

More value from healthcare real estate

Professional asset management in healthcare



White paper 1140.01-EN-15221-4

Maximum returns from capital goods for hospitals



Explore. Inspire. Connect.

Buildings, equipment and medical instruments are perishable. Their value for the hospital changes during their life cycle. Hospitals are often owner and user of most of their buildings and equipment. Capital goods should therefore not only be used in the most effective manner, but also optimally deployed with respect to ownership. The first is called facility management; the second asset management. The goal of asset management is to get the best possible return from the value of the possessions for the hospital organisation. This involves the trade-off between performance improvements, risk management and cost optimisation. This is what this White Paper is about: *get the maximum value from your assets!*

The subjects in this White Paper have been chosen based on a survey held by Royal HaskoningDHV among administrators, asset managers, technical service managers and facility managers of hospitals. In April 2016, 930 participants from 37 countries gathered in The Hague for a two-day conference on the best possible deployment of hospital real estate. We have asked them which issues kept them busy, now and in the next year. A seminar on the most urgent and most important themes from this survey was organised on June 22nd. The results of these presentations and discussions have been captured in this White Paper, supplemented with some themes which were requested at the symposium. Finally, it contains a reflection on the seminar and a practical translation of the ISO55000 standard for asset management into three handles for professional set-up of an asset management organisation.

Asset managers, facility managers, technical service managers and administrators of hospitals: we have enjoyed discussing these topics with you. This also applies to our colleagues in professional associations FMN, NVTG, NVDO, Euro-FM, IFMA and IFHE.

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Patient safety, a matter of physician and technician

'Care' and 'cure' are the primary processes of a hospital. The manner in which these processes are designed makes patient safety an elementary organisation value for each hospital. Things like administering the right medication, securing that the "correct" leg is amputated or minimising the risk of infection thus gets a lot of attention. In addition to medical instruments, assets of non-medical nature, such as IT, buildings and utilities like water, electricity and climate control, are at least as important. Patient safety therefore requires multiple perspectives: not only looking at the "visible side" of the care process, but also to the "invisible side": the facilities. This means that patient safety is also the responsibility of the technical service department, not just the medical staff.

'Behind the wall' of the heart-lung machine

A specific case is the heart-lung machine in a hospital in the Netherlands. This machine takes over the vital functions of a patient during an operation, giving the physician more options for performing the operation. The physicians involved in the purchase knew from experience how important the guaranteed operation of this device is for ensuring patient safety. This is why this equipment meets the highest possible degree of reliability, ensuring that the chance of failure is small. However, the device is attached to both the electricity and the drinking water network for its operation. This means that the risks 'behind the wall' must also be managed.



GREATEST RISK IN THE WEAKEST LINK: NON-RETURN VALVE



THE CASE: HEART-LUNG MACHINE

The most critical link was found here. Failure of one non-return valve (costs €14,-) in the connection to the drinking water network was found to lead to failure of this machine, regardless of the reliability of the equipment itself. The technical service department did know the degree of reliability required 'on the other side of the wall'. Their risk tolerance was based on the overall function of the drinking water network, not involving an acute impact on patient safety, such as with a heart-lung machine.

Risks of a compartmentalised approach

The risk approach in this case is typical of how risk management is often arranged. Risk areas such as fire safety, information security, patient safety and security are identified, evaluated, prioritised and monitored by various departments independent from each other. This approach to risk management is understandable: each

department has its own area of expertise. However, it quickly becomes uncontrollable during the implementation.

How can the numerous control measures based on the various risk assessments be prioritised and budgeted in a balanced manner? For example: should investments be made for greater reliability of medical equipment, or for the electricity supply? Even more complicated is monitoring the effectiveness of this form of risk management: who has the general overview and is there false security because of an undetected weak link in the chain? In practice, most hospitals have not explicitly considered the management priorities: is managing IT risks more important than controlling fire hazards, for example? Short-term savings on IT maintenance can later lead to disruptions in the continuity of the care process - and thus nullify the intended cost reduction.

Suboptimal risk management often leads to the gaps in risk management, proliferation of management systems and a lack of insight into the effectiveness of the measures. Hospitals often require integral, transparent risk assessments instead of a compartmentalised approach to the continuity of care.

Integral risk management is the answer

An approach which better meets the needs of hospitals is integrally identifying, analysing and managing risks. All risks and their relationships are managed from the same level of operational safety, patient safety, fire safety, information safety and security. This is based on the objectives of the organisation, such as operational safety, patient safety, quality care and patient and visitor satisfaction, and the extent to which a hospital wants to secure these objectives (= risk tolerance).

The fundamental difference of this comprehensive risk management compared to the compartmentalised risk management is that for each risk attention is paid to all the objectives of the hospital, and not just with respect to operational safety. Rather than single-minded attention to finances, labour conditions, fire safety or air quality in the operating theatre, risks are comprehensively, considering the effect on all organisational objectives and values, assessed and managed, and the chosen measures are monitored for compliance and effectiveness based on a general overview.

Energy, an asset to be managed in every hospital

Utilities are important throughout the hospital and therefore generally carefully designed and maintained. Reliable availability of utilities such as medical gases, electricity, high and low temperature heat, cold, water, steam, compressed air, demineralised water and permeate should all have a considered interruption protocol to the preferred facilities and a well thought-out emergency protocol to the bare necessities. Professional energy management can also make a significant contribution to reducing the footprint of every hospital.

Three-fold balance

With the energy transmission plant, asset management facilitates the hospital by focussing on the balance between three elements. Firstly, it concerns the delivery of energy in the correct composition. Secondly, it concerns limiting the risks which might interrupt this energy supply. Examples are risks caused by the environment, the energy transmission plant, raw materials and hospital equipment. Thirdly, it concerns maximising the efficiency of energy management.

Preference in performance

If a problem occurs in the electricity supply, parts of the hospitals should be disconnected from the power grid in accordance with an agreed interruption protocol. Only the preferred grid will receive electricity at this time. Both the grid and the supply are made redundant of the functions in this preferred grid. This is not necessarily all medical equipment. After all, it might seem obvious not to link heavy diagnostic or treatment equipment, the use of which can be delayed, to the preferred grid. A larger preferred grid requires the corresponding large capacity, which may hardly be used.

If a problem with the electricity lasts longer, a small part of the hospital might be equipped with a core emergency grid with notice after a considerable period. Examples are ventilators and laboratory cabinets with specific tests.

Power pollution

A brief interruption of the electricity supply, which can be caused by the loss of the normal power supply and switching to a secondary facility, can be disastrous for some IT equipment or the processed data. In order to absorb this brief interruption, this equipment must be fitted with an uninterruptible power supply (UPS, batteries). Numerous forms of power pollution can disrupt medical and electronic equipment and the control of mechanical systems. Protecting these assets against these irregularities requires specific facilities.

Three-fold responsibilities

Asset management creates order in management by dividing it into three core responsibilities (as explained in the last article). The overview of desired, separated performances of the utilities of a hospital requires considerations in which everyone has a role:

- *Owner role*

What is critical to the performance and reputation of the hospital? Not everything that is technically possible is medically necessary. Not everything that could happen, has to significantly harm the reputation of the hospital, some situations can be explained. The Board of Directors fulfils the role of asset owner and has to be clear in its considerations. Compliance with laws and regulations has its limits, after all.

• *Steward role*

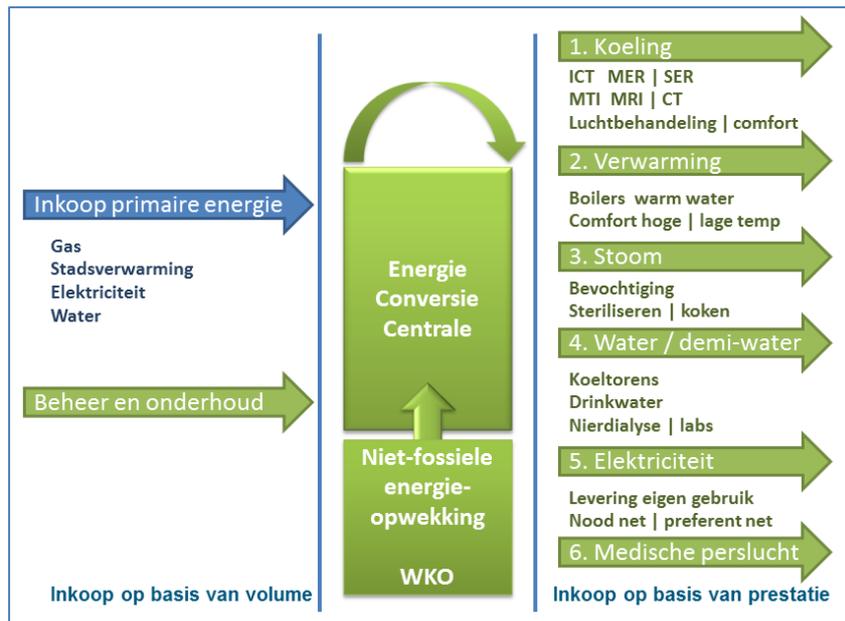
What is needed must be efficiently, effectively and energy-efficiently considered, designed and managed. This is the role of the asset manager. What configuration of turbines and thermal storage is the most efficient? An issue in which operational costs and income must be weighed against the investment costs. What is the weakest link? Perhaps not the electricity supply but in the steam supply, which is delivered by the same energy transmission plant. But also: is the energy generated, transported and used in the hospital in a cost and energy efficient manner? This involves both cooling and heating and the balance between them in the conversion, transport and use. Are there any options to use residual heat or cold in the surroundings of the hospital? Is the purchased energy generated in a sustainable manner? And is the price competitive?

The asset manager identifies and analyses deviating use, optimises combustion lines, clock times and installation schemes. He participates in benchmark projects to understand the best possible use of energy and reduction of CO² emissions. With effect from 2017, existing boilers must meet the emission standards in accordance with the Dutch Decision Emission Requirements Medium Combustion Plants (Besluit Emissie-eisen Middelgrote Stookinstallaties (BEMS)). This means that a large proportion of all the combustion plants in the Netherlands must be adapted or replaced. As of 2017, installations that fail to meet this decree will be considered a violation. The asset manager must also prevent overlapping risks. It is important to observe the same risk regime for both the front and the back of the wall for situations with high requirements. This has consequences for the replacement policy of installations behind the wall.

Hospitals increasingly do not regard this multitude of technical complexities and considerations. The energy transmission plant is seen increasingly as a 'black box' with substantial risks which must be prevented, but which also requires a level of knowledge not present in every hospital. It is now possible to outsource the role of 'utilities' asset manager.

• *Supplier role*

Finally, there is the role of service supplier. This concerns the cost-efficient risk-controlled maintenance of the energy transmission plant and the energy transport systems.



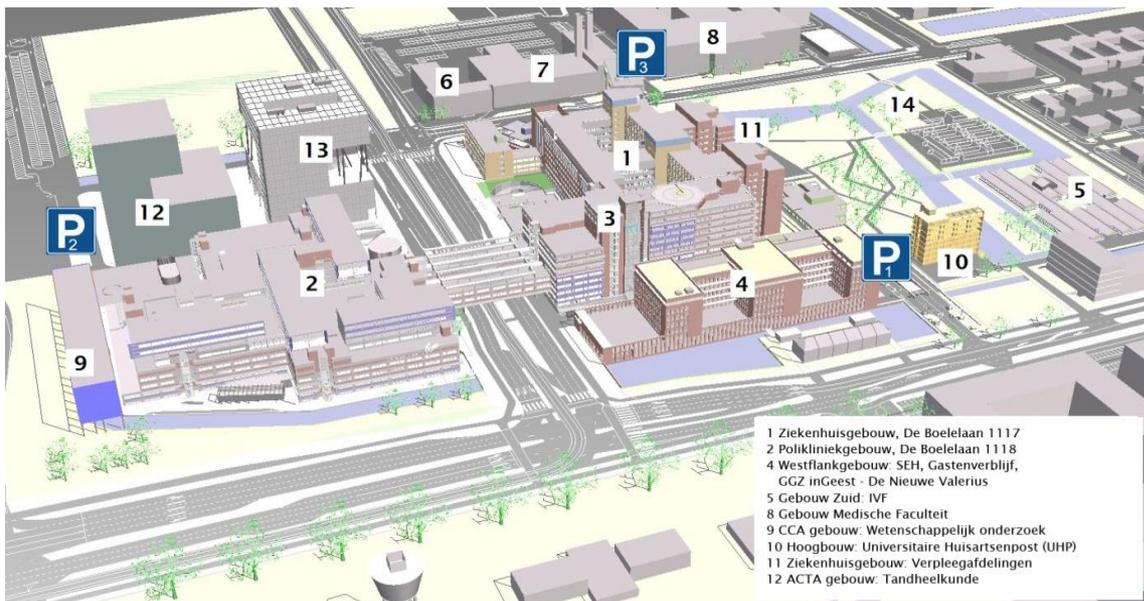
FLOWCHART ENERGY CONVERSION PLANT

CASE ENERGY MANAGEMENT VUMC AMSTERDAM



The improved performance of the energy installations and active energy management in which defect components and errors in the software were identified, led to 4% savings, which corresponds to a structural saving of € 300,000 annually (2015). Active energy management over a period of 10 years has led to more than 55 TJ in savings in the use of energy and 30 TJ in savings in the chain. This means that energy management is sorely needed in a hospital and well worth it.

“Thanks to energy coordinator Annemarie Brouwer, facility management - property management VUmc.”



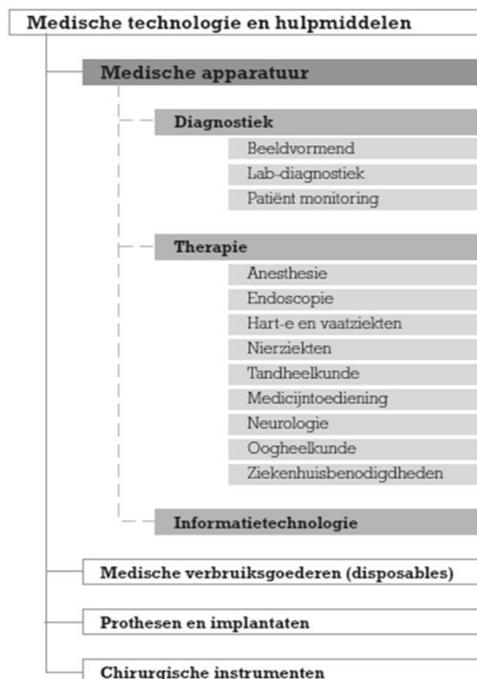
OVERVIEW COMPACT PLANT VU MEDICAL CENTRE AMSTERDAM

Asset management - crucial for medical devices

Medical equipment is a critical asset for the diagnoses and treatment of patients. In the healthcare sector, this equipment represents a segment within the medical technology and devices; from the perspective of production resources, this equipment represents a segment within the capital goods of the hospital. The nature of the medical equipment from a management & maintenance perspective is partly similar to that of the building-related assets, but also different. What characterises the medical equipment?

From a cost-benefit point of view

Even though the direct operating costs of medical devices are only 2-3% of the total operation costs of a hospital (ING, 2012), the investment costs per machine are relatively great (€50,000 to €1,500,000). Investments in medical equipment increasingly involve extensive investment in information technology, for example to allow for digital storage and exchange of MRI scans or X-ray equipment. The direct benefits of the equipment to the care process are significant, but not always quantifiable. This is why it makes sense to draw up a list of requirements and a business case before purchasing or taking out a lease for expensive medical equipment. What does the hospital need for diagnosis or treatment of a specific patient group? Such a business case, ideally based on the Life Cycle Cost method, gives a better understanding of the actual contribution of the targeted asset to the effectiveness of the hospital.



When drawing up the costs and benefits, the costs of training of staff to operate the equipment must also be included, as do the costs of maintenance and the management of the equipment including components, the energy costs during the life cycle, the costs of possible adjustments to the hospital, the technical equipment and the costs of any expansions to the capacity of the preferred grid (redundancy for electricity, warm water and medical gases).

Catalyst product and process innovation

The use of technology and medical devices in healthcare has led to substantial product innovation (new and improved equipment) and process innovation (new treatments). As a result, productivity in **MEDICAL EQUIPMENT AS PART OF MEDICAL TECHNOLOGY & DEVICES** has increased significantly. The number of patients in hospitals has increased by 3% in the last 35 years, while the number of hospital beds has decreased by 2% per year and the average hospital stay

has reduced by 3% per year.

Management risks for medical devices

A high degree of reliability and availability of medical equipment is expected, of course, but not necessarily realised. In practice, there are a few common risk factors that have influence the reliability and availability of medical equipment. Firstly, we can see sub-optimal operation of equipment upon commissioning. This can have a technical reason, but can also be caused by improper placement of the medical equipment in the room. Secondly, we can see improper management and maintenance of equipment. This is often the result of insufficiently qualified personnel for the performance of maintenance tasks. Thirdly, we can see improper use of equipment. In this case, the operating staff is often insufficiently trained to properly operate the equipment. Care staff might not know that equipment must be retested after a fall to ensure proper operation.

Designating responsibilities

The owner of the medical capital goods is the board of the care organisation, in principle, as they make the equipment available to the "users". The department manager in the primary care process often delegates the role of maintenance and management of the equipment to employee(s) at the department, who in their turn are often responsible for the release of the equipment after repair or maintenance. The role of asset manager is sometimes partially fulfilled by the technical service. Clarification of the exact roles and responsibilities demands attention in a lot of hospitals. Especially if there is a third party involved for the maintenance in the case of leases or in situations in which the maintenance, inspections and repairs are outsourced.

Five trends

> *Internet technology wireless network*

Internet care will become as common as Internet banking.

> *Increased use of DNA technology.*

DNA technology makes it possible to adjust the medication and treatment to the individual patient.

> *More complex high end.*

In the high end market, the operation of equipment becomes more complex due to the increase number of functionalities.

> *Easier low end.*

In the low end market, operation becomes simpler and the nurse or patient can perform more tasks themselves, for example using hand-held devices.

> *Lease alternative to financing.*

Due to the stricter capital requirements, more limited financial resources and increased risks within the healthcare sector, 100% financing is no longer obvious, which creates room for lease companies.

What makes a hospital a *smart building*?

Since the rapid increase of building-technological innovations, the *connectivity* and the *Internet of Things* and the availability of large amounts of data, the buzzword *Smart Buildings* has become popular. Also in the hospital environment. But what does ‘*smart*’ actually mean in relation to a hospital?

Smart starts in the care process

The principles behind asset management and *Smart Hospitals* are similar in their core: the desire to connect building performance to the needs of the user - aimed at reinforcing the primary care process. This starts with a clever design which provides a foundation for the best possible facilitation of the care processes. Examples are a map in which the walking distances of staff, patients and visitors are minimised. Another example is robustly designed building installations which can handle function changes within the building.

Gelre Hospital in Zutphen

During the construction of the Gelre hospital, the project team started using a fundamental analysis of the care processes. A model-based approach of the best possible routing was used for the final design. This results in benefits such as reduced walking times for visits and less waiting rooms.

The operational phase involves around using these design values which offer the facility manager space to facilitate further optimisations of the care process using the existing building and professional management. This results in *cost* savings thanks to more efficient deployment of staff, better climate *performance* and improved client satisfaction as building installations can predict the climate impact as a result of peak usage and *risk* management with respect to patient safety by early signalling and controlling rising temperatures of the coolant to ensure the cooling plants in the operating theatres are started on time before reaching overly high values.

Schiphol Airport

The control of the air treatment plants in the gates of Schiphol Airport are primarily initiated by flight data and secondarily adjusted by a WiFi sniffing system. This allows for targeted use of the air treatment plants, adjusted to the number of present persons. In turn, this results in constant air quality for the traveller, with greatly reduced energy and lifecycle costs.

Greatest impact first

By far most of the facility managers in healthcare have to deal with the exploitation of an already existing hospital. This does not leave much room to change the lay-out, but they can adjust the installation concepts, improve the walking routes for patients and staff, or optimise the logistics of goods. Plenty of opportunities, but where to start? “Identify the changes in your care environment, pick up your financial statements and talk with care staff, facility staff and ask how they use their time. Look for the assets and processes which would benefit

the most from implementing ‘smart’ applications, which might even require it.” Some of the domains which might be of use to the building, such as the adaptability of premises and facilities, as well as inventory management in relation to the goods logistics and the walking paths of staff, patients and visitors. Other examples are modernising the signage and demand-driven allocation of offices and treatment rooms to remove uncertainties or annoyances from patients, or to increase their satisfaction and reduce the need for space thanks to more efficient use.

Orbis Medisch Centrum in Sittard

A well-known example from the market are the Automated Guided Vehicles used in the Orbis MC. Automation of the logistics of food, medication, waste and medical devices results in significant savings.

Implementation

As a facility manager, you face the task of achieving the best solution. In order to identify the desired effect, smart solutions require adaptation of the organisation and work processes. Many smart solutions also require additional data and information management. This requires additional efforts and training of the management organisation. Especially when this concerns a technological innovation or new insight in the field of logistics, for example. It might then be useful to enter into another type of cooperation to realise the conception, implementation and monitoring of the desired result. Making the building ‘smart’ cannot be done without the (asset management) organisation.

Nederlandse Spoorwegen

Based on a sensor system in the stations, NS is able to perform various analyses related to the behaviour of travellers. Based on research into chosen walking routes and waiting times at facilities, targeted adjustments are made that help the traveller to find their trains more quickly and allow them to visit retail locations on their route. An opportunity for hospitals?

Reflection: sustainable maintenance and management begins with one language

The challenges for successful asset management could be seen in the various presentations and interactions at the healthcare seminar of June 22nd, 2016. Successes are achieved through good communication, ownership and being open to unexpected issues. The most important learning point is the concrete formulation of common objectives from the primary and facility processes. Both in focussing on patient safety, pursuing energy conservation, proper management of medical instruments and in the smart design of hospitals. Relying on each other's expertise, ownership and involvement then becomes of interest.

Each in their own role

How can safety, comfort, energy consumption and other performance technical systems be improved during the usage phase? In the world of buildings and installations, the answer to this question is complicated by the multitude of parties active 'between technology and use'. In commercial real estate, we make the distinction between the investor/owner, his property manager, the maintenance parties and the housed organisation, its facility manager and its maintenance parties.

The distribution of roles is often simpler in hospitals. However, the fixed roles of the involved parties and the nature of the agreements determine whether or not they will talk and work within their own 'silo'. The asset owner (usually the Board of Directors) and facility and asset managers play a crucial role: the asset manager from the perspective of the ownership of the assets; the facility manager from the perspective of the use of these facilities.

Care-driven result agreements

Focussing on the primary objectives to reach safe, sustainable and efficient use of assets reduces the risk of misunderstandings in the agreements between the involved parties. The owner and the housed organisation provide direction by formulating their objectives clearly. The asset manager makes, given his competence and expertise, choices based on the objectives of the user/owner. These objectives successively lead to usable orders for service providers, provided they have been translated correctly. Basing actions on shared objectives offers service providers room to provide more value within these orders. Regardless of whether the players are employed by the same organisation, or distinct market parties, making agreements on the results to be delivered (performance and reward) and the accountability ensures transparency, room for direction and thus better results. Proper preparation, contracting and quality assurance of the realisation of the service providers is not easy. ISSO publication 101 can provide guidance for buildings and building systems.

Professional set-up of the asset management organisation

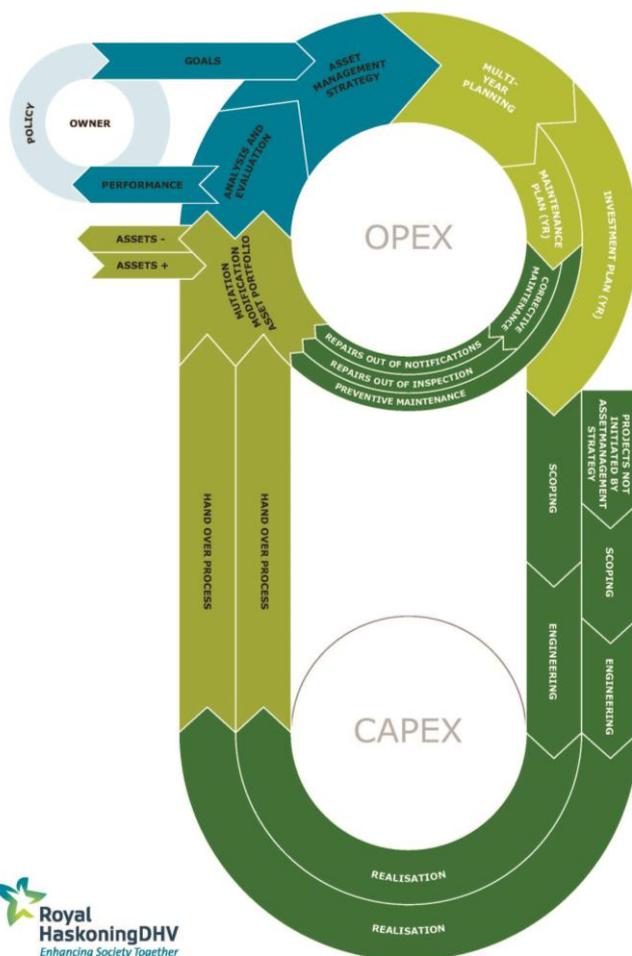
Professional asset management can be reduced to three times three characteristics: the overall consideration of the three basic values of the assets; the distribution of the management of the assets in three basis roles; and three core domains that should be professionalised. These three attributes offer guidance for the (improved) set-up of the management organisation.

Value creation with company resources

NEN-ISO 55000 defines asset management as the coordinated activities used to achieve value from capital goods (assets). First, the assets must be properly set-up in a coherent system: the hospital. Effective assets are then purchased, maintained, used and cleaned for this hospital. Value creation takes place at all levels within the primary process.

Value creation for management and maintenance means focussing on the required performances of company resources and controlling the risk of loss at the lowest lifetime costs. On a tactical level, this means assessing investments as a business case for the contribution to the corporate values of the hospital, risk reduction and efficiency.

Value creation is also optimising the lay-out of the hospital as a system during construction and remodelling. This creates cohesion between the investment plan (capital expenditure) and the annual plan for management and maintenance (operational expenditure) as captured in the figure.



ASSET MANAGEMENT PROCESSES AND CONTROL CYCLE

Professional consideration of values

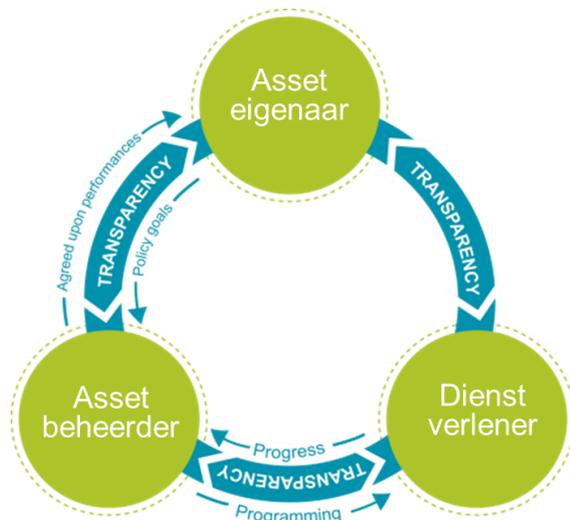
Asset management uses company resources (buildings and medical technology) to facilitate the care process of the hospital, by:

- Guaranteeing asset-related *performances*.
- Limiting asset-related *risks*.
- Maximising asset-related *efficiency*.

Distribution of roles created order

Asset management is based on three core roles: the owner, the steward and the service provider.

- *Owner* of the assets of the building.
- *Asset manager*, the steward of the assets of the building.
- *Service provider(s)* who provide services for the operation of the assets of the building.



DISTRIBUTION OF ROLES IN PROFESSIONAL ASSET MANAGEMENT

In professional asset management, these three main roles are assigned distinct responsibilities to capture the goals they set and report on. This improves the permanent nature of roles and promotes transparency in communication and the fulfilment of roles.

Core domains of professionalisation

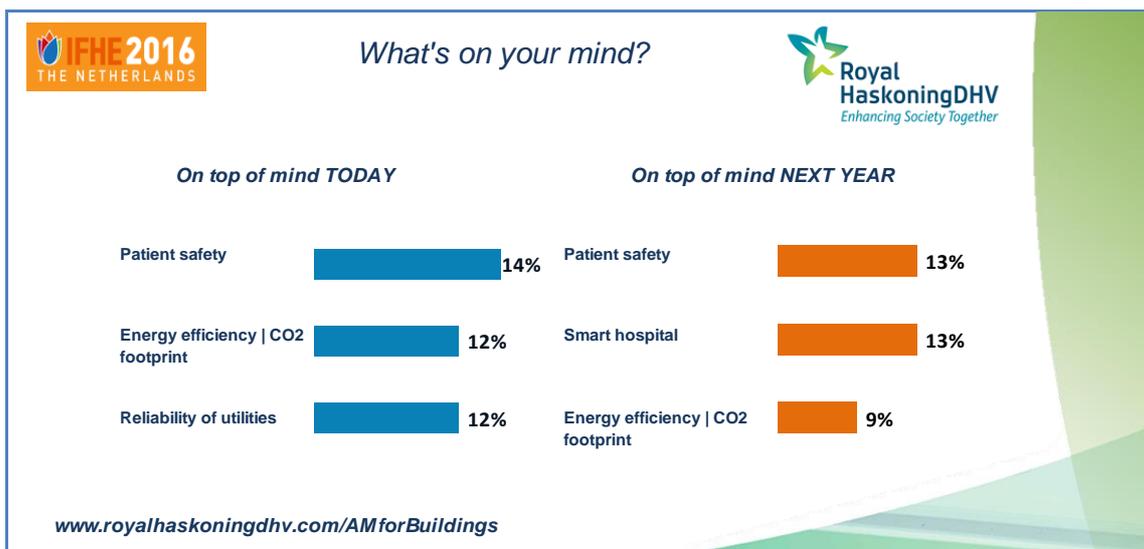
Finally, professional asset management has three core domains:

- *The assets*. These are the capital goods, the company resources such as the hospital, the technical installations and the medical technology itself. These must be 'fit for purpose'. Their status is clear and incorruptible.
- *The process*. Asset management requires the set-up of a uniform control model, designed for the use, management, maintenance and adjustments of the assets, with a cyclic relationship between the ownership, the investment plan and the operation.
- *The organisation*. Do people know what their role, their tasks and their responsibility in their contribution to the organisation objectives are? Are they competent and equipped with the right information, knowledge, experience and tools?

The first domain can be determined by identifying the (critical) assets. An asset dashboard can be set-up to monitor the asset-related performances, risks and costs. The degree of maturity of the second and third domain can be identified by means of a (maturity) scan of the work processes, protocols and the tasks and responsibilities of the employees.

Results survey IFHE Convention 2016

During and after the World Convention of the Federation of Hospital Engineers, which was held on the 17th and 18th of April in The Hague in collaboration with the Dutch Association for Technology in Healthcare, Royal HaskoningDHV held a survey. Directors, technical and facility managers could for a score of issues (see figure) indicate what kept them busy, and what the expectations for the next year were. The results of this survey, which was completed by more than 55 relevant respondents, provided the following outcomes: patient safety and energy and CO2 emission reductions are regarded as both the most urgent and the most important themes. Reliable utilities are an important and urgent third issue for the respondents; smart hospitals are an important issue for the years to come.



SURVEY RESULTS OVERVIEW WITH WORD-CLOUD OF ALL ANSWERS

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Image material

Title page photo notes, medications, stethoscope | ING Sectorstudie Medische Apparatuur 2012

Page 3 Photo heart-lung machine | [VSD](#)

Page 7 Flow Chart Energy Conversion Plant | Royal HaskoningDHV

Page 8 Overview plant VUmc and infographic | Vumc Annemarie Brouwer

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Explore. Inspire. Connect.

Colophon

This White Paper *"Added value from healthcare property '-Professional asset management in healthcare* is offered by Facility Management Netherlands and was developed in collaboration with Royal HaskoningDHV.

FMN is the leading independent professional association for those interested in the facility management domain. The members of FMN are employed in various sectors and various facility industries. FMN energises and inspires and connects members, branches and worlds.

The world around us is changing at an ever-increasing pace. Examples are trends like technologisation, robotisation, globalisation, big data, weconomy, urbanisation and themes like healthy & fit lives. The impact of these trends on how we deal with labour, work spaces and each other is huge. Facility management - the discipline that focuses on the environment in which people work, learn, improve or meet - can help organisations translate these trends and implement them in their own organisations. The field not only also helps organisations ensure talent loyalty and increase employee satisfaction and labour productivity, but also contributes to customer experience and satisfaction. However ... this requires the field to develop into a strategic discipline with a logical relation with the boardroom. FMN wants to play a leading role in this development of the field.

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