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Abstract

In the face of rising customer sophistication, changing industry economics, and intensified competitive pressures, common IT service delivery strategies are outdated these days. IT providers increasingly shift from traditional point-to-point offshore outsourcing to sourcing from a range of global locations. Within just a few years, delivery centres have been built up in multiple geographically dispersed countries. This determines the development of a business strategy referred to as global delivery model (GDM). Despite the emergence of GDM to become a preferred strategy in IT outsourcing, little is known about the performance of these relatively novel network structures. Against this background, we aim to examine the relative efficiency of GDMs offered by IT providers. This paper presents the results of the first stage of a two-stage research project. Drawing upon the resource-based view of the firm, we developed a conceptual framework of how providers' GDM-related resources impact market performance. Furthermore, we introduce data envelopment analysis (DEA) as a methodology to assess relative efficiency in global delivery. Finally, we conducted a preliminary study to test the appropriateness of DEA for our endeavour and to provide first insights into global delivery performance.

Keywords: data envelopment analysis, efficiency, global delivery model, resource-based view of the firm

1 Introduction

The information technology (IT) service market has been subject to tremendous changes within the last few years. Gone are the days of single-location outsourcing when India was the world's primary IT offshoring country (McCarthy, Apte, Ross and Thresher 2007). A growing global demand for IT experts has led to salary increases on the Indian subcontinent. This forced companies in the IT industry to seek for alternative locations. At the same time, an increasing availability of skilled human resources in Eastern Europe, South America, and the Asia-Pacific Region along with the development of advanced and sophisticated communication technologies has made sourcing opportunities possible, which were out of reach before. As a result, IT providers are increasingly expanding their global presence to ramp-up their service and delivery capabilities. Today, IT resources are procured simultaneously across a range of multiple locations. This development determines the emergence of a new business strategy. The so-called global delivery model (GDM) describes a service delivery and provision strategy where IT vendors integrate multiple geographically dispersed resources such as skills, expertise, and knowledge through a network of onshore, nearshore, and offshore locations in order to maximize service delivery performance and to provide clients with seamless solutions (Ang and Inkpen 2008, McCarthy et al. 2007). A GDM is a combination of an IT onshore and offshore model. This strategy requires regional service and support centres (SCs) in direct customer contact to closely cooperate with development centres (DCs) spread out across the entire globe.

Several streams of research are concerned with outsourcing and offshoring of IT. For example, research in the area of IT outsourcing (ITO) success has identified best practices to design service level agreements and to improve delivery performance (Goo, Huang and Hart 2008, Goo, Kishore and Rao 2009, Gopal and Sivaramakrishnan 2008, Lacity and Willcocks 1998, Lee, Miranda and Kim 2004). Furthermore, issues related to relationship management have been studied (Bekmamedova, Prananto, McKay and Vorobiev 2008, Gefen, Wyss and Lichtenstein 2008, Grover, Cheon and Teng 1996, Koh, Ang and Straub 2004, Lee and Kim 1999, Levina and Ross 2003, Rai, Maruping and Venkatesh 2009) and the impact of cultural and country-specific factors on outsourcing performance has been examined (Dibbern, Winkler and Heinzl 2008). Previous contributions on globally distributed work and development have focused on knowledge exchange processes between employees (Leonardi and Bailey 2008), socio-cognitive aspects of communication (Vlaar, van Fenema and Tiwari 2008), and the impact of process-based learning on performance (Ramasubbu, Mithas, Krishnan and Kemerer 2008). In addition, there has been some contribution to GDM success research. For instance, a study by Ang and Inkpen (2008) who investigated the impact of cultural intelligence on ITO success as well as a single-case study by Mastakar and Bowonder (2005) who analyzed in-depth the GDM capabilities of a leading Indian ITO provider. For detailed information on the status quo of ITO research, see Dibbern, Goles, Hirschheim and Jayatilaka (2004) as well as Lacity, Khan, Yan and Willcocks (2010). These studies have enhanced our understanding of offshore-related challenges, success factors in IT outsourcing, how to design globally distributed work, and the management of globally distributed IT projects. However, to the best of our knowledge, no attempt was made to compare existing GDMs with each other and identify why such strategies outperform other ones. In order to reduce this research gap, we initiated a two-stage research project. The presented paper is concerned with the first stage where we are aim to develop a structured approach of how to evaluate relative efficiency of GDMs and provide first insights into providers' global delivery performance. In a second stage, which is out of scope of this paper, we aim to identify the reasons of the positive deviance of the efficient providers. In particular we investigate the following research questions in this paper:

(1) What are providers' global delivery resources and how do they impact performance outcomes?

(2) What is the relative efficiency of ITO providers in transforming global delivery resources into performance outcomes?

In order to answer the first question, we developed a conceptual framework based on the resource-based view of the firm (RBV). While there are several approaches available to assess relative performance, this paper applies data envelopment analysis (DEA) to answer our second research question. DEA is a linear programming procedure, which uses multiple inputs and multiple outputs to evaluate the relative efficiency of production units (Charnes, Cooper and Rhodes 1978). To the best of the authors' knowledge, this study is the first one using DEA in the context of ITO and global delivery. This raises our third research question:

(3) Is DEA an appropriate method to evaluate relative efficiency of GDMs?

The paper proceeds as follows. In the next section, we clarify the concept of RBV and introduce our conceptual framework. Subsequently, we provide a brief introduction into efficiency evaluation using DEA. To answer research questions two and three, we conducted a preliminary study. The key findings are offered in the fourth chapter. We conclude with the theoretical and practical importance of our findings and by discussing implications for future research.

2 Conceptual Framework

The first step in efficiency measurement is a definition of inputs and outputs. Based on RBV, we aim to study the relationship between the global delivery resources a provider deploys (inputs) and its performance outcomes (outputs). RBV defines a resource as "an asset or input to production (tangible or intangible) that an organization owns, controls, or has access to" (Helfat and Peteraf 2003, p. 999). Such resources are mandatory to fulfill a firm's task and can lead to sustained competitive advantage if they are valuable, rare, imperfectly imitable, and non-substitutable (VRIN) (Barney 1991, Dibbern et al. 2004).

In the area of IT research, a considerable part of literature on RBV deals with the identification of corporate IT resources and their impact on enterprises (e.g. Bharadwaj 2000, Mata, Fuerst and Barney 1995). However, RBV has not been adapted to the context of global delivery so far. Thus, in the first stage of our overall research project, we identified a set of common valuable global delivery resources that IT providers utilize. According to Barney (1991), corporate resources are classified into three categories: physical, human, and organizational resources. Physical resources are assets like a company's technology, its' global offices, and its' geographical position (Barney 1991). As described earlier, a GDM is a combination of an onsite and an offshore model. SCs provide regional support for clients, manage and coordinate ongoing projects and acquire new contracts. Globally dispersed teams in a network of DCs execute IT services to customers. With centers at multiple locations, providers can simultaneously access several valuable resource markets, get time advantages and minimize risks. Thus, we presume that the most important physical GDM-resource of an ITO company is its global reach with SCs and DCs. Organizational resources are assets such as a firm's internal planning, controlling, and coordinating systems as well as advanced processes to satisfy customers' needs (Barney 1991). With the implementation of a GDM strategy, the entire corporate culture needs to be aligned on geographically dispersed work and global delivery of services. This implies an intensive training of employees and the adoption of structured and sophisticated processes (Ramasubbu et al. 2008, Vlaar et al. 2008) in order to overcome negative issues in globally distributed work such as social boundaries (Levina and Vaast 2008), knowledge transfer problems (Leonardi and Bailey 2008), as well as cultural (Dibbern et al. 2008) and work practice differences (Rai et al. 2009). There are two major difficulties in assessing organizational GDM resources. First, due to the fact that they are intangible, they are hard to observe, quantify and measure from outside a company. Second, they are difficult to compare between different enterprises because they are often rare and inimitable. Thus, we suggest relying on common quality signals like ISO certifications as well as CMMI (former CMM), a major indicator of quality in the offshore outsourcing market (Qu and Brocklehurst 2003). Human resources are skills and capabilities of managers, teams, and individuals within an enterprise (Barney 1991). These, in particular, include IT-related technical and managerial knowledge (e.g. Bharadwaj 2000, Melville, Kraemer and Gurbaxani 2004) as well as several soft skills like employees' cultural

intelligence, their experience and loyalty, as well as language skills (e.g. Joseph, Ng, Koh and Ang 2007, Moore, Parker, Ross and Thresher 2008). In IT research, widely accepted quality signals for technical IT skills are the Six Sigma method, the ITIL framework, and the P-CMM certification. Like organizational GDM resources, comparable data on soft skills are difficult to gather. Thus, we recommend to conduct case studies or to rely on expert rankings. IT providers differentiate themselves on the basis of the GDM resources they deploy. A provider, who has learned to combine these physical, organizational, and human assets effectively, can create superior GDM capabilities that contribute to achieve high performance outcomes (see figure 1).

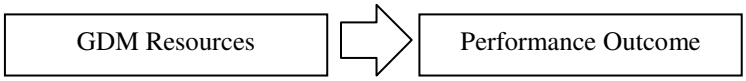

Figure 1. Conceptual framework

We recommend measuring the performance outcome by customer satisfaction, which is defined as "a positive affective state resulting from the appraisal of all aspects of a firm's working relationship with another firm" (Anderson and Narus 1984, p. 66). Customer satisfaction is a widely used construct in IT research for assessing the success of ITO (e.g. Grover, Cheon and Teng 1996, Koh, Ang and Straub 2004, Lee, Huynh, Kwok and Pi 2003, Lee and Kim 1999, Susarla, Barua and Whinston 2003). It is assumed to have a positive impact on customer loyalty (Kern and Willcocks 2000, Mojsilović, Ray, Lawrence and Takriti 2007), to increase the intention to continue an engagement with a provider, and to procure further services from this company (Barber and Venkatraman 1986, Bolton, Lemon and Verhoef 2008, Koh et al. 2004). Moreover, satisfaction leads to a positive word-of-mouth which supports the acquisition of new projects (Barber and Venkatraman 1986, Mojsilović et al. 2007).

3 Data Envelopment Analysis

In order to answer our second research question, we first have to clarify the concept of efficiency. In economic literature, there are different understandings of this term. We describe relative efficiency in line with the definition of technical or rather Pareto-Koopmans efficiency. A production unit is called efficient, if, and only if it is not possible to reduce any input of this unit without increasing at least one other input or reducing any output (Ray and Jeon 2008). Thus, efficiency is a quality indicator measuring the performance of transforming inputs into outputs.

In the second chapter, inputs (global delivery resources) and outputs (performance outcomes) were specified. A subsequent step in efficiency measurement is to establish a relationship between those inputs and outputs. Since we aim to consider multiple inputs and outputs in our study, a calculation of a simple ratio of these variables would not be suitable enough. Therefore, we reviewed more complex approaches such as regression analysis and decided to use DEA for our endeavor. The primary advantage of this approach is, that it enables us to incorporate multiple inputs and multiple outputs. We discuss the benefits and limitations of this approach in comparison to others in our final chapter. DEA is a non-parametric evaluation method to determine the relative efficiency of a set of production units, referred to as decision making units (DMUs). Such DMUs have to be functional homogenous which means that they perform the same task and convert the same set of inputs into the same set of outputs (Alpar, Porembski and Pickerodt 2001). In previous studies the proposed methodology was applied to evaluate the efficiency of public institutions, organizational units, and business processes (e.g. Banker, Kauffmann and Morey 1990, Charnes et al. 1978, Reiner and Hofmann 2006) In IT research, DEA was used to compare DMUs such as countries (Bollou, Ngwenyama and Morawczynski 2006) and restaurants (Sigala 2003) in utilizing IT investments and to evaluate the relative efficiency of e-commerce users (Beck, Wigand and König 2003), ERP software products (Ghapanchi, Jafarzadeh and Khakbaz 2008, Lall and Teyarachakul 2006), and web sites (Alpar et al. 2001).

Based on an input-output-configuration of a DMU in comparison to other DMUs in the dataset, an efficient frontier is estimated. Consider a situation, where DEA is applied to assess the relative efficiencies θ_i of $i = 1,...,n$ DMUs in transforming a set of $j = 1,...,k$ inputs x_j into a set of $h = 1,...,m$ outputs y_h. Then, the relative efficiency θ_o of a particular DMU $o \in i$ is obtained by solving the following fractional programming problem (Charnes et al. 1978):

$$\theta_o = \min\left\{ \theta_o \left| \sum_{i=1}^{n} \lambda_{io} y_{hi} \geq y_{ho}, \forall h = 1,...,m; \sum_{i=1}^{n} \lambda_{io} x_{ji} \leq \theta_o x_{jo}, \forall j = 1,...,k; \lambda_{io} \geq 0, i = 1,...,n \right. \right\}$$

This program is computed independently for each of the i DMUs to determine the optimal weights λ_{ii} and generate individual efficiency scores θ_i with values ranging from 0 to 1.0. A DMU with an efficiency score of $\theta_i = 1.0$ (100%) is classified as efficient and is therefore a part of the efficient frontier. In general, more than one unit receives such an efficiency score. Inefficient units receive a value of $0 \leq \theta_i < 1.0$, where $1.0 - \theta_i$ shows the individual degree of inefficiency of DMU i.

4 Preliminary Study

We conducted a preliminary study to test the appropriateness of DEA (research question 3) and to provide first insights into GDM performance (research question 2). Data for our study were collected in cooperation with an independent international market research company that has high domain-specific knowledge in the field of ITO and global delivery. We identified 30 IT providers that had implemented a GDM strategy. Vendors with less than three DCs were not considered in our analysis. All 30 providers had been asked to take part in our study. Of these, 22 companies agreed to participate. We issued an online survey to collect data on customer satisfaction in an international panel of ITO clients. Members of this panel are decision-makers in large, small, and medium-sized companies and public institutions. Two-thirds of the members are employed in the United States of America. The remaining decision-makers are from other counties, mainly Europe. We assessed customer satisfaction with (1) the delivery performance against the contracted service level agreements, (2) the relationship management, (3) the ability to deliver innovation and continuous improvement, (4) the price competitiveness against performance, and (5) the flexibility with respect to price model evolution, volume and scope changes. The items were measured using a 5-point Likert scale from 1 (very dissatisfied) to 5 (very satisfied). Out of the 22 IT providers, four companies achieved less than 75 customer responses and were therefore not taken into consideration. Thus, in the end, 18 IT providers were included in our study, representing a response rate of 60%. Fourteen of these providers are part of companies of the IT service and consulting industry. Two of these companies achieved an annual value of more than 10 billion US$, seven a revenue between 5 and 10 billion US$ and five a revenue of less than 5 billion US$. The remaining four IT providers are part of huge technology conglomerates with annual revenue of more than 60 billion US$. Data on input variables were collected by telephone interviews with ITO providers' senior management staff. Their physical GDM resources global reach of service centres and global reach of delivery centres describes the number of countries in which a provider operates SCs and DCs. With respect to organisational resources, we consider vendors' CMMI-level and ISO certifications as common quality signals. Moreover, we add a rating of providers' GDM process maturity that has been critically appraised by experts of our cooperating partner. Due to inconsistent responses on human assets, we could not include a single technical IT resource in our preliminary study. However we were able to gather data on employee loyalty and to consider another expert rating of employees' language skills. All expert ratings in our study were measured using a 5-point scale from 1 (very bad) to 5 (very good).

As introduced earlier, we calculated the relative efficiency of the 18 GDM providers in our final dataset using DEA. Out of these, nine vendors were classified as efficient and the remaining nine ones as inefficient. The average efficiency across all units in the dataset is 91.11%. This high average value is mainly attributable to the fact that every second vendor is part of the efficient frontier. Further, it

indicates, that most of the providers in our study are equal efficient. The individual inefficiencies of the nine inefficient providers range from 33.16% to 0.82% where four providers achieve a high inefficiency of more than 25%. Two of these providers are headquartered in Europe, one in the United States, and one in India. The lowest theta value of $\theta = 0.6684$ had been assigned to the Indian vendor. In this study, we will not go into more detail on each provider's individual efficiency but present global findings in order to derive implications for future research.

4.1 Finding 1: Impact of the country of origin

We investigated the efficiency of ITO providers with headquarters in Europe, India, and the USA. There are six providers from each region in our study. We found that the country of origin does not have a considerable impact on the efficiency scores (see table 1). In each region, three providers are classified as efficient and three as inefficient. Vendors from the USA are slightly more efficient than their competitors from India and Europe. However, when looking at the output values, providers from the Indian subcontinent achieve a remarkably higher customer satisfaction. This result indicates, Indian providers have ramped-up their global delivery capabilities more effectively.

Country of origin	Group size	Average efficiency score	No. of efficient providers	Average customer satisfaction score
Europe	6	0.8994	3	3.5
India	6	0.9062	3	4.1
USA	6	0.9279	3	3.7

Table 1. DEA and customer satisfaction scores with respect to providers' home country.

A closer examination of the five output dimensions in our study shows, that the principle reason for the high average customer satisfaction score of providers from India is respondents' satisfaction with delivery performance against the contracted service level agreements. Here, the Asian vendors receive a remarkably high output of 4.7. A potential explanation of this observation can be found in prior literature. Koh et al. (2004) found that organizational resources such as providers' obligation for clear authority structures and taking charge as well as effectively designed human resource management structures, knowledge transfer processes, and deployment strategies for inter-organizational teams lead to higher satisfaction with contracted performance. This relationship can be seen in our dataset as well. We found a good correlation of .55 between the input GDM maturity and the output delivery performance against the contracted service level agreements.

4.2 Finding 2: Impact of global delivery headcount

The cores of each GDM are the DCs where customer-related services and activities are provided. One major advantage of these networks is the possibility to benefit from economies of scale. Due to the fact that greater scalability and flexibility grows in the number of employees, we presume a positive impact of the headcount on efficiency and customer satisfaction. We subdivide GDM providers into companies with a large ($\geq 100,000$), a medium-sized ($20,000 - 99,999$), and a small ($< 20,000$) delivery headcount. In our preliminary study, medium-sized providers achieve the highest average efficiency (see table 2). Looking at the outputs, we found that large and medium-sized companies achieve higher average customer satisfaction scores than their small-sized competitors. The fact that companies with a large headcount received poor efficiency values can be attributed to their greater usage of GDM resources. However, they receive a remarkably higher customer satisfaction with the delivery of innovation and continuous improvement (4.0) than their small (3.3) and medium-sized (3.5) competitors, which indicates positive economies of scale.

The ability and willingness of a provider to make changes to service level agreements during an ongoing relationship is a key success factor in ITO (Haried and Ramamurthy 2009, Kern, Willcocks

and van Heck 2002). In contrast to the positive impact on innovation and continuous improvement, we found that this contract flexibility of a provider is negatively correlated (-.29) with the DC headcount.

DC headcount	Group size	Average efficiency score	No. of efficient providers	Average customer satisfaction score
Large	4	0.8400	1	3,9
Medium-Sized	8	0.9529	4	3,9
Small	6	0.9029	4	3,5

Table 2. DEA and customer satisfaction scores with respect to providers' DC headcount.

4.3 Finding 3: Impact of the deployment strategy

Besides the delivery headcount, providers also differ with respect to staff assignment. In our study, four providers rely on an onshore staffing strategy, with more than two thirds of DC-headcount onshore (Western Europe and North America), nine rely on an offshore staffing strategy, with more than two thirds of the DC-employees offshore (Africa, Asia-Pacific, Eastern Europe, and South America), and the remaining five rely on a balanced staffing strategy. The results presented in table 3 indicate that efficiency and customer satisfaction are substantially higher in offshore and balanced staffing. Four out of the five providers in the balanced group were classified as efficient.

Employee staffing	Group size	Average efficiency score	No. of efficient providers	Average customer satisfaction score
Onshore	4	0.8137	1	3.2
Balanced	5	0.9476	4	3.7
Offshore	9	0.9342	4	4.0

Table 3. DEA and customer satisfaction scores with respect to providers' staff assignment.

These findings indicate, that providers' employee sourcing and staffing strategy impacts global delivery performance. One major topic in ITO research is offshoring to emerging countries (Dibbern et al. 2004, Lacity et al. 2010). Due to the fact, that India used to be the world's primary offshoring country over a long period of time (Ang and Inkpen 2008), little research is concerned with an investigation of other global regions (Lacity et al. 2010). With the emergence of GDMs in ITO, providers are increasingly faced with the challenge of a geographically dispersed human resource acquisition and staff assignment. Looking at the five output dimensions, we found that the offshore group achieves considerably higher customer satisfaction with price competitiveness against performance (4.0) than providers with a balanced (3.2) and an onshore staffing strategy (2.8). Members of the worst performing onshore group source most of their DC headcount in Eastern Europe, while vendors of the offshoring group primarily deploy their human resources on the Indian subcontinent. This might be evidence for valuable and rare human resources in India.

4.4 Finding 4: Impact of practical experience with globally distributed work

Another field of interest in our study was the impact of provider's practical experience with globally distributed work on efficiency and customer satisfaction. We subdivided vendors into early movers that shifted work to foreign countries before 1995, millennium movers who started with globally distributed work at the beginning of the millennium-reprogramming boom in 1995, and late movers with six or less years of experience. Our results show that experience has only little impact on the average efficiency scores (see table 4). Millennium movers perform slightly better than late and early movers. However, looking at the output values, we see that early and millennium movers are considerably better in satisfying their customers.

Experience	Group size	Average efficiency score	No. of efficient providers	Average customer satisfaction score
Early mover	8	0.8986	3	3.8
Millennium	7	0.9293	4	3.9
Late mover	3	0.9022	2	3.3

Table 4. DEA and customer satisfaction scores with respect to providers' experience.

Previous studies found that time to collect and integrate knowledge play a crucial role in the development of superior physical, human, and organizational IT resources (Bharadwaj 2000). Practical experience with transnational work leads to superior performance of globally dispersed teams through cross-cultural learning of employees as well as the formation of common values within organizations (e.g. Gregory 2010, Levina and Vaast 2008, Vlaar et al. 2008). Our study supports these findings to some extent. All groups have a similar average efficiency. However, the efficiency scores of the late movers are solely rooted in a relatively low input usage. Members of this group achieved the lowest customer satisfaction scores in the dataset. This finding indicates that the implementation of a GDM strategy with superior physical, organizational, and human resources is time-consuming which makes them imperfectly imitable.

4.5 Finding 5: Impact of business familiarities

Finally, we took a closer look at the providers' service delivery background. Despite the fact that all vendors in our study offer a wide range of services, they differ with respect to their service offering history. Eight providers used to be system integrators, "responsible for the overall system design and integrating product and service components supplied by a variety of external suppliers into a functioning system" (Davis, Brady and Habday 2007, p. 184). The business of six vendors was the development and distribution of individualized enterprise software. Additionally, four vendors were former IT Infrastructure service providers. We found that the service delivery background has an impact on performance. Software vendors and system integrators achieve substantially higher efficiency values than infrastructure service providers (see table 5). Especially software vendors stand out from the rest. They received a remarkably high customer satisfaction of 4.2. Also, five companies within this group are classified as efficient.

Background	Group size	Average efficiency score	No. of efficient providers	Average customer satisfaction score
Infrastructure	8	0.8317	2	3.4
Software	6	0.9693	5	4.2
System integration	4	0.9830	2	3.9

Table 5. DEA and customer satisfaction scores with respect to providers' background.

We argue that providers differ with respect to their business familiarities, which we define as "the extent to which a provider has prior experience and/or understanding of the client organization's business and technical contexts, processes, practices, and requirements." (Lacity et al. 2010, p. 412). Previous studies found, that business familiarities positively impact ITO success (Lacity et al. 2010), for instance, by reducing rework (Gopal, Mukhopadhyay and Krishnan 2002). Software vendors and system integrators are used to provide solutions adapted to their clients' requirements and specific needs of customers industry sector. In contrast to this, infrastructure service providers used to offer only tangible and standardized IT resources such as hardware, operating systems, and network technologies. These services require less domain-specific knowledge and less interaction with customers. Therefore, we conclude that software vendors and system integrators have higher business familiarities than infrastructure service providers. The fact, that providers' service delivery

background still impact its' performance can be viewed as an indicator that once developed valuable business processes are imperfect imitable resources.

4.6 Summary of Findings

The average output value across all 18 DMUs is 3.8. A total number of eight GDM providers achieve above-the-average customer satisfaction scores. Five DMUs are classified as efficient and achieved an output larger than 3.8. They have a background in software development as well as more than six years of experience with global delivery. Moreover, two system integrators from the United States with a balanced global staff assignment are part of the efficient frontier with an output value of 3.8. A further three providers achieved superior customer satisfaction but are not classified as efficient. These vendors are from India and rely on an offshore staffing strategy. Two units are efficient with an output less than 3.8. We found that these are small-sized former European infrastructure service providers with less than six years of experience with globally distributed work. Finally, five providers are inefficient with below-the-average customer satisfaction scores. All these units have a background in infrastructure service provision.

5 Conclusion and Recommendations

To succeed in an increasingly competitive environment, providers have to meet customer expectations in the most efficient manner. Until 2015, forecasts by Forrester Research predict rapid changes on the IT landscape that will force vendors to reposition their companies (Mendel, Krauss, Holmes and Green 2008). Thus, IT providers have to create strong and flexible processes and continuously improve their global delivery capabilities.

In this paper, we offer first insights into a two-stage research project and pose three research questions. With respect to our first research question, we developed a conceptual framework for evaluating the relative efficiency in global delivery. Based on the RBV, we specified physical, organizational, and human GDM resources. However, we did not empirically test their impact on the performance outcome. This limitation will be addressed in our future research, where we will have a closer look at the relationship between GDM resources and customer satisfaction in order to identify capable input variables and to refine our conceptual framework. In order to answer our second research question, we conducted a preliminary study. Based on relative efficiency measurement approaches, we are able to compare providers on the basis of a set of valuable resources they have in common. In the subsequent research stage we aim to identify why some GDMs outperform others. This implies a deeper investigation of each efficient provider through in-depth case studies in order to identify VRIN resources that led to their positive deviance in the market. Even though that this is out of scope of this paper, the results of our preliminary study offer valuable initial insights, which we aim to investigate in greater detail in the future. For instance, finding 1 and 3 might be indicators for the existence of VRIN human global delivery resources in India. Furthermore, we found evidence that experience with globally distributed work (finding 4) and business familiarities (finding 5) are positively related with providers' performance. Thus, we conclude that the efficient providers in our study have built up superior business processes, which form VRIN organizational global delivery resources. Due to the fact, that this study is the first one using DEA in the context of ITO and global delivery, we aimed to answer whether this methodology is appropriate to evaluate the relative efficiency of GDMs. The main advantage of DEA is its ability to handle multiple inputs and multiple outputs (multidimensionality) with different measurement units simultaneously (Charnes et al. 1978) in contrast to parametric approaches like regression and stochastic frontier analysis. Beside this, regression analysis only relies on the average performance scores as basis for relative efficiency (Boles, Donthu and Lothia 1995). Further, DEA determines the efficiency values based on observed data only instead of relying on a priori specified structural forms or using statistical dependencies between variables such as parametric approaches (Yu, Wie, Brockett and Zhou 1996). One the one hand, this makes DEA less prone to

specification errors if the actual shape of the production function is unknown (Cubbin and Tzanidakis 1998). On the other hand, it limits the results to the DMUs in the data set. Generalizable statements based on DEA require a consideration of all DMUs within a specific market segment (Wilson 1995). Thus, the presented findings in our paper are only valid for the 18 providers in our study. Beside this, DEA does not test for statistical dependencies between variables. Thus, as mentioned above, we aim to analyze the relationship between inputs and outputs in a subsequent study. Because of its multidimensionality, we conclude that DEA is a suitable approach for evaluating relative efficiency in global delivery. However, we also aim to address the downsides of this methodology in our future research by empirically testing the relationship between the variables and by adding providers that were not considered in our preliminary study to our data set.

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