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PRICING STRUCTURES FOR SOLUTIONS: AN EXPLORATORY STUDY WITHIN THE OIL AND GAS INDUSTRY

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PRICING STRUCTURES FOR SOLUTIONS:

AN EXPLORATORY STUDY WITHIN THE OIL AND GAS INDUSTRY[1]

Abstract

A growing number of companies have begun to realise the potential for differentiating their product offerings by integrating services to provide customised solutions. Although there is now an extensive and growing literature on this trend, researchers have only recently begun to consider the pricing structures for such solutions. To address this shortcoming, the present study adopts an exploratory case-based approach to investigate a buyer (drilling contractor) and two suppliers of offshore capital equipment, each of whom provides condition-based maintenance solutions for offshore drilling units in the upstream oil and gas industry. The findings of the study identify a number of underlying mechanisms for solution offerings (i.e. innovativeness, benchmarking alternatives, measurability, replicability and operational risk) that are important considerations in the process of determining appropriate pricing structures based on the buyer's business model, procurement practices and maintenance strategy vis-à-vis the supplier's capabilities and the buyer–supplier relationship. The present study contributes to the literature by providing empirical evidence on and insight into the complexity of determining the pricing structure for solution offerings from the perspective of the supplier as well as the buyer.

Keywords: solutions, pricing, value-based pricing, condition-based maintenance, buyer–supplier relationship

1. Introduction

A growing number of companies have begun to realise the potential for differentiating their product offerings by integrating services to provide customers with solutions (Davies, 2004; Davies et al., 2006; Szwejczewski et al., 2015; Tuli et al., 2007). Although there is now an extensive literature on the selling of such solutions (Nordin & Kowalkowski, 2010), only limited attention has been paid to the complex nature of pricing such offerings (e.g. Bonnemeier et al., 2010; Rapaccini, 2015; Sawhney, 2006). Of particular interest are value-based approaches to pricing (Töytäri et al., 2015), such as gain-sharing arrangements from

[1] An earlier version of this paper was presented at the Spring Servitization Conference held in Manchester, United Kingdom (see Boa, Frandsen & Raja, 2016).

productivity increases. However, the identification and fair sharing of these joint productivity gains are far from straightforward and require a clearer understanding of the customer's business model. The solution supplier needs to understand and identify how the customer earns revenue and makes a profit (Johnson et al., 2008). Coupled with this, there is a need to consider differing maintenance strategies in the buyer's organisations and the implications this may have for pricing. As such, the ability to appropriately determine the pricing structure for industrial solutions is a challenge now facing many organisations, and it requires further research.

In this paper, then, we contribute an understanding of the mechanisms that explain the decision regarding which pricing structure should be employed for different solution offerings. We address the following research question: *How can we understand the pricing of solution offerings, and what are the mechanisms that impact the choice of pricing structure?* The present study is based on a buyer organisation and two different suppliers of solutions. In brief, the solutions considered are those offered to a drilling contractor operating in the upstream oil and gas industry. The two solutions are for condition-based maintenance (CBM) and are evaluated from both the supplier and buyer perspectives. These different perspectives result in important insights into the difficulties associated with pricing, suggesting that many challenges seem to occur as a result of a gap in the perception of value between the parties involved. An important contribution of this study is the attention it devotes to the necessity of understanding contextual factors when determining the pricing structure for solution offerings.

The remainder of the paper is structured as follows. In Section 2, we summarise the relevant background literature. This is followed in Section 3 by a presentation of the research methodology in Section 3, and Section 4 details the industry background and key actors involved. Section 5 presents the results of the study, followed by the discussion in Section 6.

Lastly, in Section 7, we offer some concluding remarks and detail the study's limitations and avenues for further research on pricing in a solutions context.

2. Literature review

2.1 *Solutions and pricing structures*

A solution is defined as a 'customized and integrated combination of goods and services for meeting a customer's business needs' (Tuli et al., 2007, p. 1) that delivers satisfaction (Raja et al., 2013). The extant solutions literature has devoted much attention to the strategic implications of providing solutions (Baines et al., 2009; Ulaga & Reinartz, 2011), the type of organisational set-up required (Sawhney, 2006; Raja et al., 2018) and the relational approach necessary for selling solutions (Tuli et al., 2007; Windahl & Lakemond, 2010). Although selling is undoubtedly an important aspect of solutions (Reinartz & Ulaga, 2008), few studies have adequately discussed how such offerings are priced.

The literature has typically discussed the cost-based, competition-based and value-based pricing strategies (Rapaccini, 2015; Nagle et al., 2016). Although pricing has been extensively discussed (Dorward, 1987; Nagle et al., 2016; Hinterhuber & Liozu, 2013), the issue of pricing in a solutions context has only recently started to gain traction (e.g. Sawhney, 2006; Rapaccini, 2015; Van Ostaeyen et al., 2013; Bonnemeier et al., 2010). The task of pricing solutions is by no means straightforward. Sawhney (2006) suggested that there are four major reasons for this complexity:

(1) the task of pricing services involved in solutions is more complex than products;
(2) the services provided as part of solutions are typically customised, so a standardised approach to pricing is difficult;

(3) solutions, in certain cases, may force the provider instead of the customer to accept risk, and the price of this risk is difficult to determine; and
(4) the provision of solutions often involves a longer-term relationship with the customer, which the price structures need to reflect.

Reen et. al. (2014) explained that most of the barriers to pricing are connected to value, because the distance and lack of collaboration between the buyer and supplier can create divergent views regarding the value created. This subjectivity in perceived value complicates the value-added calculations as well as the information asymmetry between the buyer and supplier (Zhang et al., 2015)

For solutions, several types of pricing structures are prevalent, such as traditional fixed price, subscription-based pricing and gain-sharing pricing (Sawhney, 2006), to name a few. These pricing structures are depicted as clearly distinct alternatives. However, what is less clear is the extent to which different pricing structures are relevant for delivering a solution for a particular context and when one pricing structure is preferable to another. The literature is ambiguous regarding the mechanisms that influence the pricing structure of solutions. In referring to mechanisms, we draw on the definition provided by Elster (1999): '*frequently occurring and easily recognizable causal patterns that are triggered under generally unknown conditions or with indeterminate consequences*' (p. 1, italics in original). For solutions, it has been advocated that providers move towards the more profitable, value-based approach (Hinterhuber & Liozu, 2013; Sawhney, 2006). However, the various mechanisms that a provider needs to consider for solutions have yet to be clearly identified.

We elaborate on the value-based pricing perspective below.

2.2 *Value-based pricing*

Value-based pricing is defined as 'the value a product or service delivers to a pre-defined segment of customers as the main factor for setting prices' (Hinterhuber, 2008, p. 48). Extending this definition, Töytäri et al. (2017) explained that '[v]alue-based pricing logic requires a profound understanding of a customer's business model, business drivers, and processes, and ultimately, what customers value, instead of focusing on product/service attributes and a supplier's competitive position' (p. 238). In terms of profit potential, research has highlighted the superiority of the value-based pricing approach to cost- and competition-based approaches (Liozu & Hinterhuber, 2013; Morris & Fuller, 1989).

A value-based approach requires a number of specific, key capabilities (see Töytäri & Rajala, 2015). However, there are numerous organisational and institutional barriers to moving towards such an approach (Töytäri et al., 2015). Pricing solutions on the basis of the customer's perceived value (Flint et al., 2002) – that is, value-based pricing – is guided by the logic of allowing the value captured by the solution provider to be indexed to the value created by the solution for the customer (Sawhney, 2016). Compared to cost-based or competition-based pricing, it is thus a proactive pricing strategy that is highly focused on the customer. Bonnemeier et al. (2010, p. 228) highlighted the important point that 'various companies fall short in extracting value from their customers' and that despite the high profit potential of value-based pricing, its practice can be extremely complex, requiring creativity and precisely defined courses of action. Hence, it is rarely used in practice in industrial markets (Hinterhuber & Liozu, 2012).

Even so, Nagle et al. (2016) argued that strategic pricing should be value-based, proactive and profit-driven, regardless of industry. Sawhney (2006) emphasised that one should

ensure that the amount and timing of customer payments for the solution are aligned to when the actual value is realised by the customer. The price of a solution should be based mainly on the value it is perceived to add to its customer (Woodruff, 1997). It has been suggested that a gain-sharing agreement is a type of pricing structure in which the added value is most closely aligned with the customers' perceived value, whereas transaction-based pricing has the least value-based pricing features (Bonnemeier et al., 2010; Sawhney, 2006).

Furthermore, previous studies of solutions have noted that understanding risk, and potentially being able to reduce or reallocate it for the customer, can be a significant value proposition (Girotra & Netessine, 2011; Hou & Neely, 2017; Reim et al., 2016). An operational risk-reduction-based value proposition is, however, strongly influenced by the customer's maintenance strategy regarding the assets concerned, that is, how the customer deals with the risk of the equipment failing. Maintenance strategies range from run-to-failure to planned maintenance schemes, as well as CBM strategies (Kumar & Kumar, 2004), employing condition– and remote–monitoring technology (Grubic & Jennions, 2017). Although CBM is an important enabler for solutions offerings, it does not alone provide the basis for value-based, gain-sharing pricing. Equally significant is the relationship between the buyer and the supplier when crafting a maintenance solution. Trust, coordination, flexibility and investment are increasingly required when the buyer and supplier share the goal of a long-term, productive, commitment-based relationship (Carmeli et al., 2016). The buyer–supplier relationship is directly influenced by the buyer's procurement model (Kraljic, 1983).

Hence, this backdrop demonstrates the necessity of further exploring such issues within a solutions context and developing a better understanding of the mechanisms that impact the choice of pricing structure.

3. Research methodology

This study adopts an exploratory qualitative case-based approach (Yin, 2009) to identify the driving forces behind the pricing structures for complex solution offerings. This approach is appropriate for an under-researched area that is still at a nascent stage of development (Edmondson and McManus, 2007).

3.1 Case selection

In this study, we adopted a purposeful sampling approach (Miles & Huberman, 1994; Patton, 2015), targeting two suppliers of solutions to a customer (buyer) in the oil and gas industry (see Table 1). In adopting a multiple-case approach, we were able to compare the different solution offerings provided by the supplier firms and obtain a dyadic perspective on value creation.

Table 1: Sample characteristics

Actor	***Customer***	***Supplier A***	***Supplier B***
Provider of:	Offshore drilling contractor	Global provider of equipment, services and components to the oil and gas industry	Global producer of specialised products within heat transfer, cooling and separation
Industry	Upstream oil and gas	Oil and gas	Energy, manufacturing, biotech, beverage industries
Product/Service in focus	Harsh Environment Drilling Services	Derrick Drilling Machine[2]	Decanter Centrifuge
Number of employees	4,000	50,000	18,000

[2] A Derrick Drilling Machine, or topdrive, is a large electric motor that is suspended using a hoisting apparatus via a draw-works and travelling block. It suspends a long drill string, with a drill bit attached to the end, this can be rotated at various speeds.

3.2 Data collection and analysis

The data were collected from the three firms over a six-month period and were derived from multiple sources (i.e. semistructured interviews, emails, meetings, internal documentation and numerous informal conversations; see Table 2 for an overview). Because one of the authors was employed by the buying organisation, the authors had privileged access to data that would otherwise have been difficult to obtain. This allowed for access to sensitive data related to price assessments and supplier relationship evaluations. A detailed log of all data collected was maintained for the duration of the study. The various data sources were coded and analysed using conventional approaches (see Miles & Huberman, 1994). In addition, the authors made extensive use of mind-mapping tools to capture and understand the institutionalised practices of the case firms and how these impinged on the maintenance strategies, the relationships between the firms and the resources and capabilities described, as well as the pricing mechanisms used. Importantly, the use of multiple sources allowed for triangulation, which corroborated and enhanced our understanding of the case firms (Lincoln & Guba, 1985; Miles & Huberman, 1994). The findings were validated through individual and group feedback sessions with the case firms.

Table 2: Overview of data collected

Type of data	*Customer*	*Supplier A*	*Supplier B*	*Total*
Interviews	• Programme Manager • Project Engineer • Technical Superintendent • Superintendent Engineer • Head of Projects • Head of Project Procurement • Category Manager, Procurement • Reliability Specialist • Electrical Engineer • Assistant Driller • Vibration Specialist	• Senior Manager, Standardisation and Monitoring Programmes • Director, Equipment Monitoring Services • Onsite solutions director • Project Manager • Spare Parts Coordinator • Software Engineer	• Connectivity Programme Manager • Segment Business Manager, Energy, Service – process Technology • Product Manager, Product Centre Decanters • Regional Business Manager • Business Development Manager Oil and Gas Drilling • Parts and Service Manager	21
Emails pertaining to the study	• Reliability • Integrity and vibration analysis • Supplier collaboration • Monthly newsletter • Pricing mechanism feedback • Reliability on a topdrive • Previous business cases on condition-based maintenance • Head of Projects input • Smart data • Leasing vs buying a topdrive • Reduced impact of yard stay • Risk matrix	• Research topic alignment • CBM questions to Supplier A • Pricing mechanism feedback • CM solution follow up • Spare parts delivery • CBM tender discussion • Yard stay feedback • Field service cost • Reduced impact of yard stay deadlines	• Supplier B deliverables • Estimated maintenance cost • Questions related to spares and service • Pilot project direction • Pricing mechanism feedback • Pricing services in Supplier B • Pricing connectivity • Value proposition of connectivity • Feedback on equipment • Pricelist	130
Meetings	• Monthly project meeting • Supplier Evaluation • CBM Project Meeting • Organisation meeting • Department meeting • Business case walk-through • CBM status meeting	• Reliability and pricing call • Troubleshooting project meeting • CBM follow-up meeting (whole day)	• Connectivity Project Meeting • Online Industry Outlook meeting • CBS/Supplier collaboration meeting	13
Internal documentation: examples of document titles	• Monthly internal news publication • Quarterly reports • Vibration analysis presentation • Smart data kick off presentation • CBM TPS, SAP downtime data sheets • Top drive maintenance guidelines • Topdrive Maintenance Optimisation Presentation • Top Drive- Root Cause Analysis • Leasing Business Case • Total Cost of Ownership (TCO) for Drilling Equipment • Technical specification for drilling package	• Drilling equipment tender • Webpage news feed • Organisational chart • Minutes of Meeting • Equipment and service tenders • Equipment brochures • Cost and Schedule impact from Supplier A equipment	• Idea description • Commercial plan- Drilling offering • Connectivity feedback (US) • Idea description • Strategy guidelines • Connectivity program presentation • Connectivity organisation • Connectivity questionnaire • Pilot project presentation • Price list	35*

4. Industry background and key actors

The context of this study is the upstream oil and gas industry. Recent studies have shown that the world crude oil market is undergoing increased integration due to globalisation and is subject to increased risk due to the political climate (Ji and Fan, 2016), whereas the trade in liquified natural gas is becoming more sensitive to import prices (Zhang et al., 2018). Additionally, the industry has suffered severe contraction due to low oil prices and oversupply, with many firms struggling to survive. Due to the uncertainty occasioned by lower oil revenues, the exploration and drilling of oil wells has experienced a reduction. The industry can be characterised as conservative, which explains why it has undertaken only minor changes to operating models and limited process innovations. In the past, providers of critical drilling equipment focused on delivering high-quality and safe products, reflecting the important buying criterion for customers. This has changed, and there is now a greater emphasis on price reduction and cost. For drilling contractors, maintaining highly complex assets demands specialised and expensive maintenance services, which has become a focus point for cost savings. Technological advancements have made CBM a viable option for operational cost savings. Maintenance is strategically important for drilling firms, because reliability is crucial for both short- and long-term revenue generation. Thus, it is unsurprising that drilling firms pursue efficiencies in operating expenditure (OPEX) as well as capital expenditure (CAPEX). CBM focuses on improving equipment design and performance to increase efficiency and prevent recurrent failures. This is in contrast to more reactive maintenance strategies, such as the run-to-failure approach (Brax & Jonsson, 2009).

In this study, we explore the pricing structure for two different solution offerings provided by different suppliers (i.e. a drilling equipment supplier and a decanter supplier) to a

drilling contractor (the buyer/customer) (see Figure 1), which are briefly discussed in turn below.

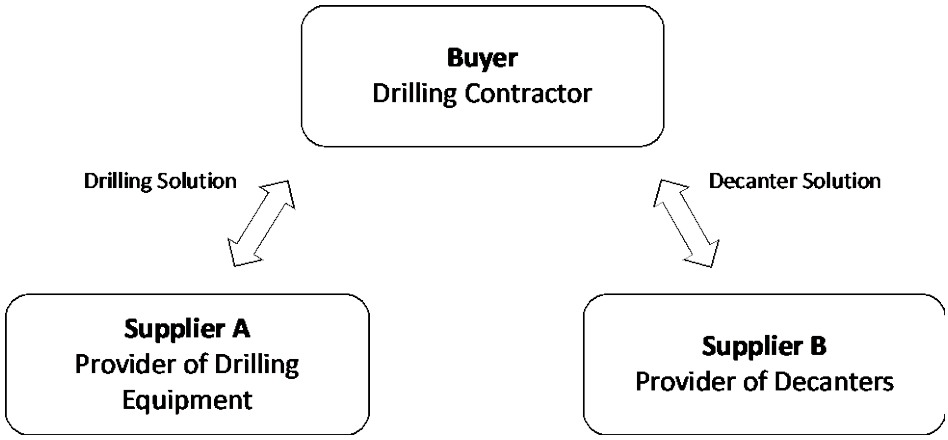

Figure 1: Key actors in study

4.1 The buyer: drilling contractor

The buying organisation studied was a relatively small player, focused on the niche area of harsh-environment offshore drilling. It operated a fleet of 16 drilling rigs and employed approximately 4,000 full-time employees (FTEs). Its annual revenue for 2015 was 2.5 billion USD, with a profit of 751 million USD. During the study period, the company encountered an industry in turmoil, due to record-low oil prices. Consequently, to remain competitive, there was a growing focus on cost and headcount reduction. The buying organisation was dependent on fewer contracts with its customers and, concomitantly, sought cost savings by decreasing operational downtime through closer supplier collaboration and a more focused approach on improving the reliability of equipment.

4.2 Supplier A: provider of the drilling solution

Background: The drilling equipment provider dominated the high-margin rig systems market, with its products and services being utilised on most oil- and gas-drilling rigs. The industry

contraction resulted in low investment in new builds, which impacted the sale of new equipment. However, the global rig fleet was ageing and required future overhauls and service, which was likely to benefit this supplier. Thus, there was a need and opportunity for service in both the short and long term with an emphasis on cost reduction, although competition within after-sales was increasing.

Scope of solution: The buyer had asked the supplier to increase the reliability of its equipment through the use of CBM to lower downtime, preferably through a risk-sharing agreement. The request stemmed from the fact that the buyer could lose millions of dollars in downtime every year on a handful of rigs alone. The solution involved the installation of sensors, data collection devices and analytics, the latter done in cooperation between the supplier and contractor in order to develop the algorithms appropriate to predicting failures of specific, highly complex machinery. With the correct measurements and diagnostics (the equipment, service and spare parts), it was possible to facilitate the lowering of both information asymmetry and total operational risk.

Pricing structure for the drilling solution: Given the high value of risk, there was a financial incentive to establish a gain-sharing pricing structure. Lower downtime for the buying organisation would lead to increased revenues, which could be shared with the supplier. Both parties emphasised the need for a good relationship in a gain-sharing solution. The supplier possessed the technical know-how and resources yet claimed that it lacked the administrative and organisational set-up for a gain-sharing agreement. The supplier was interested in establishing a basis (or platform) on which the solution could be made replicable, so that only the front end of the solution would require customisation to meet customer needs, allowing the supplier to enjoy the profit potential of a replicable solution.

4.3 Supplier B: provider of the decanter solution

Background: The decanter solution provider was a highly diversified supplier of innovative engineering products, services and solutions, with a well-known brand. Decanters were priced at an estimated 20% higher rate than low-cost competitors. The firm faced increasing competition, in part due to commoditisation, yet it maintained a competitive position in most markets due to its perceived brand value. This supplier had proactively engaged in an investigation of CBM-enabled solution selling, but was struggling with how to price it.

Scope of solution: This involved the same technological principles as the drilling solution, but it required fewer sensors, because the equipment was simpler and the solution mainly involved manual support, including error alerts, via dedicated personnel, spare parts management and account administration. This meant that fewer updates were required from the equipment on a day-to-day, minute-to-minute basis, because the value was derived from the maintenance management support and the prediction of errors over the long term.

Pricing structure for the decanter solution: The solution was considered less complex. It was based on CBM and provided as a free-of-charge service by the supplier to existing or new owners of decanters, under the assumption that future spare parts and services would be purchased from the supplier. The supplier maintained good relationships with customers that were deemed high value and that the solution targeted. The monitoring of the focal equipment was feasible in real time. It was also suggested that the solution would be more easily replicable for the supplier, because part of the interface between the buyer and supplier was clear and the scope of the delivery was smaller.

5. Results

In this section, the findings from the study are presented with reference to the buyer, the suppliers and solution offering in order to explain the pricing structures. For each level, we provide illustrative excerpts from the data in Tables 3–5.

5.1 *The buyer perspective*

5.1.1. Business model

A customer's business model explains how it creates value. It is found to help the supplier understand whether the solution requires critical equipment and processes, which in turn affects whether the customer outsources maintenance or pays for it up front, as well as the degree of the service or product's price sensitivity. For maintenance solutions, this is found to be critical, because suppliers need to understand the buyer's price sensitivity in order to be able to price discriminate and set the price as close to the customer's perceived value of the solution as possible. If the customer is constrained from or unable to maintain its critical equipment in a highly reliable state (the drilling solution), the solution will be less price sensitive than it may be in respect of noncritical equipment (the decanter solution). Further, the value of the solutions is found to vary according to whether those solutions influence the customer's customers directly, yet there is also the potential for further complexity. Because maintenance solutions are typically long-term in nature and demand extensive collaboration and technical expertise, the pricing structures for such solutions should take into account potential agency problems (gain sharing pricing) and require clear contractual frameworks (cf. Liinamaa et al., 2016).

5.1.2. Procurement practices

The buyer's internalised procurement practices are found to have a strong influence on the evaluation of the solution, and thus also on the pricing structure proposed by the supplier. If the decision-maker in the buying organisation has positive experiences with, for example, gain-sharing agreements, they are more likely to suggest it for solutions. The culture and customary approach of the buyer will also influence its openness to innovative pricing measures. Buyers with centralised procurement departments directing purchasing may have a strategy or tendency to focus on CAPEX, as a result of an emphasis on key performance indicators (KPIs) concerned with savings with a short-term focus. The individuals within the organisations may have technical backgrounds and hence be more likely to focus on the technology than on pricing metrics. Such buyers might adopt a more conservative approach and prefer old-fashioned transaction-based pricing over value-based pricing.

The buyer is found to be constrained by the need for regulatory bodies' approval of its equipment, and all future contracts are highly dependent on the equipment's reliability, as well as on how safely that equipment performs. This is an important value driver for connectivity and a reason why the buyer is attempting to mitigate the risk and cost involved in downtime and yard-stays by enabling on-time maintenance only.

5.1.3. Maintenance strategy

The maintenance strategy of the customer (i.e., the buying organisation) is found to be important for pricing structures, because it guides the perceived value of the maintenance solution by being either proactive or reactive, depending on the complexity, size and cost of equipment repairs. All of these factors relate to the risk mechanism, which explains the level and value of risk the buyer is willing to pay the supplier to take on. It also influences the

perception of value involved with postponing payments via subscription structures or the level of potential value-added by cooperation, which could be facilitated by gain-sharing structures.

Several aspects of the equipment are relevant when preparing to sell a maintenance solution. The decanter solution is a mid-range to simple maintenance solution, because the equipment has a relatively simple centrifugal movement. Furthermore, this equipment has a lower CAPEX, is highly reliable and is noncritical due to a redundancy strategy of keeping two additional machines available in the event that one of the four breaks down. The maintenance strategy is thus basic preventive maintenance and corrective (run-to-failure), which is simple and does not spur much demand for CBM or gain-sharing pricing.

On the other hand, the Derrick Drilling Machine (a key piece of drilling equipment) is found to require a more sophisticated maintenance approach, because it is a more complex and highly automated piece of machinery, with several hundred hydraulic hoses. If it breaks down, the offshore crew typically has 20 minutes to get it back up and running before downtime is registered, which is evidently difficult. Therefore, CBM is suggested as a useful strategy for reducing the downtime of the Derrick Drilling Machine, and because the maintenance solution is in development, a gain-sharing (reduced risk) pricing structure is a better option for both parties. The maintenance strategy further reflects the customer's in-house maintenance skills and its expectations regarding the supplier's capabilities and resources. The maintenance strategy will point to the aspects of maintenance that are most valuable for the customer, be they the service hours, spare parts or cost of downtime.

Table 3: Buyer level illustrative excerpts from different data sources

Buyer/customer context	Drilling Solution	Decanter Solution
Business Model	• '[The Derrick drilling machine] is operationally critical for our business. It is an expensive and complex piece of machinery, which can cost us around 500.000 USD per day in lost revenue if it breaks down'. (Programme Manager, Customer). • Due to the significant potential of cost reduction with the use of a CBM-solution, the customer and supplier are both more likely to benefit through cooperating in a gain-sharing structure with a minimum payment to the supplier and a 50/50 sharing of recovered downtime based on an index departing from current levels. (Project Engineer, Customer, Notes from meeting).	• 'it [a decanter] is not critical equipment. Customers are probably not very likely to pay a lot of money for a "remote diagnostics kind of service"' (Superintendent Engineer, Supplier B). • To align perceived value with price, no upfront cost is suggested and a low (zero-based) subscription structure is instead proposed (Connectivity Programme Manager, Supplier B).
Procurement practices	• The contract [for the CBM solution] has to be very good, otherwise the supplier will sneak out of it. We already have condition monitoring on our equipment, but we cannot agree on whose fault it is (Technical Superintendent, Customer, Notes from meeting). • 'However, despite relatively low spend, Supplier A has stated, that due to the willingness and constructive and proactive approach on e.g. joint innovation, the Customer is considered one of Supplier A´s five most important customers' (Category Manager Procurement, Customer).	• Supplier B would like to say that they price according to value, but in practice, they act more according to competition. 'transactional [pricing] with a discount customer and value-based [pricing] when we have bigger projects, or in other words, if the customer is price-biased or value based' (Segment Business Manager, Energy, Service – Process Technology, Supplier B). • The pricing decision is dependent on the input from the customer and can only be correctly priced if the customer provides the correct input. The suppliers have to base their price on the customer's technical specifications and will include a risk premium in the quote if this input is poor, which increases the price (Project Engineer, Customer, Notes from meeting).
Maintenance Strategy	• CBM should reduce unplanned maintenance and downtime, it is however not always true [for all types of equipment] More dismantling [of equipment for maintenance purpose] often leads to more failures. This is a good argument for CBM (Assistant Driller, Customer, Notes from meeting). • 'The drilling equipment provided by Supplier A is not like a GE jet-engine. One cannot simply compare the promise of a functional Rotating Drilling Machine with the promise of a functional jet engine, as the jet engine is a simple rotating device that has the same type of resistance, rotation speed and thus vibration trends' (Director Equipment Monitoring Services, Supplier A).	• The separation of gasses or solids from drilling mud is necessary to keep a rig in operation, and the task is thus in principle critical. However, due to the preferred maintenance strategy of having redundant decanters on the rig, breakdowns on a single decanter does not influence the operations of the rig (Technical Superintendent, Customer, Notes from meeting). • As a decanter is not a critical piece of equipment, the customer is unlikely to pay a premium for remote diagnostic services. As there are potential cost saving opportunities, the feasibility of implementing these should be determined by a business case (Superintendent Engineer, Customer).

5.2 *Supplier-level considerations*

5.2.1. Resources and capabilities

The resources and capabilities employed to develop, provide and control the solution and the pricing structures in use are highly important, because, logically, the supplier should be confident about the solution. We find that the supplier needs to be able to deliver, plan and control the pricing structure of the solution, which demands significant cross-functional and time-consuming work. Thus, the resources and capabilities influence the reputation of the providing company both before and after entry into an arrangement. Skilled employees who know their equipment, as well as other employees who are able to administer and control the pricing structure, are required to a larger degree when employing gain-sharing agreements than when engaging in transaction-based pricing. This is due to the increased complexity and enhanced administrative burden involved in devising a gain-sharing contract. Moreover, the pricing mechanisms are dynamic rather than static and so are likely to change. For example, the supplier can – due to market conditions – change perceptions of risks and, in turn, the preferred way of pricing a solution.

5.2.2. Supplier relationship with buyer

The relationship between the buying organisation and the supplier can remain at arm's length if there are no mutual gains from cooperating in the long run. However, the maintenance solutions have shown that there can be significant gains from cooperating, which can be a basis for a relational approach, laying the foundation for the co-creation of value at higher levels rather than seeking to maximise returns at an individual level. When seeking to employ pricing

mechanisms linked to the value-added of the solution, a high level of trust is found to be necessary in order to avoid the zero-sum optimising that will destroy, rather than create, value.

The value of the relationship (contractual or not) has to be of greater worth than that which would be achieved by terminating the relationship. Either party might exit the relationship if the cost of staying in it exceeds the value realised. The cost associated with monitoring the other party if the relationship of trust no longer exists is significant. For example, in the case of the decanter offering, the buyer may see greater value in ending the contract if it believes it can replicate the services internally and possesses the know-how to do so.

Table 4: Supplier level illustrative excerpts from different data sources

Identified mechanisms	Drilling Solution	Decanter Solution
Resources and Capabilities	• 'Also, the customers are asking for CBM NOW and not in 2018 where we were expecting to be delivering this. They are kind of asking us to run before we can crawl' (Senior Manager, Standardisation and Monitoring Programmes, Supplier A). • 'Despite the sensors being installed, poor connection has led to delayed data transmission and delayed response when errors occurred'. This has led to significant reductions in the price paid for the monitoring service' (Category Manager, Customer). • 'Supplier A knows their equipment the best, but we also know a lot about it, therefore we are able to develop a better maintenance solution together' (Head of Project Procurement, Customer, Notes from meeting).	• 'everyone is expecting something simple, like the Atlas Copco solution, but we do not have a budget to so this' (Connectivity Programme Manager, Supplier B). • 'We should be doing the type of service that we can do and only we can capitalize on our competencies. Just telling the customer if something is on or off is not core competency, but giving us the data and get advisory services from us is much more value' (Connectivity Programme Manager, Supplier B).
Supplier relationship with their customer	• 'Historically Supplier A set a price and held the customer "at ransom". This changed with the downturn. [previously] No one knew when or what parts to change, which was expensive for the customer. The idea with CBM is that you can see when the part is about to break [and only change it then] and both the supplier and the customer is then better off' (Project Engineer, Customer). • 'We base our service on trust. We assume they have the most interest in keeping the equipment going. We [Customer and Supplier A] should be able to reduce 8 out 10 failures' (Senior Manager, Standardisation and Monitoring Programmes, Supplier A).	• 'We have a very good relationship with most of our customers' (Regional Business Manager, Supplier B). • What influences business model and pricing: criticality [of equipment], closeness with the customer, the decision maker liking [Supplier B] and knowing who to sell to (Segment Business Manager Energy, Service- Process Technology, Supplier B, Notes from meeting).

5.3 *The solution (offering) level*

5.3.1. Innovativeness

If a solution is unprecedented, it becomes increasingly difficult for the buyer to evaluate the solution and more complex for the supplier to deliver the solution successfully, leading the buyer to perceive it as riskier. The added level of risk might make the buyer reluctant to pay large amounts in advance and instead prefer long-term payment structures whereby the financial risk can be reduced. For the supplier, there is an increased element of risk in the initial start-up phase, as well as a degree of uncertainty about how to bundle and price the solution.

5.3.2. Benchmarking alternatives

Benchmarking against the second-best alternative (or alternatives) to the solutions serves as a comparative benchmark for the differential value created by the solution. For the solution supplier, it may mean following existing pricing practices preferred by customers, or at least having an awareness of them, in order to match market prices (competition pricing). The additional value-added generated by the solution from the second-best alternative is what makes the buyer consider the solution, and the pricing structure itself can contribute to this differential value.

Value-based pricing of solutions is arguably less profitable if fierce competition dominates the industry and prices are undercut continuously. Therefore, the context in which the solution is provided should not be disregarded when implementing value-based pricing.

5.3.3. Measurability

Measurability concerns the ability to measure the solution performance in qualitative and quantitative ways, which enables (or prevents) different pricing structures. The ability to measure the outcomes of a solution in qualitative ways is found to be important for high value-added pricing structures, such as gain-sharing or certain subscription pricing strategies, because those outcomes are not straightforward to 'count'. In order to determine whether the solution delivers to the required extent, it is necessary to have methods for quantification that are verifiable by a third party.

The cost of remote monitoring in, for example, a gain-sharing solution can be high, particularly when real-time monitoring is requested for remote locations in harsh environments. The differential value derived from real-time monitoring, such as that stemming from the drilling solution, should thus be significant. By contrast, the decanter solution is a less costly measure, but it also fails to directly generate high value from the monitoring.

Respondents commented that some services, like expert services, can be hard to monitor and verify for the buyer, due to the expert knowledge required to properly understand the relevant service and action. This reinforces the need for trust between customer and supplier.

5.3.4. Replicability

The ability to replicate the solution affects its revenue potential (cf. Davies et al., 2006; Raja et al., 2017; Storbacka, 2011). Neither of the solutions studied was considered a 'one-off' solution, and both were therefore considered to be somewhat easily adjustable to fit specific customer segments. They are thus not fully customised but complex solutions, and it was found that in order not to add further complexity to the solutions or the suppliers delivering them, the pricing

needed to match the customer segment and complexity level. If a solution is easily replicable and needs little integration into a customer's operations, the lower the cost and complexity involved in pricing. By contrast, if the solution is highly complex and custom-made, there are fewer options for replicating and revenue will have to be derived solely from the individual solution.

5.3.5. Operational risk

Although operational risk is measured by its value in a business model, it is difficult to quantify and create a price structure for it. When including risk in a solution by pushing the ownership of risk onto a partner, incentives for reducing the risk become important. Aligning the incentives of the actors is essential to ensuring that the buyer and supplier work towards the same goal and the correct pricing structure can be key. Technology and expert capabilities potentially reduce the risk borne by suppliers, and gain sharing can be a useful means of incentivising a supplier to take on the risk. However, this requires the supplier to be aware of the risk and confident of its ability to handle and lower the risk. In this way, greater value is created for both the provider and customer.

Table 5: Solution level illustrative excerpts from different data sources

Identified mechanism	Drilling Solution	Decanter Solution
Innovativeness	• The supplier of the drilling solution is being pulled into the market by the customer(s) and thus faces a battle against time in that market to develop the capabilities to successfully deliver the solution (Director, Equipment Monitoring Services, Supplier A). • '2 years ago, I was just sat at my desk doing my job, which no-one really seemed to care about (reliability studies of equipment), now everyone wants to know about reliability, condition monitoring and would prefer the results were delivered yesterday' (Vibration specialist, Customer).	• 'We are a little behind the 8-mile here' (Parts and Service Sales Manager, Supplier B) which means that Supplier B might be missing out on revenue (because they are not yet providing connected solutions for improved equipment uptime). • Despite the ability to compare the decanter solution with existing connectivity solutions on the market, the solution involves great challenges when it comes to pricing and organising. (Connectivity Programme Manager, Supplier B, notes from meeting)
Benchmarking alternatives	• 'The second-best alternative is developing the necessary capabilities in-house to do the majority of the maintenance in-house in coordination with a third-party vendor. However, for the major overhauls and certifications, [Supplier B] would have to be involved, which would likely increase prices for the certificates and increase cooperation difficulties with [Supplier B]. The second-best solution is less likely to deliver as high an uptime as the proposed maintenance solution with [Supplier A]' (Programme Manager, Customer). • We have an offer from a competitor, but we don´t know how serious they are. The market is forcing people to do anything (Programme Manager, Customer, Notes from meeting).	• 'The second-best alternative to the decanter solution, is to run the decanters until failure, which for some of Supplier B´s customers are a preferred strategy' (Field notes from conversation with Connectivity Program Manager, Supplier B). • 'Do you have redundancy? If yes [as is evident for the decanters], No CBM' (Technical Superintendent, Customer, Notes from meeting).
Measurability	• '…the Derrick drilling machine with sensors, significantly improves the measurability of the equipment, which is hardly accessible and in almost constant operation' (Assistant Driller, Customer). • Concerns pertaining to the quality of the existing data, has the implication that qualitative measures and estimates must be used to price, which increases the risk for the supplier. Consequently, there is consensus that a gain-sharing solution should include a floor and cap. (Field notes of conversation between Project Engineer and Project Manager, Customer, Notes from meeting).	• 'Utilising the drifting data (if we had data monitoring on the machine already) we could show how we did with the customer, how we made the failure rate drop' (Business Development Manager Oil and Gas Drilling, Supplier B). • 'The equipment [the decanter] is simple and easily measured and accessed on the rig' (Assistant Driller, Customer). • 'What happens if monitoring and data transfer to governing bodies become mandatory?' (Connectivity Programme Manager, Supplier B).
Replicability	• 'Supplier A aims to provide the solution to their large base of drilling costumers, but each customer takes a fair degree of customisation, which is why they must charge an installation fee to cover some of the development cost' (Senior Manager, Standardisation and Monitoring Programmes, Supplier A). • The most valuable part of CBM [for Supplier A] is the steady revenue stream from the [replicability of the] CBM service (Senior Manager Standardization and Monitoring Programs, Supplier A, Notes from meeting).	• 'The solution should be simple and easily replicable' (Exchange of conversation: Product Manager, Product Centre Decanters and Connectivity programme manager, Supplier B). • 'This is due to the solution is costly to develop and due to the relatively large market to be covered. Further, across the organisation, several other equipment could benefit from connectivity, and the decanter solution is a pilot project for what could become a highly important strategic matter in the future' (Connectivity programme manager, Supplier B).
Operational risk	• 'At the end of the day, much of the decision comes down to risk, as it is the cost and the ability to remove some of that risk that determines whether to outsource it and how to price it' (Project Engineer, Customer). • 'The solution [in a potential contract] could result in 60 % less down time, personally I think it could reduce it much more. However, promising more could be very risky and therefore very costly.' (Senior Manager Standardization and Monitoring Programs, Supplier A, Notes from meeting).	• '…size and purchase price matters... so do the demands from API (American Petroleum Institute)' (Technical Superintendent, Customer). • As it is not a critical piece of equipment, the customer is most likely not willing to pay a lot of money for it. However, if there is a cost saving opportunity, it would be up to a business case to proof whether we could have avoided service that has cost us money in the past or not (Superintendent Engineer, Customer, Notes from meeting).

6. Discussion

6.1 Contrasting the solutions: explaining the pricing mechanisms

The solution offerings of both Supplier A and Supplier B are discussed in order to describe the different pricing mechanisms at play. Table 6 juxtaposes the two suppliers in terms of their scope, CAPEX, OPEX, revenue models and the lifespans of their solution offerings.

Table 6: Comparison of two solutions

	Drilling Solution (Supplier A)	**Decanter Solution (Supplier B)**
Scope of solutions	• Condition-based maintenance of all drilling equipment • Access to all data • Maintenance support • Document control • Maintenance Management System interface • Ownership of 50% of cost of downtime • All non-operational service related to the certificate of conformity (COC)	• Condition monitoring on decanter • Remote diagnostics support • Document control • Spare parts management
CAPEX	• Installation 2.8m USD (upfront)	• None
OPEX	• Hybrid: Fixed fee and 50/50 sharing of cost of downtime	• Fixed fee zero-based subscription pricing
Revenue model	• Gain-sharing of reduced downtime measured in million USD	• Solution contingent on purchase of service and spare parts during the lifespan
Solution lifespan	• Estimated 20 years	• Estimated 20 years

The drilling solution (Supplier A) was scoped and priced to fit the high operational risk of the equipment, as well as to match the complexity of the solution and the perceived need for strong incentives for the supplier to improve its offerings. Due to the criticality of the equipment for the buyer's operations, there is a high value on risk, because equipment downtime leads to revenue losses ranging from 200,000 to 500,000 USD per day. Risk was found to be of higher value for the drilling equipment due to its cost, large size and complexity, which requires the focus of the maintenance strategy to be preventive. The solution was proposed by the buyer, who had an interest in sharing equipment-related risks with the supplier. The key lies in the

supplier's capabilities and technology-enabled improvements in measurability. These are likely to significantly lower equipment downtime, adding value for both the customer and supplier.

Friction in the buyer–supplier relationship impacted the smooth flow of information. In part, this was due to the novelty of the solution, potential interpersonal issues between employees and the severe pressure to perform experienced by both parties. Furthermore, although few viable alternatives currently exist in the marketplace, potential future collaborations between the customer, a software company and a third-party service provider may provide competition for Supplier A. The cost of developing the solution is high; thus, the ability to replicate the offering for other customers is an important consideration for the supplier when seeking to maximise returns and offset development costs (cf. Davies et al., 2006).

The decanter solution (Supplier B), on the other hand, was found to be premised on a zero-based fixed fee structure, because it did not have a direct impact on the customer's business model. The preferred maintenance strategy was one of building in redundancy by having additional decanters onboard the rig. This was practically feasible and did not place major financial constraints on the customer. It reduced the operational risk of the equipment significantly, as well as the potential value of including risk in a solution (cf. Giotra and Netessine, 2011; Hou & Neely, 2017). The buyer found its maintenance strategy to be the most viable, but stated that it was open to economically preferable alternatives. That said, individual preferences articulated by interviewees within the buying firm varied to a large extent, highlighting the importance of building trust between decision-makers in both the buyer and supplier firms (cf. Carmeli et al., 2016; Liinamaa et al., 2016). Supplier B was found to possess the resources and capabilities required to supply the simpler decanter solution, but was initially reluctant to enter a gain-sharing contract due to its fear of not being able to deliver and thereby

damaging its reputation and trust level. The decanter solution was set at zero dollars per annum for the solution itself and was made contingent on the purchase of high-margin services and spare parts throughout the lifespan of the equipment, because this had a higher perceived value than monitoring of the equipment. It was a new solution, and the buyer evaluated it to be of medium value, given the existence of alternatives. Industry contraction prevents the supplier from charging for the solution up front. However, 'locking in' its large customer base to procure spare parts and services allows for the use of a subscription-based structure. It is a replicable solution, which is easy to measure and adds value indirectly to the supplier and directly to the customer.

6.2 Contextual considerations for pricing solutions

Understanding the particular value of a solution is important for identifying suitable mechanisms to base the price on value (cf. Sawhney, 2006). If components of the solution change the value, the most suitable pricing structure for the solution might also change. Hence, the choice of pricing structure should be linked to the value generated for the customer. Increasing customer value from the solution increases the possibilities for new ways of pricing solutions (Bonnemeier et al., 2010). Benchmarking the offering with the second-best alternative has been suggested as a way to understand the relative added value (Nagle et al., 2016). However, our study suggests that pricing decisions need to be guided by a broader set of considerations that account for contextual factors. In other words, our empirical findings suggest that the pricing of solutions is conditioned by a number of premises at the buyer, supplier and offering (solution) level.

Our two supplier cases suggest that a precondition for developing a solution-based offering is a thorough understanding of the customer's business model and that the problems

addressed by the solution would be considered important in light of the customer's business model and maintenance strategy. In the oil and gas industry, the recent emphasis on reducing operating expenses has resulted in drilling operators changing their business models, which both poses challenges and offers opportunities for their suppliers. Buyers differ strongly in their procurement practices and maintenance strategies. Procurement practices impact the way in which a buyer evaluates a supplier's solutions offerings as either strategic or noncritical to their operations (Kraljic, 1983), whereas maintenance strategies impact how buyers deal with operational risk and hence the value of solution offerings. Moreover, for buyers with sophisticated maintenance capabilities and a wide variety of assets and equipment, there may be differences in maintenance strategy depending on the particular equipment. These are preconditions that the supplier should consider when determining the appropriateness of developing a solution-based offering.

In addition to considering prerequisites for technology-enabled solutions based on the buyer context, it is important to consider the need for higher-order capabilities and resources on the supplier side as well as the necessity of a strong relationship between the buyer and supplier (cf. Ulaga & Reinartz, 2011). These are then important in order to successfully develop and sustain value-based pricing structures, such as subscription pricing and gain sharing (Sawhney, 2006). The scoping of the value-based pricing structure further depends on a number of specific mechanisms at the solution level.

For the drilling solution, the high operational risk and high measurability, coupled with the relatively low replicability and available alternatives as well as the high innovativeness of the solution, seem to be the right conditions for developing gain-sharing pricing structures. This provides incentives for both the buyer and supplier to mitigate the operational risks. The lower

operational risks and ready availability of alternatives in the form of redundancy as a maintenance strategy for the decanter solution, along with the lower level of innovativeness, reduce the appropriateness of gain-sharing arrangements. However, the high measurability and replicability facilitates an offering emphasising possible cost reductions, which can be realised through subscription pricing.

7. Concluding remarks, limitations and further research

This study contributes to the literature on value-based pricing of solutions by developing an empirically grounded framework for understanding the contextual complexity that needs to be considered when determining the choice of pricing structure vis-à-vis the supplier's capabilities and the buyer–supplier relationship. This study complements previous research that has modelled pricing decisions (e.g. Zhang et al., 2015; Zhang et al., 2018).

In this study, we found that within the buyer context, the business model and procurement practices were broadly speaking in favour of value-based pricing. The industry context created a sense of urgency, requiring an open mind towards buyer–supplier collaboration. However, the buyer's maintenance strategy, the third aspect, differed significantly for the two types of solution offerings. Importantly for decanters, redundancy was used to counter the risk of malfunctioning equipment, whereas preventative maintenance was preferred for drilling equipment, because redundancy is technically, economically and practically infeasible. Moreover, there was a perception within the customer organisation that moving to CBM and predictive maintenance could offer a potentially stronger maintenance strategy for the drilling equipment. This explained the difference in the perceived value of the solutions, which encouraged different pricing structures suitable to the different levels of risk, maintenance strategies and given context. In so doing, the present study goes beyond

considering risk only from a supplier perspective for solution offerings (Hou & Neely, 2017) and considers the buyer perspective as well.

With regard to the supplier level, the relationship with the buyer was found to play a critical role, because subscription-based and gain-sharing pricing structures rely on a high level of trust. In addition, on the supplier level, the resources and capabilities dedicated to pricing the solutions were found to be influential in the choice of pricing structure, because value-based pricing is considered highly time-consuming and a cross-functional task. Furthermore, the study contributes by identifying certain underlying mechanisms of the pricing of solutions. These pertained to the ease of measuring the outcome, the possibility of replicating the solution of lower complexity, the benchmarking of the second-best alternative and its innovativeness, which were identified as important considerations for explaining the pricing structure.

This study has important managerial implications for suppliers of solutions. It is necessary for suppliers to identify and understand the customer's maintenance strategy, its procurement strategy and its overall business model, when seeking to price a solution. This will facilitate the supplier's understanding of how the customer generates revenue and what the customer might value the most from the solution being offered. This means that when considering what pricing structure to employ, the supplier needs to consider its own ability to deliver as per specified and whether there is a sufficiently strong relationship between customer and supplier. If there is a lack of trust, increasing emphasis will be placed on the measurability of the solution. The supplier firm needs to be able to adjust the solution and pricing according to whether the solution is very innovative, easily replicable, and easy to measure, whether there are many or few alternatives and whether or not it includes operational risk. The latter is of particular importance, because taking on some of the customer's operational risk, as

exemplified in the case, has the potential – considering all mechanisms carefully – to increase value for both the customer and supplier.

Finally, like all studies, ours has limitations. We draw on only two suppliers of solutions and a buyer organisation, which limits the generalisability of the research findings. However, analytical generalisability is possible, and other researchers may compare the results from this study to other contexts or follow a replication logic in the context of the same or different industries with further cases (Yin, 2009). Further research is needed to explore how pricing structures evolve over time, especially because solutions are typically delivered over extended periods.

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