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Outsourcing of Maintenance Activities In oil industry of Iran Benefits, Risks and Success Factors

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ABSTRACT

Outsourcing some maintenance functions or the entire maintenance of specific equipment is one of the options available to maintenance managers in managing their department more effectively. Organizations may expect to achieve many different benefits through successful maintenance outsourcing, although there are significant risks that may be realized if outsourcing is not successful. The purpose of this study is to provide a structured review of the vast amount of outsourcing literature that has accumulated in the past decade using a decision support framework. The contents of more than 60 publications are analyzed using a variety of approaches. A decision support framework is used to first classify whether the studies address outsourcing benefits and risks. Next, each classification is further described by the type of benefits, risks, etc. This research project assessed numerous benefits and risks associated with maintenance outsourcing and also the role that proper relationship management plays in ensuring that a correctly established outsourced maintenance relationship stays on the path to success, and remains a win-win encounter for both parties. One of the most successful outsourcing services in the oil industry NISOC are outsourcing maintenance that have been granted to the South Turbine Engineering Services and Equipment Co. Research has shown that relationship management has a large impact on the success of maintenance outsourcing. Several factors should be considered in establishing an outsourced maintenance relationship with the potential for long-term success. This paper also discusses the results of an investigation into the role of relationship management in the success of maintenance outsourcing by users of production facilities. The results of a survey in the oil industry of Iran (NISOC) reveal a strong correlation between successful outsourced maintenance and proper on-going management of the outsourcing relationship.

1. INTRODUCTION

1.1 National Iranian South Oil Company.(NISOC):

In charge of onshore oilfields in southern Iran. Focuses on onshore upstream activity in the province of Khuzestan. As Khuzestan is the main oil and gas-producing province, this entity is among the most significant in the NIOC family.

History and structural condition of the NISOC as the birthplace of the oil industry in Iran, after the first oil well drilled in Masjed Soleiman in the Middle East since 1908, has been focus of development of new technologies to extract oil and gas production .

The company has more than 50 small and large hydrocarbon fields in the range of 400 thousand square kilometers of area in addition to the northern province of bushehr to Khuzestan province, the country produces more than 80 percent of crude oil.

1.2 South Turbine Engineering Services and Equipment Co:

Since the company began operations in major oil-producing south side forces oil has been active with various topics.

1.3 Outsourcing is a common practice among both private and public organizations and is a major element in business strategy. Perhaps most organizations now outsource some of the functions they used to perform themselves. (Kremic et al. 2006).

We have focused on the industrial maintenance Outsourcing perspective.Maintenance is a critically important function of any business that is dependent on physical assets for producing products or providing services.

A vast amount of research has been done on the benefits and risks of outsourcing (e.g. Lacity et al. 2008; Yang et al. 2007; Kremic et al. 2006; Garg and Deshmukh 2006; Bailey et al.2002; Gilley and Rasheed 2000).Organizations may expect to achieve many different benefits through successful outsourcing, although there are significant risks that may be realized if outsourcing is not successful.

First we review the outsourcing literature with the objective of identifying those references that may provide guidance for managers and researchers. The review of the literature is organized based on the outsourcing decision framework given in Figure 1

In certain cases there is a good business case for outsourcing some of the maintenance to an external party. This research project assessed numerous benefits and risks associated with maintenance outsourcing and also the role that proper relationship management plays in ensuring that a correctly established outsourced maintenance relationship stays on the path to success, and remains a win-win encounter for both parties. The following aspects of outsourced maintenance were investigated:

-What are the benefits of maintenance outsourcing?
-What are the risks involved?
-What management systems and elements need to be in place for maintaining a win-win outsourced maintenance relationship?
-What role does proper management of the outsourced maintenance relationship play in the success of the outsourced maintenance experience?
-What challenges in the Iran oil industry may threaten the success of outsourcing maintenance?

A literature study was performed to provide answers to the first three questions. A field survey was then conducted to verify these answers and to answer the last two questions.

From the information obtained in the literature, definitions were developed for good outsourced maintenance.

2. RESEARCH APPROACH

Organizations may expect to achieve many different benefits through successful maintenance outsourcing, although there are significant risks that may be realized if outsourcing is not successful. There is an abundance of maintenance outsourcing literature where many benefits, risks, decision factors, and key success factors have been presented.

A number of things can be done to ensure a successful long-term relationship. In order to identify these requirements, a literature study was conducted to review the knowledge areas of plant maintenance, business relationship management, and outsourcing. The aim of the literature study was to identify the following:

What are the maintenance outsourcing benefits and risks that are identified in literature? This question is addressed in the second section and may help managers determine if outsourcing is an appropriate option in their situation:

-What is good/successful outsourced maintenance?
-What are the essential elements for managing a sustainable win-win relationship in outsourcing physical asset maintenance?

The answer to the second question was used to develop a theoretical framework for successfully managing an

outsourced maintenance relationship. The answers to these questions also formed the basis for a questionnaire that was used to conduct a survey through interviews with maintenance managers and maintenance service providers. The aim of the survey was to test the validity of the first two answers and to obtain answers for the following two questions:
-What role does proper relationship management play in the success of maintenance outsourcing?
-What challenges unique to Iran and relevant to such a relationship are experienced?

The survey focused on successful maintenance outsourcing experiences as case studies. The results of the survey were used to validate the theoretical work, and to provide evidence that mismanagement of the outsourcing relationship is a major cause of failed maintenance outsourcing.

First we review the outsourcing literature with the objective of identifying those references that may provide guidance for managers and researchers. The review of the literature is organized based on the outsourcing decision framework given in Figure 1. The figure depicts the typical elements of the outsourcing decision and shows where, benefits, risks, and key success factors are typically encountered in such decisions.

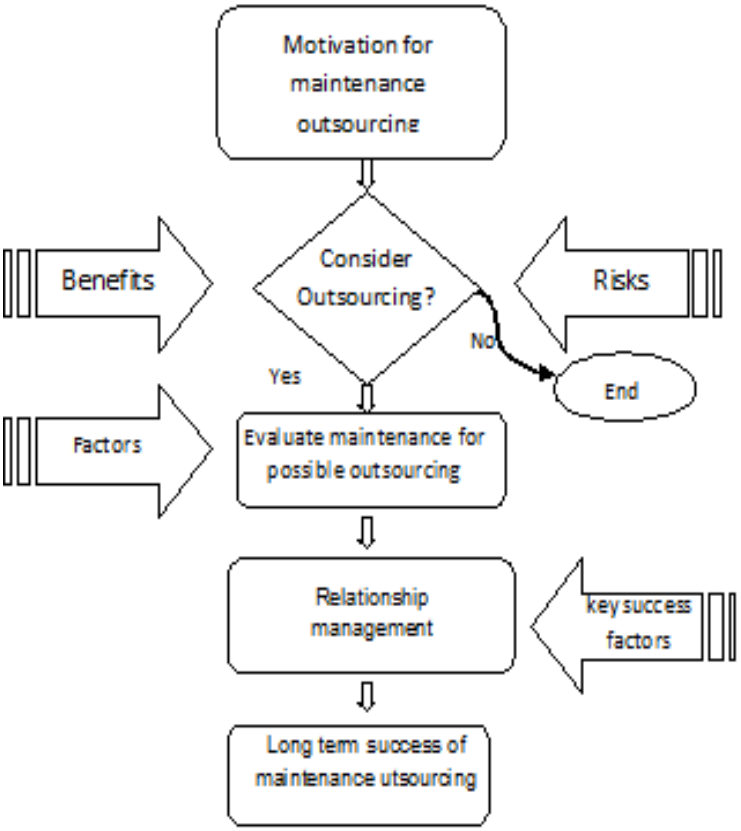

Figure 1: Outsourcing decision framework

3. LITERATURE

Process equipment maintenance is one of the major functions of any large asset intensive of oil industry. Over the last 30 to 40 years, maintenance has developed from being reactive to proactive, and from being seen as a necessary evil into a strategic focus. In today's business environment, maintenance is becoming a profit center. (Campbell,1995) feels strongly that maintenance should be part of the life cycle management of a physical asset, and must be planned for in the early design phase of the asset.

Industrial maintenance has undergone a remarkable structural change, which includes two different aspects: firstly, the attitudes of company decision-makers towards maintenance have changed, and secondly the maintenance activities of industrial companies get outsourced more and more often to outside service providers. Maintenance is no longer seen as a mere cost pool by industrial companies, it is understood instead that critical

competitive edge can be reached through comprehensive asset management (Al-Turki 2011; Simões et al. 2011; Al-Najjar 2007; Alsyouf 2007; Madu 2000; Löfsten 1999).

(Levery ,2004) feels that business management is only concerned most often with the immediate cost of maintenance. This is especially true when the plant is performing reliably and competitive pressures are felt. A focus on reducing the maintenance budget is however misplaced: it is short-term, and will most often lead to an increase in total cost in the longer term. (Levery ,2004) also indicates that the total cost of bad/inadequate maintenance is mostly hidden, and consists of:
-Excessive spares inventories
-Accelerated depreciation of capital investments
-Excessive capital investment through redundancy
-Wasted production operator time
-Inability to produce at maximum rate
-Scrap and rework
-Poor quality and reliability of product
-Failure to meet delivery targets
-Lost reputation and current/future sales

Many maintenance approaches or strategies have been developed, such as Reliability Centered Maintenance (RCM), Total Quality Maintenance (TQMain), Total Productive Maintenance (TPM), and Business Centered Maintenance (BCM). Sherwin (8) discusses these approaches. They have been applied with varying success by many businesses. The most recent approach is to see all of these strategies as tools in the maintenance toolbox; the challenge is to integrate their use and apply them in the correct place, order, and manner.

The fact that both operations and maintenance play a significant role in the maintenance of physical assets is well recognized . (Levery ,2004) also finds that the relationship between production and maintenance is often quite delicate.

In addition, both the number of employees focusing on equipment maintenance and the amount of money invested in maintenance activities have grown (Garg and Deshmukh 2006). Particularly the nature of process industries with continuous production systems highlights the importance of successful proactive maintenance: these kinds of industries are vulnerable to the potential major losses induced by lost production, which can be caused by not allocating enough resources into asset maintenance, or by maintenance actions of poor quality Marttonen and Kärri(2012).While industrial maintenance has received more attention from company decision-makers, it is at the same time one of the services outsourced more and more often to service providers (Tarakci *et al*. 2009; Quélin and Duhamel 2003). Close competition has increased the practice of industrial companies to focus on their core competences, which rarely include maintenance. Together with many other supportive activities, maintenance gets often outsourced to service companies (Redondo-Cano and Canet-Giner 2010). Despite the practical significance of maintenance outsourcing, this research area still remains somewhat unexplored in the academic literature.

Rushing with outsourcing can lead to backsourcing, which means reversing the outsourcing decision. Backsourcing is often very challenging and costly (Quélin and Duhamel 2003). Unfortunately, the company decision-makers often assume outsourcing to have created additional value, instead of actually measuring the outcome. Previous research has mostly studied outsourcing on a highly aggregate level, whereas studies focusing especially on maintenance outsourcing hardly exist.

In addition, most previous studies have addressed outsourcing as a one-time operation and not as a process calling for continuous follow-up (Dekkers 2011). Thus the previous tools for outsourcing performance measurement have often lacked a long-term perspective.

A vast amount of research has been done on the benefits and risks of outsourcing (e.g. Lacity *et al*. 2008; Yang *et al*. 2007; Kremic *et al*. 2006; Garg and Deshmukh 2006; Bailey *et al*. 2002; Marttonen and Kärri(2012)). There is also some previous discussion on the cost categories of industrial maintenance (e.g. Marttonen *et al*. 2011).

4. THE ORETICAL FRAMEWORKS

This study on outsourcing maintenance required a theoretical framework that was developed from the available literature and practical experience. Inputs in the development of the framework were expected benefits, risks and elements of good outsourced maintenance, and the client/service provider relationship.

4.1 Expected benefits of outsourcing

All firms are seeking benefits from the smallest through the greatest activities they commit. Whatever such benefits are to the outsourcer, benefits like economic savings, flexibility, and concentration on core-competencies are among the main benefits that come to our minds first.

Previous literature has partly considered the benefits of outsourcing from the maintenance point of view, for example Quélin and Duhamel (2003) state that the main reasons for maintenance outsourcing are cost savings, focusing on value-adding activities, and access to external know-how. However, most outsourcing research has been done on a more general level. We have collected the most relevant outsourcing benefits that are also applicable to maintenance outsourcing, using the previous literature.

Focus on core activities. The most strategic factor influencing the outsourcing decision is to allow the organization to focus on its core activities (Sislian and Satir, 2000).By focusing on core activities, an organization can support its position for a competitive advantage. The decision on exactly what function is core should have bearing on whether or not to outsource them. This view assumes that there is no strategic competitive advantage to retaining control of the property functions. (Assaf,2011)

Improve flexibility to the changing market dynamics. Flexibility, which is a strategic factor, includes operational flexibility, resource flexibility, and demand flexibility (Kremic et al., 2006). The potential for improved flexibility is measured by the organization's ability to change the service range in response to market conditions (Jennings, 2002). In today's rapidly changing world, an organization has to respond quickly to changing customer demands. Outsourcing helps the organizations to be flexible by providing reliable workers to reduce the time needed to complete works (Djavanshir, 2005).

Increase the speed of implementation. Some services such as corrective maintenance need rapid responses to repair failures. Therefore, the speed of implementation is the important factor. Outsourcing enables an organization to put pressure on a contractor to respond to changes because the contractor should have the resources to perform a service in the agreed time (Greaver, 1999).

Function difficult to manage. If a service is complex or integrated, or if there is no qualified management staff, the organization may get appropriate equipment from service provider (Kremic et al., 2006; McDonagh and Hayward, 2000).

Safety management. To avoid loss of life, personal injury, property damage, and to ensure safe and healthful conditions for persons, the use of skilled external management should reduce the exposure to legal liability for accidents that may be occurred in the work situations. It must however be noted that an organization is not able to contract out of its duty of care to occupiers and users of the facility and must maintain adequate risk management procedures to ensure that contracted services are performed. (Assaf,2011)

Achieve flexibility with changing technology. The growth and change in all aspects of technology necessitates

flexibility through constantly monitoring and developing the growth rate to remain competitive. (Assaf,2011)

Need for specialized expertise. Specialist contractors can afford to advance in new technologies and innovative practices, because they perform only one service and have all the means to perform it. They can focus on identifying areas susceptible to improvement and on the knowledge needed to act successfully (Alexander, 1996). They are however susceptible to a short-term focus commensurate with the term of the contract for services.

Acquire new skills or technical knowledge. Outsourcing may help an organization to gain new skill and knowledge so that it can afford to develop its expertise to maintain high-level technology. Therefore, when some services are outsourced, an organization should gain new skills or new technical knowledge from the outside supplier (McDonagh and Hayward, 2000).

Save the overall cost. The key driver for many outsourcing decisions is the reduction in the cost of labor, materials, and parts (Lindskog, 2005). The function is outsourced when the in-house costs are higher than the anticipated costs for outsourcing the function. Therefore, the higher the internal cost to perform the function relative to the anticipated cost of outsourcing, the greater the probability of outsourcing (Kremic et al., 2006).

Reduce the labor and operating cost. Costs can be reduced, either by saving on labor costs or by using new technology for efficiency. Djavanshir (2005) stated that the best benefits of outsourcing are in reducing the labor and operating cost, and gaining a competitive advantage. The decrease in labor and operating costs is based on a contractor's experience to perform or provide a certain service more efficiently and effectively. (Assaf,2011)

Make fixed costs into variable costs. Outsourcing helps an organization to move fixed costs (such as payroll or labor productivity and materials) so that they become variable costs (Anderson, 1997). Costs for operating resources and investments of fixed infrastructure can be reduced step-by-step after the services have been outsourced. Then the payment to the contractor would convert the fixed costs into variable costs (Blumberg, 1998).

Improve cash flow. An organization's cash flow is improving when it has fewer employees, and then it requires less infrastructure and support systems, which may result in greater efficiency by reducing variable cost and managed cost (Fontes, 2000). Some organizations outsource to achieve better cost control that improves the cash flow (Anderson, 1997). Outsourcing has the probability to be long-term if contractors can offer quality services more cost-effectively than in-house (Yik and Lai, 2005).

Cash infusion. Outsourcing is desired when the costs offered by contractors are low enough than the added overhead and profit (Fontes, 2000). All tools, equipment, vehicles, and facilities used in the current operation have value if they improve cash infusion by being transferred to the contractors (Corbett, 1998).

Make capital funds more available for core activities. Reducing the need to invest capital funds in non-core functions, and making them available for core areas, makes organizations sometimes consider outsourcing to increase flexibility in finance and to make capital funds more available for core activities (Djavanshir, 2005;).

Increase economic efficiency. The motivation of outsourcing is sometimes economic, such as scale efficiency (Arino et al., 2001). Organizations that specialize in particular services make a relatively large business volume, which allows them to take advantage of scale economies and thus to operate and maintain the services more cost-effectively (Quelin and Duhamel, 2003).

Quality factors

Service quality includes quality planning, quality control, quality assurances, and quality improvement. If the organization's service quality is held in high regard, outsourcing the service should be seen as a potential improvement (Anderson, 1997). The quality factors influencing the decision to outsource services, as illustrated

in Figure 5, are: reach higher service level, improve service quality, meet special requirements, and achieve competitive advantage. (Assaf,2011)

Improve service quality. Service quality appears to be an important factor regarding the scope of service. The quality of maintenance work is required to bring facilities and equipment to a condition that meets acceptable facilities maintenance standards. When some services are outsourced, the quality of services should be measured against the standards (Campbell, 1995; Hendrickson, 1998).

Improve quality requirements. The way to gain competition advantage is to outsource non-core activities for improving service requirements so that the outsourcing will help to compete with others. Maintenance requirements continuously change due to wear and tear, technological developments, and changing operational requirements. The quality requirements involve statutory and regulatory compliance with minimum standards of material and implementation (Campbell, 1995; Hendrickson, 1998).

Achieve high quality of service for competitive advantage. When an organization is currently recognized for a high quality, there may be concern by decision makers that outsourcing might affect the quality of services (Kremic et al., 2006). Organizations need to react rapidly to user requirements, and so outsourcing is seen as a means to accomplish high competitive advantage. The availability of contractors encourages organizations to outsource their non-core activities. As a result, the quality of services is improved at a lower cost (Quinn, 2000; Campbell, 1995).

Procure higher reliability and competency. The quality and reliability of processes and services may be improved by engaging a contractor based on past performance (Al-Najjar, 1996). Strategy for service quality needs to reflect the organization's position to develop competitive advantage and higher reliability through the services that it offers. The high quality of services establishes reliability and can generate satisfaction for users (Kremic et al., 2006).

Rather than discussing potential benefits individually in detail, they are summarized in Table I along with a list of references From 2000 to now.

Table 1: Expected outsourcing benefits

Expected benefits	Referent researches
Cost savings	Adler (2000), Fan (2000), (2002), Kakabadse and Kakabadse (2000a), Krizner (2000), Laarhoven et al. (2000), Bailey et al. (2002) ,(Lindskog, 2005) Djavanshir (2005), (Kremic et al., 2006), Yang et al. (2007), Assaf et al. (2011), Tajdini and Nazari (2012), Marttonen and Kärri(2012)
Reduced capital Expenditures	Kakabadse and Kakabadse (2000a), Assaf et al. (2011), Tajdini and Nazari (2012)
Capital infusion	(Fontes, 2000). (Djavanshir, 2005, Assaf et al. (2011),Tajdini and Nazari (2012)
Transfer fixed costs to variable	(Fontes, 2000 ,Kakabadse and Kakabadse (2000a), (Yik and Lai, 2005), Assaf et al. (2011),Tajdini and Nazari (2012), Marttonen and Kärri(2012)

Increase economic efficiency	Arino et al.(2001),Quelin and Duhamel, (2003), Assaf et al. (2011), Tajdini and Nazari (2012)
Quality improvement	Jennings (2002), Kakabadse and Kakabadse (2000a), Quinn, 2000, Bailey et al. (2002) Roberts, V. (2001), (Kremic et al., 2006), Lacity et al. (2008), Assaf et al. (2011), Tajdini and Nazari (2012), Marttonen and Kärri(2012)
Increased speed	Kakabadse and Kakabadse(2000a), Lacity et al. (2008), Tajdini and Nazari (2012), Marttonen and Kärri(2012)
Greater flexibility	Jennings(2002), Kakabadse and Kakabadse (2000a, b), (Jennings, 2002) , Roberts, V. (2001), Djavanshir, 2005), Garg and Deshmukh (2006) ,(Kremic et al., 2006)., Yang et al. (2007), Lacity et al. (2008), Assaf et al. (2011), Tajdini and Nazari (2012), Marttonen and Kärri(2012)
Access to latest technology/infrastructure	Kakabadse and Kakabadse (2000a) Roberts, V. (2001), Wright (2001), Assaf et al. (2011), Tajdini and Nazari (2012)
Access to skills and Talent	McDonagh and Hayward, 2000 ,Wright (2001), Kremic et al., 2006, Tajdini and Nazari (2012), Marttonen and Kärri(2012)
Increase focus on core Functions	Adler (2000), Jennings (2002), Kakabadse and Kakabadse (2000a, b), McIvor and McHugh (2000), Roberts, V. (2001), Wright (2001), Garg and Deshmukh (2006), Assaf et al. (2011),Yang et al. (2007), Tajdini and Nazari (2012), Marttonen and Kärri(2012)
Get rid of problem Functions	McIvor (2000a), (Kremic et al., 2006; McDonagh and Hayward, 2000). Tajdini and Nazari (2012)
Increased safety	Assaf et al. (2011), Marttonen and Kärri(2012)

4.2 Potential risks of outsourcing

Outsourcing, despite the benefits it offers, can be a risky decision. Because outsourcing is a rather recent tool of managers. The complete costs are not yet known, high possession risk in itself.

The lack of methodology is believed to cause some outsourcing failures (Bounfour, 1999; Lonsdale, 1999). This thinking is supported by Lonsdale who suggests that outsourcing failures are not due to an inherent problem with outsourcing but rather the lack of guiding methodology for managers (Lonsdale, 1999).

Baitheiemy (2003) state that, while outsourcing is a powerful tool to cut costs, improve performance, and refocus on the core business, outsourcing initiatives often fall short of management's expectations. Through a survey of nearly a hundred outsourcing efforts in Europe and the United States, Baitheiemy (2003) found that one or more of seven "deadly sins" underlie most failed outsourcing efforts: (1) outsourcing activities that should not be outsourced; (2) selecting the wrong vendor: (3) writing a poor contract; (4) overlooking personnel issues; (5) losing control over (he outsourced activity; (6) overlooking the hidden costs of outsourcing: and (7) failing to plan an exit strategy (i.e., vendor switch or reintegration of an outsourced activity. Outsourcing failures are rarely reported because firms are reluctant to publicize them.

While it is recognized that all the potential risks of outsourcing are not currently known, The most relevant outsourcing risks that are also applicable to maintenance outsourcing have been collected from the literature, and are presented in Table 2 From 2000 to now.

The outsourcing literature referenced in the table warns of the following potential risks: unrealized savings with

a potential for increased costs, employee moral problems, over dependence on a supplier, lost corporate knowledge and future opportunities, and dissatisfied customers. It is also noted that outsourcing may fail because of inadequate requirements definition, a poor contract, lack of guidance in planning or managing an outsourcing initiative, or because of poor supplier relations. For different applications of outsourcing risk assessment, the risks of Table 2 can be specified as risks that will diminish after the outsourcing process and as long-term risks that are related to a relationship between the customer and the service provider. The inability of the service provider and the decreased work morale can be seen to diminish after the outsourcing has been implemented, while the other risks of Table 2 can be seen as long-term risks. In addition, the risks especially related to backsourcing or the ending of the service relationship, include lost know-how, dependence on the service provider, and risks related to contracts or partner selection. Marttonen and Kärri(2012).

Table 2: Potential risks of outsourcing

Potential risk	References
Unrealized savings or hidden costs	Kakabadse and Kakabadse (2000a, b), Bailey *et al*. (2002), Baitheiemy (2003), Robaina (2006), Kremic *et al*. (2006), Yang *et al.* (2007), Tajdini and Nazari (2012), Marttonen and Kärri(2012)
Decreased flexibility	Roberts, V. (2001), Bailey *et al*. (2002), Robaina (2006), \ Yang *et al.* (2007), Tajdini and Nazari (2012), Marttonen and Kärri(2012)
Poor contract or poor selection of partner	Klopack (2000), Krizner (2000), Bailey *et al*. (2002), Baitheiemy (2003), Robaina (2006) Kremic *et al*. (2006), Yang *et al.* (2007), Tajdini and Nazari (2012), Marttonen and Kärri(2012)
Lost know-how or Loss of knowledge/skills	Kakabadse and Kakabadse (2000a, b), McIvor (2000a), Roberts, V. (2001),Tajdini and Nazari (2012)
Loss of control/core competence	(Klopack (2000),Roberts, V.(2001), Bailey *et al*. (2002), Baitheiemy(2003), Robaina (2006), Kremic *et al*. (2006), Yang *et al.* (2007), Tajdini and Nazari (2012)
Supplier problems (poor performance or bad relations, opportunistic behavior, not giving access to best talent or technology)	Kakabadse and Kakabadse (2000a), Avery (2000), Fuller et al. (2000) , Roberts, V. (2001), Baitheiemy (2003), Kremic et al. (2006), Yang et al. (2007),Tajdini and Nazari (2012),Marttonen and Kärri(2012)
Losing customers,opportunities, or reputation	Kakabadse and Kakabadse (2000a), Roberts, V.(2001), Marttonen and Kärri(2012)
Dependence on the service provider	Bailey *et al*. (2002), Robaina (2006), Kremic *et al*. (2006), Yang *et al.* (2007), Marttonen and Kärri(2012)
Threatened data security	Bailey *et al*. (2002), Tajdini and Nazari (2012), Marttonen and Kärri(2012)
Poor morale/employee issues	Kakabadse and Kakabadse(2000a), Story (2000) ,Baitheiemy (2003), Kremic *et al*. (2006), Yang *et al.* (2007) , Tajdini and Nazari (2012),

The main consequences of the risks of maintenance outsourcing are presented by Marttonen and Kärri (2012) in Table 3.

Table 3: The main consequences of the risks of maintenance outsourcing

RISKSOF MAINTENANCE OUTSOURCING		CONSEQUENCES OF THE RISKS
Inability of the service provider	→	Increased maintenance costs
Decreased work morale	→	Negligence in operating assets, protests induced by employee firings, worsened company image in the labor market
Lost know-how	→	Increased maintenance costs if the service relationship comes to an end
Dependence on the service provider	→	Worsened terms of contract, Increased maintenance costs if the service relationship comes to an end
Additional or hidden costs, unrealized benefits	→	During the service relationship worsened terms of contract or decreased quality of maintenance work
Threatened data security	→	Information leak-outs to the competitors
Decreased flexibility	→	Commitment to the maintenance contracts despite production and economic conditions
Lost company image and customers	→	Worsened company image through outsourcing announcement and employee firings, negative publicity through service provider actions
Risks related to contracts or partner selection	→	Inadequate terms of contract, service provider opportunism or bankruptcy

4.3 Good outsourced maintenance

Bendor-Samuel (2004) states that the primary benefit of outsourcing is the creation of value. With this in mind, as well as the realization that value is more than just money, ten additional attributes describing good outsourced maintenance were identified:

-Better availability of equipment
-Better reliability of equipment
-Lower cost of maintenance
-Better safety record
-Improved environmental performance
-Sustainability of good performance
-More value created
-Sustainability of service
-Growth of maintenance capacity
-Better continuous improvement

4.4 Framework for a win-win maintenance outsourcing relationship

Byham (2004) regards outsourcing as the process through which a business allocates some activity that it would be capable of doing in-house to an external provider. It is a long-term relationship between supplier and

beneficiary, with a high degree of risk-sharing, and should not be confused with contracting out, which refers to work assigned to an outside supplier on a job-by-job basis (also see Embleton (10)).

4.5 Elements for successful management of outsourcing relationship

Niekerk and Visser (2010) State that Twenty-two elements for successful management of a win-win maintenance outsourcing relationship are essential. A study of these elements revealed five management systems that must be in place and properly executed on an ongoing basis. The five essential management systems are:

-A system to sustain support
-A system to maintain team unity
-A system to manage performance
-A system to manage relationship wellbeing
-A system to ensure cohesion

These five systems are shown schematically in Figure 1.

The **Support Retention System** is essential to ensure that all the other aspects of the relationship continue to receive the appropriate amount of support and attention, and that there will be a force that drives the continued success of the relationship.

The **Team Unity System** is critical to prevent misalignment, and to ensure that the soft issues that are so important in good relationships are taken care of.

The **Relationship Health Management System** is required to identify and eliminate proactively any unintentional disagreements before the relationship suffers any damage that could have been prevented.

The **Performance Management System** is crucial, since it regulates the perceived fairness of the engagement. It is also the win-win indicator. It must be as objective as possible, and be well-aligned with the objectives of both parties.

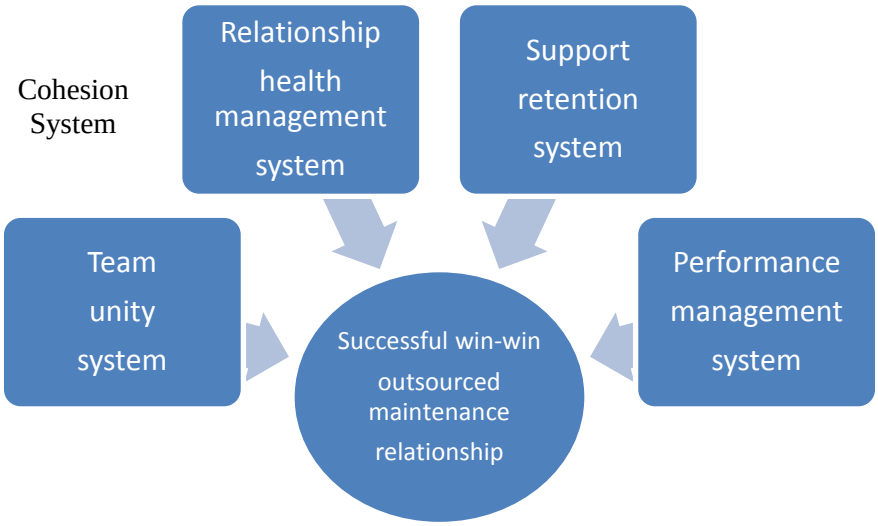

Figure 2: Outsourced maintenance relationship management framework

The **Cohesion System** encircles the other systems, and is required to ensure that all the other systems remain operational throughout the life of the relationship. It is the glue that keeps the other systems together. It consists of mechanisms to manage change, to ensure regular communication on all levels, and to ensure continued commitment.

The five essential management systems and twenty-two basic elements of outsourced maintenance are shown in Table 4 below.

Table 4: Essential systems and elements of an outsourced maintenance relationship

Management System	**Basic elements**
Support retention system	Support from top management Clear, agreed roles and responsibilities Suitable organization with skilled people and the required resources Maintenance strategy aligned with client's business objectives Maintenance policies and plans that meet client's operational needs Accountability on both sides
Team unity System	Shared vision Common goals Shared expectations Joint planning and review Shared responsibility for success Shared risk and reward
Performance management system	Objective performance measurement Incentives/remuneration that drive improvement Effective continuous improvement program
Relationship health management system	Relationship wellbeing assessment Profitability for both partners Mechanism to identify and reconcile differences Clear contingency plan and exit strategy
Cohesion System	Change tracking and update mechanism Regular communication Collaboration agreement/commitment

For the framework to be effective in delivering a sustained win-win relationship, the basic elements given in Table 1 must be in place, sufficiently established, and well and regularly maintained.

5. SURVEY DESIGN

A survey was done to test the opinion of a number of individuals within organizations in the oil industry. The following criteria were used in selecting candidates for interviews:

-Client is a Iran operation and user of heavy equipment
-Business success of client reliant on equipment performance
-Maintenance outsourced directly impacts the availability of critical equipment
-Outsourcing relationship is older than one year, or failed
-Holds management position and is responsible for the outsourced maintenance
-Outsourcing supplier has/had suitable organization with skilled staff
-The outsourcing decision must have been strategically correct

These requirements resulted in a limited choice of National Iranian South Oil Company and Associated companies. In order to ensure that enough good data was gathered, the field survey was conducted through personal interviews with maintenance managers and outsourcing provider relationship managers.

6. DISCUSSION OF RESULTS

Fifteen personal interviews were conducted over a period of about two months. During these interviews, data was gathered and analyzed on five successful outsourced maintenance cases and Expected benefits and Potential risks outsourcing of other cases . Only the most important results are presented in this paper. The results of our research on NISOC outsourced maintenance include overhaul of turbine ,overhaul Air compressors , has been done by the south turbines company and other rotating equipment that consider for outsourcing.

6.1 Good outsourced maintenance

The survey indicated clear support for the following attributes that affect outsourcing of maintenance:

-Sustainability of good performance
-More value created for both parties
-Sustainability of the service
-Continuous improvement

The other attributes were considered less essential, with the explanation that outsourced maintenance would often be considered to be good only if it maintains the availability, reliability, cost, safety, and environmental performance of the previously successful in-house effort.

The following additional attributes were identified, and should be added to the list of originally identified elements to improve the definition of good outsourced maintenance:
-Win-win long-term partnership
-Supportive business case
-Good contract

The definition of good outsourced maintenance could thus be formulated as:
Good outsourced maintenance is good maintenance when performed by an external party where:
-The relationship is a win-win partnership that creates more value for both partners
-The service is sustainable over the long term, and renders sustained good performance, and
-It leads to a growth in the maintenance capacity of the client, and enables continuous improvement.

6.2 Expected benefits and potential risks of outsourcing and also importance of elements for managing the outsourcing relationship successfully

Respondents were asked to indicate the benefits , potential risks and importance of the 22 basic elements (Table 4) on a scale of Low (not essential), Medium (essential), or High (critically essential). The results are summarized in the bar charts in Figure3 , Figure4 and Figure5 below.

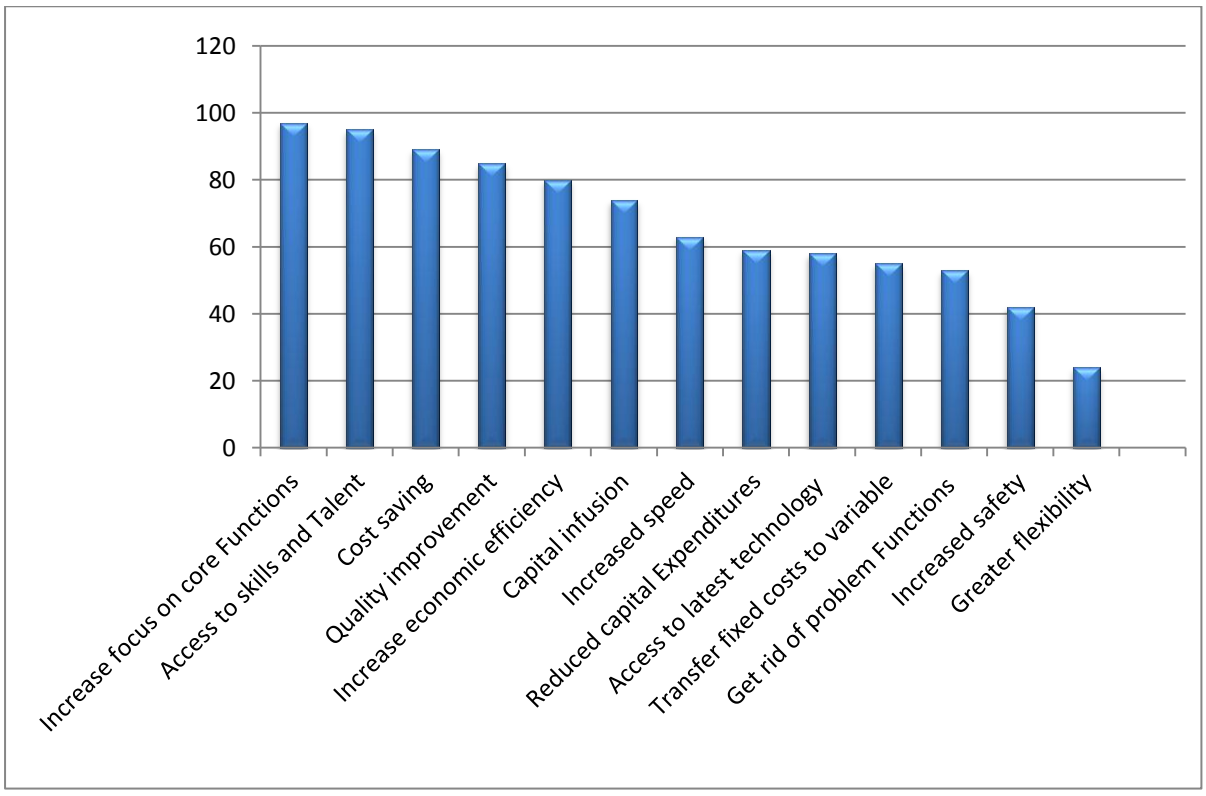

Figure 3: Expected benefits maintenance outsourcing

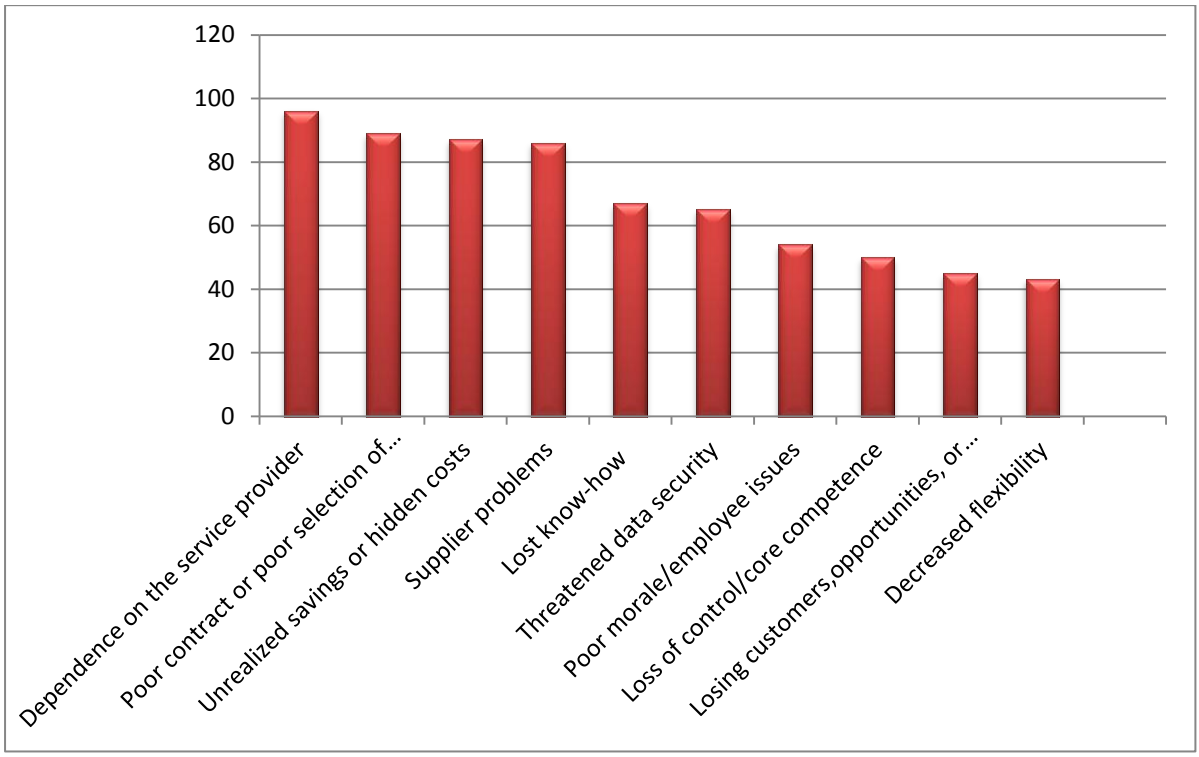

Figure 4: Potential risks of maintenance outsourcing

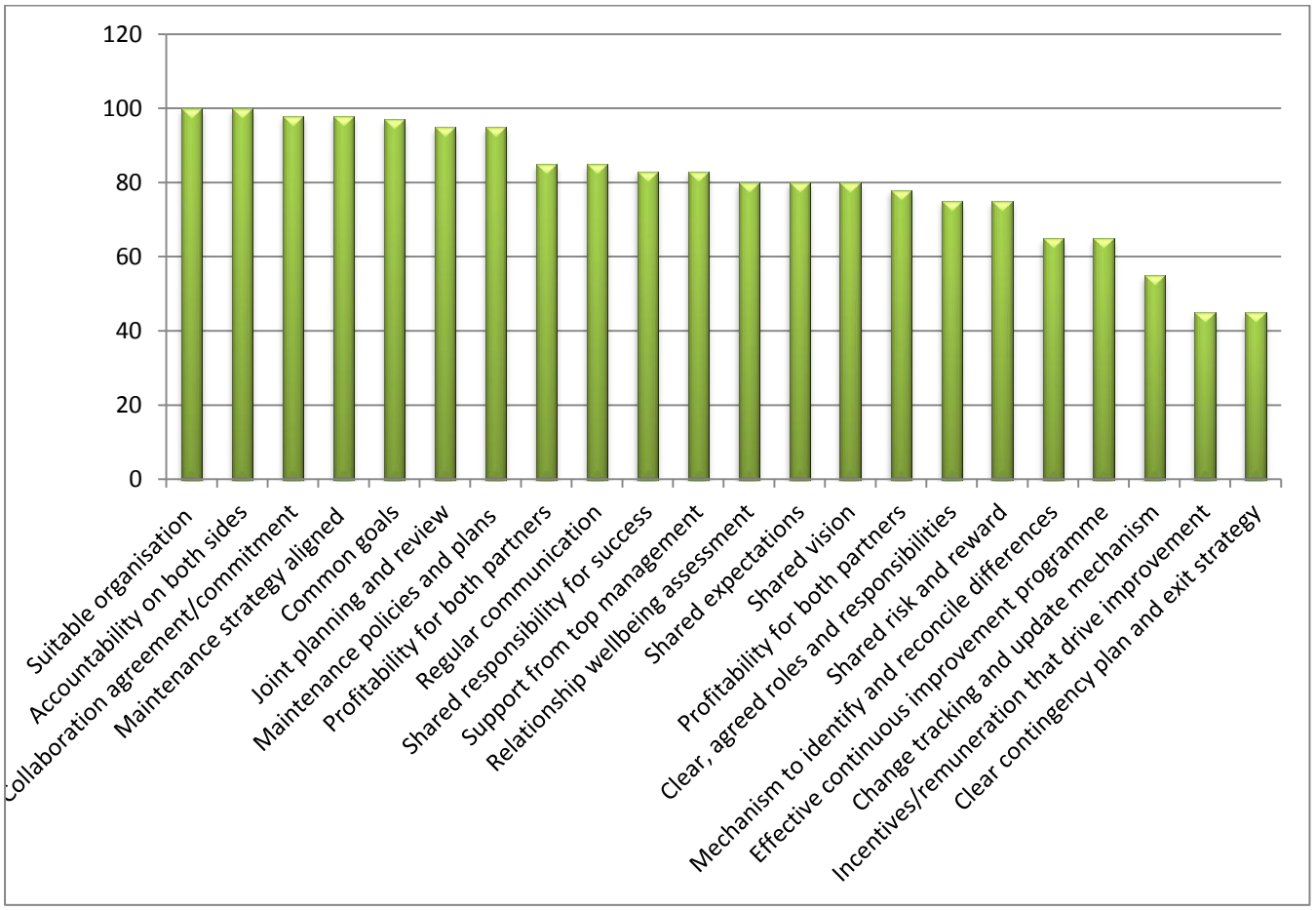

Figure 5: Importance of the basic elements of successful outsourced maintenance

Review of Benefits:
Benefits like Increase focus on core Functions , Access to skills and Talent and Cost saving are among the main benefits .

Review of Risks:
Risks such as Dependence on the service provider, Poor contract or poor selection of partner, Unrealized savings or hidden costs and Supplier problems were identified as the main risks.

Review of elements of successful outsourced maintenance:
It is clear from the 100% rating by all respondents that the critically essential elements of a win-win relationship are:
-Suitable organization with skilled people and the required resources
-Accountability on both sides
-Collaboration agreement and commitment
-Maintenance strategy aligned with client business objectives
-Common goals

As seen in Figure 5 above, none of the respondents rated the importance of any element as Low.

The data for the 22 basic elements shown in Figure 5 was also combined for the five management systems. The relative importance of these five systems is shown in Figure 6.

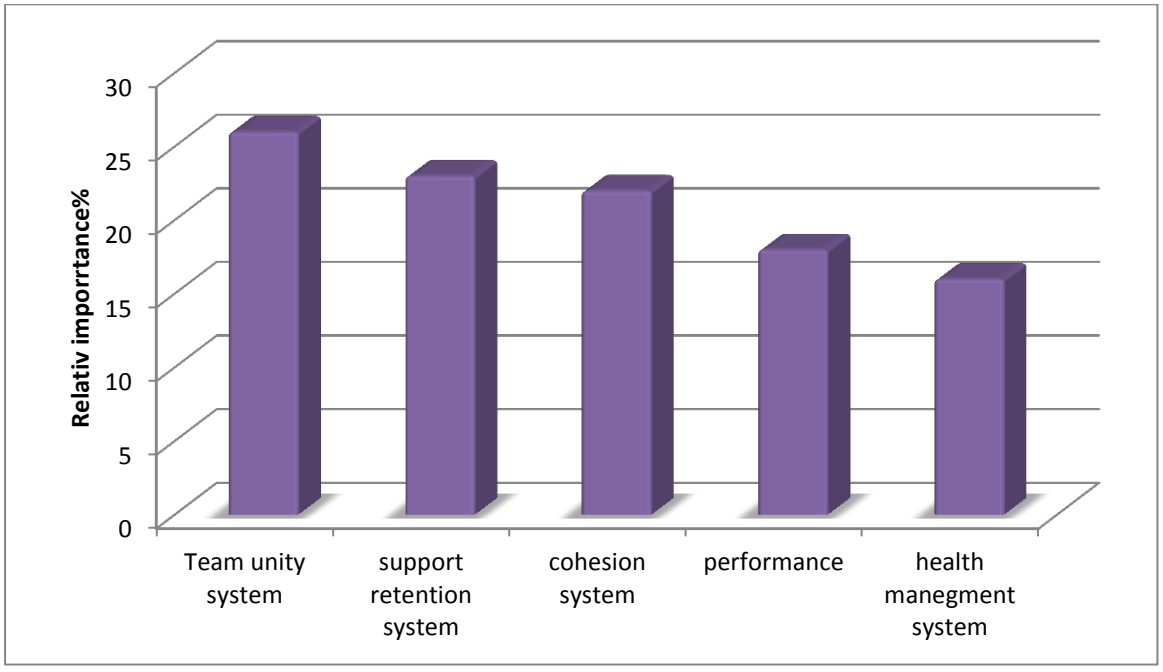

Figure 6: Importance of the management systems for successful outsourced maintenance management

It is clear from Figure 6 that the respondents saw the Team unity, Support retention, and Cohesion systems as the most important management systems.

7. CONCLUSIONS

Organizations are doing more maintenance outsourcing than ever before and managers are in desperate need of information in an organized form that will help them identify opportunities, challenges, and decision factors related to maintenance outsourcing. There is an abundance of information related to maintenance outsourcing in

the literature that is waiting to be put into a more structured form for better decision support. With this study we attempt to accomplish this task.

Organizations may expect to achieve many different benefits through successful maintenance outsourcing, although there are significant risks that may be realized if outsourcing is not successful.

This research identified the benefits , risks and also most important attributes of good outsourced maintenance, and the essential elements for managing outsourced maintenance in the oil industry.

Benefits like Increase focus on core Functions , Access to skills and Talent and Cost saving are among the main benefits. Risks such as Dependence on the service provider, Poor contract or poor selection of partner, Unrealized savings or hidden costs and Supplier problems were identified as the main risks.

The definitions and attributes of good outsourced maintenance given in this paper should enable maintenance managers of asset-intensive plants in the oil industry to determine the quality of their outsourced maintenance, and to set goals for improvement where required.

One of the most successful outsourcing services in the oil industry NISOC are outsourcing maintenance that have been granted to the South Turbine engineering services and equipment Co.

The results of our research on NISOC outsourced maintenance include overhaul of turbine ,overhaul Air compressors ,and other rotating equipment has been done by the South Turbine Engineering Services and Equipment Co.

They expect steady, dependable relationships with sustained good performance and steady long-term improvement. The focus is not on immediate improvements in results such as cost and reliability, although these results are also important.

The survey's strong support for the 22 identified essential elements for managing outsourced maintenance confirmed the validity of the proposed relationship management framework, and therefore also the use of these elements to test the level of relationship management present success outsourcing experience.

Although the cohesion system seems to be the most critical for keeping the relationship alive, the support and unity systems are the foundation systems determining the health of the relationship.

This confirms that proper ongoing management of the relationship is required for long term success – in other words, that insufficient and/or improper management of the outsourced maintenance relationship is a main contributor to failed outsourced maintenance.

Maintenance managers should take note of these shortcomings, and update their existing contracts accordingly.

The proposed framework for managing the outsourced maintenance relationship towards a win-win long-term partnership is simple and clear, and should promote understanding of the process required; while the identified essential elements provide a practical mechanism to pinpoint shortcomings in the relationship. Effective implementation and maintenance of each of the identified system elements should deliver the vision of a long-term win-win partnership.

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