INFORMATION TECHNOLOGY AND THE ORGANIZATIONAL STRUCTURE OF MODERN BUSINESS OUTSOURCING

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Abstract

The organization of modern business has been affected by the development of information technology. Information technology, in particular, affects organizational structure through vertical disintegration and international production sharing. For example, firms outsource information services such as software development and call-center operations, and also computing services. This study considers the outsourcing of information services as being promoted by a drastic reduction of transaction costs, rather than simply by the difference in production costs. This study also focuses on the service attributes that affect the transaction costs of information services, and provides an analytical tool for the firm’s choice of organizational structures. It also discusses the outsourcing decisions of firms by using this tool with examples of several types of outsourcing of information services.

Key words: Offshore Outsourcing, Cloud computing, Transaction Cost Economics

Category & Number: 5

JEL Classification Code: L2

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1. Background
Technological change has been one of the major reasons for structural change in business organizations\(^1\). A change in technology has affected business operations, and as a consequence, new business operations have defined new organizational structures. Milgrom and Roberts (1992: 543) briefly summarize this change as follows: “organizations change when their environments and the technologies they use change, and as they accumulate information and experience about what kinds of organizations work best for particular tasks”.

This concept is also applicable to modern business environments. Drastic improvement of information technology (IT) has enabled firms to outsource various types of services overseas. For example, information services such as call-center operation, financial data processing and software development are now outsourced overseas. These types of outsourcing are called “offshore outsourcing” of information services. Another case of outsourcing is the adoption of cloud computing. By using cloud computing, firms can use computing services that are provided by entities outside of the firm. Cloud computing saves firms from having to build and own their individual computer resources and allows firms to use and pay for only the shared resources.

Cloud computing is “a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources” (Mell and Grance, 2011: 2). In short, cloud computing is a shared computing resource which can be used by many users. Cloud computing is categorized as public, private, and hybrid computing. Public cloud computing is shared by anonymous users globally, and private cloud computing is used by a specific organization. Hybrid combines public and private. In this study, cloud computing refers to public cloud computing, in order to focus on aspects of the outsourcing of computing services, unless otherwise noted.

Cloud computing provides a wide range of services depending on whether it provides ready-made services or platforms on which customized services can be added. For example, SaaS (Software as a Service) provides ready-made information services for e-mail, human resource management, supply chain management, and customer relationship management. For instance, Salesforce.com provides services such as Customer Relationship Management (CRM)\(^2\). On the other hand, PaaS (Platform as a Service) provides basic functions, but end-user services have to be constructed on the platform. IaaS (Infrastructure as a Service) provides a minimal set

\(^1\) The present paper discusses the structure of business entities, including the unit of business operations and the relations of these units within a firm, and also the relations between firms. Change in the organizational structure of firms could result in organizational change of industrial structures or of society as a whole, but this paper primarily focuses on the organizational structure of business entities.

\(^2\) http://www.salesforce.com/products/
of hardware functions so that services and platforms can be added on the infrastructure. *Amazon Web Services* offers mainly platform services so that customers can create and use services on the platform. In this paper, cloud computing is sometimes also referred to as the outsourcing of computing services.

Outsourcing of information services and computing services is a phenomenon that affects the organization of modern business, and these services have common features. For example, both types of outsourcing utilize information technology, are outsourced globally, and have service characteristics or attributes. The outsourcing of these services affects organizational structure in the direction of vertical disintegration and international production sharing. From a macroeconomics perspective, the impact of the outsourcing could become pervasive, particularly on employment and productivity, because it can affect the role of a country in the global value chain.

Because of the potential impact on domestic employment and innovative capacity, empirical analyses on offshore outsourcing and cloud computing have been conducted, for example, in Amiti and Wei (2005, 2009); Falk and Wolfmayr (2008); Liu and Trefler (2008), and Takagi and Tanaka (2012, 2014, forthcoming). However, to understand the impact of outsourcing and to discuss economic policies, analysis on the mechanisms behind the outsourcing of these services is essential. Particularly, insight into how information technology has enabled objective information services to be divided from organizations, and outsourced overseas is important in understanding the organizational structure of modern business.

An overarching framework that explains the effect of information technology on organizational structure is not available. Development of information technology has been generating new business models not only for offshore outsourcing of services and cloud computing, but also for global internet media and commerce services. Analysis of the fundamental mechanisms of outsourcing will contribute to understanding the organizational changes associated with the adoption of information technology. Therefore, the present study clarifies how the development of IT affects the structure of business organizations by specifically focusing on the outsourcing decisions of firms, and by providing an overarching framework for such analysis.

### 2. Prior studies

This section reviews prior studies on the decisions of firms regarding outsourcing. The major focus of prior studies related to outsourcing have been based on transaction cost economics (TCE), which provides a theory about the boundary and structure of firms (Coase, 1937; Williamson, 1975). TCE is generally referred to as a starting point to discuss outsourcing and organizational issues in various articles such as Willcocks and Lacity (1995), Ono and Stango (2005) and Michael and Michael (2011). Several articles for practitioners also refer to TCE and

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3 http://aws.amazon.com/
how TCE affects the success of outsourcing projects. (Kennedy and Sharma, 2009; Manning, 2006).

However, in-depth analysis of TCE regarding the outsourcing of information services is not abundant. Among the few studies of this nature, Dibbern et al. (2008) identify extra costs that arise in outsourcing projects rather than the direct costs paid to the vendor, and analyze the extra costs by TCE and a knowledge-based view of firms. From case studies, Dibbern et al. show how extra costs are different across each project, because conditions may differ, such as client-specific knowledge, absorptive capacity, and geographic and cultural distance.

Ang and Straub (1998) empirically analyze the determinants on the outsourcing of information systems and show that transaction costs affect outsourcing decisions, but conclude that such costs are much smaller than the differences in production cost. Bahli and Rivard (2003) identify risks concerning the outsourcing of information services such as 'lock-in', and discuss lock-in from the perspective of TCE and agency theory. Blair et al. (2011) focus on modularity of tasks or activities and examined contracts that determine the interface of vendor and buyer, although these authors do not focus on the outsourcing of information services.

In general, these prior studies discuss TCE to estimate the true cost of the outsourcing of information services to help firms decide on the value of outsourcing projects. The common feature of these studies is that they view the outsourcing of information services as possible. However, how information technology enables these information services to be tradable is not fully discussed. This is the point missing in prior studies because tradability is essential to understanding how information technology changes the organization of business and the economy. In the next section, a theoretical framework is discussed to explore the relationship of technological development and transaction costs, and the relationship's effects on outsourcing decisions.

3. Theoretical foundation
This section provides a theoretical foundation for the analysis presented in Section 4 by discussing the focal points of transaction cost economics (TCE) and service attributes.

3.1 Transaction cost economics
Traditionally, TCE views the boundary of firms as determined by transaction cost. Ronald Coase views that tasks in an organization are conducted within the organization when it is less costly than carrying out the transactions through the market (Coase, 1988). Transaction cost includes the various costs incurred to conduct transactions in the market, such as finding partners, and making and enforcing contracts. Oliver E. Williamson developed Coase’s theory by introducing two important human factors behind transaction cost: opportunism and bounded rationality (Williamson, 1975). Williamson showed that the market fails when these two human

4 For more detail on the contents of transaction costs, see Coase (1988) and Dahlman (1979).
factors are combined with environmental conditions: bounded rationality with uncertainty, and opportunism with small-numbers exchange relations.

Under bounded rationality, the uncertainty surrounding a task provides a motivation for firms to conduct the tasks within the organization. Williamson (1975: 9) states, “If, in consideration of these limits, it is very costly or impossible to identify future contingencies and specify, ex ante, appropriate adaptations thereto, long-term contracts may be supplanted by internal organization”. In order to minimize the loss caused by uncertainty of the information services, frequent and close communication is required. Therefore, uncertainty is associated with the costs for communication and traveling.

On the other hand, opportunism is caused by small-numbers exchange or Ex Ante Small Numbers (Williamson, 1975:48). In particular, Ex Ante Small Numbers is caused because “Although a large-numbers exchange condition obtains at the outset, it is transformed during contract execution into a small-numbers exchange relation on account of (1) idiosyncratic experience associated with contract execution, and (2) failures in the human and nonhuman capital markets” (Williamson, 1975:29). Simply put, a first contract winner acquires specific assets such as know-how and better understanding of the contract, and this asset helps the seller win future contracts. Where a buyer cannot switch the supplier because of the specific assets that are acquired by the first contractor, a hold-up problem arises.

Williamson (1975) suggests that such a situation can be mitigated by conducting the activity in-house, because internal audits and hierarchical order can reduce information asymmetry and opportunism. Therefore, the outsourcing decision is also related to the prospects of opportunism by small-numbers exchange. If the outsourced activity includes a high asset specificity and the buyer faces the risk of opportunistic behavior, the buyer would conduct the activity in-house.

Williamson’s (1975) solution for such opportunism and the risk of hold-up is to carry out the activity in a hierarchical organization. However, what are the exact costs for avoiding a hold-up problem if a firm outsources the project? These costs are summarized in three points. First, there is the cost for internalizing the assets which have been obtained by third-party vendors. If a vendor acquired specific assets of the client and the client did not have sufficient knowledge of the assets, the client would need to invest in claiming back the asset to avoid opportunistic behavior. The second point concerns the costs for specifying a contract. Without sufficient specification of a contract, the contents of the activity and the know-how for conducting it remain part of the vendor’s knowledge. Third, there is a cost for overseeing the vendors to avoid the accumulation and hiding of specific assets of the client. These costs for internalizing assets, specifying contracts, and overseeing vendors are the major costs needed for avoiding hold-up risk in outsourcing projects, and conversely, if these costs are reduced, there is a greater chance for outsourcing the business.

TCE focuses primarily on transaction cost, which Coase (1988: 114) explains as follows, “In order to carry out a market transaction it is necessary to discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct
negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on”. Therefore, it is inferred that the transaction cost is externalized from the production cost, which is the genuine cost for producing the goods or services. TCE does not focus on the difference in this production cost, but in practice, production costs could be diverse across countries because they reflect the difference in factor prices. This difference in production costs has certainly promoted the outsourcing of information services. However, the differences in production cost have been obvious even before the current trend of information services outsourcing. Therefore, this study views the drastic reduction of transaction cost, rather than the reduction of production costs as fostering the outsourcing of information services.

3.2 Service economy
In the marketing and management fields, services are defined to have four attributes: intangibility, heterogeneity, simultaneous production and consumption, and perishability (Zeithaml and Bitner, 2003: 21). For example, a haircut as a service fulfills all four attributes. One cannot physically touch haircut services; the contents of the haircut differ slightly depending on the customer because each customer’s preference and property are different. Getting a haircut becomes possible under the cooperation between provider and customer, and one cannot store the haircutting services. These attributes suggest that “many services require customers to participate in creating the service product” (Love lock and Wirtz, 2004:11). Because of these service attributes, outsourcing in the service sector has been limited to businesses whose specifications are easily defined, such as in electricity and water supply, finance, and construction. In other words, if the degree of service attributes change, the tradability of the service will also change correspondingly.

Among the four attributes, heterogeneity and simultaneous production and consumption play the most important roles on transaction cost and outsourcing decisions. Heterogeneity represents the contents of services that are different depending on each customer. Particularly, where the contract requires a client’s specific knowledge or asset, heterogeneity is associated with “asset specificity”, which causes a small-numbers exchange and therefore, opportunism.

Simultaneous production and consumption represent services that are produced and consumed simultaneously by interaction of the provider and customer. Also, the contents of services are not specified perfectly beforehand. Therefore, Simultaneous production and consumption is also associated with uncertainty and bounded rationality in transaction cost economics.

The service sector is becoming more and more important to the economy, and as seen in this section, service characteristics influence the transaction costs of the services. Also, the distinction between manufacturing and services is becoming vague. Various products now include service components. On the other hand, some information services may also have a
similarity to products. Cusumano (2010: 74) phrases this as “the gradual “servitization of products” as well as the “productization of services””. In order to discuss the tradability of businesses including service factors, it is essential to analyze the service characteristics of the particular task.

3.3 Overall framework

One of the features of the present study is to combine two theories: transaction cost economics and service attributes. Considering the discussions in section 3.2, the relations between the related concepts are shown in Figure 1.

First, heterogeneity, as one of the service attributes requires specific assets to serve a certain client, and therefore, can cause opportunism and small-numbers exchange relations. The risk of opportunism is mitigated with the costs for avoiding the hold-up problem. As discussed in section 3.1, the costs for internalizing assets from the provider to client and specifying and overseeing contracts are the content of transaction costs. When these costs are too large, the business is conducted in a hierarchical manner. Conversely, if there is a factor which can reduce these costs, then business is more likely to be provided by third-party vendors.

Simultaneous production and consumption can cause uncertainty of services, which is also caused by bounded rationality. In this paper’s context, the costs for reducing uncertainty are the communication and traveling costs between providers and customers. On the other hand, uncertainty and bounded rationality are also related to the difficulty in specifying contracts. Therefore, simultaneous production and consumption are related to the costs for avoiding the hold-up problem.

Based on these arguments, the overall framework of outsourcing decisions is shown in Figure 2. This study assumes that the development of IT affects service attributes, and the change in service attributes reduces transaction costs. The reduction of these transaction costs affects the overall decisions on outsourcing.

**Figure-1: Relationships of terms**

<table>
<thead>
<tr>
<th>Service attributes</th>
<th>Factors of transaction costs (Williamson 1975)</th>
<th>Contents of transaction costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heterogeneity</td>
<td>Opportunism + Small numbers exchange</td>
<td>Costs for avoiding hold-up</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Internalizing assets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Specifying contract</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Overseeing contract</td>
</tr>
<tr>
<td>Simultaneous production and consumption</td>
<td>Uncertainty + Bounded rationality</td>
<td>Communication and traveling</td>
</tr>
</tbody>
</table>
3.4 Scope of analysis

When the economy is divided into manufacturing and services, the outsourcing of business processes has four variations depending on a combination of client industry and the outsourced business process. As Figure 3 shows, this combination of manufacturing and service industry can outsource manufacturing or service functions. When the manufacturing sector outsources the manufacturing function, it takes the form of intermediate components or OEM (Original Equipment Manufacturer), where the manufacturing of the final products is outsourced. Recently service firms also outsource manufacturing processes. For example, Malecki and Moriset (2008) show how Microsoft worked with Flextronics and various EMS (Electronic Manufacturing Services) for the production of the Xbox.
This study specifically focuses on the outsourcing of information services and computing services. These services can be outsourced from both manufacturing and service firms. Services such as sales management, human resources management and accounting are common services for most firms, and computing services are the platform for these services. Therefore, the outsourcing of information services from the manufacturing and service sector does not have a significant difference in terms of its contents and tradability. Based on this point, the present study focuses on the outsourcing of information services and computing services from both manufacturing and service sectors, without specifying the difference between the client industries.

4. The effect on organizational modes
Based on the arguments in the previous section about service attributes and transaction costs, this section constructs an analytical tool which operationalizes the concepts and analyzes the decisions on the organizational mode.

4.1 Analytical tool
Taking into account the discussion in the previous section, Figure 4 represents an analytical tool developed to operationalize the theories of TCE and service attributes. The vertical axis shows the degree of heterogeneity which also measures the costs of hold-ups such as internalizing assets and specifying and overseeing contracts. The horizontal axis shows the degree of simultaneous production and consumption, which also measures the costs for communication.

![Figure-3: Scope of analysis](image-url)
and traveling. The contents in the dashed boxes (A to E) represent the choice of a suitable organizational mode based on the combination of service attributes.

Figure-4: Analytical tools on organizational modes

![Diagram of Analytical tools on organizational modes]

When the heterogeneity of a certain service is very high and there is a high risk of opportunism and hold-up, these services are conducted by hierarchical organization (C) because of the high costs for internalizing assets, and for specifying and overseeing contracts. On the other hand, if simultaneous production and consumption is very high, and therefore there is a high need for close communication, these services are also conducted by hierarchical organization (C).

When the level of heterogeneity and simultaneous production and consumption become lower, there is a chance for outsourcing. When heterogeneity and the risk of opportunism is relatively high, the task is outsourced to the firms established or acquired by user firms to enjoy cost reduction while mitigating the risk of opportunism. IPA (2012) shows that among Japanese IT service firms that have experience with outsourcing software development services, 46.4% of those firms have established their own subsidiary companies, one of whose services is to provide outsourced software development. The outsourcing to the subsidiary companies is called “captive sourcing” (Gottfredson et al., 2005; Baldia, 2007). Captive sourcing combines the benefit of cost reduction and hierarchical control, while flexibility is achieved less than outsourcing to third party vendors. As a result, there are choices on offshore captive sourcing.

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5 There are some variations in the case of high simultaneous production and consumption. For example, firms can outsource to a provider whose workers reside in a client’s location, so that providers and clients work in the same place and enable close communication. Additionally, there are cases of dispatched workers in the hierarchical organization. The choice between dispatch work or outsourcing in a clients’ location could also depend on the contents of the work and labor regulations.
(A) or domestic captive sourcing (B) when the heterogeneity is relatively higher, and offshore outsourcing (D) or domestic outsourcing (E) when the heterogeneity is lower.

On the other hand, less simultaneous production and consumption leads to less cost for communication, thus promoting the outsourcing of the tasks. The required costs for communication are related to the decision on domestic or international outsourcing. If the buyer and provider need close communication and coordination on the activity, it is less easy to outsource the project overseas because of the difference of language, cultural norms, and business customs. Conversely, if the required proximity becomes less important, it becomes easier to outsource the project overseas. As a result, the level of simultaneous production and consumption defines the choice between domestic (B, E) or offshore (A, D) outsourcings6.

The present study focuses on service attributes and transaction costs as factors on outsourcing decisions. However, there is a growing concern with information security regarding outsourcing projects, such as the risk of leakage of confidential information and personal data. In prior studies, Gonzalez et al. (2008) list security problems as one of the risks of information systems outsourcing. They point out the importance of keeping confidentiality when providers are serving several competitors. Because the development of information technology has made it easier for information to be copied and transferred globally, the risk of security is higher when information protection has to be enforced across different organizations in outsourcing projects. The costs for security consideration and the associated risks are also one of the transaction costs in the choice of organizational structures.

5. Application of the analytical tool
This section experimentally applies the analytical tool in section 4 and analyzes the choice of firms on outsourcing. It discusses the effect of information technology on the firm’s decisions on organizational structure by using several cases: software development, call-center operation, and cloud computing. The analysis is mainly based on prior studies on the history of related technology and business.

5.1 Software development
In terms of software development, heterogeneity has been significant particularly for customized software projects, therefore, defining the specifications of the projects has been important (Cataldo and Herbsleb, 2013; Palacio et al., 2011; Gopal et al., 2011). Even in

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6 This paper focuses on the effect of IT, but there is also another factor that reduces uncertainty. For example, improvement of contract terms also affects the tradability of services. Blair et al. (2011) identified several important features to reduce uncertainty such as a “Master Agreement” plus “Statement of Work” structure, identifying a small number of key personnel as decision-makers, invoking or developing standardized metrics, codification of processes, and periodic evaluation of performance against standards. These contractual improvements also reduce uncertainty in outsourcing projects.
outsourcing projects, specification is still important for software development, and mediation by bridge-SE (the vendor’s system engineer who resides in a clients’ location) is adopted in outsourcing projects (Umezawa, 2007). In this sense, *heterogeneity* has not changed. Therefore, the choice between captive or non-captive sourcing depends on the original level of the heterogeneity of each project.

Then again, required *simultaneous production and consumption* and associated costs for communication have been reduced with the development of information technology such as TV conferencing and development management tools. For example, Palacio et al. (2011) provide a comprehensive survey on distributed software development (DSD). They propose the use of instant messaging (IM) and collaborative working spheres (CWS) to support communication, and the use of personal activity management (PAM) to help project management. In general, the introduction of technologies to support communication, to manage source code and product, and to help project management are important to enable the offshore outsourcing of software development. Because of the reduction of *simultaneous production and consumption*, firms are more likely to outsource the development process.

In a Japanese context, development of customized software is often outsourced from user firms to IT vendors, and from IT vendors to third-party software companies (IPA, 2011). This “multi-layer outsourcing” used to be conducted domestically, but outsourcing overseas has grown since the early 2000s (IPA, 2010). IPA (2011) points out that under a multi-layer outsourcing industrial structure, offshore outsourcing of software development has increased the downward pressure of prices for small- and medium-sized IT firms.

Based on this domestic background in Japan, software development has been conducted through domestic captive sourcing (B) or domestic outsourcing (E) as in Figure 5, depending on the heterogeneity of the software. When firms outsource the development process overseas, they have a choice to take offshore captive sourcing (A) or offshore outsourcing (D). In order to reduce the risk of opportunism in an offshore outsourcing project, offshore captive outsourcing (A) has been also one of the options. Usually captive sourcing is more costly then outsourcing, but the difference of prices across countries may offset the cost associated with establishing subsidiary companies abroad.

The analysis of the example of the role of development tools in outsourcing decisions needs in-depth case studies. However, there are several case studies on offshore outsourcing of software development. Saisho (2010) introduces the case where Hitachi Software Engineering (now Hitachi Solutions) established an offshore development center in Hanoi, Vietnam, in 2005, by ensuring a system development team in FPT software, a Vietnamese software company. This case seems to combine the benefits of offshore captive sourcing (A) and offshore outsourcing (D). Saisho (2010) also raises the case of CSC, a U.S. based company, which acquired a Vietnamese software company, FCG, to provide software development and maintenance services. This is a case of offshore captive sourcing (A), developed by M&A.
5.2 Call-center operations

In terms of call-center operation, *simultaneous production and consumption* has also been reduced by the introduction of technology. Call-center operators have to share customers’ information with other business departments to respond to various customers’ demands. However, the introduction of CRM (Customer Relationship Management) systems based on broadband network have drastically reduced communication costs between call-centers in distant location and other departments.

CRM systems are computer systems designed typically to support call-center operators in recording and managing interactions with customers, but there are various functions in CRM systems. Torggler (2009) classifies CRM systems by functions and stages of business, and shows that CRM systems support various activities such as recording customer data, marketing support, complaint management, and data analysis for marketing, sales, and services. CRM systems, therefore, provide various functions for managing data on customers and sales, but this data is used by various organizations such as marketing, sales, and customer support.

With the introduction of CRM, the record of customer support activity is simultaneously shared by business headquarters and call-centers, and a summary of information can be reported periodically from call-center operations. Thus, the development of CRM systems has reduced *simultaneous production and consumption* and associated communication costs between call centers and other departments.

The organizational structure for call-center operations is shown in Figure 6. Traditionally, call-center operations have been conducted within organizations through a hierarchy (C). Generally, the development of IT such as in CRM systems has reduced the *simultaneous production and consumption* attributes. On the other hand, there is a possibility that penetration of CRM may promote the standardization of customer management business
and therefore reduce *heterogeneity*. However, the information on each customer is different and even confidential for each firm. Therefore, the choice between captive or non-captive sourcing depends on the original level of heterogeneity in each firm.

MOSHI MOSHI HOTLINE, a Japan-based company that provides call-center services for customers, owns subsidiary companies in Vietnam and Dalian, China, for providing call-center services (Nikkei sangyo shinbun 2014). This company provides various back office services including customer relations from an office in Dalian, China, and standardization is one of the services for customers\(^7\). The establishment of offshore sites of the company in China and Vietnam exemplifies the transition from domestic outsourcing (E) to offshore outsourcing (D).

### Figure-6: Organizational structure of call-center operations

5.3 Cloud computing

Computing services in general used to be provided within an organization because of the necessity of customization for each organization. However, along with the convergence of optimal business processes, provision of standardized services for a large volume of customers in the form of cloud computing has become more economical.

For example, Bills (2013) shows that the way to realize the value of cloud computing is through standardization and simplification, and gives several examples in which firms benefit from standardization of business processes in the course of adopting cloud computing. McNeill et al. (2011) provide the result of a survey that shows access to standardized business processes

is the motivation for outsourcing for 80% of user firms. This standardization reduces the heterogeneity of computing services.

On the other hand, virtualization, a technological innovation for cloud computing, has enabled many firms to share the same computing resources. Additionally, penetration of broadband networks such as fiber-optics has also allowed responsive functionality in distant locations. Thus, virtualization and an improved network infrastructure have reduced the required proximity between computing services and user firms.

The organizational structure of cloud computing is shown in Figure 7. In terms of public cloud computing, the choice for firms is whether to use domestic or international cloud services (C to D or E). The choice between them depends on the requirements for close communication. If the service requires close communication between providers and clients, the firm will choose domestic outsourcing. Other factors such as regulations on personal information protection, or business contingency would also affect the decision on using domestic or international cloud computing.

One example of international cloud computing is Google Apps, which provides various tools such as email, video conferencing, scheduling, and word-processing. Google Apps is used by Japanese firms such as ANA, BEAMS, MISAWA HOMES. The exact location of the data centers of the service is not available, but generally, the location of the data centers in cloud computing services is not limited in Japan.

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8 Baldwin and Clark (1997, 2000) introduced the concept of modularity to deal with complex systems. Modularity consists of sub elements: abstraction of functions, information hiding within each module, and interface to define the interaction between modules. Public cloud computing is analogous to the modularity of computing services in terms of information hiding and specification of interface. This modularization can also reduce the heterogeneity of computing services.

9 Virtualization is a technological element which enables users to utilize the shared computing resource as if the resource is used only by the user.

10 On the difference of public, private, and hybrid cloud computing, see section 1.


6. Conclusions
This study has analyzed the mechanisms behind a firm’s decision to use outsourcing information services, by considering transaction cost economics and service attributes. This paper provides a framework and analytical tool to operationalize the theory of TCE to better understand a firm’s choice of organizational structure. Experimental application of the tool to examples shows that the tool helps a firm's understanding of the influence of IT on service attributes and transaction costs, and how service attributes and transaction costs affect the firm’s choice of organizational structure. Compared to prior studies, the present study discusses IT as an enabler of outsourcing, and analyzes the effect of IT on a firm’s decisions on its organizational structure.

The service sector, in general, in its relation to trade has become more standardized, and the standardization is related to the adoption of information technology. In terms of CRM or cloud computing, standardization evolves as major suppliers provide services to more customers, which results in *de facto* standards. Standardization is also a subject of economic policy. In the software development field, development processes, quality management, and IT skills have been discussed in various standardization endeavors both at the national and international level. These discussions result in various *de jure* standards such as those adopted by the International Organization for Standardization. From an economic policy point of view, it is important to understand what services can be standardized and are likely to be outsourced in order to form effective industry and employment policy.

This study sheds light on the changes in transaction costs as determinants of the outsourcing of services, but as the experimental application shows, there are many other factors that could also affect outsourcing decisions, such as regulations on data protection, information
security, the core competencies of firms, the effect on knowledge creation and spillover. Understanding how these factors also affect these aspects and integrating these aspects into transaction cost analysis is a subject for our future research.

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