OFFSHORING SOFTWARE DEVELOPMENT: INDIA/CHINA CHOICE A TRANSACTION COSTS PERSPECTIVE

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ABSTRACT

The purpose of this paper is to interpret the decision to choose a country to entrust its service providers with the software development activity. Based on transaction cost theory, the cost measurement waxes derived from this theory are used to compare two competing countries in the Offshore market: India and China. Salary, ICT, language, trust and economic and institutional stability are the points of differentiation on which this study is based. By using an exploratory and a comparative study based on secondary data from different statistical sources, the study confirms that according to the TCT, India remains a more appropriate choice than China for client firms seeking to outsource software development activity. This paper is completely original and proposes a new research component that links TCT predictions with the country chosen as a part of Offshore's strategy.

KEY WORDS

Offshoring, Software development, TCT, India, China.

JEM CLASSIFICATION: F23, F43, L22, L23, L86, O11.

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L'OFFSHORING DU DEVELOPPEMENT LOGICIEL : LE CHOIX ENTRE INDE/ CHINE PERSPECTIVE DE COUTS DE TRANSACTIONS

RÉSUMÉ

Le but de ce papier est d'interpréter la décision de choisir un pays pour confier à ses prestataires l'activité du développement de logiciels. En se basant sur la théorie des coûts de transactions, les critères de mesure de coûts retirés de cette théorie sont utilisés pour comparer entre deux pays concurrents dans le marché de l'Offshore que sont : l'Inde et la Chine. Le salaire, les TIC, la langue, la confiance et la stabilité économique et institutionnelle sont les points de différenciation sur lesquels s'appuie cette recherche. En utilisant une étude exploratoire et comparative basée sur des données secondaires retirées de différentes sources statistiques, cette recherche confirme que selon la TCT ; l'Inde demeure un choix plus approprié que la Chine pour les firmes clientes cherchant à externaliser l'activité du développement logiciel. Ce papier est complètement original et propose un nouveau volet de recherche qui lie les prédictions de la TCT avec le pays choisi dans le cadre de la stratégie d'Offshore.

MOTS CLÉS

Offshoring, Développement de logiciels, TCT, Inde, Chine

JEL CLASSIFICATION : F23, F43, L22, L23, L86, O11.

الاوفشور لتطوير البرمجية: الخيار بين الهند/ الصين
منظور تكاليف الصفقات

ملخص

تهدف هذه الورقة إلى تفسير قرار اختيار بلد وهذا من أجل القيام بالتوكيل إلى مورديه وظيفة تطوير البرمجيات بالاعتماد على نظرية تكاليف الصفقات، تم استعمال معايير قياس التكاليف المنبثقة من هذه النظرية من أجل المقارنة بين بلدين منافسين في سوق الأفشور، و هما: الهند و الصين. الأجر، تكنولوجيا المعلومات والاتصال، اللغة، الثقة و الاستقرار الاقتصادي و المؤسساتي هي نقاط التمييز التي يعتمد عليها هذا البحث. باستخدام دراسة استكشافية و مقارنة معتمدة على معطيات ثانوية منبثقة من مصادر إحصائية مختلفة، تثبت هذه الدراسة أنه على حسب نظرية تكاليف الصفقات فإن الهند تبقى خيارا أكثر ملائمة مقارنة مع الصين بالنسبة للمؤسسات الزبون الساعية إلى تخريج وظيفة تطوير البرمجيات. هذه الورقة هي أصلية تماما و تقترح مجال بحث جديد يربط بين تنبؤات نظرية تكاليف الصفقات مع البلد المختار في إطار استراتيجية الأفشور.

كلمات مفتاحية

الأفشور ، تطوير البرمجيات، نظرية تكاليف الصفقات، الهند، الصين.

تصنيف جال:F23, F43, L22, L23, O11

INTRODUCTION

As a strategy for inter-firm cooperation, Offshoring or Offshore strategy is an approach widely applied in economic and managerial life. Using a service provider located in a country far from the client firm is one form of Outsourcing an activity that was previously managed internally.

Offshoring is defined by Prikladnicki and Audy (2010, p. 780) as : "*the move to an external third party in another country*". Thus, the geographical boundaries that separate the client firm from its service provider are those that determine the form of the chosen Outsourcing.

If both parties of the transaction operate in the same country, the Onshoring is referred to. When the actors involved in the transaction move to two nearby countries, the Outsourcing strategy is called Nearshoring.

Today, the client firm is freeing itself from the management of certain activities that are supposed to be of secondary strategic importance by entrusting them to another legally independent party. Software development is the most common function outsourced to a remote service provider. Offshoring of software development is defined as : "*software work undertaken at geographically separated locations across national boundaries in a coordinated fashion involving real time (synchronous) and asynchronous interaction*" (ulHaq et al., 2011).

In its theoretical framework, this orientation towards outside the firm's borders is justified by certain theoretical approaches based on planned goals. Transaction cost theory is the theory most often used to guide such a decision. The TCT considers that the firm uses Outsourcing to reduce costs through a reduction in transaction costs. This theory therefore provides a rational and applicable economic clarification of the Sourcing decision.

By choosing a country that offers the least expensive service, the TCT perspective is represented. It is therefore clear that the most prominent countries in the Offshore service are those that can serve the application needs of the client firm at low cost (Mudambi and Venzin, 2010).

India is now dominant as an attractive target for various customers, particularly for software development. India has been able to make surprising progress over the past two decades and ranks first among the leading countries in the Offshoring market (Kobayashi-Hillary, 2010).

China, on the other hand, is another emerging economy and is emerging among the target countries. China also attaches particular importance to the global technology performance that remains a vital engine of economic growth in the country (Mees, 2016).

In this work, this pioneering attempt aims to present a comparison between India and China according to certain points that produce a

minimal difference between these two leading countries in the Offshore software development market. These points have their origins in the assumptions of transaction cost theory.

The analytical method used in this study is the conceptual approach. This method allows us to design, through an interdependence of previous knowledge, an integral model of analysis on a recent, innovative and pioneering subject (Gagnon, 1982; Mellenbergh et al., 2003). The conceptual approach is therefore the most appropriate to propose a new research strand as proposed in this paper.

1- TCT AND OFFSHORE STRATEGY

Founded by Williamson in 1975, TCT is one of the most widely cited theories in the economic and managerial literature. In particular to address the Sourcing issue, TCT has been able to occupy an important place as a theoretical basis to which researchers and practitioners refer. The notoriety of the TCT relies on its ability to justify the firm's organizational decision by exposing an integral predictive model to such a choice.

The general idea assumed by the TCT is that the search to reduce transaction costs is the main objective set by the firm. The ability to reduce these costs leads to a reduction in the firm's total costs. This economic proposal is formed as follows:

Internal costs=Production costs + Coordination costs;
External costs=Production costs + Transaction costs.

The TCT stipulates that the choice between adopting an internal solution (Insourcing) or an external solution (Cooperation or Market) depends on the cost level of a given transaction.

For Williamson, the external solution has always the advantage in terms of production costs, because the economies of scale realized by firms specialized in a particular field allow them to offer services at lower costs (Walker and Weber, 1984).

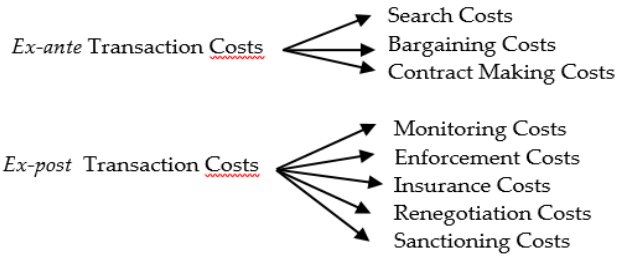
However, coordination costs represent the costs resulting from the use of hierarchy as a means of coordination (Williamson, 1988). In this context, Claver and others (2002, p. 296) note that : "*if one goes out to the market, coordination costs become transaction costs*". In general, these costs

refer to those resulting from internal coordination between functions and services.

The reduction in transaction costs leads to a reduction in all external costs. This tilts the choice towards the external solution. Conversely, if the firm perceives high transaction costs, the internal solution is the one that should be chosen in order to reduce costs.

Therefore, Offshoring as an external solution is chosen if transaction costs have been low. Transaction costs depend on the specificity of the assets, the frequency with which the transaction occurs and the uncertainty surrounding it. As a result, the firm uses Offshoring if these three characteristics of the transaction accompanied by a low level of opportunism and limited rationality are weak.

In his book (1975), Williamson described two categories of these costs: *ex-ante* costs, which refer to costs produced before the contract was signed, and *ex-post* costs, which are incurred after the contract is signed. These costs are fragmented as follows:



2- DEVELOPMENT OF A CONCEPTUAL MODEL COMPARING INDIA AND CHINA BASED ON TCT ASSUMPTIONS

Choosing to work with an Indian service provider or, if not, a Chinese service provider is done according to the TCT by balancing all costs:

Costs1 = Production costs + Transaction costs (choosing an Indian service provider);

Costs 2 = Production costs + Transaction costs (the choice of a Chinese service provider).

When Costs1>Costs2, the foreign client firm will choose to outsource the software development activity to a Chinese service provider;

When Costs1< Costs2: the Indian provider is the one who serves the application need at a low price and will therefore be the target for the Outsourcing firm.

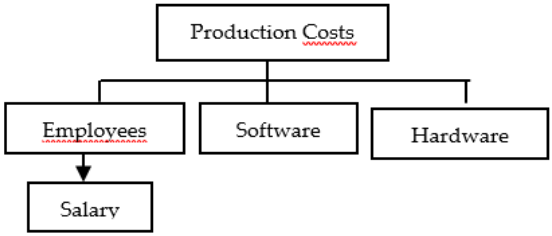
As a result, two sources of costs become the core of the adopted comparison. These are production costs incurred by the Indian or Chinese service provider, and transaction costs that are borne by the client firm to carry out an Offshore transaction.

With regard to production costs, only the main factors that have a direct effect on the costs of producing software will be analyzed. The salary of the human assets involved in the development project, programming software and technological equipment are the source of production costs borne by the chosen service provider.

According to Carmel and Tjia (2005), in a software development project, salary is the main factor triggering production costs. The pooling of non-human resources between different clients and the relatively long lifespan of the operability of such assets makes their cost negligible. Employees (programmers, analyzers, controllers, managers) are therefore the economic burden of any software development project.

Consequently, and to simplify our comparative model, we focus only on wages as a point of differentiation in the level of production costs between providers in these two countries, as shown in the following figure:

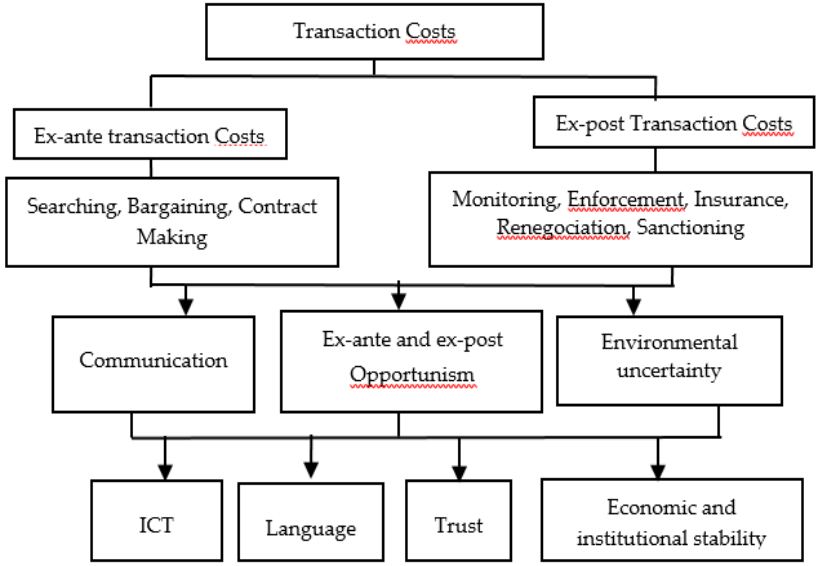
Figure n° 1: Sources of software development costs.



Source: According to the author

As for transaction costs, different sources were mentioned by the authors. The eight sources of transaction costs mentioned above can be produced by certain determining factors. ICT, language, trust and the country's economic and institutional stability remain the basic elements leading the client firm to bear transaction costs as shown in figure 2

Figure n° 2: Modeling transaction cost sources



Source: According to the author

In this work, our model is based on four main factors that give rise to ex-ante and ex-post transaction costs: communication costs, language, trust and economic and institutional stability. The various sources of transaction costs mentioned above have their origins in this study in these four interacting factors.

Communication costs, which include the costs incurred by the client firm when seeking, selecting and contacting the service provider and when entering into and monitoring the contract, are a source of transaction costs. Today, the level of use of information and communication technologies between the two contractual parties determines the transaction costs that may be generated. Especially for the Offshore strategy, the adoption of *ex-ante* and *ex-post* electronic communication between the client firm and its service provider has become essential to reduce communication costs (Palvia, 2004; Hahn and Bunyaratavej, 2010).

As far as language is concerned, it refers to the means by which communication between the contracting parties takes place. If the two parties involved in the transaction cannot unify their communication language, costs increase. The linguistic gap between them often leads to third party intervention to make the bipolar relationship approachable before and after the contract is signed. A misunderstanding of the needs leading to the failure of the Outsourcing operation can also occur.

Trust, which is a decisive criterion, determines the path of the contractual relationship (Williamson, 1993). According to Fukuyama (1995), trust is a key factor in the success of any international economic relationship. Economically, confidence depends on the level of opportunism that may be perceived by the provider. Pre-contractual (adverse selection) and post-contractual (moral hazard) opportunism require the firm to put in place control and monitoring procedures to identify such behavior (Akerlof, 1970). Being trustworthy is one of the crucial factors that reinforce the success of the dual relationship (Tiwana and Bush, 2007).

In addition, institutional and economic stability is one of the factors that determine the degree of environmental uncertainty. Among the

various sources of uncertainty, economic and institutional stability remains the main challenge as part of an Offshore strategy (Hahn and Bunyaratavej, 2010). Using a service provider located in a country experiencing destabilization in terms of reforms implemented is an irrational choice for the client firm. This permanent change increases the degree of uncertainty surrounding the transaction and therefore reinforces the possibility of a subsequent renegotiation to include the new contingencies in the contract.

3- THE EMPIRICAL STUDY

One of the main questions raised in the Outsourcing literature, particularly with regard to information systems, is "Where to Outsource?" (Palvia, 2004; Graf and Mudambi, 2005). In our study, we selected the two countries that rank first in the global technology delivery market.

Despite their recent and late emergence as an international economic power, India and China have been able to crush and compete with traditionally developed countries in different trade sectors (Rodriguez, 2011).

The Chinese economy is particularly based on the industrial sector. Products remain the main Chinese exports with revenues of US$230 trillion out of a total of US$421 trillion in annual revenues obtained in 2017. The software industry is another vital sector in China. By exporting such services, the country generated approximately US$54, 1 trillion in 2017 (China Statistical Yearbook, 2018).

Unlike China, the Indian economy is much more oriented towards the technology services industry than the product industry. In 2019, the annual revenues of the Indian industry reached US$180 billion. Most of these revenues were generated by the export of technological services. Software exports account for 48% of all Indian exports during 2010 and 2011 and generate US$5, 6 trillion in 2018 (Statista, 2019).

To carry out our comparative approach, macroeconomic statistics for India and China have been removed from various sources. The Global Economy, International Communication Union, Word Economic Forum, World Bank, MFI and various websites are the

different sources used to access secondary information used to make a comparison between the two countries.

As mentioned in our conceptual model, salary, adopted ICTs, language, trust and economic and institutional stability are the main points of analysis in this study. Through the secondary information that we will acquire on each of these factors, which differs from one country to another, we can compare India and China. This comparison will then allow us to conclude that one country is superior to the other in terms of technological performance from the TCT perspective.

3.1- The salary

It is clearly observable that wages are one of the crucial factors taken into account when the firm is faced with a strategic approach. For an Offshoring decision, the salary is often quoted by researchers. Joshi and Mudigonda (2008), for example, see that India and China's widely perceived economic prosperity today is due to their low wages.

It is clear that India is known for its low global wage level. This decrease in salary is due to the high number of Indian graduates faced with low employability. Indian universities produce 400,000 highly skilled engineers per year compared to 60,000 in the United States (Kaul, 2006). For Indian students, technological and computer sciences is a preferable field. The technology sector is considered as an energetic future for the country since India has been able to leave its global footprint in this sector.

For their part, Chinese students prefer to study in technological sciences. Nearly 40% completed their scientific career in STEM (Science, Technology, Engineering and Mathematics) in 2013 (McCarthy, 2017). 4, 7 million students enrolled in 2016 compared to 2, 6 million in India and 568,000 in the United States (The World Economic Forum, 2016).

The number of Indian graduates is lower than in China, but the salary of a developer in India remains low compared to a worker in the same position in China. According to a survey conducted by LLC, the average salary of a Chinese software developer is best $13,400 per year, while an Indian programmer receives $10,300 (Lemon, 2005).

The economic law of supply and demand is presented. The number of jobs offered is much higher than the number of jobs requested in India than in China. The unemployment rate in China is 3, 9% compared to 8, 8% in India (Statista, 2019).

Indeed, the wage gap between China and India represents an opportunity for client firms in the field of Offshoring. Their selection focuses on Indian service providers, because the low salary that is directly reflected in production costs creates an economic privilege for India at the expense of China.

3.2- The adoption of ICT in inter-firm relationships

Various studies have confirmed the impact of ICTs in encouraging the use of inter-firm relationships, such as those conducted by Bensaou and Venkatraman (1996) and Benjamin et al. (2003).

Communication costs refer to the financial burden borne by the client firm when communicating with the service provider. Today, ICT refers to a fast, flexible and perfect means of communication. Communication costs have become extremely low after the introduction of such means of communication.

According to a report by Kshirsagar and Madgavcar (2019), it is the digitization process in India in particular that has been identified as the second fastest among the 17 mature and emerging economies that have been studied. The website usage rate in India is 50% in the different industrial sectors and 60% in services. Thus, 90% is the rate of use of electronic emails in industry is 80% and 70% in services (OECD, 2018).

However, the adoption of websites in China is 60% in industry and 70% in services. 90% is the rate of use of electronic emails in industry and 85% in services (OECD, 2018).

As for exports, 80% is the rate of use of websites to communicate with foreign providers and customers in China and the same percentage has been identified in India. On the other hand, 95% and 90% are respectively the email usage rate in India and China (OECD, 2018).

The statistics mentioned above show that the level of ICT use in the Indian and Chinese economies is almost identical. As a result, it can be

confirmed that there is not much difference between the two countries in terms of the communication costs incurred by the Outsourcing firm.

3.3- The language

Language as a means of communication between the client firm and its service provider plays an essential role in the estimation of transaction costs.

Language is the only means of communication between individuals. Consequently, the latter remains one of the factors guiding the scope of the inter-organizational relationship. Exist several studies that have exposed the role of language, including: Fixman (1990), Luo and Shenkar (2017) and Malik and Bebenroth (2018).

Since English is the world's first language in all spheres of society, Indian governments attach particular importance to English at all levels of education.

In Asia, India is the country dominated by the number of English-speaking citizens followed by Pakistan and the Philippines (Dylanlyons, 2017). According to the 2011 Indian census, 129 million (10. 6%) of the Indian population is fluent in English and 0. 02% of the population considers English their first language.

Despite the eight different languages deployed in India, but English is almost the official language of economic operations. Indian service providers publish their offer information on the Internet using the English language. This simplifies the search and selection of service providers by client firms from other countries.

On the other hand, China only recently began to give importance to the English language after the country's political and economic opening. The Chinese language is an official language and is the only language of communication between the inhabitants. About 10 million people speak English, i. e. less than 1% of the Chinese population (Smith, 2017).

Moreover, in all Chinese firms in all sectors of activity, the Chinese language is the only one used. This linguistic deficiency therefore creates a difficulty in communicating with firms in different countries. In addition, Chinese governments only offer restrictive information to

client firms about Chinese manufacturing companies, including technology service providers. Qu and Brocklehurst (2003) add that it is difficult to access information about Chinese providers, particularly through the English language via the Internet or any means of communication.

Since English is the first language of international communication, especially in economic terms, it will be more difficult and costly to choose a Chinese service provider by entrusting it with an extremely technical and uncertain activity such as software development. Direct, correct and fast communication with an Indian service provider is sufficient to reduce transaction costs than is not the case with Chinese service providers.

3.4- The trust

In their work in 2010, Fink and Kessler emphasized the importance of trust in the success of all kinds of cooperation between firms. Trust is the key to a successful bipolar relationship. This assumption is reasonably supported in the literature by contributions such as Lorenz (1999) and Liao and Lon (2019).

As part of Offshore's strategy, trust plays a decisive role in determining the success or failure of the operation. Especially for an exclusively technical function such as software development, client firms perceive trust with the service provider as an inevitable condition for establishing a dual relationship (Dahlgrün and Bausch, 2019).

The selection of a service provider is based on a set of tangible and intangible circuses that reflect the degree to which the other party strictly and legally respects the contractual clauses mentioned in the Offshore contract. These circuses are perceived differently from one region to another and this is the main reason that has long made China an inadequate target for establishing a cooperative relationship. Various studies have been conducted in this context to address the issue of trust with Chinese firms (Kriz and Keating, 2010).

The extremely different nature of Chinese culture and the country's late opening to the world lead to a widely perceived difference in economic and social behavior with other countries. This difference

compared to what is deployed in Western countries creates a great deal of confusion around the concept of trust (Redding and Witt, 2007).

For a Chinese service provider, the question of trust remains a broad one to be tightened up in a contract. Trust is a broad and intangible concept based on a set of social principles and is understood as*social credit rating* (Tong and Yong, 1998). Chinese firms consider that it is not mandatory to respect what is mentioned in the contract in order to be trustworthy. Nevertheless, for Western firms, a contractual relationship based on trust is one in which strict monitoring of what the contract dictates is the only behavior (Wank, 1996).

On the other hand, the intertwined culture in India and the almost Western orientation of its citizens lead to making the applicability of economic and social concepts deployed there with other countries adjustable. Just like the Western client firm, the Indian service provider chosen perceives trust in the same way. Compliance with contractual clauses produces a certain level of trust between the two parties.

Although the Indian economy is often based on an asymmetric steering system where most firms are family owned, but the software industry is one of the sectors that gives much more importance to the contract as a relationship regulator (Harriss, 2002).

Therefore, the difference in defining trust between Western and Chinese firms creates a dual disagreement between the contracting parties and often makes it difficult to work together (Bjorkman and Kock 1995). However, Indian service providers prefer, like the Western firm, a highly personalized transaction to direct the behavior of the parties. So, the choice between India and China turns towards the benefit of India.

3.5- Economic and institutional stability

The country's economic and institutional stability is another crucial factor that determines the level of transaction costs. For the client firm, countries experiencing economic and institutional turbulence remain a bad choice. Establishing a medium or long-term relationship with a service provider in a structurally unstable country means moving towards permanent renegotiation to include new contingencies not previously foreseen.

Economic and institutional stability has its main roots in the concept of environmental uncertainty. The latter as a major source of transaction costs has been the subject of several research projects aimed at presenting the firm's sourcing decision. These include: Krickx (1995), Fan (2000), Moschuris (2007), Guzek (1986) and Lamminmaki (2011).

As two emerging countries, China and India are characterized by a high degree of instability in terms of economic and institutional reforms. A variable growth rate requires a permanent updating of the decisions that organize economic activity.

From a growth rate of 10, 63% in 2010 to 6, 6% in 2018; and a rate of 5, 5% forecast by the IMF in 2024, the change in economic and institutional reforms to accompany this heavy instability in the country remains one of the priority objectives of Chinese governments (Congressional Research Service, 2019). According to Chinese Politburo: the country must reach: stable employment, stable finance, stable trade, stable foreign investment, stable investment, and stable expectations.

Economic conflicts with the United States are another factor of instability in the country. These conflicts, which hamper economic cooperation between the two poles of economic power, and the embarrassment caused by Chinese exports, are increasing. This economic antagonism leads China to confront the opponent's policies by adopting reciprocal decisions.

On the other hand, India's precarious growth rate forces Indian governments to continually modify its economies to lock in change. From 8, 49% in 2010 to 6, 98% in 2018, the country must restructure itself sustainably by updating reforms at all levels (World Bank, 2018). The IMF (2018) reports that India's late reforms after 1990 in liberalizing

its economies by simplifying control over international trade, imports and investment have helped to strengthen the country's growth.

As a result, it appears that neither the Indian nor the Chinese environment ensures a predetermined contractual continuation without there being a need for subsequent renegotiation according to new events. This renegotiation produces transaction costs in excess of what was originally anticipated.

CONCLUSION

In this work, the decision to use a service provider was highlighted by entrusting it with the activity of software development through the understanding of economic reasoning based on the assumption of transaction cost theory.

This pioneering attempt was intended to broaden the applicability of this theory to the choice of the target country for Offshoring. To do this, two countries almost close in terms of their classification among the leaders in the Offshore market were studied. The increasing orientation of firms towards Indian and Chinese technology performance reflects the economic privilege held by these countries.

The results of this study highlight several points of analysis proposed for the first time in the literature. This paper assumes, from a research perspective, to reduce the costs that the client firm balances the costs produced when selecting an Indian service provider or, in the opposite case, a Chinese service provider. This allows it to choose the country that serves his needs with the minimum of costs.

As far as production costs are concerned, statistics indicate that India remains the most appropriate country due to the low salaries of its developers. In fact, production costs become low for a firm choosing an Indian service provider.

However, the four differentiation factors that have been analyzed as determinants of transaction costs generally suggest India's economic superiority over China. Although the use of ICTs in business and economic and institutional stability are almost similar in both countries, language and trust redirect choice towards India at the expense of China.

Today, there are some attempts to create a more global theoretical framework by complementing the TCT assumptions with a strategic vision based on resource-based theory. However, this analytical juxtaposition has affected the firm's Outsourcing and Sourcing choice and not Offshoring as such.There is no scientific attempt to focus on Offshoring the software development function from a TCT perspective. This is why the present work has a defect in terms of theoretical bases, which is compensated by a conceptual illustration of a new model of analysis. On the other hand, it reinforces the priority and precedence of the latter in addressing the subject.

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