Competencies required for managing outsourced maintenance: case study in a Dutch hospital

Msc Business Administration

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Abstract

Outsourcing business activities is a trend that has been around for many decades. It has continually increased in popularity due to improvements in IT and communication, but also under the pressure of rising global competition. In some cases a business process is only partially outsourced, subsequently altering the expectations and skillset required from any remaining employees that used to be responsible.

The aim of this study is to discover competencies required for the remaining workforce to effectively manage an outsourced activity. To achieve this, a case study was performed within the maintenance department of a Dutch hospital. In this hospital maintenance tasks were outsourced and executed through contracts with external parties. To provide background information for the actual research a literature review was conducted, resulting in a theoretical framework describing factors impacting effectiveness of this hospital maintenance department.

A qualitative research approach was applied to derive results for this study. Using quota sampling, fifteen participants were selected for this research. Semi-structured interviews with open-ended questions were used to collect data. The interviews were recorded on audio tape and field notes were taken. Transcripts from these interviews combined with the analyses of internal documentation resulted in competencies themes for the functions control room technician, locally deployed technician and contract manager.

Based on the research results, an overview of competencies for the three functions were created. In addition, it is concluded that these competencies are currently undeveloped or absent among a majority of the existing workforce. Recommendations to increase effectiveness for management of outsourced maintenance are provided.

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1. Introduction

1.1. Outsourcing requires unique skills

An organization's capability to manage change has become progressively more important over the past decades. Two main causes often mentioned are globalization and intensifying competition, but other political, technological and economic developments also contribute to the tumultuous environment. Whether these developments are international or local, organizational adaptability is key for a firm to thrive and survive in their environment full of uncertainties. This adaptability or organizational change means the firm must be able to adjust structures and business processes to remain successful or achieve a competitive advantage.

A common approach to achieving such a beneficial position is through assessment of the essential activities of an organization, also called the core business or competencies. Prahalad and Hamel (1990) discuss core competencies for organizations as a means to enter new markets. Core competencies can be defined as the resources and capabilities within an organization that are valuable, rare or inimitable (Ireland & Hitt, 2005). Within these core competencies lie the main advantages or strengths of an organization and a strategic choice can then be made to either dispose of or outsource non-essential activities.

Outsourcing basically means an organization hires external parties to execute activities for the firm instead of performing these internally. Frequently mentioned advantages of outsourcing include cost reduction, improved customer service, gain competitive advantage and more recently achieve operational flexibility (Deloitte, 2014). Some examples of often outsourced business activities are information technology, accounting, production and facilities management (see Figure 1).

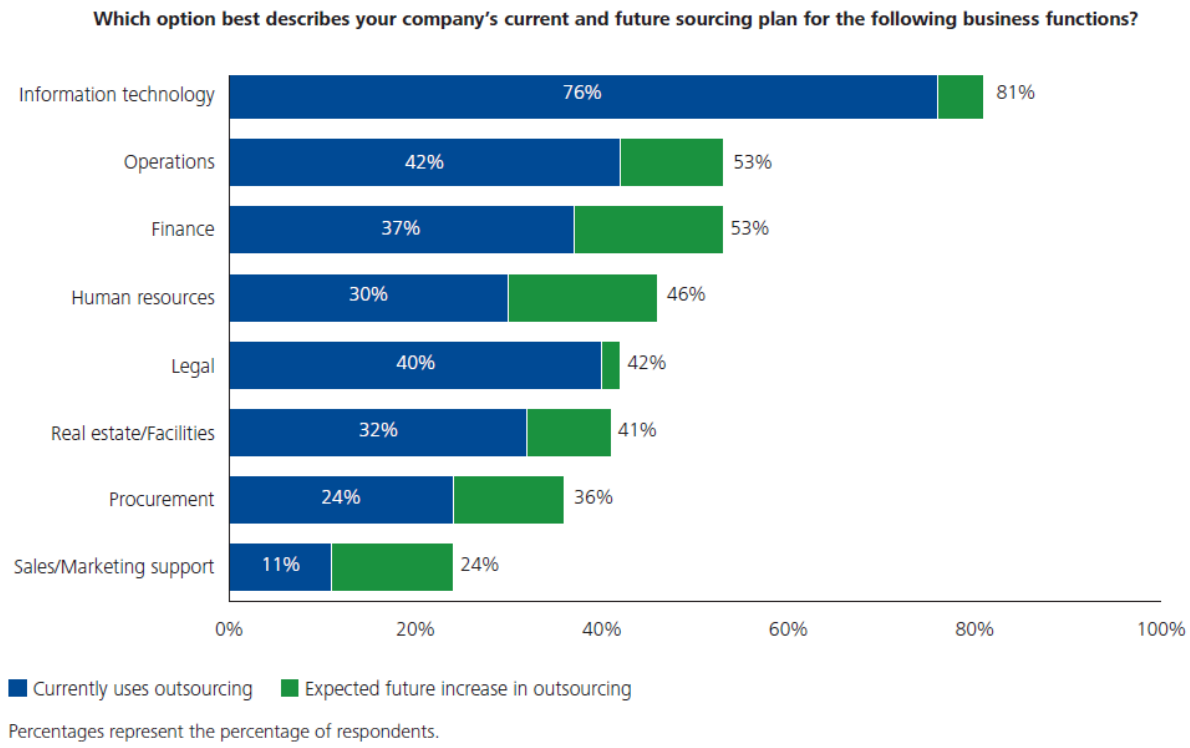

Figure 1. Global outsourcing trends (Deloitte, 2012)

Although outsourcing can be an effective solution, it is not immediately the holy grail of cost reducing strategies or organizational success. There are multiple risks involved that could lead to failure, e.g. outsourcing the wrong activity, losing control over the outsourced activity, loss of communication, loss of critical skills and overlooking personnel issues (Barthelemy, 2003; Tsang, 2002). A majority of these risks seem to be employee-related, a decisive factor could be how the internal workforce is involved with the outsourced activity. In fact, Lepak and Snell (1999) state that effective management of employment has become more complicated and is more directly related to organizational effectiveness due to increased outsourcing. The role of the employee changes from providing the service, towards being an interface between external providers and internal users. What skillset does the employee need to make the outsourcing decision a success?

In this study the focus will be on discovering competencies – the skillset - required for internal employees to effectively manage a (partially) outsourced business process. In

addition, other factors that influence effective management of this particular business process are investigated and discussed. A case study will be done at the maintenance department of a Dutch hospital, Medisch Spectrum Twente, where the decision has been made to outsource the majority of maintenance tasks.

1.2. The organization

Medisch Spectrum Twente (MST) is a specialized medical organization tasked with the improvement and care of the health for ~ 264.000 Dutch citizens in the region of Enschede in the Netherlands. It is one of the largest non-academical hospitals in the country. It provides specialized medical care and treatment from hospital locations in Enschede and Oldenzaal, and from polyclinics in Haaksbergen and Losser.

Table 1: MST figures per year

	Hospital beds	Admissions	Day Admission	Nursing Days	Polyclinic visits
Amount	1070	30.100	33.100	172.000	472.000

Retrieved from http://nl.wikipedia.org/wiki/Medisch_Spectrum_Twente

MST has permission to provide facilities for general care, dialysis center, trauma center, thorax center, radiotherapeutical center and a HIV-treatment center. To provide these services, MST has approximately 4000 employees, among them are 240 medical specialists. The hospital has access to a helipad to ensure fast transportation of organ transplants, neonates and patients in a critical state. MST works with a yearly budget of roughly €325 million to finance their organization.

1.2.1. Maintenance department

The maintenance department, named Gebouwbeheer, is allocated with the task of the maintenance of buildings, green space and installations. This responsibility is split over three locations: one in Oldenzaal and two in Enschede, i.e. Haaksbergerstraat (69.207 m^2) including

the parking garage Haaksbergerstraat (24.041 m^2) and Ariensplein (49.291 m²). In total, this means that currently 32 employees (29.2 FTE) are responsible for the maintenance of a floor area of 142.539 m² and the accompanying installations.

1.2.2. Developments for Gebouwbeheer

In recent years the department was forced to operate under difficult conditions. Throughout the organization cutbacks were required and a halt on recruitment was issued. In response to this, the department has been professionalizing its service provision. As a consequence, the focus has been put on reducing the execution of facility services internally. In practice, this means that service execution is preferably outsourced to external parties but managed and controlled internally. For Gebouwbeheer this means maintenance tasks are increasingly outsourced to external contractors and managing these contracts raises new challenges (Lammers & Overkamp, 2011).

In addition to these changes, construction on a new hospital site for MST has been started in May 2012 and the new building is expected to be put into use in the first quarter of 2016. The location Ariensplein will be used up to 2018, after which activities should be transferred to the new location or Haaksbergerstraat. For Gebouwbeheer this means a rise in maintenance responsibility of 78.400 m² in addition to the current 142.539 m², an increase of 55% in volume. It is also expected that the workload will experience spikes until Ariensplein is removed from the building roster and location Haaksbergerstraat has been renovated.

Simultaneously, Gebouwbeheer will be experiencing a significant natural decline in personnel. From 37 employees in 2011, this is expected to drop to 27 employees in 2016. The average age of the unit is 48.2 years, with 63.5 the highest and 22.3 the youngest ages. Other major developments that impact the unit are:

- Rising demands on quality control for multiple systems approaching similar levels to those of medical technology.
- Available and fitting technical personnel will be scarce to find.
- More intensive use of the buildings increases the pressure to provide services beyond standard office hours.
- The end-user experiences the path towards the technician that solves the problem to be too long-winded and outdrawn.
- The feedback from Gebouwbeheer towards the end-user is considered to be sub-standard.

1.2.3. New organizational structure and outsourcing

In the past, employees of Gebouwbeheer were personally responsible and deployed to solve (technical) issues in and around the hospital. The shift towards outsourcing, expanding building roster, more stringent regulations and other developments demand changes in the way the unit is organized. In addition, the amount and composition of the workload for certain functions will be reformed. This led management of the department to the decision to create a new organizational structure. Part of the solution for Gebouwbeheer was the investment in better maintenance planning and the other part was sought in a two-way pilot.

The unit launched a pilot using a control room to manage external parties that perform daily maintenance tasks in and around the hospital locations. In this control room crucial and important installations are monitored and technical supervision on external contractors is performed. All contractors receive work permits from the control room and also sign off there when tasks are completed. In addition, a pilot was started where technicians were deployed locally within the hospital. These technicians can be addressed by clients to perform certain corrective maintenance tasks autonomously, without going through the usual procedure of reporting disturbances.

1.3. Research question

The maintenance department of the hospital developed a new organizational structure to accommodate the outsourcing decision. Job descriptions for three new internal positions have been formulated, but an overview of the necessary skillsets is lacking. In this study these three job positions within the unit Gebouwbeheer will be analyzed regarding their required competencies. : The respective functions are control room technician, contract manager and locally deployed technician. Other job positions are excluded from this research. The proposed organizational structure (i.e. use of a control room and local service provision) is leading, alternative solutions will not be considered. In addition recommendations to improve the effectiveness of the maintenance department will be provided based on the research, but a full transition plan is not within the scope of the assignment.

The developments for Gebouwbeheer lead to the following main research question:

“Which competencies are needed for the functions control room technician, contract manager and locally deployed technician so the department Gebouwbeheer can manage outsourced maintenance effectively?

To answer the main question two sub-questions are formulated within the given scope:

- Which major aspects influence effective management of outsourced hospital maintenance?
- Which competencies are required for the control room technician, the contract manager and the locally deployed technician?

To ensure the main research question is answered satisfactorily, a literature review will be performed and field research will be conducted in the form of interviews. The literature review will focus specifically on the principal themes resource-based view, competencies,

outsourcing and effective (hospital) maintenance. Multiple semi-structured interviews will be held with management, technicians and other relevant employees to discover the competencies required in practice. Combining the literature review and interviews allows for the competencies to be mapped accurately and recommendations to be created for aspects influencing effective management of outsourced maintenance for the department Gebouwbeheer.

2. Literature review: factors influencing outsourced maintenance

Proper research requires context and direction, therefore literature on topics concerning this case study will be reviewed. The focal point of this study is the existing workforce, therefore the worth and impact of the employee for a firm in general is investigated to start with. These employees operate in a relatively unique environment, thus exploring how hospital maintenance can be organized and which factors affect effectiveness is a logical next step. Finally, outsourcing the majority of maintenance can yield both advantageous and detrimental results, uncovering the nuances helps in developing the best approach.

2.1. Value of human resources: resource-based view

Determining the factors that influence long-term profitability and thus survivability of a firm has been a hotly debated topic for many decades among managers and academics. Two of the most well-known frameworks in strategic management literature are those introduced by Michael Porter and Jay Barney. (Porter, 1979) discussed five external forces impacting competitive power and organizational strategy; supplier bargaining power, buyer bargaining power, threat of new entrants, threat of substitute products/services and competitive rivalry. Barney provided a more internally focused theoretical tool, his resource-based view (RBV) argued that a firms resources, strategy and its performance are interrelated (Barney, 1991). According to both authors, sustained competitive advantage is the key to a successful organization. RBV proponents, such as Barney and Wright (1998) state that for a firm to obtain this kind of advantage, it must have access to a combination of resources that are valuable, rare, inimitable and have organizational support (see Figure 2).

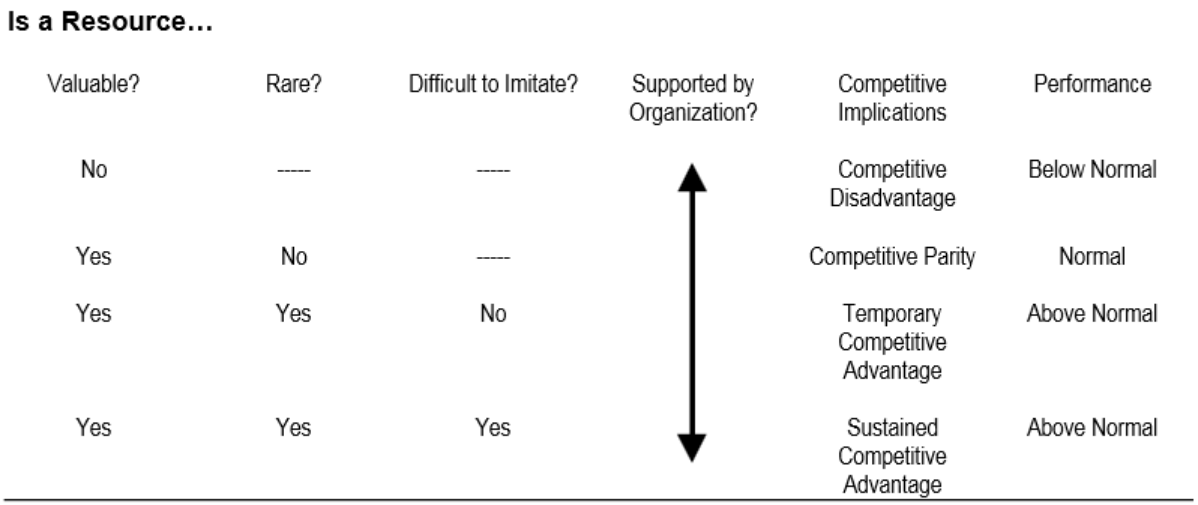

Figure 2. The VRIO Framework (Barney & Wright, 1998)

In theory, this ensures that competitors are unable to copy or easily acquire a similar advantage. Barney (1991) identified three resource categories; namely physical capital, organizational capital and human capital. Physical capital resources include the buildings, equipment, physical technology and access to raw resources. Organizational capital resources encompass a firm's structure, planning, coordinating and controlling systems. The human capital resources comprises training, skills, experience, intelligence and insights of a firm's managers and employees. The RBV discusses how to achieve superior performance on the most compounded organizational level, namely that of the whole firm. This study focuses on the performance of the maintenance department within a Dutch hospital. Whether RBV is also applicable on departmental level remained unclear in the first decade of research on this topic.

In 2004 a group of researchers investigated the viability of business process performance as the dependent variable and examined which resources could generate a competitive advantage from this perspective. Their study confirmed that RBV is also applicable on the business process level and thus that departmental performance depends on the mix of capital resources and chosen strategy (Ray et al., 2004). Although all three resource categories can lead towards an advantage, both the physical capital and

organizational capital resources are set in stone within the hospital this case study is held. Therefore, the human capital resources are of primary interest for this research.

2.1.1. Human resources affect firm performance

"Human resources always are a potential source of sustained competitive advantage" (Wright et al., 1994, p. 29). How to extract this advantage from human resources is the practical dilemma faced by managers. Human capital resources are not synonymous or limited to a firm's total number of employees, it also includes human resource (HR) practices. Before discussing how human capital resources can result in a competitive advantage, a definition of its components is required. In conformity with Wright et al. (1994), human resources are defined as *"the pool of human capital under the firm's control in a direct employment relationship"* (p. 7). Additionaly, HR practices are defined as *"the organizational activities directed at managing the pool of human capital and ensuring that the capital is employed toward the fulfillment of organizational goals"* (p. 7).

In short, Wright et al. (1994) conclude in their paper that to develop a source of sustainable competitive advantage, the human resources must have high levels of knowledge, skill and abilities (KSA) combined with the motivation to behave productively (see Figure 3).

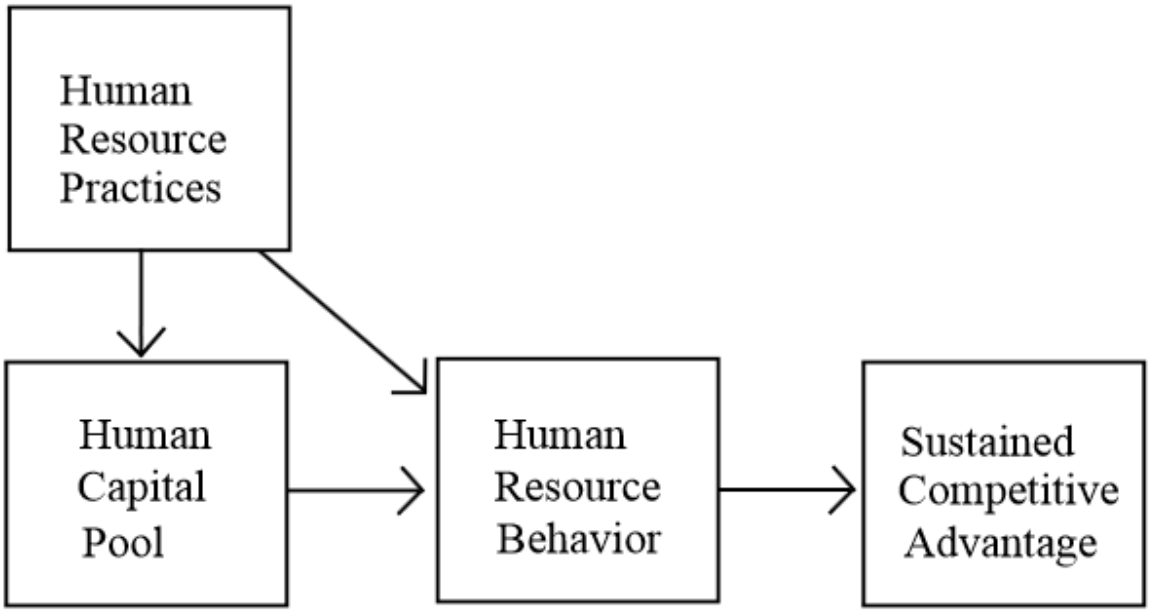

Figure 3. Human Capital Resources (Wright et al., 1994)

Solely ensuring employees possess the appropriate competencies or KSA to perform required tasks is not enough, it is essential that their behavior contributes towards organizational goals. Without such value-added behavior, attaining any advantage through human capital resources will be difficult. For example, during routine inspection a maintenance employee notices that a machine is close to failure, but still functioning. The employee can decide to wait for the machine to break down or to schedule repairs to prevent a potential shutdown. One of these choices might be preferred, depending on the critical role of the machinery. Therefore, the competencies combined with the behavior of human resources affect the firm's performance. In addition, Barney & Wright (1997) state that sustainable competitive advantage is achievable through constant training and development of employees to perform firm-specific work processes and procedures. HR practices still have an important function on moderating the human resources and their behavior to achieve a sustainable competitive advantage, yet they are often not rare enough or easily duplicated and thus provide no such advantage in itself.

2.1.2. Competencies: Knowledge, skills and behavior

From a HR perspective, competencies are viewed as the capabilities or characteristics of an individual that relate to effective job performance. Enhancing a firm's performance through human capital resources, employees require the proper knowledge, skills and abilities (KSA) while exhibiting behavior that contributes towards organizational goals. *Knowledge* is defined as an organized body of information of a factual or procedural nature that can be applied to the performance of a job. In short it is the employee's familiarity with the subject matter. *Skills* are defined as the level of proficiency and expertise in a specific learned task and there are three main categories; physical skills, verbal skills and mental skills. *Abilities* refer to the capacity to perform an observable activity at the present time or produce an observable product. This often requires a combination of knowledge and skill; some examples are running a marathon within four hours or producing accurate, monthly reports. *Behavior* is defined as the way one acts or conducts oneself towards others and behaves or responds to a particular situation or stimulus.

Human capital theory differentiates between general skills and firm specific skills of human resources (Flamholtz & Lacey, 1981). General skills are possessed by individuals and provide value to a firm but are transferrable across various organizations, e.g. reading proficiency, mathematical knowledge. In contrast, firm specific skills only provide value to a particular organization and usually are worthless to other firms (e.g. knowledge of a firms policies, skillful use of firm-specific IT). Multiple HR academics propose that sustainable competitive advantage is mapped through the uniqueness and value of employee skills (Barney & Wright, 1998; Lepak & Snell, 1999). Often this means firm-specific skills, yet it should be stressed that general skills are required to maintain competitive parity. Although general skills are important and add value, they are easily duplicated or recruited and thus can

only result in a temporary advantage. Therefore it is important to ensure that HR have the required general skills, but also develop firm-specific skills in the long run.

Although it is clear that the human capital pool and its behavior are variables that impact organizational success, in this case study, the department is responsible for maintenance and operates in an outsourcing setting. It would be insufficient to not discuss the influence of this context on the effectiveness of the maintenance department. Accordingly, the next sections will explore maintenance and outsourcing literature to identify factors affecting this effectiveness.

2.2. Importance of building maintenance

Preliminary design, construction and maintenance; these are the three phases that are crucial in determining the longevity of buildings. Correspondingly, Shohet (2006) states that these are the salient phases which are decisive for the effectiveness of a buildings' maintenance management. The importance of the first two phases is frequently recognized, whereas maintenance is often undervalued. In a perfect world a building that slides into ruin and loses its functionality would simply be replaced. Unfortunately this is often not an option due to many constraints in the real world, e.g. time, government regulations or money. Therefore, to ensure that performance (= functionality) of a building meets expectations over the years, maintenance in some form or another is desirable.

In general terms *maintenance* can be described as a combination of all technical, administrative and managerial actions during the life cycle of an item intended to retain it in, or restore it to, a state in which it can perform the required function (EN13306, 2010). More specifically, *building maintenance* is defined as the art of controlling the rate at which structures deteriorate towards a state of unserviceability and collapse (Smith, 2002). For this

study, the term maintenance encompasses both this general description and that of building maintenance.

Whereas certain building types can remain highly functional with low demands on maintenance (e.g. storage facilities, car parks), more complex types require a more stringent, continuous and recurring approach (e.g. a nuclear plant or the international space station). According to Kobus (2008) hospitals can be put in the complex category; the performance of hospital buildings and components depend to a large degree on maintenance and issues concerning the management of maintenance have a major impact on the performance of constructed facilities (Amaratunga et al., 2002).

Before exploring factors influencing the effectiveness of a maintenance department, it should be discussed what *effective maintenance* is. According to Dekker (1996) the main question faced by maintenance management is whether output is produced efficiently and effectively, in terms of manpower/materials used and in terms of contribution to company profits. This implies that a skilled workforce with access to the proper equipment and materials is crucial for efficient and effective results, but does not elaborate on what effective or efficient maintenance is. Márquez et al. (2009) argue that maintenance effectiveness translates into firm satisfaction through the condition and capacity of its assets or the reduction of overall costs due to availability of assets when required. In a more recent study, Barberá et al. (2012) suggest that good maintenance management reduces overall cost of productive activity (efficiency) and ensures correct performance of equipment and its functions (effectiveness) while reducing the level of risk to people and negative effects on the environment (effectiveness). This last approximation of effective maintenance will be adopted for this study. Ensuring that buildings and machinery run smoothly while retaining minimal down-time is crucial to the production processes. Even more so, for a hospital it could be

disastrous if an operation room had to be shut down unexpectedly, negatively affecting production (potential surgeries) and possibly endangering patient health.

The final argument underlining the importance of effective maintenance is a financial one, calculations have shown that the costs for maintenance and operation of a building in general comprise 80% of total life cycle costs of buildings (Kirk & Dell'Isola, 1995). From a total production costs perspective, maintenance is also a large culprit for various industries, amounting to between 15% and 40% percent in total (Al-Najjar & Alsyouf, 2003). Hassanain et al. (2013) support this statement for hospitals in particular; *"the cost of maintenance in buildings, and particularly in hospitals constitute a major part of the total costs of the facility"* (p.12).

To summarize, these studies stress that due to potentially high cost and complexity, organizing maintenance properly and effectively is an important issue. For a hospital in particular, to maintain high operational levels and functionality, maintenance should be a key part within the organization. Aside from the importance of functional mechanical, electrical and medical systems in a hospital, the quality of the physical environment also has impact on the recovery rate of patients, employee satisfaction and organizational productivity. Therefore, it is essential to discover which elements impact effective maintenance and how these can be managed.

2.3. Management of maintenance

Modern *maintenance management* is defined as all the activities of management that determine the maintenance objectives or priorities, strategies and responsibilities and implement them by means such as maintenance planning, maintenance control and supervision (EN13306, 2010). Although maintenance is usually not core business but a

supportive process for an organization, good maintenance management can be a large contributor to the profitability and sustainability of an organization.

After reviewing 142 papers, Garg and Deshmukh (2006) classified six areas of interest for maintenance management, namely maintenance optimization models, maintenance techniques, maintenance scheduling, maintenance performance measurement, maintenance information systems and maintenance policies. Although these classifications are of academic interest, it is a reflection of the issues relevant to maintenance in practice. Indeed, in a more strategic approach Tsang (2002) distinguishes four dimensions covering similar themes of importance for organizing maintenance: namely service-delivery options, organizational design, maintenance methodology and the infrastructure of support systems. In their endeavor to develop a framework for maintenance management, Márquez et al. (2009) incorporate comparably themed factors to these strategic dimensions and provide examples of implementation methods. Additionally, Barberá et al (2012) proposed a general maintenance management model which emphasizes that it is not an isolated process but depends on many compounding factors (e.g. customer requirements and satisfaction, resources, infrastructure, support systems, business goals and suppliers). An overview of the most impactful factors described by these authors will be presented below.

First of all, the decision which *maintenance techniques* to adopt is crucial, since there is a diversity to choose from and implementation requires diverse strategies. In their review on maintenance management literature, Garg and Deshmukh (2006) classified ten categories to distinguish these maintenance techniques. In another study, Al-Najjar et al. (2003) discerned six major approaches to maintenance. Additionally, Tsang (2002) suggests there are four basic forms of maintenance. In essence these authors agree on a trio of techniques that form the foundation; these are corrective, preventive and condition based maintenance. The earliest maintenance technique used is simply called run-to-failure or corrective maintenance

(CM). CM is maintenance in its most basic form; when a machine/system fails or breaks down, tasks are performed to bring it back to operational levels or replace it if necessary. CM has been the starting point from which new techniques flowed and one of these was a more time-based approach, namely preventive maintenance (PM); it can be defined as *'a series of tasks performed at a frequency dictated by the passage of time, the amount of production, machine condition that either extend the life of an asset or detect that an asset had critical wear and is going to fail or break down'* (Garg & Deshmukh, 2006, p. 10). Simultaneous to the popularity of preventive maintenance, products and production techniques became more complex, while expectations on quality and reliability also kept rising. Due to this, preventive maintenance became a major expense for many organizations (Jardine et al., 2006). The key to the solution for a more efficient technique was found in condition based maintenance (CBM). CBM is not time-based or predetermined, but revolves around monitoring operating levels of a system and engaging in maintenance tasks when predetermined limits are exceeded. In addition to these well-known techniques, there are a plethora of approaches that expand or specialize further. Of particular interest for this study is an approach called *maintenance outsourcing*, this involves the employment of external companies which are then (partially) responsible for specific maintenance tasks. Goals often pursued with this technique are to lower costs, achieve higher quality, reduce workforce size and focus business resources on the core competencies. Obviously the list of applicable maintenance techniques is diverse and lengthy, but it is arguably important to select and implement the right techniques for optimal and effective maintenance management.

A second recurring factor of importance are the choices on the *service-delivery options*; this pits the possibilities of internal provision of maintenance against outsourcing these tasks. Outsourcing maintenance enables certain benefits but risks are involved that have to be handled properly, these are discussed in a later section. Decisions on *organizational*

design includes workforce specialization, location, composition and flexibility of the workforce. Specialized machinery requires specific knowledge and skills and having a multitude of these systems might lead to the preference for job specialization, whereas a multi-skilled workforce can ensure more flexibility and be more efficient. A decentralized, localized workforce could be preferred depending on the necessary response time and depth of knowledge.

Another important factor influencing organizational design is the type of maintenance work that is required and this strongly correlates with the choices in service-delivery. *Maintenance methodology* concerns decision-making on which techniques and maintenance policies to apply. Tsang (2002) distinguishes four basic approaches to maintenance: run-to-failure/corrective maintenance, preventive maintenance, condition-based maintenance and design improvement. This is similar to the techniques discussed earlier, except for the latter which emphasizes the importance of enhancing chosen techniques to reduce resource requirements, amount of maintenance or improve reliability.

Finally, to effectively manage maintenance, Tsang (2002) argues proper *support systems* are required. These encompass strategic choices on topics such as communication, maintenance information systems, reward and recognition, education and training, and performance measurement. Various authors emphasize the need for these support systems. To be able to effectively organize, budget and schedule maintenance activities within a hospital, performance evaluation of the maintenance department is a vital tool. Identification of performance indicators can provide maintenance managers with essential information to improve their strategic and tactical decision making. Based on preceding research, Shohet (2006) defined four key performance indicators affecting the implementation of maintenance within a hospital. These indicators include composition of labor, organizational effectiveness, maintenance efficiency and building performance.

The merits of documentation and proper maintenance information systems are often mentioned. For effective maintenance management, administration of the maintenance department and their strategies concerning maintenance techniques are vital components (Horner et al., 1997). In addition, proper administration of maintenance work can prevent high costs of maintenance in the future. According to Colen and Lambrecht (2012), properly trained maintenance personnel is a requirement for optimal maintenance execution. Defective or poor solutions can lead to higher future maintenance costs. On the organizational front, Adenuga (2012) argues that maintenance managers require certain skills and attitude success factors to effectively manage maintenance operations in a hospital. Iyagba (2005) supports this and states that the quality of the maintenance manager affects staff performance, productivity and turnover.

An abundance of elements influencing maintenance management effectiveness have been discussed, yet it is not an isolated process; internal and external factors to the organization also have an impact. In their study, Barberá et al. (2012) depict the context, processes and resources of the maintenance system including these internal/external factors in an effort to develop an advanced maintenance management model. The external factors outside the system include *customers* and *suppliers* of the maintenance department, where the customer requirements and satisfaction are of consequence combined with supplier requirements and concerning outsourcing of tasks.

There are numerous similarities between the categories found in the literature review performed by Garg and Deshmukh (2006), maintenance modeling literature Barberá et al. (2012) and the strategic dimensions deemed crucial for maintenance management by Tsang (2002). Through key decisions in the discussed areas combined with fitting competencies within the human capital pool and the right HR behavior, excellence in maintenance operations can potentially be achieved. Since the service delivery option, namely maintenance

outsourcing, plays an important role in this study and has been depicted as an influential variable, this is discussed more thoroughly in the next section.

2.4. Risks and rewards of maintenance outsourcing

In many areas of healthcare, outsourcing has become a common strategy for the execution of non-core activities by external contractors who are specialized in these activities (Langston & Lauge-Kristensen, 2013). Independent of the manpower sources (in-house or outsourced), successful execution of maintenance tasks depends on properly detailed specifications, good planning and supervision (Seeley, 1987). According to Adenuga and Ibiyemi (2012), the success of the maintenance operation relies on adequate supervision and quality control. Outsourcing maintenance can be a beneficial policy; it opens up possibilities for cost savings, improved quality, operational flexibility, reduces staff numbers and facilitates the transferal of knowledge from external specialists onto internal personnel. Outsourcing can be particularly interesting for hospital organizations, where expertise on many (medical) systems is required for proper maintenance. On first glance, it can be enticing to attract specialized external partners to maintain these systems.

However, multiple authors recognize certain risks related to outsourcing; some of which are employee-related issues, loss of critical skills, lack of internal expertise to manage external contractors and potential loss of control (Campbell, 1995; Quinn & Hillmer, 1995; Shohet, 2006). Tsang (2002, p. 16) mentions similar risks and stresses that *"it is extremely risky to outsource work when the company does not have the competence either to assess or monitor suppliers, or when it lacks the expertise to negotiate a sound contract"*. Iyagba (2005) states that there might also be less obvious disadvantages. One of those is that long-term exclusive outsourcing contracts create a dependency on that contractor and that might isolate the organization from the market. In the long run outsourcing vital maintenance tasks can create dependency on external parties: *"by giving up the vendor exclusive right to*

understand one's business, one may be making it harder in the long term to terminate the relationship" (Adenuga & Ibiyemi, 2012, p. 2).

Keeping maintenance activities in-house has its own benefits, including familiarity with the assets, how assets operate, awareness of maintenance requirements, quick response time in case of emergencies, personal commitment and loyalty to the hospital. Some disadvantages of in-house deployment are that full training is required, sufficient work must be available to utilize their full potential, less flexibility in the workforce and monotonous work can reduce their motivation (Adenuga & Ibiyemi, 2012).

To summarize, outsourcing maintenance services is like wielding a double-edged sword. As discussed above it has potential benefits, but to fully reap the benefits the various disadvantages and risks have to be considered carefully. When outsourcing maintenance activities is a given, it is important that measures are taken to reduce the risks involved.

3. Research model

From the combined literature review, a multitude of factors have been identified that impact the effectiveness of a hospital's maintenance department. This provides a valuable framework within which to investigate the required competencies for the department. Full implementation of a maintenance model is beyond the scope of this study and is also difficult to implement in reality. Lopez and Crespo Márquez (2009) acknowledge this by stating that *'maintenance deals with highly diverse problems even in firms within the same productive sector, due to this it is very difficult to design an operating methodology of general applicability'* (p. 5).

Because this study is concerned with the effectiveness of the maintenance department of a Dutch hospital, and the impact of human resources in particular, influencing factors derived from the literature are specifically modeled for the maintenance department of this hospital (see Figure 4).

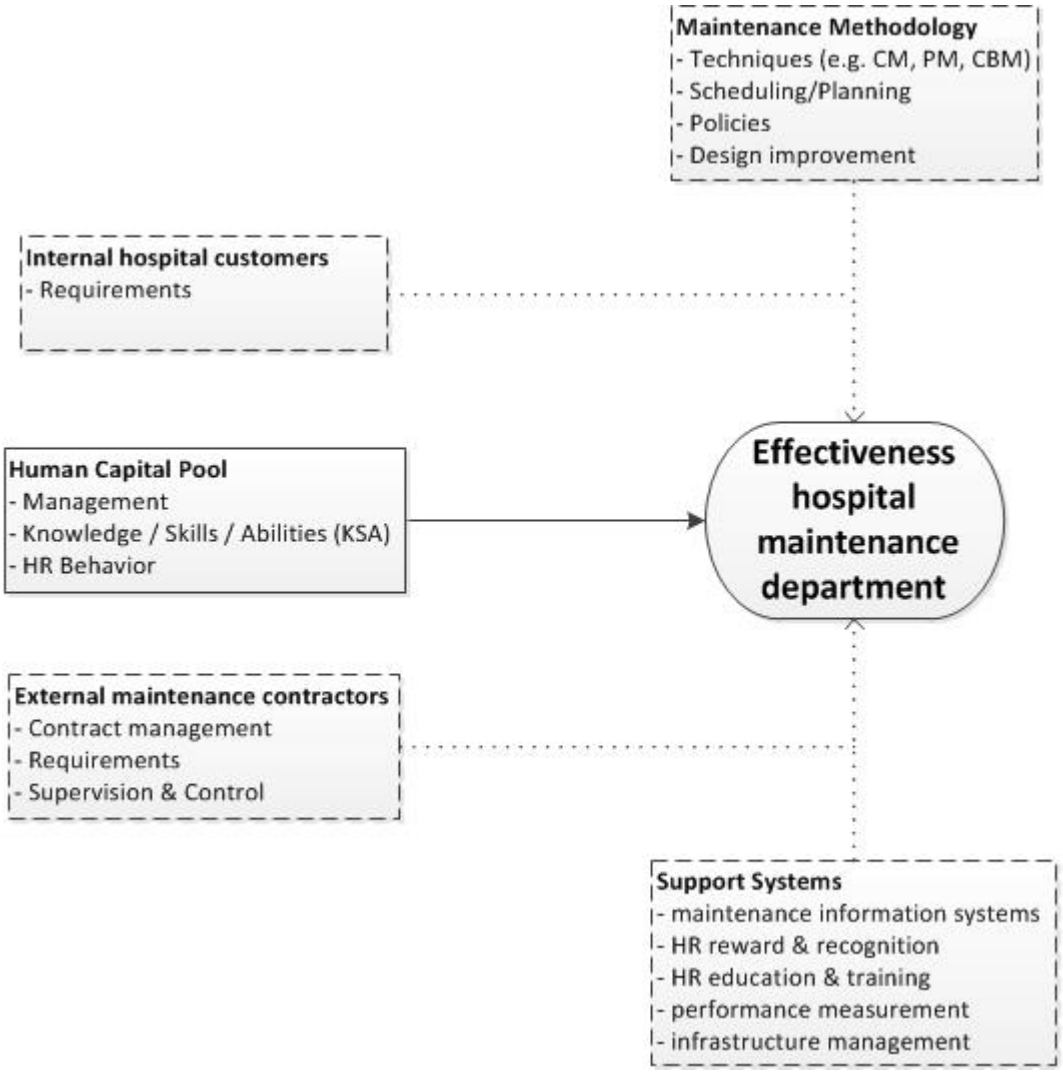

Figure 4. Theoretical Model of factors impacting the department's effectiveness

4. Research Design

4.1. Research methodology

This study is focused on answering an exploratory question; through discovery of factors that influence management of maintenance outsourcing, to ultimately identify and interpret optimal competencies for the existing workforce. Although the literature review uncovers multiple factors that influence effectiveness of a maintenance department, the review also shows a lack of specific solutions or implementations for the effectiveness of such a department in a hospital. Therefore, no hypothesis or theories have been tested, but the specific situation of this case study is examined and analyzed. Due to the unique requirements and setting of this study, the explorative nature of qualitative research is most suitable in discovering the necessary data (Creswell, 2013).

4.2. Data collection

The approach to research in this study was qualitative and the main method used to collect data was in-depth interviews. Eight distinct interview protocols were developed to query the selected participants. The disparity in background and depth of knowledge among participants was the reason for the diversity in protocols. Each protocol was semi-structured and contained open-ended questions to optimally explore the experiences, ideas and opinions of the participants (Creswell, 2013). The specific questions used can be found in Appendix A. In addition, internal documentation was analyzed to supplement findings from the interviews (see Table 2).

Table 2: Internal documentation and purpose of analysis

Document	Purpose of analysis
Function profile 'Regiekamertechnicus'	Identification of predetermined goals and competencies for the control room technician

Function profile 'Technisch medewerker'	Identification of predetermined goals and competencies for the locally deployed technician
Function profile 'Contract manager'	Identification of predetermined goals and competencies for the contract manager
Index of general competencies MST	Map the research results onto competency definitions used within the hospital.

The sample population was mainly restricted to employees of the hospital and its maintenance department in particular. Another condition for subgroups of participants was that they had to be employed in specific functions of interest for this study, namely control room technician, contract manager and locally deployed technician. Using quota sampling, fifteen respondents divided over eight roles were selected to participate (see Table 3).

Table 3: Roles and number of respondents

Respondent role	# of respondents
Employee function 'control room technician'	4
Employee function 'contract manager'	2
Employee function 'locally deployed technician'	2
Management department Gebouwbeheer	3
HR-advisor department Gebouwbeheer	1
Projectleader MST	1
Business manager Enexis	1
External contractor	1

The decision to include these roles seems straightforward, nonetheless the arguments will be provided. The function roles, i.e. *Employee function 'control room technician', 'contract manager'* and *'locally deployed technician',* are the new main job functions, therefore employees operating in the pilot have vital knowledge and experience to share. *Management department Gebouwbeheer* comprises a departmental manager, an external interim manager and a maintenance engineer (responsible for maintenance planning and policies). Their direct involvement and responsibility for the organizational change makes

their perspective invaluable. The *HR-advisor department Gebouwbeheer* played a role in developing the new job descriptions and the hospital's competencies chart, thus could provide important contextual information. Due to heavy involvement of maintenance employees in hospital-wide projects, the *Projectleader MST* involved with the department possesses valuable knowledge on the requirements of these employees. The function 'control room technician' has similarities to employees in the control room of the Dutch electricity network provider Enexis, therefore the *Business manager Enexis* can provide useful insights on required competencies and behavior from their perspective. Finally, external firms have intensive interaction with the maintenance employees and perform a great part of maintenance tasks, thus an interview with an *'External Contractor'* can help develop an understanding of desired competencies and behavior from an outsider's perspective.

In an ideal scenario, sampling continues until information redundancy or saturation is achieved, the point at which additional research does not result in new information or themes. In reality, sampling is constrained by population size and allotted time (Shadish et al., 2002). Five participant roles had a significantly small number of eligible respondents, e.g. management, projectleader and hr-advisor, making selection a simple task. The *Employee Function 'locally deployed technician'*, had four candidates of which only two participated due to time constraints. As *external contractor*, an employee of the largest and longest involved maintenance firm was interviewed. For the biggest sample pool, i.e. *Employee Function 'control room technician',* the choice was made to diversify over respondent skillsets. This allowed for a broader spectrum of relevant data discovery, while the higher number of respondents increases information saturation and completeness of the data.

Before each interview, the respondents were introduced to the goal of the interview and ensured that their answers were confidential and would only be used for this research. The interviews held with the respondents were recorded on an audio device to ensure

accuracy and completeness of the data. In addition to the audio recordings, field notes were taken each interview to highlight important observations or remarks during the interviews.

4.3. Data analysis and interpretation

The analysis of the gathered data consisted of two separate tasks before joining the results, namely transcribing the audio files and examining the internal documentation. The transcription was done for each interview recording individually, resulting in fifteen transcriptions. The transcribing process was not done literally but verbally, since the results required were content-based and not dependent on punctuation or pronunciation. Descriptions and themes involving competencies or KSA from each transcription were coded and interrelated into an overview for all transcriptions. This provided a clear picture on which to interpret the meaning of the data. To increase validity and accuracy of the data, participants had the opportunity to review their own transcripts and comment on the interpretation.

Internal documents were provided by management of the maintenance department at MST (see Table 2 above). Three documents cover the new function profiles, including definitions, responsibilities and competency descriptions. These documents were created by management of Gebouwbeheer for three reasons: to inform the board of the new organizational structure, as input to determine required competencies and allow the current workforce to apply for the new positions. The fourth document was an index containing general competency definitions, which the hospital intended to apply to all functions organization-wide.

The patterns and themes emerging from both the interview data and document data were combined to provide a complete overview of the data researched. The competency descriptions were then mapped onto the competency-index provided by the hospital and the

results can be found below. These results are then discussed and conclusions or recommendations are drawn.

5. Results

For all functions (control room technician, contract manager and locally deployed technician) the goals as stated in internal documentation supplemented with findings from the interviews are given. This provides the necessary context to interpret the competency themes resulting from the data. These competencies will be presented in separate tables for the three functions and also for the combined general and supervisory competencies.

In each table the first column ‘MST function profile’ consists of competency descriptions derived from the internal MST documentation, the second column ‘Results from interviews’ represents the interview results and the third column ‘MST Competency-index’ maps these on the general competency-index provided by the hospital. The results of interviews also shows a tally (x#), this stands for how often the competency theme was identified over all interviews.

Throughout the results important descriptive quotes are provided as context for the competency themes and subsequent discussion. Subsequently, for each function results from the interviews are compared with the predetermined competency requirements. Finally, quotes from external interviewees that provide vital context are summarized.

5.1. Function control room technician

“Dit is het kloppend hart van de TD [Technische Dienst]” said one respondent, stressing how vital this function is to the maintenance department. According to the function description created by management, the goal of this function is threefold: 1) safeguarding the quality of installations, 2) monitoring the performance of installations and operate them to optimally reduce disruptions, 3) rectify disruptions to the installations. These installations all have electrical engineering, mechanical engineering and building engineering components.

They range from the fire alarm system, heat provision and electrical network to sterile airflows for the operating rooms.

One of the current control room technicians described their job like this: *"Bewaken van de installaties via GebouwBeheerSysteem (GBS), storingen preventief afvangen. Daarnaast rondes lopen om storingen voor te zijn/op te sporen. Daarnaast externe partijen begeleiden."*. The safeguarding and monitoring of installations is done through computer software (GBS) that receives information via multiple sensors and additionally the control room technicians perform routine check-ups: *"Vanuit de regiekamer preventief de rondes gelopen moeten worden en metingen gedaan moeten worden op de installatie om te kijken of het niet anders klinkt of anders ruikt dan het normaal moet doen. Dat is echt de machinekamer, ketelhuis etc."* Disruptions are mostly rectified by external contractors and the supervisory role for the control room technician is often mentioned: *"Bewaken dat de juiste firma's met de juiste mensen komen werken en dat de juiste veiligheidsmaatregelen worden getroffen."* This supervision was previously absent, according to the majority of respondents: *"Controle op werk, aanwezigheid en veiligheid door externen ontbrak, nu via de regiekamertechnicus beter georganiseerd."*

Comparing the function profile and interview results so far, identical goals were found in the data. However, there was one additional task frequently mentioned in the interviews, participation in projects by control room technicians. One respondent formulated the need for this project participation as follows:*"Bij verbouwingen is de vakinhoudelijke kennis nodig om goed de projecten uit te kunnen voeren en de kennis uit het project kan de regiekamertechnicus zo ook weer terugsluizen naar de technische dienst."* The role of the control room technician in projects was stressed by another: "*Om gebouwdelen anders in te richten voor andere functie of gebruik, of een medische invalshoek waar vernieuwingen in nodig zijn. De input hoe dat er dan uit moet zien, waar moet de nieuwe ruimte aan voldoen,*

welke technische infrastructuur is nodig, daar moet dan de technische input door regiekamertechnici op worden geleverd." In summary, for their specific disciplines and installations, the control room technician can be involved in project groups to design and/or modify certain areas of the hospital. This fourth task combined with the previously mentioned tasks and associated responsibilities, led the respondents to describe the competencies found in Table 4 below.

It is important to note that the department also makes a distinction between control room technician A and B, this is shown by the label RKT-A in Table 4. The distinction is described by one respondent as follows: "*Daar staat dat regiekamertechnicus A een installatieverantwoordelijke is die aangeeft hoe de infrastructuur van je ziekenhuis is, zodat geborgd is dat het aan alle eisen en normering voldoet. Feitelijk verlang ik van deze functie dat die de eerst aangewezene is die hier keuzes in maakt en anderen meeneemt in die visie en anderen delen daarvan kan laten uitvoeren binnen de totale bandbreedte/kaders van zijn visie."* This implies that A is responsible for certain installations whereas B is not. Another respondent argues that the required competencies are essentially the same, except for documentation skills and experience: "*Qua competenties zijn in aanleg hetzelfde; diepgang van technische kennis. Vaardigheden qua rapporteren kan een stukje naar beneden [voor B]. Voor de rest is het in essentie hetzelfde, maar zit het verschil in de vakvolwassenheid. Van regiekamertechnicus A vraag je grote zelfstandigheid en B mag vaker bij A aankloppen."* In conclusion, it is stated that B should be seen as a junior or development position: "*Het [regiekamertechnicus B] is ook bedoeld als een instroom- of groeifunctie, dus meer op de regiekamer zitten en monitorende taken en ze hebben nog niet de vaardigheid om de installatie te monitoren naar de toekomst of kennis van alle zorgprocessen.*" One respondent emphasized the difficulty of recruiting control room technicians due to the multi-skilled demands: "*je zoekt communicatief-vaardige technici die ook nog zin hebben in verslaglegging*

en op hun vakgebied ook nog eens vrij breed zijn. Dus dat zijn al schaap met vijf poten risico's, dus dat betekent dat je een aantrekkelijke werkgever moet zijn om dat soort mensen in de toekomst uit de markt te halen."

Table 4: Competencies function control room technician

MST function profile	Results of interviews	MST Competency-index
<u>Knowledge</u> Technical certificate (MBO4-5) Health care processes MST Composition and function of all installations Effect of installations on health care processes Legal regulations concerning installations Safety regulations & environmental legislation Deep understanding installations (RKT-A) Additional courses (RKT-A)	<u>Knowledge</u> Composition and function of all installations x10 Deep understanding installations x8 (RKT-A) Health care processes MST x8 Technical certificate MBO4+ x5 Legal & Safety regulations x5 Trends & developments x2(RKT-A) Protocols DBS	Leidinggeven 1 (Besluitvaardigheid) Leidinggeven 3(Delegeren) Leidinggeven 6 (Plannen & Organiseren) Leidinggeven 7 (Voortgangscontrole) Ondernemen 8 (Marktgerichtheid) Ondernemen 9 (Netwerken) Ondernemen 11 (Patiënt-/Klantgerichtheid) Analyse & besluitvorming 12 (Conceptueel Vermogen) Analyse & besluitvorming 13 (Creativiteit) Analyse & besluitvorming 14 (Oordeelsvorming) Analyse & besluitvorming 15 (Omgevingsbewustzijn) Analyse & besluitvorming 16 (Organisatiesensitiviteit) Analyse & besluitvorming 17 (Probleemanalyse) Communicatie 19 (Inlevend Vermogen) Communicatie 20 (Luisteren) Communicatie 21 (Mondeling communiceren) Communicatie 22 (Onderhandelen) Communicatie 23 (Overtuigingskracht) Communicatie 24 (Presentatie) Communicatie 25 (Samenwerken)
<u>Skills & behavior</u> Independent Analytical skills Discipline Persuasiveness Written & oral communication (RKT A > RKT B) Acuity Solution driven Systematical Accurate Perseverance Patience	<u>Skills</u> Written & oral communication x8 Time management x7 Analytical skills x5 Perseverance x5 Delegate & Coordination skills x5 Independent x5 Solution driven x4 Project skills x4 Documentation skills x4 Accurate x3 Computer Skills Organizational sensitivity	

Negotiation skills (RKT-A) Creating policies (RKT-A)	Decisive Mobility Resourcefulness	Communicatie 26 (Schriftelijk communiceren) Communicatie 28 (Representativiteit) Motivatie 29 (Ambitie) Motivatie 30 (Discipline) Motivatie 31 (Initiatief) Motivatie 32 (Integriteit) Motivatie 33 (Inzet) Motivatie 34 (Leervermogen) Motivatie 35 (Kwaliteitsgerichtheid) Motivatie 36 (Resultaatgerichtheid) Persoonlijk gedrag 38 (Accuratesse) Persoonlijk gedrag 39 (Assertiviteit) Persoonlijk gedrag 40 (Durf) Persoonlijk gedrag 41 (Flexibiliteit) Persoonlijk gedrag 43(Mentale weerbaarheid) Persoonlijk gedrag 44 (Onafhankelijkheid) Persoonlijk gedrag 45 (Organisatieloyaliteit) Persoonlijk gedrag 46 (Stressbestendigheid) Persoonlijk gedrag 47 (Vasthoudendheid) Persoonlijk gedrag 48 (Verantwoordelijkheid) Persoonlijk gedrag 49 (Zelfstandigheid)
	<u>Behavior</u> Proactive x7 Studious x6 Stress resistant x5 Team spirit x5 Customer-oriented x4 Professional attitude x3 Flexible x3 Integrity x3 Empathy Enthusiastic Collective responsibility	

5.1.1. Descriptive quotes control room technician

Clear examples on the importance of deep understanding of the installations were provided: *"Als er op radiologie twee extra versnellers worden bijgeplaatst, zo'n regiekamertechnicus A moet dan kunnen zeggen dat is prima, maar dat betekent voor mij dat de hoofdspanningsring moet worden verzwaard en daar komen investeringen bij kijken."* Others stress the need to understand the impact of installations on healthcare processes: *"een elektrotechnische installatie in het ziekenhuis heel anders is dan een installatie in een winkelcentrum, omdat hier mensenlevens afhankelijk zijn van de elektrotechnische installaties."*

The need for control room technician A to develop documentation skills originates from his installation responsibility: *"Vastlegging en rapportage is heel nadrukkelijk wel voor regiekamertechnici A, want die moet een veranderingsvoorstel aan zijn installatie wel goed op tafel kunnen leggen. Hij hoeft niet dikke vette beleidsstukken voor de raad van bestuur kunnen schrijven, maar wel goed kunnen verwoorden. Dus op enig abstractie niveau over de toekomst kunnen nadenken."*

Multiple respondents emphasize stress resistant traits and communication skills, especially in case of calamities: *"Als het werkelijk misgaat, staan zij direct vooraan. Bij een calamiteit zijn dit de mannen die zonder trillende handjes door kunnen pakken en besluitvaardig zijn. Als het misgaat staat iedereen naar die mannen te kijken tot aan de raad van bestuur." "Stressbestendig. Kalmte is wel een waardevol iets, je moet echt proberen het overzicht te houden, rustig zijn en goed nadenken wat de gevolgen zijn van je handelen tijdens een storing. Niet blindelings iets gaan doen, een stapje terug en eventueel een kop koffie erbij als het een grote storing is. Wat ga je doen? Wat is het plan? Dus ook communicatieve vaardigheden, want je moet ook mensen in het veld aansturen."*

The coordination role and delegating others internally during calamities is often discussed: *"Bij een calamiteit de leidende rol op zich nemen, mensen aansturen, informatie verzamelen en vooral niet zelf de storing oplossen maar een stap terugdoen en het overzicht houden, dat is een belangrijke capaciteit. Daarnaast moeten ze met zijn 2-en, de ene storingsgericht en de andere communicatief gericht, de boel snel oplossen."*

In case of disruptions control room technicians tend to lapse into their old fix-it technician role instead of coordinating others: *"Niet zelf direct storingen willen oplossen, coordinerende/leidinggevende rol aannemen als je op regiekamer zit"*.During a major calamity this was shown to be true as well: "*Bij grote calamiteit is de regiekamer het centrum waar informatie bij elkaar komt. Nu rent iedereen als kip zonder kop alle kanten op. Iedereen moet eigenlijk in de koffiekamer verzamelen en de regiekamer coordineert de boel."*

One respondent reflected on the lack of knowledge among majority of control room technicians to be responsible for installations: *"bij menigeen ontbreekt kennis over alle installaties, omdat ze uit de apparatuur komen. Ongeveer zes hebben installaties onder zich, en twee of drie hiervan kennen alle installaties en de rest komt niet uit installaties. Totaal zouden acht personen installatieverantwoordelijk worden en eigenlijk moeten twaalf personen de basiskennis hebben, dat zijn er nu drie."* Another respondent is concerned with the lack of broad knowledge on installations among control room technicians: *"Intern is weinig brede basiskennis over de installaties (bijv. verpleegoproep), dat moet er wel komen."*

The group control room technicians is expected to be mainly self-managed: "*Een regiekamertechnicus moet het zelf kunnen regelen en alleen als hij daar niet uitkomt dat hij opschaalt naar contractmanager of naar de manager. Zelfstandigheid moet dus hoger zijn dan nu. Veel meer toe naar kaders waarbij ze zelf de verantwoordelijkheid oppakken. De regiekamer belangrijk zelfsturend team, daar hoeft weinig toezicht en sturing op plaats te*

vinden." However, some respondents support the notion that current fit between function and employee is insufficient: *Dat gaat mis op technische kennis, zelfstandigheid en zelfsturendheid. In mijn ogen zijn er weinig mensen nu in de pilot die aan de omschrijving voldoen, omdat het grotendeels techneuten zijn die altijd werkbonnen kregen en met een karretje rondreden en nu heel andere dingen moeten doen. Daar is nog een hele uitdaging in te vinden."* Multiple respondents recommend an educational level above MBO4, because of the desired autonomous group behavior: *"De HBO'er kijkt meer naar het geheel en heeft vaak betere communicatieve vaardigheden en kan daardoor beter minder technisch onderlegde mensen overtuigen van zaken. Je moet ook scenario's uit kunnen werken en ja, ik denk dat daar HBO voor nodig is."*

Several respondents mention that the general behavior of some control room technicians does not contribute towards an autonomous, self-regulating group:"*Verkeerde houding, instelling van 'het-niet-willen-en-op-eigen-manier-doen'. Je zit in een team, behandel elkaar met respect maar wees wel eerlijk en spreek elkaar op zaken aan en accepteer kritiek."* One respondent was displeased by the lack of eagerness to learn:*"Als het rustig is, zit ik ook wel eens op internet. Maar pak dan ook eens het GBS erbij of verdiep je eens in de documentatie van installaties die je nog niet goed kent. Niet zo van lang leve de lol"*Another respondent describes control room technicians should be more disciplined: "*Sommige mensen houden zich ook niet aan afspraken en fietsen overal tussendoor; bijvoorbeeld geldigheidsdatum werkvergunning aanpassen omdat dit makkelijker is."*

Acknowledging the difficulties of identifying current levels of competence and developing those necessary, a respondent said the following:"*Hoe gaan we zo beoordelen of iemand geschikt is als rol voor installatieverantwoordelijke of voor de regiekamer? Wat moet je doen om je op de gebieden die ondermaats zijn te ontwikkelen? Hoe toets je of iemand*

communicatief vaardig is? Laat je een brief schrijven, laat je een mail sturen? Wellicht met scenario's gaan werken om te kunnen beoordelen."

Another respondent emphasizes the next step that should be taken by management after mapping these competencies; create a clear development program for the competencies required from control room technicians: *"Elk jaar cursussen op het vakgebied waar men verantwoordelijk voor is. Voor iedereen sowieso enkele basiscursussen, zoals stoomketeloperator, brandmeldinstallatie. Ook de protocollen kennen van alles, bijv lift/heli-dek protocollen, of operatiekamer-luchtbehandelingskasten. Deze protocollen staan in DBS. Er moet duidelijk zijn wat de basiscursussen zijn naast de opleiding. Er moet een duidelijke structuur komen in opleidingsmethodiek. Basiskennis voor ketelhuis is bijvoorbeeld cursus Keteloperator."*

Concerning the relations between the three functions, the control room technician and locally deployed technician are said to be the most interconnected:"*Regiekamertechnicus en technisch medewerker hebben de belangrijkste relatie: technisch medewerker ziet wat op de werkvloer gebeurd en regiekamertechnicus wat in de installatie gebeurd. Zij zijn samen de ogen en de oren op de werkvloer."* However, the difference in output expectations is striking: "*Verder is het verschil wel groot, de regiekamertechnici zijn de machinisten en de technisch medewerkers zijn de butlers.* One respondent accurately described the parting line in responsibilities between these two functions is anything related to installations: "*Zodra het installaties betreft moet de RKT erbij betrokken worden of als een opdracht teveel tijd kost. Zij[technisch medewerker] moeten aandacht hebben voor alles wat in het zicht ligt en als hier wat aan moet gebeuren moeten zij dat doen. Zodra het achter de muren verdwijnt, in de technische ruimtes, dan moeten ze dat doorschakelen naar de regiekamer.*"

5.1.2. Conclusion control room technician competencies

Comparing the knowledge requirements, the competency themes from documentation and interviews are almost identical. A minority of themes are distinct between transcript results and function profile, i.e. additional courses (RKT-A), trends & developments discipline and protocols DBS [document administration system].

Concerning skills, the contrast between themes from the function profile and interviews is more prominent. Certain commonly sought-after skills from the document were not mentioned in the interviews, namely discipline, persuasiveness, patience and acuity. The respondents on the other hand, were more elaborate in describing a variety of specific skills not found in the function profile. Frequently mentioned themes are time management, delegate/coordination skills, project skills and documentation skills.

Finally, behavior was not explicitly described in the internal documents, yet respondents were asked specific questions on this topic. The data shows a multitude of behavioral expectations. Frequent recurring themes are proactive, studious, stress resistant, team spirit and customer-oriented behavior.

5.2. Function contract manager

The internal documentation provides a brief description of two goals for the contract manager. The primary goal of this function concerns contracting, planning, and managing activities for external contractors. A secondary aim is to plan and schedule the employees of the maintenance department.

One respondent emphasized contract management: "*Bewaken van de voortgang en de inhoud van de contracten met externe partijen."*Another argues that the contract manager is an agent translating the hospital's maintenance requests towards external contractors:"*De contractmanager is de intermediar tussen wensen MST en de zakelijke partners. Omdat we*

veel gebruik maken van externe partners, zijn er nogal wat contracten die geregeld moeten worden. Dus de dagelijkse aansturing nu geschied met werkvoorbereiders, dat gaat zometeen iets anders, door zogenaamde contractmanagers. Die de balans in de dagelijkse werkvoorraad in combinatie met onze externe partners moeten zien te borgen." The results show agreement with the documentation on the goals for the contract manager. These two tasks and corresponding responsibilities led the respondents to the competency themes found in Table 5 below.

Table 5: Competencies function contract manager

MST function profile	Results of interviews	MST Competency-index
Knowledge Technical certificate (HBO) Health care processes MST Composition and function of all installations Effect of installations on health care processes Legal regulations concerning installations Safety regulations & environmental legislation Additional business courses	Knowledge Contract management x8 Effect of installations on health care processes x6 Composition and function of all installations x5 Market conformity x4 Safety & Legal regulations installations x2 Technical certificate x2 No technical certificate x2 Business certificate (HBO) Negotiation knowledge	Leidinggeven 1 (Besluitvaardigheid) Leidinggeven 3 (Delegeren) Leidinggeven 6 (Plannen & Organiseren) Leidinggeven 7 (Voortgangscontrole) Ondernemen 8 (Marktgerichtheid) Ondernemen 9 (Netwerken) Ondernemen 11 (Patiënt-/Klantgerichtheid) Analyse & besluitvorming 13 (Creativiteit) Analyse & besluitvorming 14 (Oordeelsvorming) Analyse & besluitvorming 15 (Omgevingsbewustzijn) Analyse & besluitvorming 16 (Organisatiesensitiviteit) Analyse & besluitvorming 17 (Probleemanalyse) Analyse & besluitvorming 18 (Visie) Communicatie 19 (Inlevend Vermogen) Communicatie 20 (Luisteren) Communicatie 21 (Mondeling communiceren) Communicatie 22 (Onderhandelen) Communicatie 23 (Overtuigingskracht) Communicatie 24 (Presentatie)
Skills & behavior Independent Analytical skills Planning Discipline Written & oral communication Persuasiveness Acuity Systematical Accurate Negotiation skills	Skills Written & oral communication x9 Negotiation skills x6 Relations management x5 Perseverance x4 Thoroughness x3 Persuasiveness x3 Planning x2 Control external parties Computer skills Assessment skills Organizational sensitivity Systematical	

Perseverance Patience	Documentation skills	Communicatie 25 (Samenwerken) Communicatie 26 (Schriftelijk communiceren) Communicatie 28 (Representativiteit)
	<u>Behavior</u> Stress resistant x5 Positive attitude x2 Integrity x2 Driven Studious Collective responsibility Professional attitude Humor	Motivatie 29 (Ambitie) Motivatie 30 (Discipline) Motivatie 31 (Initiatief) Motivatie 32 (Integriteit) Motivatie 33 (Inzet) Motivatie 34 (Leervermogen) Motivatie 35 (Kwaliteitsgerichtheid) Motivatie 36 (Resultaatgerichtheid) Persoonlijk gedrag 38 (Accuratesse) Persoonlijk gedrag 39 (Assertiviteit) Persoonlijk gedrag 41 (Flexibiliteit) Persoonlijk gedrag 43 (Mentale weerbaarheid) Persoonlijk gedrag 45 (Organisatieloyaliteit) Persoonlijk gedrag 46 (Stressbestendigheid) Persoonlijk gedrag 47 (Vasthoudendheid) Persoonlijk gedrag 48 (Verantwoordelijkheid) Persoonlijk gedrag 49 (Zelfstandigheid)

5.2.1. Descriptive quotes contract manager

The need for good planning skills combined with knowledge of installations and their impact on healthcare processes is made clear in this example: *"Niet dat je hoogzomer de koeltorens gaat onderhouden of in de winter het ketelhuis. Daarmee zou je de boel ontregelen en belangrijke processen in het ziekenhuis platleggen."*

Another respondent provides an example of why basic knowledge of installations combined with communication skills is required: *"Als je kijkt naar operatiekamers, zo zijn er meer belangrijke ruimtes binnen een ziekenhuis. Dan moet de contractmanager weten wil je daar de luchtbehandeling regelen, dat het aan een aantal elektrotechnische en werktuigbouwkundige systemen vast zit waar ook een besturingssysteem op zit. Hij hoeft dit systeem niet te kunnen gebruiken, maar moet wel goed weten dat als er een koelwater probleem is de operatiekamer buiten werking is. En dat op het moment dat er onderhoud gedaan moet worden, dat dit gevolgen heeft voor gebruikers. Hij moet weten dat op het moment dat er werkzaamheden gepland zijn en dat heeft consequenties voor bijvoorbeeld hygiënische randvoorwaarden van een afdeling, dat daar mee gecommuniceerd wordt."* Additionaly, their overall installation knowledge has to be broad but not exceptionally deep:*"Ik denk dat ze niet zo diep hoeven, dat is de taak van de regiekamertechnicus en maintenance engineer. Ze moeten wel een basiskennis hebben, maar verder meer op de contracten zitten."*

A number of respondents describe the need for the contract manager to know market conformity and develop relations to act as a mediator between different stakeholders: *Moet op de hoogte zijn van marktconformiteit. Moet een speler zijn die mensen kan binden, partijen kan binden. Maar die ook draagvlak kan krijgen van het werk van MST voor een externe partij, maar ook wat een externe partij doet binnen het MST.* Communication skills are important due to the diversity in negotiating partners: *"Hij moet op verschillende niveaus*

kunnen communiceren, met zowel teamhoofd, arts en monteur kunnen praten om tot de juiste contracten en afspraken te komen."

In addition, one respondent mentions the need to remain persistant: *"In tegenstelling tot een huismeester[technisch medewerker], dat moeten teddyberen zijn, moet de contractmanager niet anders worden als hij een boos iemand tegenover zich heeft en vasthouden aan zijn gewenste contract afspraken."*

Another respondent argued that the contract manager should be more focused on contracts and less on supervision: *"Veel meer in de contracten zitten en kennis van de contracten hebben. Ze gaan nu nog veel te veel het huis in om met contractanten mee te lopen en dat moet minder zometeen, dat zou de regiekamer moeten doen."*

5.2.2. Conclusion contract manager competencies

Comparing the knowledge requirements, the competency themes from documentation and interviews show some differences. Major themes only found in the transcript results are contract management and market conformity. In addition, the interview results indicate ambiguity on whether the contract manager requires a technical certificate.

Concerning skills, the similarities between themes from the function profile and interviews are more prominent. Still, the respondents agreed on the importance of two themes not found in the documentation, i.e. relations management and thoroughness. In conformity with results for the control room technician, the function profile describes commonly sought-after skills which respondents did not explicitly mention, i.e. independent, analytical, discipline, accurate, patience and acuity.

Finally, behavior was not explicitly described in the internal documents, yet respondents were asked specific questions on this topic. The interview results show a diversity of behavioral expectations. Frequent recurring theme was stress resistant behavior.

5.3. Function locally deployed technician

According to the function description the goal is threefold. First, the local technician exists to support the user through solving disruptions and execution of minor adjustments of the building, installations and machinery. In addition, he or she performs inspections and surveys the assigned building section. Finally, the technician provides support and supervises external contractors that are working in his/her section of the hospital.

One respondent described the role of locally deployed technician as the lubricating oil in service of other hospital departments: *"smeerolie voor de afdelingen; wij zetten een aantal technici lokaal in. Die zijn direct benaderbaar en dichtbij de daadwerkelijke gebruiker, op het moment dat deze technische problemen ervaart dan kan die technisch medewerker direct benaderen en die hem dan direct helpt met het oplossen van het probleem."* Another stresses their role as technical observer in the field: *"Ze zijn de ogen en oren in het veld en moeten dus aandacht hebben voor wat er in de ruimtes technisch niet helemaal goed is en dat of zelf oppakken of zorgen dat het gebeurd."* Multiple respondents describe that this locally deployed technician is expected to be multi-skilled: *"Het moet een handige harry zijn. Eigenlijk ben je timmerman, elektricien en loodgieter en is hij dus allround."*

Based on these three tasks and corresponding responsibilities, the respondents mentioned competency themes found in Table 6 below.

Table 6: Competencies function locally deployed technician

MST function profile	Results of interviews	MST Competency-Index
<u>Knowledge</u> Practical technical knowhow Health care processes MST Effect of installations on health care processes Specific knowledge assigned building areas	<u>Knowledge</u> Broad basic technical knowhow x9 Health care processes MST x4 Service provision of Facilitair Bedrijf x4 No technical knowledge x2 Specific knowledge assigned building areas x2	Leidinggeven 6 (Plannen & Organiseren) Ondernemen 11 (Patiënt-/Klantgerichtheid) Analyse & besluitvorming 13 (Creativiteit) Analyse & besluitvorming 16 (Organisatiesensitiviteit) Communicatie 19 (Inlevend Vermogen) Communicatie 20 (Luisteren) Communicatie 21 (Mondeling communiceren) Communicatie 24 (Presentatie) Communicatie 25 (Samenwerken) Communicatie 28 (Representativiteit) Motivatie 30 (Discipline) Motivatie 32 (Integriteit) Motivatie 33 (Inzet) Motivatie 34 (Leervermogen) Motivatie 35 (Kwaliteitsgerichtheid) Motivatie 36 (Resultaatgerichtheid) Persoonlijk gedrag 37 (Aanpassingsvermogen) Persoonlijk gedrag 39 (Assertiviteit) Persoonlijk gedrag 41 (Flexibiliteit) Persoonlijk gedrag 42 (Fysieke belastbaarheid) Persoonlijk gedrag 43 (Mentale weerbaarheid) Persoonlijk gedrag 45 (Organisatieloyaliteit)
<u>Skills</u> Independent Solution driven Discipline Customer-oriented Oral communication Mobility Quality-oriented Acuity Perseverance Patience	<u>Skills</u> Oral communication x10 Customer-oriented x7 Resourcefulness x6 Independent x4 Systematical x4 Solution driven x2 Mobility x2 Quality-oriented Analytical skills	
	<u>Behavior</u> Positive attitude x6 Professional attitude x5 Patient-oriented x4 Empathic 3x Proactive x2	

	Flexible x2 Stress resistant	Persoonlijk gedrag 46 (Stressbestendigheid) Persoonlijk gedrag 48 (Verantwoordelijkheid) Persoonlijk gedrag 49 (Zelfstandigheid)

5.3.1. Descriptive quotes locally deployed technician

Some respondents say this function requires a jack-off-all-trades with little to no technical schooling: *"Het is nu van simpel monodisciplinair, naar simpel multidisciplinair. Beste definitie van de technisch medewerker als het om vakinhoud gaat: "Wat hij thuis kan, kan hij hier ook."* Other respondents argue that technical knowledge is important for this function: *"Technische opleiding; tot MTS-niveau. Basiskennis van gebouw en techniek in gebouw. Technisch medewerker moet toch wel MBO-niveau zijn. Goed technisch onderlegt, maar niet op universitair niveau."* One respondent strongly disagrees with stripping away technical tasks and concludes that if this would be the case, the function should be changed to that of janitor: *"Maar als je die jongens een mopkar geeft, dan kan je ze beter concierge maken."* Another respondent shared their concern about the impact of this decision on career opportunities and internalizing firm-specific knowledge: *"Doorgroei wordt wel lastig, omdat de huismeester[technisch medewerker] deels wordt uitgekleed en niet mag sleutelen aan installaties, belangrijk wel zorg te dragen voor goede doorstroom. Hoe doen ze dan nog benodigde kennis op?"*

The locally deployed technicians come from various disciplines (e.g. carpenter and gardener) which currently leads too distinct differences in output and expectations: *"En de verschillende kennisniveaus, waardoor verschillende verwachtingen worden gewekt bij de verschillende gebouwdelen. Dan gaat de klant denken: 'Ja de vorige TM loste alles op en deze TM die constateert alleen wat ik zelf al doe, dat kan ik dan ook wel'. "De mensen die er nu zitten hebben niet de juiste opleiding, als je een timmerman en tuinman daar plaatst is het niet goed – moet een MBO-er opzitten. De technisch medewerker moet zelf ook initiatief tonen, niet alleen afwachten tot iemand een storing meldt."*

Another respondent argues that the absence of a clear framework of responsibilities combined with the diversity in expertise makes it hard to expect standardized output: *"De*

proef loopt heel anders dan ze in eerste instantie bedoelden. Er zijn geen kaders aangegeven en ze hebben er een timmerman neergezet maar ook iemand die regeltechnisch heel erg goed onderlegt is. Als er temperatuur klachten zijn dan loopt de timmerman naar de ruimte en zegt: "Ja dat klopt". Terwijl de regeltechnicus die gaat alles bijregelen, haalt meters op en stelt de temperaturen en regeltechniek zelf bij. Zo trekt de ene direct aan de bel bij de regiekamer en de ander loopt vrolijk zelf in de installatie te klussen. Dat lijkt me niet de bedoeling."

The merit of keeping this function in-house to retain specific behavior and skills required within this hospital is often mentioned: "*eerstelijnsopvang, dan hebben we het veelal over simpel werk – een lampje indraaien, rammelende deurklink, helpen een bureau te versjouwen. Daarvan hebben we gezegd dat moeten mensen van het ziekenhuis zijn, niet omdat dit enorm rendabel is of complex, maar dat vraagt gevoel met het ziekenhuis en de patiënt. Een leverancier heeft hier ook niet veel toegevoegde waarde, want het indraaien van een lamp is niet kennis intensief of kapitaal intensief. Je kunt daarmee wel heel dichtbij de zorg veel aandacht geven, het zijn de ambassadeurs van de technische dienst."*

One respondent provides a comical example why firm-specific knowledge is needed to operate in assigned building areas: *"Een technisch medewerker op radiologie moet op de hoogte zijn van speciale voorschriften; dat hij niet met zijn gereedschapskist even de MRI binnenwandelt. Doet hij dat wel dan is hij die kist snel kwijt en een onderhoudsklus rijker."*

Multiple respondents argue that due to the flexible and undocumented nature of the function, a systematic approach is essential: *"Goed georganiseerd kunnen werken, zit een grote uitdaging in dat niets geregistreerd wordt wat de technisch medewerker gaat doen. Ik weet niet hoe dat zou moeten, er wordt nu niets geregistreerd, maar als een technisch medewerker op vakantie gaat of ziek wordt moeten ze onderling wel iets bedenken waardoor*

ze van elkaar op de hoogte zijn waar ze mee bezig zijn. Dat is moeilijk omdat er niets wordt geregistreerd, terwijl we daar wel een mooi systeem voor hebben."

Empathic and patient-oriented behavior is often mentioned, locally deployed technician works in many different environments: *"aan de ene kant heb je de verloskamers daar is iedereen vrolijk want hier worden kinderen geboren en aan de andere kant hebben ze de oncologie waar mensen doodziek zijn, daar moet je je wel kunnen inleven."* Another respondent emphasizes this patient- & customer-oriented behavior: *"Hij moet ook prettig in de omgang zijn. Er loopt nu een technisch medewerker rond en dat is net een knuffelbeer, iedereen vindt hem altijd aardig en dat is wat je zoekt. In zo'n ambassadeursrol heb je dat wel nodig."*

5.3.2. Conclusion locally deployed technician competencies

Comparing the knowledge requirements, the competency themes from documentation and interviews show some discord. One major theme frequently mentioned by respondents is knowledge of all service provision by Facilitair Bedrijf. This is the business unit the maintenance division is a part of and which provides several supportive services for the other hospital departments. Additionally, the interview results indicate ambiguity on whether the locally deployed technician requires any technical knowledge.

Concerning skills, the similarities between themes from the function profile and interviews is apparent. Still, the respondents agreed on the importance of two themes not found in the documentation, i.e. resourcefulness and systematical. In harmony with the other functions, the internal profile describe generically sought-after skills left unmentioned by respondents, such as discipline, perseverance, acuity and patience.

Finally, behavior was not explicitly described in the internal documents, yet respondents were asked specific questions on this topic. The interview results show a

diversity of behavioral expectations. Frequent and notable recurring themes were a positive & professional attitude and patient-oriented behavior.

5.4. General and supervision competencies

Across the three function profiles found in the documentation, some competency themes are recurring for all functions. The internal documentation did not provide separate information on supervision competencies. Although it is understandable that the department makes no distinction in their job descriptions, this research emphasizes the merit of managing external contractors properly.

A respondent describes this general need for supervision: *"In verleden kon een firma binnenlopen via hoofdingang, bezig gaan en vertrekken en dan wisten we pas dat ze bezig waren geweest toen de factuur op de mat viel."* Another respondent formulated the supervisory task in a nutshell: *"Zorgen dat de juiste bedrijven met juiste mensen voor de juiste taken met de juiste bevoegdheden binnenkomen om de werkzaamheden uit te komen voeren en daar moeten wij op bewaken."* The oursourced maintenance is mainly of preventive and specialistic nature; *"In hoofdlijn de bulk van de planbare sleutelwerkzaamheden, complexe/specialistische 2e lijnstoringen. Dan bedoel ik daar waar speciaal gereedschap of certificaten nodig zijn."*Other respondents acknowledge that almost all maintenance is done externally:*" Eigenlijk al het sleutelwerk. Alles waar gereedschap voor nodig is, zowel preventief en steeds meer correctief."* In contrast, this respondent mentions that it is important to not outsource everything: *"Alles wat in communicatieve zin nodig is om de techniek in het gebouw te laten werken. Organisatie sensibiliteit, communicatie zin en technische achtergrond, begrijpen van de systemen en de juiste techneut vinden die het probleem kan oplossen blijft belangrijk om intern the houden."*

The internally described general competencies and the suggested general and supervision competency themes mentioned by respondents are shown in Table 7.

Table 7: General and supervision competencies

MST function profile General competencies	**Results of interviews General competencies**	**Results of interviews Supervision competencies**
Knowledge Health care processes MST Effect of installations on health care processes	Knowledge Broad basic technical knowhow 4x Health care processes MST 2x	Knowledge Deep understanding installations x5 Contract contents x4 Safety regulations x2 Health care processes MST Effect of installations on health care processes
Skills Independent Discipline Oral communication Perseverance Acuity Patience	Skills Written & oral communication x5 Customer-oriented x4 Patient-oriented x4 Patient safety Organizational sensibility Independence Relation management Discipline Solution driven Mobility Documentation Decisiveness	Skills Delegate and coordination skills x3 Negotiation skills x3 Communication x2 Documentation x2 Organizational sensibility Project skills
	Behavior Team spirit x5 Positive attitude x3 Professional attitude Passion Studious Winner mentality Stress resistant Collective responsibility Emphatic	Behavior Integrity x4 Professional attitude Solution driven Stress resistant

5.4.1. Descriptive quotes general and supervision competencies

A broad basic level of technical knowhow is expected of all employees within the department, and the data suggests respondents tend to agree on this: *"Ik vind dat elke functie dezelfde basis moet hebben hier, dat iedereen gewoon communicatief fatsoenlijk is zowel schriftelijk en mondeling. Daarnaast ook een bepaalde basiskennis techniek, dat vind ik wel belangrijk. We zijn toch een TD[Technische dienst], daar moet je geen ongeschoolde baker neerzetten."*

Furthermore, basic understanding on how healthcare processes are organized and are impacted by maintenance is suggested to be mandatory for the complete workforce. One example greatly emphasizes this understanding: *"Kijk, een lift in de patiëntenhal is heel belangrijk voor de patiënt, maar als die lift stil staat wordt een patiënt niet bezocht door familie. Op het moment dat lift van de traumahelikopter stil staat betekent dat een ernstig zieke patiënt misschien niet naar de operatiekamer kan en kan sterven, dus zo'n lift heeft een heel andere impact. Dat moet hij weten en daar moet hij de communicatie op aanpassen. Dus communicatieve vaardigheden is een andere die belangrijk is."*

Multiple respondents illustrate the importance of a patient-oriented approach by the whole workforce: *"Iemand die met technische storing bezig is, maar ziet dat een patient zijn weg niet kan vinden zal dan toch even met die patient in contact moeten om hem verder te helpen.""Er liggen hier even plat gezegd 800 doodzieke mensen in het ziekenhuis. Die zijn voor een deel van hun gezondheid afhankelijk van de techniek en die verantwoordelijkheid neem je op je schouders zodra je hier de poort binnen loopt."*

Concerning supervision, some respondents argue that perseverance is crucial:*"Belangrijke competentie is nog dat je laat merken dat je de baas bent over de externe en niet andersom. De buitenfirma beslist niet."*

Another respondent formulated the general attitude required from the total workforce as follows: *"het pro-actief benaderen van de techniek, zodat tendensen worden vastgelegd/gemonitord en daar zoveel mogelijk storingen preventief in worden opgepakt."* A pro-active approach to prevent as many disturbances as possible through documentation and monitoring, seems to be seen as the desired behavior of the employees.

Supervision requires four steps to be effective, namely specification, planning, inspection and control of externally performed maintenance tasks. According to multiple respondents the control room technician is responsible for specification and control on the performed maintenance. The contract manager shares responsibility for specification, but is also in charge of planning and process control:"*Specificeren is rol regiekamertechnicus samen met contract manager en wellicht maintenance engineer. Plannen: rol maintenance engineer en contract manager. Controleren: vakinhoudelijk regiekamertechnicus en procesmatig de contract manager."* The control room technician is also responsible for the safety, inspection and verification of the external contractor during activities. *"Regiekamertechnicus vangt de externe op, zet ze aan het werk en schakelt vrij. Zorgt dat ze veilig kunnen werken en dit goed uitvoeren. Regiekamertechnici zijn verantwoordelijk voor uitgevoerde werk en contract manager voor plannen." Regiekamer heeft belangrijke taak in wat er die dag gebeurd; bewaken van de veiligheid en het signaleren en acteren bij calamiteiten."* This division of responsibilities is confirmed by an external contractor: "*Regiekamertechnicus komt met probleem en een storing, vraagt of wij[externe partij] het op kunnen lossen en wat het gaat kosten. Hiermee gaan ze naar de contract manager, na goedkeuring krijgen wij een werkorder van contract manager. Naderhand melden wij ons bij de regiekamertechnici en die zou ons dan moeten controleren. "*

The actual inspection of external contractors during or after activities is stated to be lackluster: *"Controle op installateurs/aannemers moet beter en steviger door*

regiekamertechnici. Moet meer controlerende taak komen op externe firma's of ze goed, veilig en netjes werken. Bijvoorbeeld regiekamertechnicus moet in ieder geval 1x een firma controleren tijdens zijn dienst tijdens de werkzaamheden. Of de installatie-verantwoordelijke doet dat." In addition, critical assessment of the performed activities is mentioned to be insufficient: *"Goed begeleiden van externen en rapportages ter kennis nemen, niet blindelings geloven maar ook zelf nadenken. Uit de rapportages ook echt punten oppakken die van belang zijn voor de installaties."* Some respondents are confused which control room technician has final responsibility: *"Wie is verantwoordelijk voor het veiligstellen, uitvoer controleren en oplevering beoordelen door externen? Is dat de regiekamertechnicus van die dag of de opdrachtgever van de werkzaamheden?"* Finally, one locally deployed technician was unsure about his responsibilities towards external contractors: *"Begeleiden wat er moet gebeuren en zorgen dat ze veilig terecht kunnen. Ik voel me wel verantwoordelijk, maar weet niet of dat echt zo is."*

5.4.2. Conclusion general and supervision competencies

The results in this section originate from the necessity to develop an exhaustive overview of competencies. Respondents had the opportunity to specifically mention competency themes that might have been overlooked per function.

Comparing the knowledge requirements, the previously described competency themes per function show many similarities with those mentioned in Table 7. One noticeable supervision knowledge theme is contract contents. Employees involved with an external contractor ought to know the specific purpose and contents of that contract to supervise correctly.

Concerning skills, the previously mentioned themes and the general competency results are comparable – no new themes were discovered. The same conclusion can be drawn

for supervision competencies, the data emphasizes the merit of recurring themes, i.e. delegation and coordination, documentation, communication and negotiation skills.

Finally, themes on behavior comprise a variety of competencies also found in the preceding function results, frequently mentioned are team spirit, integrity and positive attitude.

In summary, no notable divergence from previously mentioned competencies is discovered. Still, the respondents provided a wealth of examples and contextual information based on the questions regarding general and supervision competencies.

5.5. Results external interviews

In addition to the interviews with employees of the maintenance department, external interviews were also conducted to explore other relevant insights. Quotes that provide context for the described competencies themes or identify dilemmas are mentioned.

5.5.1. Descriptive quotes project leader MST

The technical expertise among control room technicians play a vital role for projects: *“Daar zitten voor mij de resources die ik nodig heb om een project goed uit te voeren, in mijn eentje kan ik dat meestal niet. Ik heb altijd installatieverantwoordelijke nodig, zij hebben de technische detail kennis. Ik heb wel globale kennis van W, E & B [Werktuigbouw, Elektra & Bouwkunde], maar zij gaan de diepte in.”*

The desired educational level for project participation is above MBO4, preferably HBO with deep installation knowledge and project skills: *“Minimaal MBO+/HBO niveau, maar het liefst HBOers die verstand hebben van de installaties, weten hoe je in projecten functioneert. Nou, dan mag ik ook wel zeggen op sommige gebieden MBO+ niveau, maar het liefst denk- en werkniveau van Hbo’er.””*

The control room technician is expected to have good communication and analytical skills combined with stress resistance and strong adaptability: *"Snel kunnen schakelen, absoluut stressbestendig zijn. Goed verbaal vermogen om uit te leggen wat de problematiek is en kunnen omgaan met situaties waar je het misschien niet mee eens bent maar waarbij je je verbaal op een goede manier kunt uitdrukken. Niet dat we als schreeuwlelijkerds tekeer gaan. Een zekere mate van analytisch vermogen, om de overview te hebben van een project/probleem. Van hen wordt ook verwacht dat ze op een bepaalde manier zich kunnen vertonen en communiceren met teamhoofden en externe partijen/aannemers."*

A pro-active and professional attitude is also required from the control room technicians that participate in projects: *"Professionele houding, mja is een beetje lastig. Ik verwacht inzet en enthousiasme, niet dat achterover gezakte 'Oh, moet ik weer aanschuiven?' en dat mensen zich van te voren inlezen en voorbereiden. Ik zeg wel eens "Ik ben Moeder Teresa niet voor jullie, als ik een vergadering heb verwacht ik een stuk eigen initiatief". Dat ze zelf in staat zijn in hun agenda tijd vrij te maken om zich voor te bereiden en goed beslagen ten ijs te komen."*

The project leader argues that few control room technicians currently fit these requirements and suggests the department is responsible for improving the competencies among multiple employees to increase overall project participation and reduce individual workload: *"Er lopen een aantal mensen rond die van de hoed en de rand weten, die zet ik dus constant in op projecten. En dat vind ik erg lastig, gezien de kleine groep mensen waar ik uit put. Het zijn altijd dezelfde, ik heb 2 RKTers, 1 Me'r en nu een externe voor de luchtzijdige kant. Ik vind ook dat we iedereen een kans moeten gunnen, maar ik verwacht direct het niveau wat ik zoek; ik ga ze niet opleiden. Ik verwacht als ik resources afneem van de afdeling, dat ze geschikt zijn om in projecten mee te draaien. Dat mag ik verlangen van Gebouwbeheer, maar dan wordt de spoeling dun. "*

5.5.2. Descriptive quotes HR advisor MST

Firm-specific knowledge is one of the reasons to keep the control room technician as in internal function: *"Doel van regiekamertechnicus begint bij wens om zo min mogelijk onderhoud zelf te doen, maar wel de kritische kennis in huis hebben. Op deze manier de controle hebben op de externe partijen en ze veilig kunnen laten werken."*

The contract manager is the linking pin to fit internal requirements with the right external contracts: *"Doel om onderhoud zoveel mogelijk bij de goede partijen buiten de deur te zetten en die contracten beheren, ook spiegelen aan marktconformiteit en kritisch zijn of het de juiste contracten zijn. Belangrijk onderdeel ook stukje planning en roostering. Belangrijkste is juiste contractafspraken met leveranciers."*

Locally deployed technicians are essentially there to make the maintenance department accessible for internal clients: *"Doel om toegankelijker te zijn voor de klant om kleine dingetjes door te geven; eerder ging dat via FSM en dan naar Gebouwbeheer en dan pas naar een medewerker.*

Career opportunities should be possible between functions locally deployed technician and control room technician to retain firm-specific knowledge and skills: *"Doel van het plan is wel een stukje doorstroom, dat technisch medewerker naar regiekamertechnicus B kan groeien en deze functie naar regiekamertechnicus A.Echter is een vacature voor regiekamertechnicus A uitzetten ook geen probleem, maar de mogelijkheid om door te kunnen stromen en te ontwikkelen is wel belangrijk met het oog op interne expertise en vaardigheden."*

The goal of the general competency-index is explained, it is developed to facilitate performance evaluation on measurable competencies: *"Op basis van inhoudelijk meetbaar*

maken van prestatie-indicatoren en zichtbaar gedrag met de competenties [Competentie-index MST], dit gedrag zou je kunnen toetsen met 360 graden feedback formulieren. Beoordeling moet gaan om waar je kunt ontwikkelen, los van waar je staat. Heeft een competentie meerdere lagen en zijn er verschillen in."

5.5.3. Descriptive quotes business manager Enexis

An external interview was held at a firm responsible for large parts of the Dutch energy grid. The interviewee was responsible for managing maintenance and ensuring uptime of this network. Due to the many similarities with the function control room technician, this interview was conducted. Therefore, these quotes should be read in relation to the control room technician.

The significance of both having deep knowledge of the network and being able to estimate the impact of decisions on other parts of the network is crucial: *Je moet weten dat als je ergens een vermogen instuurt wat er in het net gebeurd, dat je er een kortsluit-vermogen doorheen kan jassen of een vermogen ergens heen stuurt wat niet kwijt kan. Goede elektrotechnische kennis is dan belangrijk. Je moet met onze systemen en software, dat je weet wat je doet. Je moet ook overzicht kunnen houden, want soms leidt 1 trafo tot meerdere segmenten. In groningen zit bijvoorbeeld een net heel lastig in elkaar. Dit is verdeeld over vier bladen en dan ook nog over vier hoofdstations, dus je moet echt goed weten tijdens een storing wat de impact van je keuzes is op het hele net."*

Accruing firm-specific skills and knowledge is important and achieved through learning on the job: *"Om kunnen gaan met het bedrijfsvoeringssysteem, dit omvat complexe software en protocollen die je niet in de schoolbanken leert. En learning on the job, dat wil zeggen monteurs die je aan de telefoon krijgt, hoe je die fatsoenlijk moet benaderen, hoe je de juiste kanalen gebruikt. Taalgebruik, we spreken bepaalt vakjargon, dat moet je dan leren."*

Behavorial traits such as stress resistance, patience and coordination skills in case of calamaties are emphasized: *"Stressbestendig. Kalmte is wel een waardevol iets, je moet echt proberen het overzicht te houden, rustig zijn en goed nadenken wat de gevolgen zijn van je handelen tijdens een storing. Niet blindelings iets gaan doen, een stapje terug en eventueel een kop koffie erbij als het een grote storing is. Wat ga je doen? Wat is het plan? Dus ook communicatieve vaardigheden, want je moet ook mensen in het veld aansturen. De uitvoerders daar zijn namelijk de ogen in het veld, dat kunnen wij hier niet zien."*

To detect discrepancies in existing and required competencies, Enexis plans to implement simulations of calamities or disturbances to provide feedback for their employees: *"Om de competenties te waarborgen zijn we bezig met een simulatie waarbij het energienet kan worden nagebootst. Dan leg je iemand een dilemma voor en aan de hand daarvan ga je dan een storingskaart behandelen. Hiermee kan de kennis dan getest en opgeschroefd worden en krijgt de medewerker feedback."*

Although evaluating employee performance on the required competency levels is desirable it is difficult to make these measurable, nevertheless a group feedback method is suggested: *"Het is heel moeilijk meetbaar hoe je die competenties beoordeeld. Nieuwe systematiek die we nu toepassen is het beoordelen van elkaar. Soort 360 graden feedback, daar moet de manager dan een stapje in terug doen alle informatie vergaren van collega's, een beeld vormen en in gesprek gaan met de persoon die het aangaat. Aan de hand daarvan kan er dan een beoordeling uitrollen."*

6. Discussion of results

"De beste technische dienst zit de hele dag te klaverjassen." - This quote perfectly describes the highest attainable goal for any maintenance department. The ideal world wherein all maintenance work is rendered superfluous, will be hard if not impossible to achieve in reality. Coming as close as possible to this ambitious maintenance setting is something to aspire to and the following discussion facilitates this. In addition to competency themes, the interviews also accrued to a rich narrative of bottlenecks and dilemmas for the department Gebouwbeheer (see the descriptive quotes in the results section). These issues will be explored in order of importance, based on both the theoretical findings and predominance in the results.

6.1. Undeveloped and absent competencies

Although the objective of this study was not to identify discrepancies between the required and actual competency levels, it was theorized that the knowledge, skills and behavior of the human capital pool strongly affect effectiveness of the maintenance department. This theory is supported in practice by a majority of the respondents who shared their concerns on this issue within the Dutch hospital. Almost all respondents acknowledged that they or their colleagues were lacking knowledge, skills or behavioral traits on some level to perform their new functions properly. This was the case in particular for control room technicians, who previously were just technicians and currently have more responsibilities that strongly deviate from their prior work.

The results indicate a lack of both deep and broad hospital-specific knowledge on installations among control room technicians. Providing an exhaustive list is beyond the scope of this research, but other competencies frequently mentioned as absent or undeveloped are time management, project skills, written communication, computer/office skills and

delegate/coordination skills. Some of these competencies can be developed through experience or internal guidance within the hospital, e.g. knowledge about healthcare processes MST, documentation skills and team spirit behavior. Other missing knowledge or skills might require courses and training from outside the hospital, e.g. specialized knowledge of installations, time management skills or negotiation skills.

In summary, provided that the maintenance department wants their workforce to function as effectively as possible, it is imperative to take stock of current competency levels and develop a clear and concise road map towards the desired levels.

6.2. Self-management issues control room technicians

Aside from the discrepancy between existing and desired competency levels, management also expects a fundamental shift in responsibility for control room technicians. Theoretical findings suggest behavior that contributes towards the department's goals is important to increase effectiveness and this resonates with the interview data.

The majority of employees in the function control room technician, used to be technicians exclusively maintaining machinery within their area of expertise. The new function requires independence and self-management from the group, yet many respondents wonder if there is a good fit between these requirements and the current pool of control room technicians. Due to the desired autonomous group behavior, multiple respondents recommend an educational level above MBO4 with an inclination towards technical HBO levels.

In addition, in case of disruptions or calamities the control room technicians tend to lapse into their old fix-it roles instead of delegating and coordinating others. There is also negative feedback on the general behavior of certain control room technicians, among other things this concerns the indifference to improve or learn and lack of discipline

To summarize, the control room technicians as a group need to grow in their self-managing role. Developing this autonomy and other behavioral traits needs to be stimulated by management through training or group sessions.

6.3. Ambiguity deployment local technician

Although both internal customers of the department and the locally deployed technicians themselves consider the pilot successful, there is discord concerning knowledge and skill requirements. When asked what management expects from the locally deployed technician, it is stated that they are considered light on technical expectations. However, it is also suggested by management that firm-specific skills, behavior and knowledge are important and the main arguments for keeping this function in-house. Other respondents argue technical certificates should be a requirement, to help standardize the function and also facilitate career flow.

Secondly, the locally deployed technicians come from diverse disciplines (e.g. carpenter and gardener), which leads too variations in output and unclear levels of expectation for customers. A framework with clear guidelines should be created, dependent on the final function profile, within which locally deployed technicians have the liberty to create own solutions. Anything outside this framework should be passed on to other functions responsible, e.g. the control room technician.

Finally, knowledge from all services provided by Facilitair Beheer was a frequent suggestion for this function. Since the locally deployed technician can be approached with requests by customers, being able to point them towards the correct service improves the customer-oriented behavior. If the decision to keep this function shallow in technical terms is maintained, it could even be considered to adjust the function and directly employ personnel as representatives for all services from Facilitair Beheer.

In summary, the function locally deployed technician is highly ambiguous in its current form. A consensus is required on the function profile and their responsibilities should be demarcated, while also pursuing a standardized level of service provision.

6.4. Relations between functions

The ambiguity of the function locally deployed technician has been discussed, but this also affects the relationship between them and the function control room technician. This relationship is stated to be the most important among the three new functions and the difference in output expectations is vast. The dividing line where the locally deployed technician should resort to the expertise of the control room technician is obvious in theory, anything installation-related or too time consuming is off-limits. On the other hand, some respondents argue that the locally deployed technicians call upon the control room technicians too quickly and should attempt solving problems more independently.

The contract manager and control room technician are mainly related through the contracts with external suppliers. The main consensus is that control room technicians provide specialized knowledge of their installations and approach the contract manager for external work orders or planning related issues.

The respondents generally agree that the relation between locally deployed technician and contract manager is limited to incidental work orders and communication regarding external contractors performing maintenance in their specific building area.

To summarize, the majority of respondents state that the relations between control room technician / contract manager and locally deployed technician / contract manager are unambiguous and functional. In contrast, there is still disagreement on when and how often locally deployed technicians pass on maintenance issues to control room technicians. It is

recommended to develop standard guidelines for this segregation of tasks between the two functions.

6.5. Supervision responsibilities

In the literature discussion it is suggested that properly detailed specifications, good planning and supervision are key to effectively manage external parties that perform the maintenance tasks. It is also stressed that to avoid potential loss of control over outsourced maintenance, internal expertise, proper documentation and quality control are required. The results reflect the relevance of these topics in practice. The department Gebouwbeheer has divided the responsibilities clear-cut over the functions, yet there still exist some uncertainties and issues according to the respondents.

The majority of respondents are in agreement that planning and creating detailed specifications is done by the maintenance engineer and/or control room technician in combination with contract manager. The control room technician is also responsible for the safety, supervision and verification of the external contractor during maintenance activities.

Even though the fundamental division of responsibilities is sound, the execution has room for improvement according to the respondents. For example, actually inspecting external contractors during or after activities is stated to be lackluster. Additionally, proper and regular assessment and documentation of executed maintenance activities is mentioned to be absent. Some respondents are also confused which control room technician has final responsibility for performed external maintenance. Finally, locally deployed technicians were uncertain whether they had any responsibilities concerning external contractors.

To summarize, the division of responsibilities appears to be appropriate and clear. Nevertheless, final responsibility should be standardized and control room technicians should

be encouraged to execute their supervisory and documentation tasks more frequently and assess the results more consistently.

6.6. Internal career opportunities

In the current organizational design there is little room for career development. It is possible for a control room technician to grow from role B into A and become responsible for installations, yet the current function profiles exclude career paths between locally deployed technicians and control room technicians. In the discussed literature it is theorized that firm-specific knowledge or skills (e.g. knowledge of healthcare processes MST or impact of installations) are valuable and impossible to recruit from outside the hospital. Although results from this study shows respondents agree with this theory, it is not taken into account regarding career opportunities. It could be argued that these competencies should be cultivated internally, since experience and time spent in the hospital are required to achieve this. The current recruitment strategy does not facilitate this, because as discussed the locally deployed technician is not required to have a strong technical background.

In summary, there is no potential for the function locally deployed technician to develop themselves towards control room technician. This theoretically reduces the way in which important firm-specific knowledge and skills can be developed and utilized, making it even more important for control room technicians to cultivate these competencies. A lack of critical skills and internal expertise to manage external contractors might lead to potential loss of control as discussed in the literature review. Designing the functions this way is not an incorrect or bad decision, yet the alternative should be considered.

6.7. Involvement internal clients

It was theorized that input from internal clients is important for the efficiency of the maintenance department, and the respondents agree on this. These clients are defined as

anyone that requires building maintenance, modifications or maintenance resources within the hospital. There are aspirations to give clients a voice on qualitative aspects of contracts with external parties and the deployment of local technicians has received a lot of positive feedback from internal departments.

In summary, the maintenance department is strongly improving their customer involvement with the new functions. Even so, there are opportunities to strengthen this involvement of clients even further (e.g. involving internal clients in drafting contracts or swifter communication from control room technicians concerning activities performed by external parties) and these should be explored.

6.8. Applicability of competency-index MST

For each function the resulting competency themes are mapped or translated into the definitions found in the competency-index provided by the hospital. This index describes forty-nine skills and behavioral traits including instances of tangible behavior. For example, the competency stress resistance has five instances of tangible behavior. One of these is described as swift recovery after a disappointment and another is outlined as keeping composure and responding calmly to rebukes.

Knowledge competency themes excluded, all other competencies can be mapped onto this index to a certain degree. Although this complies with the request from the department, the applicability is not without risks. Due to the general nature of the competency descriptions and matching tangible behaviors, they do not thoroughly encompass or fit the specific competencies required for the three functions. Therefore, it is insufficient to use these for performance evaluation or recruitment purposes.

In summary, the competency-index provided by the hospital encompass the required competencies in general. The problem lies within this generic nature, making it difficult to

apply these in practice. If these competencies are to be used for recruitment or evaluation purposes, it is recommended to specifically detail tangible behavior for the competency themes per function.

6.9. Limitations and future research

There are certain limitations to this study that are important to discuss. First and foremost, despite its merits a qualitative research approach also has certain drawbacks. It is a subjective method that is difficult to replicate and researcher bias is a possibility. Specific risks with in-depth interviews are that information is filtered through the views of respondents, not all people are equally perceptive or articulate and the data may be difficult to interpret. The nature of open-ended questions also increases risk for researcher bias, because when respondents lack an answer or sufficient knowledge to reply the researcher can try and explain the topic to receive feedback. Future research could take a more quantitative approach or include cross-referencing themes from the results to reduce to risk for researcher bias.

Secondly, the sample size of fifteen respondents and the small sub-groups in particular potentially reduce the completeness and saturation levels of the findings. Although it should be mentioned that the sub-groups sample sizes were confined by eligibility of the employees. Further research could include all employees of the maintenance department in a more detailed study.

Thirdly, it is difficult if not impossible to generalize results from this study to other settings, due to the uniqueness of the findings for the maintenance department in this case study. Future research could try to carry out multiple case studies with similar conditions and try to discover more generalizable competency themes.

The last limitation concerns the limited scope of the research. The goal of the study was to create an overview of the required competencies for multiple functions within the

maintenance department. It only marginally provides insight in the possible discrepancy between existing competency levels and necessary levels. However, this study does not develop an action plan to achieve or improve the required competencies. Future research could be focused on discovering the current competency levels and develop a progressive scheme to reach the required levels.

7. Conclusion & recommendations

The main question of this study was: *"Which competencies are needed for the functions control room technician, locally deployed technician and contract manager so that Gebouwbeheer can manage outsourced maintenance effectively?*

To answer this question a literature study was done to determine factors of importance for effective management of outsourced maintenance within a hospital. These influencing factors as described in the research model, are in random order:

- requirements by internal hospital customers
- management of the human capital pool, their knowledge, skills, abilities and specific behavior
- requirements from external maintenance contractors, supervising, controlling and managing these contractors
- the chosen maintenance techniques, scheduling & planning maintenance, maintenance policies and design improvement
- support systems, i.e. maintenance information systems, HR reward & recognition, HR education & training, performance measurement and infrastructure management

Subsequently, research was done to uncover competencies for the three functions, this involved analysis of internal MST documentation and semi-structured interviews with MST employees and other individuals related to the maintenance department. The resulting competencies for all three functions can be found below in Table 8.

Table 8: Competency overview all three functions

Function locally deployed technician	Function contract manager	Function control room technician
<u>Knowledge</u>	<u>Knowledge</u>	<u>Knowledge</u>
Practical technical knowhow Health care processes MST Effect of installations on health care processes Specific knowledge assigned building areas Service provision of Facilitair Bedrijf	Technical certificate (HBO) Health care processes MST Composition and function of all installations Effect of installations on health care processes Legal regulations concerning installations Safety regulations & environmental legislation Contract management Market conformity contracts Additional business courses	Technical certificate (MBO4-5) Health care processes MST Composition and function of all installations Effect of installations on health care processes Legal regulations concerning installations Safety regulations & environmental legislation Deep understanding installations (RKT-A) Additional courses (RKT-A) Trends & developments field of expertise (RKT-A)
<u>MST Competency-index</u>	<u>MST Competency-index</u>	<u>MST Competency-index</u>
Leidinggeven 6 (Plannen & Organiseren) Ondernemen 11 (Patiënt-/Klantgerichtheid) Analyse & besluitvorming 13 (Creativiteit) Analyse & besluitvorming 16 (Organisatiesensitiviteit) Communicatie 19 (Inlevend Vermogen) Communicatie 20 (Luisteren) Communicatie 21 (Mondeling communiceren) Communicatie 24 (Presentatie)	Leidinggeven 1 (Besluitvaardigheid) Leidinggeven 3 (Delegeren) Leidinggeven 6 (Plannen & Organiseren) Leidinggeven 7 (Voortgangscontrole) Ondernemen 8 (Marktgerichtheid) Ondernemen 9 (Netwerken) Ondernemen 11 (Patiënt-/Klantgerichtheid) Analyse & besluitvorming 13 (Creativiteit) Analyse & besluitvorming 14 (Oordeelsvorming) Analyse & besluitvorming 15 (Omgevingsbewustzijn) Analyse & besluitvorming 16	Leidinggeven 1 (Besluitvaardigheid) Leidinggeven 3(Delegeren) Leidinggeven 6 (Plannen & Organiseren) Leidinggeven 7 (Voortgangscontrole) Ondernemen 8 (Marktgerichtheid) Ondernemen 9 (Netwerken) Ondernemen 11 (Patiënt-/Klantgerichtheid) Analyse & besluitvorming 12 (Conceptueel Vermogen) Analyse & besluitvorming 13 (Creativiteit)

Communicatie 25 (Samenwerken)	(Organisatiesensitiviteit)	Analyse & besluitvorming 14 (Oordeelsvorming)
Communicatie 28 (Representativiteit)	Analyse & besluitvorming 17 (Probleemanalyse)	Analyse & besluitvorming 15
	Analyse & besluitvorming 18 (Visie)	(Omgevingsbewustzijn)
Motivatie 30 (Discipline)	Communicatie 19 (Inlevend Vermogen)	Analyse & besluitvorming 16
Motivatie 32 (Integriteit)	Communicatie 20 (Luisteren)	(Organisatiesensitiviteit)
Motivatie 33 (Inzet)	Communicatie 21 (Mondeling communiceren)	Analyse & besluitvorming 17 (Probleemanalyse)
Motivatie 34 (Leervermogen)	Communicatie 22 (Onderhandelen)	
Motivatie 35 (Kwaliteitsgerichtheid)	Communicatie 23 (Overtuigingskracht)	Communicatie 19 (Inlevend Vermogen)
Motivatie 36 (Resultaatgerichtheid)	Communicatie 24 (Presentatie)	Communicatie 20 (Luisteren)
	Communicatie 25 (Samenwerken)	Communicatie 21 (Mondeling communiceren)
Persoonlijk gedrag 37 (Aanpassingsvermogen)	Communicatie 26 (Schriftelijk communiceren)	Communicatie 22 (Onderhandelen)
Persoonlijk gedrag 39 (Assertiviteit)	Communicatie 28 (Representativiteit)	Communicatie 23 (Overtuigingskracht)
Persoonlijk gedrag 41 (Flexibiliteit)		Communicatie 24 (Presentatie)
Persoonlijk gedrag 42 (Fysieke belastbaarheid)	Motivatie 29 (Ambitie)	Communicatie 25 (Samenwerken)
Persoonlijk gedrag 43 (Mentale weerbaarheid)	Motivatie 30 (Discipline)	Communicatie 26 (Schriftelijk communiceren)
Persoonlijk gedrag 45 (Organisatieloyaliteit)	Motivatie 31 (Initiatief)	Communicatie 28 (Representativiteit)
Persoonlijk gedrag 46 (Stressbestendigheid)	Motivatie 32 (Integriteit)	
Persoonlijk gedrag 48 (Verantwoordelijkheid)	Motivatie 33 (Inzet)	Motivatie 29 (Ambitie)
Persoonlijk gedrag 49 (Zelfstandigheid)	Motivatie 34 (Leervermogen)	Motivatie 30 (Discipline)
	Motivatie 35 (Kwaliteitsgerichtheid)	Motivatie 31 (Initiatief)
	Motivatie 36 (Resultaatgerichtheid)	Motivatie 32 (Integriteit)
		Motivatie 33 (Inzet)
	Persoonlijk gedrag 38 (Accuratesse)	Motivatie 34 (Leervermogen)
	Persoonlijk gedrag 39 (Assertiviteit)	Motivatie 35 (Kwaliteitsgerichtheid)
	Persoonlijk gedrag 41 (Flexibiliteit)	Motivatie 36 (Resultaatgerichtheid)
	Persoonlijk gedrag 43 (Mentale weerbaarheid)	
	Persoonlijk gedrag 45 (Organisatieloyaliteit)	Persoonlijk gedrag 38 (Accuratesse)
	Persoonlijk gedrag 46 (Stressbestendigheid)	Persoonlijk gedrag 39 (Assertiviteit)
	Persoonlijk gedrag 47 (Vasthoudendheid)	Persoonlijk gedrag 40 (Durf)
		Persoonlijk gedrag 41 (Flexibiliteit)

	Persoonlijk gedrag 48 (Verantwoordelijkheid) Persoonlijk gedrag 49 (Zelfstandigheid)	Persoonlijk gedrag 43 (Mentale weerbaarheid) Persoonlijk gedrag 44 (Onafhankelijkheid) Persoonlijk gedrag 45 (Organisatieloyaliteit) Persoonlijk gedrag 46 (Stressbestendigheid) Persoonlijk gedrag 47 (Vasthoudendheid) Persoonlijk gedrag 48 (Verantwoordelijkheid) Persoonlijk gedrag 49 (Zelfstandigheid)

It can be concluded that – excluding knowledge requirements - the discovered competency themes were all translatable onto the general competency-index provided by MST. However, the generic nature of this index interferes with practical applicability. The tangible behaviors belonging to the general competencies do not fit those required from the functions of the maintenance department. This should be rectified if the competencies are to be used for performance evaluation, recruitment or educational purposes.

Another conclusion is that a variety of desired knowledge, skills and behavioral traits are either absent or undeveloped among the current workforce. To ensure effective management of outsourced maintenance, the discrepancy in proficiency among maintenance employees should be scrutinized.

The conclusions indicate the necessity to approach certain issues, therefore useful recommendations were derived from the results to improve the effectiveness of the maintenance department.

First of all, it is imperative to take stock of current competency levels for the three functions and develop a road map to achieve the desired levels. A starting point could be designing the tangible behaviors belonging to competencies specifically for each function. From there a survey can be conducted to chart discrepancies between desired and required competency levels and finally individual development plans can be created.

Secondly, the function locally tied technician has more potential depending on management’s vision. It can be expanded horizontally to include other services by Facilitair Bedrijf or vertically to enrich technical responsibility. Independent of these possibilities, concrete guidelines are required for this function to provide a standardized framework within which they perform their maintenance tasks in relation to the control room technician.

Thirdly, in light of cultivating specific knowledge and skills, the internal career development opportunities should be analyzed. In the current organizational design external recruitment is the only viable option to fill a position in the maintenance control room.

The fourth recommendation is that management should stimulate positive, team-oriented autonomous behavior among control room technicians through training or group sessions.

It is also recommended to explore more opportunities to strengthen the involvement of internal clients, for example client participation in drafting contracts or swifter communication from control room technicians concerning activities performed by external contractors.

The last recommendation is to standardize final responsibility for external contractors among control room technicians, encourage them to execute their supervisory task on a daily basis and assess the resulting reports more consistently for future maintenance benefits.

8. Appendix A: Interview protocols

Ik wil graag beginnen met het doel van het interview uiteen te zetten. De interviews zijn voor een onderzoek dat door MST in samenwerking met de Universiteit Twente wordt uitgevoerd. Het doel van dit onderzoek is de functies die horen bij de nieuwe organisatiestructuur te evalueren en benodigde competenties te bepalen. De gegevens verzameld met de interviews zullen samen met een literatuuronderzoek gebruikt worden om advies te geven op de implementatie en een competentiemodel voor deze functies te ontwikkelen.

Vanwege kennis op managementniveau binnen de afdeling bent u gevraagd voor dit interview. Even voor de duidelijkheid: ik zal in steekwoorden uw antwoorden noteren en het interview zal opgenomen worden met een audiorecorder, mits u hier geen bezwaar tegen heeft. Deze antwoorden worden later in het verslag anoniem verwerkt. Ook de audio-opname zal enkel door mij gebruikt worden voor de uitwerking van het interview. Het is dus allemaal volstrekt vertrouwelijk en anoniem.

Tot slot heb ik hier een vragenlijst waarop alle vragen staan die ik u moet gaan stellen. U hoeft enkel zo goed en volledig mogelijk te antwoorden. Alles bij elkaar denk ik dat we ongeveer een uur nodig hebben voor het interview.

General

Allereerst zal ik een paar algemene vragen stellen over uw werkzaamheden binnen de afdeling en daarna over de ervaring en visie op de afdeling en organisatorische verandering in het bijzonder.

Questions	Management	RK	TM	CM	PL	HR	Contractant	Externe Firma*
1. In welk jaartal bent u geboren?	●	●	●	●	●	●		●
2. Hoeveel jaren bent u werkzaam bij het MST?	●	●	●	●	●	●		●
3. In welke functies bent u werkzaam geweest bij het MST?	●	●	●	●	●	●		●
4. Kunt u uw huidige functie binnen de afdeling omschrijven?	●	●	●	●	●	●		●
5. Wat is uw connectie met de afdeling Gebouwbeheer?					●	●	●	
6. Hoe bent u betrokken bij de organisatorische verandering binnen Gebouwbeheer?					●	●	●	

* = These questions were asked in relation to the organization Enexis

Department Gebouwbeheer

Binnen de afdeling is een organisatorische verandering gaande, waardoor enkele nieuwe functies zijn ontstaan en andere komen te vervallen. Om een goed overzicht te hebben van de structuur waarbinnen de functies uitgevoerd worden, wil ik eerst wat vragen stellen over de afdeling Gebouwbeheer zelf.

Questions	Management	RK	TM	CM	Projectleider	HR	Contractant	Externe Firma **
7. Wat is het doel van de afdeling?	●	●	●	●				●
8. Wat zijn de kerntaken van de afdeling?	●	●	●	●				●
9. Welke strategie hanteert de afdeling?	●	●	●	●				●
10. Hoe vertaalt deze strategie zich in de organisatiestructuur?	●	●	●	●				●
11. Welke veranderingen liggen ten grondslag aan de nieuwe organisatiestructuur?	●	●		●				
12. Welke aandachtsgebieden zijn er te onderscheiden voor onderhoud in het ziekenhuis?	●	●	●	●				

** = These questions were asked in relation to the department Bedrijfsvoering at Enexis

Competencies

Nu wil ik graag ingaan op de nieuwe functieomschrijvingen en de competenties die hierbij gewenst zijn. In het kort zijn competenties kenmerken die relateren aan succesvolle uitvoering van een functie. Deze kenmerken dienen dan het liefst waarneembaar te zijn in het gedrag van de werknemer. Ik zal vragen stellen over de drie nieuwe functies en afsluiten met vragen over competenties in het algemeen op de afdeling.

Function Contract manager

Questions	Management	RK	TM	CM	Projectleider	HR	Contractant	Externe Firma***
13. Met welk doel is deze functie opgezet?	●	●	●	●		●		●
14. Welke functie vervangt de ‘contractmanager’?	●			●				
15. Wat zijn de voornaamste verschillen tussen deze functies?	●			●				
16. Welke aandachtsgebieden zijn te onderscheiden voor contractmanagers?	●	●	●	●				●
17. Welke relatie is er tussen deze functie en een contractmanager?		●	●					

18. Welke functie-elementen zijn echt kritisch?				●		●		●
19. Wat zijn de meest belangrijke taken?	●	●	●	●		●		●
20. Wat zijn de meest tijds-intensieve taken?	●	●	●	●				●
21. Zijn er voorbeelden van kritieke situaties voor een contractmanager?				●				●
22. Stel dat het misgaat, wat moet de contractmanager dan kunnen?				●				●
23. Welke kennis heeft een contractmanager nodig?	●	●	●	●		●		●
24. Welke vaardigheden heeft een contractmanager nodig?	●	●	●	●		●		●
25. Welke persoonlijke eigenschappen zijn wenselijk voor een contractmanager?	●	●	●	●		●		●
26. Aan de hand van welke criteria wordt de functie/medewerker beoordeelt?	●			●		●		●
27. Welke criteria zijn in uw ogen geschikt om de functie te beoordelen?				●		●		
28. Ontbreekt er in uw optiek kennis om goed te functioneren als contractmanager?				●				

29. Ontbreken er in uw optiek vaardigheden om goed te functioneren als contractmanager?				●				
30. Zijn er verder nog competenties van belang voor de contractmanager?	●			●		●		●

***= These questions were asked in relation to the function Bedrijfsvoerder at Enexis

Function control room technician

Questions	Management	RK	TM	CM	Projectleider	HR	Contractant
31. Met welk doel is deze functie opgezet?	●	●	●	●		●	
32. Welke functie vervangt de ‘regiekamer technicus’?	●	●					
33. Wat zijn de voornaamste verschillen tussen deze functies?	●	●					
34. Welke aandachtsgebieden zijn te onderscheiden voor regiekamertechnici?	●	●	●	●			
35. Welke relatie is er tussen deze functie en een regiekamer technicus?			●	●			
36. De regiekamertechnicus kan verantwoordelijk zijn voor één of meerdere installaties, kunt u hier voorbeelden van geven?	●	●					

37. Welke functie-elementen zijn echt kritisch?		●				●	
38. Wat zijn de meest belangrijke taken?	●	●	●	●		●	
39. Wat zijn de meest tijds-intensieve taken?	●	●	●	●			
40. Zijn er voorbeelden van kritieke situaties voor een regiekamertechnicus?		●					
41. Stel dat het misgaat, wat moet de regiekamertechnicus dan kunnen?		●					
42. Welke kennis heeft een regiekamer technicus nodig?	●	●	●	●		●	
43. Welke vaardigheden heeft een regiekamer technicus nodig?	●	●	●	●		●	
44. Welke persoonlijke eigenschappen zijn wenselijk voor een regiekamer technicus?	●	●	●	●		●	
45. Aan de hand van welke criteria wordt de functie/medewerker beoordeelt?	●	●				●	
46. Welke criteria zijn in uw ogen geschikt om de functie te beoordelen?		●				●	
47. Ontbreekt er in uw optiek kennis om goed te functioneren als regiekamertechnicus?		●					

48. Ontbreken er in uw optiek vaardigheden om goed te functioneren als regiekamertechnicus?		●					
49. Deze functie draait momenteel al in een pilot, wat zijn de ervaringen hiermee?	●	●	●	●		●	
50. Zijn er verder nog competenties van belang voor de regiekamer technicus?	●	●				●	
51. Zijn er nog meer verschillen tussen de Regiekamertechnicus A. & B. behalve de installatieverantwoordelijkheid?	●	●					

Function locally deployed technician

Questions	**Management**	**RK**	**TM**	**CM**	**Projectleider**	**HR**	**Contractant**
52. Met welk doel is deze functie opgezet?	●	●	●	●		●	
53. Welke functie vervangt de ‘technisch medewerker’?	●		●				
54. Wat zijn de voornaamste verschillen tussen deze functies?	●		●				
55. Welke aandachtsgebieden zijn te onderscheiden voor technisch medewerkers?	●	●	●	●			

56. Welke functie-elementen zijn echt kritisch?			●			●	
57. Welke relatie is er tussen deze functie en de technisch medewerker?		●		●			
58. Wat zijn de meest belangrijke taken?	●	●	●	●		●	
59. Wat zijn de meest tijds-intensieve taken?	●	●	●	●			
60. Zijn er voorbeelden van kritieke situaties voor een technisch medewerker?			●				
61. Stel dat het misgaat, wat moet de technisch medewerker dan kunnen?			●				
62. Welke kennis heeft een technisch medewerker nodig?	●	●	●	●		●	
63. Welke vaardigheden heeft een technisch medewerker nodig?	●	●	●	●		●	
64. Welke persoonlijke eigenschappen zijn wenselijk voor een technisch medewerker?	●	●	●	●		●	
65. Aan de hand van welke criteria wordt de functie/medewerker beoordeelt?	●		●			●	
66. Welke criteria zijn in uw ogen geschikt om de functie te beoordelen?			●			●	

67. Ontbreekt er in uw optiek kennis om goed te functioneren als technisch medewerker?			●				
68. Ontbreken er in uw optiek vaardigheden om goed te functioneren als technisch medwerker?			●				
69. Deze functie draait momenteel al in een pilot, wat zijn de ervaringen hiermee?	●	●	●	●		●	
70. Zijn er verder nog competenties van belang voor de technisch medewerker?	●		●			●	

General competencies

Ik heb nu uitvoerig vragen gesteld over de nieuwe functies en de bijbehorende competenties. Naast functie specifieke competenties, bestaan er ook generieke competenties. Dit zijn competenties die breed, onafhankelijk van functies gedragen worden binnen een organisatie.

Questions	Management	RK	TM	CM	Projectleider	HR	Contractant
71. Zijn er naar aanleiding van de strategie van de afdeling generieke competenties van belang?	●	●	●	●		●	
72. Zijn er op basis van de besproken functies competenties die een generiek karakter hebben?	●	●	●	●		●	

73. Zijn er competenties ongenoemd waarvan u vindt dat deze belangrijk zijn binnen de afdeling Gebouwbeheer?						●	

Supervision external contractors

Eén van de voordelen in de nieuwe organisatiestructuur is de flexibiliteit bij inzet van externe partijen die in het onderhoud van het ziekenhuis voorzien. Aangezien een aanzienlijke hoeveelheid onderhoudswerk is uitbesteed, heb ik hier een paar vragen over.

Questions	Management	RK	TM	CM	Contractant
74. Welke werkzaamheden worden uitbesteed?	●	●	●	●	
75. Welke relatie is er tussen deze functie en een externe partij?		●	●	●	
76. Welke verantwoordelijkheid heeft deze functie over een externe partij?		●	●	●	
77. Welke functies zijn verantwoordelijk voor het organiseren, plannen, toezicht houden op en controleren van uitbestede werkzaamheden?	●	●	●	●	
78. Welke vaardigheden zijn hiervoor nodig?	●	●	●	●	

79. Welke kennis is hiervoor nodig?	●	●	●	●	
80. Welke persoonlijke eigenschappen zijn hiervoor wenselijk?	●	●	●	●	
81. Zijn er verder nog opmerkingen of suggesties aangaande de competenties binnen de afdeling Gebouwbeheer?	●	●	●	●	

Other Questions

Questions	Projectleider	HR	Contractant	Externe Firma
82. Welk beleid voert het MST omtrent waarborging van de continuïteit binnen afdelingen? Extern uitzetten vacatures versus interne doorstroom?		●		
83. Op welke wijze kan een verschil tussen gewenste competenties en werkelijke competenties worden opgelost? Interne scholing, on the job training?		●		
84. Welk beleid voert het MST aangaande de beoordeling van medewerkers/functie uitvoering? Meetbare resultaten versus inschatting teamhoofd?		●		
85. Zijn de functietyperingen in uw ogen goed toetsbaar? Zoja, welke elementen dragen hieraan bij? Zonee, hoe zou dit kunnen worden gewaarborgd?		●		

86. Wat is uw mening over de werfbaarheid van de functies? Is het geen onmogelijke combinatie?		●		
87. Zijn de competenties voor de bedrijfsvoerder op voorhand in kaart gebracht?				●
88. Hoe worden deze competenties gewaarborgd?				●
89. Hoe wordt een gat tussen gewenste en aanwezige competenties opgelost?				●
90. Zijn er verder nog opmerkingen of suggesties aangaande de competenties binnen de afdeling Bedrijfsvoering?				●
91. Kunt u de diversiteit van projecten omschrijven waarvoor medewerkers van Gebouwbeheer ingezet worden?	●			
92. Hoe grootschalig of wat is de duur van dergelijke projecten?	●			
93. Welke functies zijn binnen de afdeling Gebouwbeheer betrokken bij projecten?	●			
94. Wat zijn de meest belangrijke taken van een medewerker binnen een project?	●			
95. Wat is de meest tijdsintensieve taak van een medewerker in een project?	●			
96. Welke kennis heeft een projectmedewerker nodig?	●			

97. Welke vaardigheden heeft een projectmedewerker nodig?	●			
98. Welke persoonlijke eigenschappen of houding zijn wenselijk voor een projectmedewerker?	●			
99. Kunt u voorbeelden noemen van een kritieke situatie in een project, waarbij de projectmedewerker moet optreden?	●			
100. Wat is uw visie op de combinatie van werkzaamheden voor het project en het normale takenpakket van een medewerker?	●			
101. Zijn er verder nog competenties van belang voor de projectmedewerker?	●			
102. Zijn er in een ziekenhuis nog generieke competenties van belang?				
103. Heeft u verder nog opmerkingen of suggesties aangaande competenties binnen de afdeling Gebouwbeheer?	●	●		

Ik wil u graag hartelijk bedanken voor de tijd die u beschikbaar heeft gesteld voor dit interview en uw antwoorden!

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