

PERFORMANCE-BASED CONTRACTING: A NEW TOOL IN SHIP MANAGEMENT?

Abstract

The shipping industry is ever more challenged by increasingly demanding performance requirements. However, performance-based contracting is hardly applied in the industry. Using this type of contracting in the relation between ship owners and managers could create a win-win situation: owners gain a competitive advantage through more aligned interests, while ship managers obtain rewards for their performance excellence.

This paper reviews performance-based contracting in ship management by analysing two successful cases. The paper first reviews literature, then uses expert interviews as basis for qualitative research.

Principal–agency theory is the framework used for analysing the cases. The results confirm the hypothesis that a competitive advantage can be obtained and maintained by using PBC for outsourced ship management services.

The full potential of PBC is not obtained, as risk is not transferred. The complicated relationship between ship manager, owner and other stakeholders such as charterers prevents further alignment of mutual interests.

Recommendations are made to enable application of PBC in ship management: review the liability limitation to allow transfer risk to the ship manager against incentives and a holistic approach is required to make better use of PBC and expand competitive advantages obtained through outsourced ship management services.

Disclaimer

This paper is written by Jeroen Hollebrands MSc. and based on the thesis for his MBA in Shipping and Logistics. The report analyses real cases of performance-based contracting in third party ship management. The contents of this paper is not related to his current employer. After obtaining his MBA in 2011 he joined Maersk Maritime Technology as Vessel Performance Supervisor. He can be contacted at: jeroen41@gmail.com.

1 Introduction

Performance-based contracting (PBC) is a relatively new type of contracting for service providers. PBC lets clients define the performance requirements, which are full-filled by service providers in a transfer of risk, for the reward of incentives for performance excellence.

This paper explains that ship owners can use PBC to comply with the ever increasing performance requirements and obtain a competitive advantage when outsourcing ship management.

1.1 Third party ship management

Historical development of third party managers

Historically, ship owners have performed all the ship management functions in-house. During the late 1960s and early 1970s two developments led to the development new groups of ship owners that started to outsource management to independent third-party ship managers [1]: Oil majors seized advantages of tax breaks on capital investments by ordering ships, while poor market conditions led to bankruptcies of ship owners forcing banks to take ownership. Both businesses did not consider ship management as core competence and started outsourcing to third-party managers.

Services provided by third party ship managers

Ship management is defined as: 'the rendering of services under contract related to the systematic organisation of economic resources and transactions required for the sustenance of a ship as a revenue-earning entity' [1]. Or, when stressing independence: 'professional, independent organizations which for a negotiated fee and with no shareholding ties with their clients undertake responsibility for the management of vessels in which it has no financial stake' [2]. This report prefers the latter, because the in-dependence between ship and owner is important in the context of performance-based contracting.

Ship management concerns all activities required to operate the ships effectively, except providing equity finance [3]. The Baltic and International Maritime Council (BIMCO) SHIPMAN contract is often used between ship owner and manager. The contract defines the ship management services [4]:

- Crewing management is the supply selection and insurance of a ship's crew.
- Technical management maintains the mechanical systems on board and includes logistics of supplies in accordance with all applicable law and regulations.
- Insurance arrangements for hull and machinery, and protection and indemnity insurance.
- Commercial management seeks and negotiates employment for the ship.

Other services can be added depending on the owner's requirements, for instance administration, legal and IT.

The owner and manager agree on a budget for operational expenses (OPEX). The owner then transfers working capital to the manager, who is required to maintain correct accounts. The operational expenses are used to keep the ship in operation and vary per ship. Manning is the largest component of OPEX. Expenses for ship finance and voyage operations are not OPEX.

The ship manager is paid for its services with the annual management fee. The fee is a fixed amount paid in monthly instalments. The fee is subject to annual review, but not adjusted by actual performances. A typical management fee is roughly five per cent of annual operational expenses.

The BIMCO contract allocates little liability to the ship manager unless damages are proven 'to have resulted solely from the negligence, gross negligence or wilful default of the Manager' [4]. In case the manager is found liable, the liability is limited to never exceed a total of ten times the annual management fee. The ship owner is obliged to indemnify the ship manager against any third-party claims.

Ship manager's competitive environment

Third-party ship managers operate in a highly competitive environment. An estimated 400 ship managers operate fifteen per cent of all ocean-going ships [5]. Despite growth of the leading ship managers the industry remains fragmented. There are relatively low barriers of entry for managing commodity type ships.

Due to the high competition level there has been little change in management fee over the last decade, despite new challenges such as: shortage of qualified crew, more stringent environmental and safety requirements, security threats and inflationary costs.

1.2 Performance management

Over the years performance requirements for ship management have increased strongly. The ISM Code was introduced in the 1990s to improve the safety at sea, prevent human injury and loss and damage to the environment. The code requires ship managers to implement an effective safety management system. Examples of other performance management requirements are: OCIMF introduced Tanker Management and Self-Assessment, Intermanager's Shipping Key Performance Indicators (KPI) project, Intercargo's bulk carrier benchmarking, EU's Flagship project and regulatory developments such as the Energy Efficiency Design Index.

Intermanager's Shipping KPI project delivers sets of KPIs for the different ship management activities. The result is expected to: increase transparency in the industry, differentiate between ship managers and better demonstrate the offerings to ship owners. The KPIs provide a tool to measure ship management performance.

The BIMCO SHIPMAN contract does not set performance requirements for the ship manager, apart from compliance with relevant regulations. The managers shall: 'undertake to use their best endeavours to provide the Management Services as agents for and on behalf of the Owners in accordance with sound ship management practice and to protect and promote the interests of the Owners in all matters relating to the provision of services hereunder' [4]. This is in line with the limited risk and fixed management fee. In practice, experienced ship owners inform their managers of their required operating standards.

1.3 Research question

The increasing performance requirements and limited transfer of risk lead to the question whether a new type of contracting should be used in ship management: performance-based contracting (PBC). PBC improves alignment of risks and incentives between suppliers and customers, resulting in increased product availability at reduced cost of ownership [6]. PBC is successfully applied in other industries. It requires ship owners to set performance requirements and use (dis)incentives to align the interests of ship managers, while the latter get the opportunity to demonstrate and be rewarded for performance excellence.

This report analyses the use of PBC in contracting third party ship management services

between ship owner and manager. Particular attention is given to competitive advantages achieved by the ship owner. This report answers the question whether PBC is a useful tool for the ship owner and how this can be achieved. The hypothesis of this study is:

Can a ship owner gain and maintain competitive advantage by using performance-based contracting when outsourcing ship management services?

This report is one of the first studies into PBC in ship management. The results can be used as justification and guidance towards further development of PBC in ship management.

1.4 Report structure

This report reviews literature and applies case study research to answer the hypothesis. First literature is reviewed to provide a theoretical answer to the hypothesis. The principal-agency theory is used as a framework to analyse ship owner and manager relationship. Case study research method is explained and applied in two cases. The cases are successful applications of performance-based contracting in ship management. Thereafter the cases are reviewed using the theoretical framework of PBC. This leads to a number of observations on the current state of PBC in ship management and gives requirements for further development.

2 Literature review

2.1 Strategy in ship management

This paper analyses the use of PBC in outsourcing ship management services to obtain a competitive advantage. A competitive advantage allows a company to offer superior value to customers. Panayides and Gray [7] found that demand for ship management services is heterogeneous despite relatively basic homogeneous services. This is explained by the variations in ship type, crew, flag and differentiation in required services.

Panayides [8] then applied the strategic framework by Porter on strategies for competitive advantage to analyse performance of ship management organizations. Panayides found that both low and high performing companies pursue cost leadership,

but a good differentiation strategy is key for ship management companies. This reduces vulnerability in competition, allows premium prices and creates better alignment with customers. Differentiation forms the basis of competitive advantage in ship management. Market and competitor analysis provide the input for differentiation.

2.2 Rationale for outsourcing ship management

Outsourcing

Outsourcing is initiated to create value for the stakeholder by: (1) lowering the purchase price of input because of the external supplier's lower cost, or (2) improving the quality of input by external supplier's superior resource or capability [9]. Resources saved, are used for strengthening own core competences to achieve a competitive advantage [10].

Vining and Globerman define outsourcing strategies based on the type of outsourced activity. For services like ship management, with high complexity and low asset specificity, they highlight the potential problem of disagreements about quality and suggest to agree upon practice guidelines [11].

Ship management outsourcing

Several factors play a role in separating ship ownership and management: the company's size, type, age and environment [2]. The larger the firm, the more delegation of decision-making takes place. This leads to changes in the hierarchical structure, which separates ownership from management. In a privately owned company the individuals or families owning the firm are usually the managers too. A public company with a large shareholder-base will more likely choose managers for day-to-day operations. The further the firm gets in the life-cycle, the more challenging in-house management succession is, an emerging reason for outsourcing. The changing environment, e.g. new regulations, may be a reason for outsourcing too.

Flexibility and expertise are the mostly cited reasons for outsourcing to third party ship managers [12]. Flexibility is the ability to move in and out of markets without operational challenges like manning the ship. This allows asset-play and quick decision-making. Expertise is another reason for outsourcing, but similarly a reason for owners to keep ship management in-house to keep the core competences. King and Mitroussi highlight succession problems leading to more outsourcing of ship management [13].

Outsourcing selection

An assessment was made to determine choice criteria for third-party ship managers [14]. Ship owners and managers were asked to rank selection criteria for managers. Competency and technical ability of personnel, and operational systems, were the highest valued selection criteria. Price was not highly rated: good service was considered more important. This is confirmed by findings in other industries [15] and Panayides' work on strategy in ship management [8].

Value in a ship management context is delivered at two levels [14]. The first level is a measure of (1) technical quality, (2) functional quality, (3) relational quality, (4) operational quality (technology, systems) and (5) image. The secondary importance level consists of (1) financial variables and (2) strategic variables. The different levels of value should be reflected in the performance criteria.

2.3 Performance-based contracting

Third-party ship management is a service industry. Services consist of deeds, processes and performance [16]. Deeds are activities to solve problems which client can not solve independently. A process is a strategy used to carry out the necessary deeds. Performance indicates how well the deeds are executed and encompasses service effectiveness and efficiency.

PBC developments originate from two sources: manufacturers and authorities. Manufacturers of goods are increasingly integrating the delivery of services in their market offerings [17]. They seek business opportunities by providing after-sales solutions to a saturated market. This extends the scope for manufacturers and adds sources of revenue. Solutions are sold as performance, while equipment ownership is retained by the manufacturer [18]. The aerospace industry is an example where only the 'up time' of aircraft engines is sold by the manufacturer [19].

Authorities increasingly adopt performance management techniques with (dis)incentives depending on outcome [20], mainly applied in the construction sector. It lets authorities define the required outcome and performance, while leaving all the technicalities to the supplier [21].

The key concept of performance-based contracting is the service provider taking over risk from the customer against payment. This improves alignment of interests of both

parties. PBC is defined as: 'a means of allocating the business risks, associated with any project, to the party best able to control the probability and seriousness of that risk. It is also a means for compensating the party assuming the risk for its exposure' [20].

One benefit of PBC is improved product reliability. Recent research indicates a significantly increased product reliability for aircraft engines contracted at performance-basis compared to traditional contracting [19]. The evidence support earlier conclusions that a win-win situation can be developed using PBC [22].

Toffel [23] developed a theoretical framework to review PBC contracts based on transaction cost economics. The advantages of these contracts are: (1) mitigating sales transaction hazards, (2) increasing incentive for efficiency and (3) creating opportunities for mutual gain by aligning incentives.

Sales transaction hazards are mitigated since the supplier has no incentive to exaggerate claims of reliability or durability because the supplier remains liable after sale. Because the customer only pays for hours of operation, the incentive is increased to use the equipment more efficiently. In a typical sales transaction the interests of manufacturer and customer not aligned. The customer seeks high quality and durability while the manufacturer aims to reduce production cost. The manufacturer seeks a high selling price. The manufacturer earns from providing maintenance and repair (a trade-off against quality reputation) while the customer seeks reliability. A manufacturer intends to sell as many units with as many paid for features, against the customers trying to minimize purchase cost.

In PBC the supplier is committed to the product during the entire life cycle, which solves many of the above-mentioned conflicts. The manufacturer is motivated to improve reliability and efficiency at a low cost.

Toffel notes two risks in PBC: adverse selection and moral hazard. These are key issues in a principal-agency relationship and require further review.

2.4 Principal-agency relationship

Agency theory is used as framework to review PBC. This is possible when PBC is used in outsourcing under a long term contract demanding performance of the supplier. Eisenhardt states: 'agency theory is directed at the ubiquitous agency relationship, in which one party (Principal) delegates work to another (Agent), who performs that work

[...] using the metaphor of a contract' [24]. In addition to adverse selection and moral hazard, Eisenhardt adds the problem of risk preference a third fundamental challenge in agency theory.

An adverse selection problem arises when the principal is not completely informed about the capabilities of the agent before contract signing: ex ante information asymmetry. The agent may withhold information or overrate capabilities. The agent has an incentive to do this because it leads to better contract conditions.

Moral hazard is the problem that the principal can not predict and be completely informed about the agent's behaviour after contract signing: ex post information asymmetry. The agent has no incentive to give the highest effort if the principal is never going to be aware of this and thus the agent will not be rewarded as such.

In agency theory it is of particular interest how to use contracts to align the interest of the agent and the principal and to solve the challenges of adverse selection and moral hazard. To achieve this high-powered incentives to ex ante align the parties' goals are required.

Agency theory distinguishes two payment models. In behaviour-based contracts the agent is paid by the principal based on (observed) behaviour (e.g. an hourly wage payment). In outcome-based contracts the agent is paid based on the achieved outcome [18]. Outcome-based contracts are considered effective to achieve the goal of controlling moral hazard [24].

Outcome-based contracts transfer risk from principal to agent [25]. The risks as described earlier by Toffel. Eisenhardt [24] states two factors affecting the cost of transferring risk to an agent. (1) The higher the outcome uncertainty, the higher the cost of transferring risk to the agent. (2) A higher risk aversion of the principal and lower risk aversion of the agent leads to a lower cost of transfer.

After applying agency theory on transportation outsourcing, Logan [25] suggests using a combination of both payment models in one contract: long-term behaviour-based contracts with open book and cost plus and outcome-based incentives with shared cost reduction. This reduces the risk for agents compared to full outcome-based contracts, which is important because agents need to invest to meet the demands of their clients, while it still gives principals the tools make the provider aware of the service goals.

2.5 Incentives

The problems in agency theory: adverse selection and moral hazard can be limited using incentives. The incentives are based on performance measures. Selecting properties to use with incentives is a central problem in agency theory [26]. Baker finds that a simple measure of 'goodness' of a performance measure is when the marginal product of an agent's activity on the performance measure is highly correlated with the marginal product of this action on the principal's objective. However, agents react to incentives in a self-interested way and flawed incentive schemes may harm the objectives of the principal [26]. Incentives schemes are flawed when the performance measures do not function as intended.

Performance measure properties

There are four major performance measure properties: uncontrollable and controllable risk, distortion and manipulation [27]. Performance measures may have uncontrollable risk (noise), which increases the costs (of transfer) since agents are risk averse [28]. Distortion occurs when measures encourage agents to take actions that are not in-line with principals objectives [29]. Manipulation occurs when agent abuses the incentive plan to increase rewards, without any benefit to the principal's objective. The agent uses specific knowledge to increases the measured performance inconsistent to the principal's objective [27].

It is a common prediction that incentives should be weaker when the greater the noise or more disturbed the performance measure. However, literature about the effects of noise on incentives shows contradicting findings [27]. These may be caused by the performance measure property: controllable risk [30]. An employee may have such specific knowledge, that incentives encourage to use that knowledge to manage the uncertainty.

Incentives

Literature distinguishes between implicit and explicit incentives. Implicit incentives are based on the evaluation of ex post performance. This gives the principal the opportunity to adjust incentive to improve the incentives' effectiveness, for instance if an agent performance was unsatisfactory due to bad luck, an reward can still be made [27]. This incentive type reduces the perceived risk of the agent [31]. Explicit incentives are awarded as per contractual agreement.

Literature mainly focuses on single performance measures connected to an incentive. A system of multiple incentives is considered better when any single performance measure is not adequate enough [27]. All four measure properties are important in incentive design, but when a measure is flawed, less weight is given to that measure's explicit incentive [27]. Using a second measure is suggested to mitigate distortions or manipulation in the first performance measure. Implicit rewards indicate that this incentive is used to deter manipulation and reward employees to exploit controllable risk for the benefit of the principal.

A review of offshore service contracts lists four requirements for incentive parameters [32]. Parameters must be measurable, observable to both parties, within the agent's sphere of control and legally verifiable. Controllability of parameters by the agent is very important, otherwise the system can become akin gambling.

Incentives need not be monetary to have an incentivizing effect. Alternative incentive methods are: automatic extension of contract term, frequency of payments, letters of appreciation, promise of future work and letters of guarantee.

Incentive-intensity

When designing the strength of the incentive, the incentive-intensity, it should be clear that a too high incentive will not be favourable for the principal. In such case the marginal effect on the benefit to the principal will be offset by the cost of the incentive. The incentive-intensity principle [33] suggests that optimal intensity of incentives is defined by four factors: (1) the marginal profits created by the additional effort, (2) the measurability of the desired activities, (3) the risk aversion of the agent and (4) the agent's responsiveness to incentives. If an agent is risk averse, or unresponsive to incentives, then the incentive should be high to generate any effect.

3 Research method

This paper uses exploratory research into the application of performance-based contracting in outsourced ship management services. Non-standardised and semi-structured interviews are used as a basis for qualitative research. All contributions to the research were made on confidentiality basis.

This research is based on is a qualitative case study methodology with a strong exploratory content. Eisenhardt [34] states that case study 'is particularly well-suited to

new research areas or research areas for which existing theory seems inadequate. This type of work is highly complementary to incremental theory building from normal science research. The former is useful in early stages of research on a topic or when a fresh perspective is needed ...'. Case studies are the preferred research method when 'how' and 'why' questions are being asked, when the researcher has little control over events and when the focus is on a contemporary phenomenon within some real-life context [35].

Literature research and expert interviews are used to conduct exploratory research, because PBC in a ship management context is relatively new and not covered in academic literature.

This paper analyses two cases. Both cases have successfully applied PBC over several years, which provides enough information to study these cases in detail. Both concern outsourcing of ship management services by a ship owner, but in different contexts. The author is aware of more applications of PBC in the industry, but these lacked availability of data.

Theory-building research often uses multiple data collection methods [34]. Using different data resources provides stronger foundations for theory building. This report uses research based on documentation and interviews. The documents are based on literature, notes related to the cases, presentations at seminars, articles from industry newspapers and magazines.

The interviews were held face-to-face, by phone and email. In addition to people directly involved with the cases, other industry participants were interviewed on the subject. The interviews were based on semi-structured questionnaires with different questions for ship manager and owners. The interviews were taken during the research period, which allowed for verification of theories developed in researched cases. The interviewees were willing to discuss under the condition to keep all data anonymous.

4 Case Studies

4.1 Introduction

This study analyses two cases of performance-based contracting. Both are successful applications of PBC in ship management. The cases provide the basis for answering the

hypothesis.

4.2 Case A: Specialist ship owner

Context

This ship owner decided to outsource the entire fleet to one external ship manager to enable maximum economies of scale. The owner short-listed several candidates based on technical skills who were invited to tender for management of all vessels. The managers were asked to provide OPEX and CAPEX budgets and propose a performance-based contracting system for all vessels over a three year period.

The proposals were reviewed and ranked. The aim was to find the manager with the best 'cultural fit', where a balance needed to be found between benefiting from economies of scale and personal attention. Trust was a very important factor in selecting the right manager. The chosen manager was relatively small when selected because it had differentiated towards providing a level of high service, instead of solely pursuing economies of scale.

The contract

To create alignment between the ship manager and owner, the manager was considered a 'partner' instead of a 'supplier of services'. The partners operated using an umbrella contract which contained BIMCO SHIPMAN and CREWMAN contracts for each ship. The contract period was set at three years.

To further align the interests of both parties performance-based contracting was adopted. The contract contained two types of performance measures: budgetary controls and KPIs. Each performance measure had a weight factor. The OPEX and CAPEX budgets were based on the three year estimates given in the quotations. The KPIs were averaged across the fleet and consisted of operational and safety indicators.

A fixed management fee was set per vessel per year. The total amount of incentives to be earned over the three year period was about ten times the annual management fee per vessel while penalties amounted about seven times the management fee.

PBC in operation

Outsourcing all ship management activities led to a significant change in the company. An elaborate communication scheme between manager and owner was developed to keep all parties well informed. Contact consisted at least of: annual board meetings,

monthly operational meetings, weekly conference calls, crew seminars, financial and safety audits at the ship manager, supervision of cargo operations and ship visits.

After implementation of PBC, time-consuming discussions evolved about the allocation of costs. This was caused by the budgets being connected to incentives. For example, due to expenses on planned maintenance to machinery the OPEX budget was exceeded, consequentially the ship manager incurred a penalty. However, the manager had the opinion that these expenses should be classified as capital expenses because they upgrade the value of the ship. In another instance unplanned downtime was blamed to the owner being complacent in investments in up-to-date and reliable equipment. Valuable time was spent on these discussions trying to prevent penalties, which distracted from the core business of managing the ships safely and efficiently. Ultimately, the owner decided to discard all penalties and only keep the incentives in the contract.

After three years at contract renewal the PBC clauses were reviewed and changes were made. Not by raising performance levels, but by replacing KPIs with new measures. This was used to focus onto a particularly area and create a better alignment between the owner's strategy and the manager's performance. For example a new KPI was implemented that requires vessels to be fully prepared for dry docking during the vessels' docking window. This is of strategic importance because the vessels are tramping and a docking opportunity could occur upon short notice. Another new KPI was officer retention, which was of strategic importance to keep high levels of operational knowledge on board.

Evaluation of PBC

The case used two payment models: long-term behaviour-based contracts as management fee and outcome-based incentives based on performance. The budgetary measures and KPIs had two different roles. The budgetary measures triggered the largest incentives and were implemented to control expenses. The KPIs acted as quality assurance. Their contribution to the incentives was lower compared to the budgetary parts of incentive, but were essential to prevent manipulation of budgetary measures [27].

The incentive-intensity was relatively high: based on a 3-year budget the maximum bonus was about twenty per cent of total management fees, while the penalty could

amount to about fifteen per cent. For a low profit margin business these incentives were substantial. Unfortunately the penalties caused elaborate discussions which resulted in a loss of focus on performance. Apparently the effect of deductions on earnings weighed higher than obtaining bonuses. After removing the penalties, the bonus incentives got more focus. This improved alignment of owner's and manager's interests and reduced the risk of the manager.

There was intensive communication between both parties discussing the outcome (KPI and expenses) as well as the behaviour of the ship manager. The owner was always fully aware of the state of the ship and the activities on board. This was further supported by the monitoring system accessible to the owner and the audits by the owner on board and at the manager's office.

The regular meetings were used to review the behaviour of the ship manager and align the strategies of manager and owner. The exchange of information led to a better understanding on both sides.

4.3 Case B: Crew Management outsourced

Context

A ship owner decided to outsource all crew management activities to a well-known ship manager. Technical management was still performed by the ship owner.

The contract

The contract was based on a standard SHIPMAN contract with additions. An incentive system was added based on KPIs. Four categories of performance measures were used: owner performance, victualling, training and innovation. Each category was linked to an incentive system. The total available incentive was about three per cent of the total annual operational expenses of the ships. The contracts were reviewed annually.

The incentive tied to 'owner performance' was divided into three sub-categories: safety, people and costs. The safety indicators are based on universally applied KPIs. Operating below agreed thresholds enabled the bonus. For instance, scoring an annual LTI below threshold gives the ship manager the entire safety incentive. The costs KPI enabled incentives when the costs were below budget. All costs of operations were entirely transparent to the owner, since these had to be reimbursed to the ship manager. Therefore negotiations on next year's budget were based on detailed bottom up

calculations with allowance for year-on-year inflation. This prevented the manager to forecast too high budgets to benefit from reduction incentives (adverse selection).

The on-board feeding costs was linked to an incentive which increases linearly with lower costs compared to base case cost. A large share of the bonus was used to motivate the crew, for instance as rewards for increasing efficiency. This was considered an essential requirement.

The crew had to comply with all regulations but training and study leave were to be managed efficiently to earn the incentive. An incentive was given when installing and using a cargo simulator before agreed date. Finally, incentives were available for innovations improving business performance, which were assessed case-by-case.

This PBC was successful and used over a considerable period. Performances were evaluated annually and new KPIs were set where required. Communications between parties took place on a daily basis.

Evaluation

The cooperation between manager and owner was considered successful by both parties. The PBC gave the ship owner a tool to focus on certain elements of crewing for a relatively small increase in expenses.

Some KPIs proved to be manipulable. For example, it was experienced that after a crew member got injured on board while in port, an unplanned repatriation of that person followed immediately. It was then argued that this injury did not affect the safety statistics since the injured crew member was already on leave.

The incentives for reducing victualling expenses were aimed at reducing waste and consumption of luxury foodstuff. Experience had shown that victualling expenses were relatively high compared to other vessels. Rewards to the crew as a return on victualling expenses saved were essential to have their corporation. This KPI evidences how benchmarking from other vessels was used in a PBC system.

The incentives related to training put a cap on the expenses with the goal to improve efficiency. The innovation incentive was implicit and left room for discussion for instance about the required extent of operational or financial improvement.

One of the problems was the interpretation of numbers and definitions. Elaborate definitions were required to make all parties interpret the KPIs identically. The example

of crew repatriation after an injury was an unwanted event, which was incentivized due to inadequate definitions. This was solved by improving the definitions, but this led to increased monitoring costs.

This case did not transfer additional risk to the manager because there were no penalties clauses. Interviewee regards KPIs as a means to bring focus to a particular area of ship management, since the standard contract is very general.

5 Discussion

5.1 Introduction

The two cases are further analysed using the theoretical framework for PBC, which results in a guidance for using PBC in ship management.

5.2 Competitive advantage through outsourcing

The cases represent typical outsourcing in ship management. The rationale for outsourcing is not just cost-driven, but rather for expertise and resource availability. Flexibility is of less importance since both owners are transportation providers for their industry and have no interest in exiting their sector or entering new ones. The outsourcing decision is not driven by issues related to family ownership.

It was found that value in a professional ship management context is made up of two levels: an operational level and financial level. These values provide owners with a competitive advantage and should therefore be incorporated in the ship management contracts as performance measures. For instance, off-hire is a measure of technical quality. Poor technical quality leads to equipment failure and possibly unplanned off-hire. The earning capacity of ships is lost during off-hire. Managing ships without unplanned off-hire is a competitive advantage. Including off-hire in PBC improves the competitive advantage. The performance measure of off-hire is implemented in the incentive system of Case A. The same case includes more performance measures that refer to the technical quality of the ships (e.g. port state controls, vessel condition reports). The preference for operational quality over financial quality is not reflected in the contracts. In fact, the cases allocate more weight to controlling budgets.

5.3 Principal – agent framework

Transfer of risk

Neither case transfers risk from owner to manager, which limits the effectiveness of PBC. There are several causes: (1) in a standard BIMCO contract the ship owner is responsible for the full insurance of the hull and machinery. In case of damages to equipment caused by operational mistakes of the manager, full insurance is still provided. (2) There is no transfer of ownership. Therefore the manager does not become responsible for selecting the right equipment, or improving reliability. (3) The BIMCO contract limits the liability of the ship manager.

In case of risk transfer, causality is the next challenge. Several interviewees have highlighted this as for performance-based contacting in ship management. For example, a ship manager becomes responsible for all maintenance against a fixed sum per year. The performance is then measured against equipment availability. This is considered difficult to implement due to the complex stakeholder structure in ship management. External factors beyond the ship manager's control can severely affect the operation of the ship's equipment, for instance bad fuel quality supplied by the charterer [36]. The ship manager would bear the increased maintenance expenses, while not directly causing the problem.

Cost effectiveness through economies of scale is an important reason for outsourcing. However, a transfer of risk increases the management fees to include insurance. The increase in fees can offset the expenses saved through outsourcing. This is particularly the case where ship manager do not have full control over the risk probability or when the relative impact is high to them. For instance, risk insurance becomes very high when insuring protection against revenue loss by off-hire. Ship managers have no involvement in the chartering of ship thus can not appreciate the revenue, therefore the impact is not even known to the manager.

The ship manager's willingness to take on risks varies per organization. The agent's wealth is an important factor in determining an optimal contract [37]. A ship manager operating five ships is more affected by one penalty than a manager operating hundred ships. Literature suggests that a wealthy and risk-neutral agent can become a 'residual claimant' on the produced output. But increasing poverty of the agent worsens the incentive problem. The more risk averse, the more incentives come at the cost of a higher risk premium [37].

Adverse selection

The cases provide little evidence of adverse selection. Case A short-listed qualified listing ship managers and in Case B a well-known manager was contracted. In both cases the parties developed enduring relationships which is a sign of successful selection. The owners benefited from their previous experience as ship manager and were able to appreciate manager's qualities before signing the contract.

Literature suggests using a ranking system (tournament model) as a tool to select the best agent [38]. Intermanager's Shipping KPIs is such a system that can be used to solve adverse selection. This is particularly useful for ship owners with less experience in ship management.

Moral hazard

Both cases use two measures against the moral hazard problem: frequent communication and outcome-based incentives. Intense communication between parties is evident at all levels: from daily communications to full-scale audits. This creates awareness of each party's activities and objectives. Further transparency is improved by the principle of reimbursement of operational expenses by the ship owner, requiring full transparency. The observability of the agent's effort is improved as is trust.

The contracts use a combination of different outcome-based incentives that reflect agent's performance. This is in-line with literature as: 'Any signal [...] that is informative of the agent's effort should be used to condition the agent's compensation scheme' [39].

In Case B the performance measures are less inter-connected, which increases the chance that unwanted actions are taken to improve the KPIs enabling the highest incentive at the expense of other performance measures.

Periodic reviews of KPIs are used to update performance measures where necessary. The number of KPIs remains the same, but focus changes. Case A evidences that this allows to improve the competitive advantage of operations. In Case B the focus is set on some aspects of ship management for similar reasons.

Periodic reviews in PBC can be prone to the 'ratchet effect'. This term was coined by Berliner [40] after analysing management in Soviet firms. Managers experienced that over-performance led to the 'ratcheting up' of next year's targets. This effect resulted in contra-productiveness aimed to keep target levels low. The cases do not evidence performance-levels ratcheting up. This is explained by the transparency and frequent

communication between the parties which leads to good observability of the agent's efforts.

Case B evidences benchmarking outcomes with the other fleet. This review forms the basis to encourage lowering victualling rates on outsourced vessels using PBC. In Case A the owner benchmarks against their own ship management expertise to evaluate the manager's performance.

In both cases some performance measurements are recorded by the agent itself (e.g. off-service and safety statistics). This bears the risk of manipulation, but this has been not reported as an issue, because of the extensive communication and transparency. Interviewees have highlighted that performance measures need to be accurately defined to avoid misunderstanding. Definitions were improved at periodic reviews. A review of government-initiated PBC schemes suggests to use third party certification for quality assurance and monitoring [41].

Limited liability

Limitation of liability is common in ship management contracts. This complicates the moral hazard problem and reduces the optimal solution, because agents experience less risk. On this subject Laffont and Martimort write: 'With moral hazard and limited liability, there is a trade-off between inducing effort and giving up an ex ante limited liability rent to the agent. The principal chooses to induce a high effort from the agent less often' [39]. In practice this means that the principal can not punish the agent adequately in case of failure and incentives need to be higher in case of success. A solution is to introduce revenue sharing.

5.4 Revenue sharing

Principal–agency theory suggests revenue-sharing as a solution to the moral hazard problem: 'Making the risk-neutral agent residual claimant for the hierarchy's profit is an optimal response to the moral hazard problem' [39].

Revenue-sharing between ship owner and manager is not common and has challenges. A ship owner earns revenue by providing transportation services to a charterer, governed by a charter party between owner and charterer. A ship management contract concerns the operational management of the vessel, between owner and manager. The two contracts are entirely separate. However, the performance of the ship manager

directly influences the charterer through the voyage operations and care for cargo. The charterer benefits from an efficient ship manager. For example, operating a ship at optimal trim saves fuel, which directly improves the charterer's bottom-line. But for the ship manager there is little incentive to improve fuel performance as long as speed and fuel consumption comply with contracted figures [42].

The benefits for the charterer are not passed on to the manager. To achieve the optimum performance a holistic approach is required, which optimizes the benefits for ship owner, manager and charterer. Because of this tripartite relationship, a bipartite contract between ship owner and manager does not maximize the full competitive advantage for the ship owner. This has been evidenced by the two cases that lack any performance measures towards the cargo owners.

In other industries revenue-sharing is achieved by the equipment manufacturers retaining ownership and guaranteeing fixed maintenance costs. Ship managers are not suppliers of equipment, the ships are constructed by shipyards upon specifications agreed with the owner. This adds further complication to the PBC structure. Recently, manufacturers of marine equipment have signed contracts with ship owners based on PBC principles. This development is logical in the overall PBC context, but leaves out the role of the ship managers.

5.5 Performance based contracting

Performance-based contracting contains certain key elements: performance requirements, standards and (dis)incentives [41]. These are not applied in traditional ship management contracts, because these are behaviour-based. A company earns a fixed management fee regardless of performance.

In both cases the contracts contain elements of PBC: performance measures and standards are defined that trigger incentives. Although the performance requirements are defined, they do not cover the entire scope of ship management (e.g. no measures of navigational performance). The cases only focus on certain elements of ship management. The overall ship management performance is not driven by these PBC constructions.

The contracts do not contain penalty clauses, as such there is no transfer of risk from owner to manager. This goes against the aim of PBC to allocate business risk to the

party best able to control the probability and seriousness of that risk.

Due to the limited scope and no transfer of risk, PBC is not used to its full potential. There is room for improvement to better reward the performance of ship manager after taking on more risk. This would improve competitive advantages through better performance by the manager for the benefit of the owner.

5.6 Limitations and recommendations for further research

This study is based on two cases which used standard BIMCO contracts with limited liability for the ship managers. Information has been handed over and discussed based on anonymity.

Research on strategy in shipping is limited. There are few books and papers available discussing generic corporate strategies in shipping. On a more detailed level, for instance discussing competitive advantages in ship management, even less research is available. This has proven to be a challenge when looking ahead at a topic such as PBC.

The levels of risk appreciation and allocation between ship owners and managers are not well documented. Ownership structure and strategy allows some owners to accept higher levels of risk compared to others. A similar difference is expected to exist between ship managers. The level of risk preference is expected to depend on size, structure and strategy. Further research risk preference of ship owner and manager is required.

The Shipping KPI project provides uniform performance measures ship management. It could be the basis for performance-based contracting in ship management as it provides fully defined KPIs. A new contract can be developed and tested with the data from this project. This proves insight in the feasibility of applying these KPIs in a PBC. It is therefore recommended to develop and test performance-based contracts for ship management.

6 Conclusion

The demanding performance requirements in shipping, raise the importance of performance-based contracting. Potentially, it is an important tool for ship owners to gain and maintain a competitive advantage when outsourcing ship management services. PBC enables the ship owner to steer and reward the performance of the ship

manager with much better tools compared to a standard contract. This paper has reviewed the theory and analysed two real cases applied in ship management.

The principal–agency theory is used to analyse performance-based contracting. The major advantage of PBC is the transfer of risk to the agent in return for an incentive. PBC is not frequently applied in ship management, two existing cases are reviewed. Both cases use performance measures to steer focus to certain ship management areas. This improves the owners' competitive advantage, which confirms the hypothesis.

The cases only used bonuses, no penalties. The full potential of PBC is lost in these cases. Risk is not transferred due to the limitation of liability in contracts and no retainment of ownership as in other industries. Also, the tripartite relationship between ship manager, owner and charterer prevents incentives from charterer to manager, because the contracts are not aligned.

To encourage better application of PBC in ship management it is suggested to review the liability limitation and to enable the transfer of risk to the manager against incentives. A holistic approach is suggested to implement PBC and obtain the competitive advantages through ship management. This aligns the interests of ship manager, owner and charterer better.

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