of Sydney and Faculty of Business at Charles Sturt University. Lester has more than 40 years in teaching, and consulted to many public and private sector organisations. He is a Fellow of the Australian New Zealand Marketing Academy (ANZMAC) and the Australian Market and Social Research Society (AMSRS).

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