

## Understanding Hotel Maintenance Management

Pedro Longart

To cite this article: Pedro Longart (2019): Understanding Hotel Maintenance Management, Journal of Quality Assurance in Hospitality & Tourism, DOI: [10.1080/1528008X.2019.1658148](https://doi.org/10.1080/1528008X.2019.1658148)

To link to this article: <https://doi.org/10.1080/1528008X.2019.1658148>



Published online: 28 Aug 2019.



Submit your article to this journal [↗](#)



Article views: 17



View related articles [↗](#)



View Crossmark data [↗](#)



# Understanding Hotel Maintenance Management

Pedro Longart 

Business Division, Al Ain Men's Campus, Higher Colleges of Technology, Al Ain, United Arab Emirates

## ABSTRACT

The main purpose of the paper is to offer an overview and understanding of hotel maintenance for hotel managers. It highlights the importance of this function and its inherent challenges and key issues. The sampling frame consists of thirteen, 4–5-star hotels in Quito, Ecuador. Semi-structured, in-depth interviews were conducted with managers who oversee maintenance. The research follows a qualitative approach to data collection and analysis. The research had important findings, amongst them that planned preventive maintenance was the preferred maintenance strategy. The paper developed and applied a framework for researching hotel maintenance management, from strategic, operational and stakeholder viewpoints.

## KEYWORDS

Hotel maintenance; hotel operations; maintenance management; hospitality operations; maintenance strategies; hotel facilities management

## Introduction

Hotels are “dynamic, complex and costly buildings to operate and maintain with a variety of engineering systems” (Chan, Lee, & Burnett, 2003, p. 495). These systems need to be maintained regularly since hotel operations are performed 24 hours a day, all year round (Lai, 2013). This entails a process that needs thoughtful planning. This management process, namely, maintenance management is thus defined as all the management activities that determine objectives, strategies and priorities of the maintenance function and the subsequent responsibilities such as maintenance planning, supervision and control (Campbell, 1995; Campbell & Jardine, 2001).

Complaints about maintenance such as a noisy lift or a jammed door lock have been found to be the fourth source of unpleasant responses by hotel guests (Xiang, Schwartz, Gerdes, & Uysal, 2015). It has also been found that they were the cause of negative experiential encounters (Desmet, Guiza Caicedo, & Van Hout, 2009; Xu & Li, 2016). These negative perceptions are aggravated during peak months without an evident decline in the level of maintenance (Mattila & O'Neill, 2003). These negative perceptions in terms of customer dissatisfaction with maintenance vary according to the type of hotel and average daily rate. For instance, customers of luxury hotels or those paying higher rates showed more

**CONTACT** Pedro Longart  [pedrolongart@hotmail.com](mailto:pedrolongart@hotmail.com)  Higher Colleges of Technology, PO Box 17155, Al Ain, United Arab Emirates

Color versions of one or more of the figures in the article can be found online at [www.tandfonline.com/wqah](http://www.tandfonline.com/wqah).

© 2019 Taylor & Francis Group, LLC

dissatisfaction than customers of budget hotels (Li, Ye, & Law, 2013; Mattila & O'Neill, 2003). Losekoot, van Wezel, and Wood (2001) found that between 25 and 33% of the complaints in a hotel were due to the 'hard' element (facilities). This implies that efforts on the 'soft' elements such as customer interaction are meaningless unless key aspects of the facility are resolved.

Arenas and Colina (2010) bemoaned the fact that hotel managers are not conversant with maintenance management practice. They are not familiar with either the costs involved in maintaining the facility, or with the impact that it has on the business operation. That leads to depending on regular repairs (breakdown maintenance) rather than investing in planned preventive maintenance. The need to show that maintenance management strategies have an impact on overall business performance may convince hotel managers of the need to improve maintenance management practices and allocate budgets that better serve the purpose of improving maintenance management indicators and consequently business performance.

The paper attempts to address Arenas and Colina (2010) bemoaning the fact that hotel managers do not understand maintenance management. The purpose of the paper is to look into the basics of hotel maintenance management and its challenges in order to provide a simply formatted structure that hotel managers can understand. To achieve this purpose it delves in a more detailed way into hotel maintenance management practices. This extends the findings of the paper of Pitt, Cannavina, Sulaiman, Mahyuddin, and Wu (2016) – see literature review-. This research is based on an investigation of 4 and 5-star hotels in Ecuador. This cross-sectional study will attempt to explore the intricacy of managing such a complex operation in a country where hotel maintenance management is a labor-intensive function, with maintenance departments in most hotels. Although the research is undeniably influenced by its context, the principles of hotel maintenance management still apply. In order to define the objectives more precisely, it is necessary to conduct a literature review so that research gaps are clearly identified and addressed in the research.

## **Literature review**

### ***Initial considerations***

Garg and Deshmukh (2006) divided the literature around maintenance management into six (6) distinctive areas: maintenance optimization models, maintenance techniques, maintenance scheduling, maintenance performance measurement, maintenance information systems; and maintenance policies. It appears that in the context of hotels, two of these have been the subject of discussion in research papers regarding hotel maintenance: maintenance techniques and maintenance performance. Likewise, Crespo-Márquez, Moreau de Leon, Gómez Fernandez, Parra Márquez, and López Campos (2009) divided the

maintenance management process into two parts, maintenance strategies (which relates to techniques) and strategy implementation (linked to indicators). The maintenance process is the course of action and it should be aligned with actions at all levels of business activities, namely, strategic, tactical and operations (Marquez & Gupta, 2006). Following this line of thought, maintenance management should not be viewed in isolation. It may imply that the maintenance management and its relationship with business activities would impact overall business performance. Maletič, Maletič, Al-Najjar, and Gomišček (2014) presented a model that showed the impact of maintenance on profit margin and overall competitiveness. Their study highlighted that companies can benefit from the implementation of good management practices, an assertion also made by authors like Lofsten (1999), Al-Najjar and Alsyof (2004) and Al-Najjar (2007). In a study conducted in hotels, Kimes (2001) conducted a quality audit study in hotels, measuring the number of defects found in certain areas of the hotel. The authors defined as deficient hotels those which had at least one defect each in the exterior, the guest room, and the guest bath, while the properties that did not have defects in all three of those areas during the same period were termed non-deficient hotels. They found that “deficient” hotels in the sample recorded a Revpar of about \$2.80 less. There is a paucity of research on hotel maintenance management practices (Lai, 2013). One of the latest papers by Pitt et al. (2016) focuses on practices in a city in China, a revealing survey of strategies and practices. This literature review refers to papers published in hospitality but to a great extent reviews general maintenance literature.

### ***The strategic view***

Khazraei and Deuse (2011) created a very elaborate taxonomy on maintenance strategy. These authors clarified that following a European way of elucidation, they can be divided according to timeframes: preventive or corrective. Richard, Tse, Ling, and Fung (2000) stated that there are two main classifications of maintenance routines: unplanned and planned maintenance. Arenas and Colina (2010) refined the classification offered by Richard et al. (2000). According to Arenas and Colina (2010), there are four main types of maintenance. These are: Corrective maintenance (unplanned), planned preventive maintenance, Predictive Maintenance and Total Productive maintenance. Chan, Lee, and Burnett (2001) defined corrective maintenance as a traditional maintenance strategy, with two main types: Reactive Maintenance (RM) and Emergency Maintenance (EM). In the first one, maintenance is triggered by failure (Swanson, 2001). Emergency maintenance is also referred to as breakdown maintenance. Whereas RM does not prevent occurrence of the failure event, EM does prevent occurrence by some sort of repairing action. Planned preventive maintenance is preferred to corrective maintenance as it can reduce the costs of corrective maintenance by as much as 30% (Asociación Chilena de Seguridad, 2005).

Khazraei and Deuse (2011) added pro-active maintenance and included Total Productive Maintenance (TPM) and Reliability-Centered Maintenance (RCM) under that category. In the context of hotels, there is little evidence of a systematic application of predictive or pro-active maintenance. Strategies like Reliability-Centered Maintenance (RCM) which is a 'process used to determine what must be done to ensure that any physical asset continues to do what its users want it to do in its present operating context' (Moubray, 1997, p. 9) are not widely used in hotels (Arenas & Colina, 2010). However, regarding predictive maintenance, Torres Rodríguez and Góngora Medina (2009) implemented such a system in a Cuban hotel using vibration analysis techniques with important results. There was a reduction from 80 interventions in planned preventive maintenance to only 29 using predictive techniques. This led to a reduction of 191% in costs and 29% in the required maintenance time. Predictive maintenance can also rely on subjective measures such as smell, sight, hearing or touch (Johansson, 1993). Total Productive Maintenance (TPM) is an entire program for improving maintenance functions in any organization and involves its entire workforce (Al-Hassan, Chan, & Metcalfe, 2000). Salonen and Bengtsson (2011) do not classify TPM as a maintenance management endeavor though. These authors state that TPM is a comprehensive management approach and encompasses a different, unique business perspective with their own implementation practices, tools and techniques. Cesarotti and Spada (2009) claimed that for hotel services the implementation of TPM reduces the time for maintenance and that the strong reliance on intangible elements are facilitators for the application of a TPM approach. These authors claim that with TPM there are reduced costs and wider employee satisfaction. However, TPM has been found to face many barriers in its implementation (Poduval, Pramod, & Raj, 2013). Both RCM and TPM approach maintenance form a much broader business context. They establish a link between component failures and overall business performance (Murthy, Atrons, & Eccleston, 2002). In terms of popularity of strategies, Fraser (2014) using a broad conceptualization of planned maintenance conducted a review of the literature found that Condition based Maintenance, a type of predictive maintenance was in 42% of the papers, followed by TPM with 37% and RCM with 21%. However, it is important to note that this survey was on overall maintenance, not focused on hotels. In the Latin-American hotel industry, Arenas and Colina (2010) preferred planned preventive maintenance to other strategies. They state that RCM requires costly instrumentation. TPM requires a cultural change and does not constitute a maintenance management technique but an overall management system, beyond the scope of the maintenance manager. Within those systems, a criticality analysis of components can be performed, using different criteria, such as failure effect and failure risk (Waeyenbergh & Pintelon, 2002).

Hotels need to look into maintenance management strategically. This is because the usual lack of a maintenance management strategy applies to all companies, included the manufacturing sector (Salonen & Bengtsson, 2011). In

a survey in Sweden, Alsyouf (2009) found that only 48% had a written maintenance management strategy and 28% had no maintenance management strategy at all. As stated by Tsang (1998, p. 87) “considering maintenance a purely tactical matter is myopic”. A decision that should be considered to be strategic is the decision of whether to keep the maintenance services in-house or to outsource them (Lam and Ham, 2005). Pitt et al. (2016) demonstrated the increasing importance of outsourcing in hotel maintenance. Tsang (2002) claims that if certain maintenance activities enhance the company’s competitiveness by doing it cheaper, better or in a timelier manner, they should be done in-house. As for the reason quoted for outsourcing, more specific reasons are the lack of equipment/tools available, lack of spare parts and higher reliability and competency (Hassanain, Assaf, Al-Hammad, & Al-Nehmi, 2015). In the particular case of hotels, Lamminmaki (2005) applied the six-asset specificity dimension of Williamson (1985, 1988, 1991) for decision-making guidance. On the other hand, preventive maintenance (PM) or other maintenance management strategies relate to the maintenance policies which in turn, are connected to equipment replacement (also called maintenance policy). Sarkar, Panja, and Sarkar (2011) listed four of these policies: age-dependent, periodic, failure-limit and repair limit policies. This is an aspect worthy of research in the hotel context.

### ***The operational view***

Pintelon, Pinjala, and Vereecke (2006) defined human resources as one of the infrastructure decision elements in maintenance departments. According to Khalili, Hosseini-Nasab, and Moobed (2015) looking into the optimal allocation of human resources is key as it represents an important factor for reducing the total cost in many systems. In the hotel industry, there is no known survey of how this allocation is conducted. For general maintenance practice, Garcia-Garrido (2003) distinguished between plants with continuous processes and plants that have shifts (2 or 3). How hotel maintenance activities are scheduled seems to be a research gap that merits investigation. In this respect, Stipanuk (2006, p. 45) stated that “the scheduling of PM activity should be done in order to smooth the workload”. Hence, activities are not accumulated but rather “are staggered throughout the months to allow for productive use of labor”.

In terms of qualifications, Delmar (1995) defined specific job descriptions and person specifications for different staff members in the hotel maintenance department, who should have high school education as a minimum. O’Fallon and Rutherford (2011) defined three functions: administrative functions (clerical, purchasing, record keeping, etc.), building system functions (HVAC, plumbing, electricity, refrigeration, food protection equipment, computer systems and lifts) and crafts (carpenter, painter, groundskeepers, etc.). The organization’s structure proposed by O’Fallon and Rutherford (2011) consists of a maintenance manager, aided by an assistant, managing the three functions described above. Stipanuk

(2006) argued that maintenance managers should have some level of mechanical and electrical skills. A study in the US suggested that a typical maintenance manager would have significant on-the-job experience and have been in the hospitality industry for a short period of time (O'Fallon & Rutherford, 2011). Maintenance staff also need a wide range of skills in small properties (Stipanuk, 2006). Garcia-Garrido (2003) puts forward the dichotomy of opting for specialized technicians or multi-skilled staff and argues that multi-skilling results in costs reduction and may represent an optimization tactic.

In terms of record keeping, Stipanuk (2006, p. 40) used the term "Maintenance management systems". This was deemed an essential part of managing maintenance as it helps in assessing performance and managing needs more effectively.

Stipanuk (2006) distinguished between manual systems and computerized systems. However, they have some common features and forms. The first form is the work order, which contains details like this: person who makes the request, date/time, location, problem reported, staff assigned to do the job, date when job is completed and who completed it and time spent. There are also equipment data cards that are used to record facts and information of significance and room data cards that record information about guestrooms. In addition, another important recordkeeping system is the inventory record, which may also be listed under equipment or room cards, and lists all supplies needed by the property. The computerized maintenance management systems (CMMSs) can facilitate the job enormously (Kostek, 2010; Labib, 2004; Swanson, 1997). In hotels, maintenance requests need to be recorded promptly so that swift actions are taken to deal with the malfunctioning facilities (Lai & Yik, 2012).

Another aspect of keeping a maintenance management system is managing the performance of the maintenance department (Stipanuk, 2006; Kumar, Galar, Parida, Stenström, 2013). Pintelon et al. (2006) listed it as another key infrastructure decision element. Muchiri, Pintelon, Gelders, and Martin (2011) asserted that it is in the interest of asset managers to relate the impact of the maintenance process to the outcome. Poor or insufficient maintenance will cause a property to operate inefficiently (Thumann, 1999). On the other hand, (Parida, Kumar, Galar, & Stenstrom, 2015, p. 2) stated that "today's assets managers and asset owners need to know the relationships between the outputs of the maintenance process for assessing their contribution to the business goal". De Groote (1995) approached performance management from a very holistic angle and did not look only at particular indicators but on aspects such as the organizational chart, the management of spare parts, the personnel and the budgets. More specific indexes for assessing performance in the hotel were developed by Chan et al. (2001).



### ***The stakeholder view***

The maintenance process encompasses stakeholders who may be active within the process or external to the process. Some examples of stakeholders within the process are the people who perform technical and administrative actions. External stakeholders are interested in the required function of those actions (Soderholm, Holmgren, & Klefsjo, 2007). O’Fallon and Rutherford (2011) argue that it is important not only to liaise with other departments (housekeeping and purchasing being the closest relationships) but to educate top management about the significance of the maintenance function for the hotel. Garcia-Garrido (2003) put forward the concept of the internal client in which maintenance is considered a supplier of production (client-supplier relationship). Delmar (1995) detailed the client-supplier relationships that the Maintenance department has. For example:

- (1) With management (reports, authorizations, instructions, building modifications).
- (2) With the finance department (budgets requests, payroll, inventory control).
- (3) With human resources (bonuses, training, shifts, hiring, training, etc.).
- (4) With purchasing (Requests, requisitions, specifications, bids, stock control).
- (5) With housekeeping (Room repairs requests, room availability, work order reception, improvement suggestions or building modifications).
- (6) With Food and Beverage (Failure report, availability of kitchens and dining rooms, work order reception).
- (7) With security (Handling of emergency situations, risk prevention, staff access to certain areas).

Process reliability is affected by users of equipment, for which the concept of “ownership” applies. This consists of care of equipment, and minor maintenance which leads to a good operation (Narayan, 2012). In a hotel kitchen it applies to the head chef, who may “own” the equipment and may monitor the correct operation of the equipment, and minor maintenance chores like cleaning.

Another important decision that affects hotel internal stakeholders is the hotel budget. Shah-Ali (2009) stated that for a successful maintenance function the most important factor is a sufficient budget allocation. Replacing or maintaining equipment to extend the lifetime is an asset management decision that is normally taken by the owner or general manager, but with an important input of the maintenance manager (Stipanuk, 2006). A tool that maintenance managers can use to demonstrate the return on investment of maintenance activities is Value-Driven Maintenance (VDM). VDM is a maintenance management methodology which needs an effective

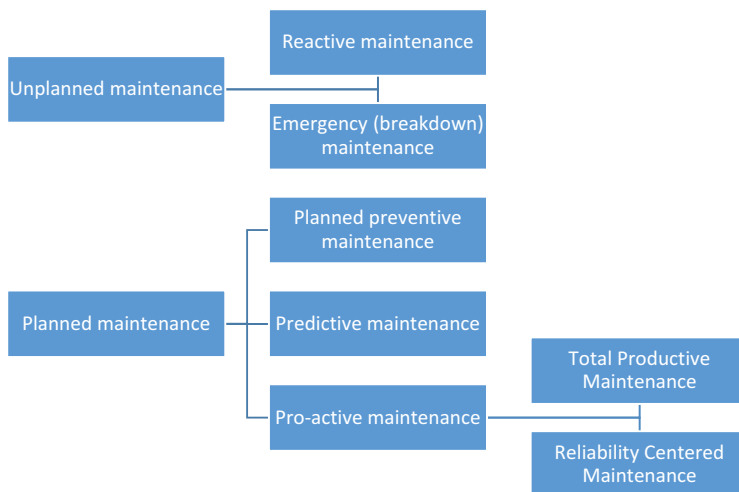


maintenance management performance system. The key drivers of VDM are asset utilization, resource allocation, cost control and Health & Safety/environment (Stenstrom, Parida, Kumar, & Galar, 2013).

In a hotel, departmental managers have daily involvement with the engineering facilities since they are users of its services. Therefore, it is normal that in top management meetings in most hotels, departmental heads are in formal contact with the engineering/maintenance manager (Stipanuk, 2006). The dynamics of those relationships are also worthy of investigation as they may help to understand good practice as the hotel is a complex system in which all functions are interrelated. Soderholm et al. (2007) proposed a holistic management system of maintenance management, with the ultimate aim of increasing stakeholder satisfaction. This framework provided useful ideas for the development of the research framework.

### ***A summary of the literature review***

First, the research looks into the definitions and the taxonomy of maintenance strategies and differentiates them from maintenance policies. Indeed, as stated by Khazraei and Deuse (2011, p. 98), “there exist different definitions of maintenance in scientific and technical literature, but still a concrete and well-structured classification, which can be used as an ultimate reference, is absent”. That also applies to the case of hotel maintenance, and the paper attempts to look into this research gap, and will propose a hotel maintenance system.



**Figure 1.** Proposed classification of hotel maintenance strategies.

**Table 1.** A summary of maintenance types, definitions, pros and cons.

Maintenance type	Definition/author	Pros	Cons
Reactive maintenance	Maintenance that is triggered by failure but does not guarantee that breakdown will not occur again (Swanson, 2001)	<ul style="list-style-type: none"> <li>Minimizes maintenance manpower and money</li> </ul>	<ul style="list-style-type: none"> <li>Unpredictable.</li> <li>Increased overall maintenance costs for critical failures.</li> <li>Failure can occur again</li> </ul>
Emergency (breakdown) maintenance	Break-down maintenance is a failure-based maintenance mode that restores the system to its original state after a partial or complete failure occurs in the system (Xu & Xu, 2017)	<ul style="list-style-type: none"> <li>As above</li> </ul>	<ul style="list-style-type: none"> <li>As above but makes sure that failure is not likely to occur again.</li> </ul>
Planned preventive maintenance	Maintenance is regular, repetitive work done to keep equipment in good working order. (Khazraei & Deuse, 2011)	<ul style="list-style-type: none"> <li>Reduces likelihood of failure reoccurrence.</li> <li>Fosters a culture of prevention of failure.</li> <li>Aims at optimizing accuracy and efficiency. (Khazraei &amp; Deuse, 2011)</li> </ul>	<ul style="list-style-type: none"> <li>Requires significant resources and manpower.</li> <li>Demands strict supervision</li> <li>Routine tasks, personnel may not be motivated.</li> <li>There may be a cost overrun with no significant improvements (Galar &amp; Kumar, 2017).</li> </ul>
Predictive maintenance	Regular monitoring of the actual condition, operating efficiency and other indicators that will provide data to ensure maximum interval between repairs and minimize failures (Mobley, 2002)	<ul style="list-style-type: none"> <li>Maximizes equipment availability and machinery life expectancy.</li> <li>Reduces downtime, overtime costs and secondary equipment condition. (Khazraei &amp; Deuse, 2011)</li> </ul>	<ul style="list-style-type: none"> <li>Tests and techniques require specialized equipment and training.</li> <li>Relatively expensive (Khazraei &amp; Deuse, 2011)</li> </ul>

*(Continued)*

**Table 1.** (Continued).

Maintenance type	Definition/author	Pros	Cons
Total Productive Maintenance	Total Productive Maintenance (TPM) is an entire program for improving maintenance functions in any organization and involves its entire workforce (Al-Hassan et al., 2000).	<ul style="list-style-type: none"> <li>• Reduces the time for maintenance.</li> <li>• TPM may fit very well in hotel contexts.</li> <li>• Reduced costs and wider employee satisfaction. (Cesarotti and Spada, 2009)</li> </ul>	<ul style="list-style-type: none"> <li>• TPM has been found to face many barriers for its implementation (Poduval et al., 2013).</li> <li>• Requires a cultural change.</li> <li>• Beyond the scope of the hotel maintenance manager (Arenas &amp; Colina, 2010).</li> </ul>
Reliability Centered Maintenance	‘A process used to determine what must be done to ensure that any physical asset continues to do what its users want it to do in its present operating context’ (Moubray, 1997, p. 9)	<ul style="list-style-type: none"> <li>• Recognizes that not all equipment is of equal importance.</li> <li>• Detects and pinpoints precise problems that occur and ensures advanced installation and repair techniques are performed (Khazraei &amp; Deuse, 2011).</li> </ul>	<ul style="list-style-type: none"> <li>• RCM requires costly instrumentation (Arenas &amp; Colina, 2010)</li> </ul>

Secondly, by comparing the taxonomy of Khazraei and Deuse (2011) with literature on hotel maintenance, this paper offers a simpler classification (see Figure 1).

A summary of definitions, pros and cons of every maintenance type is in Table 1.

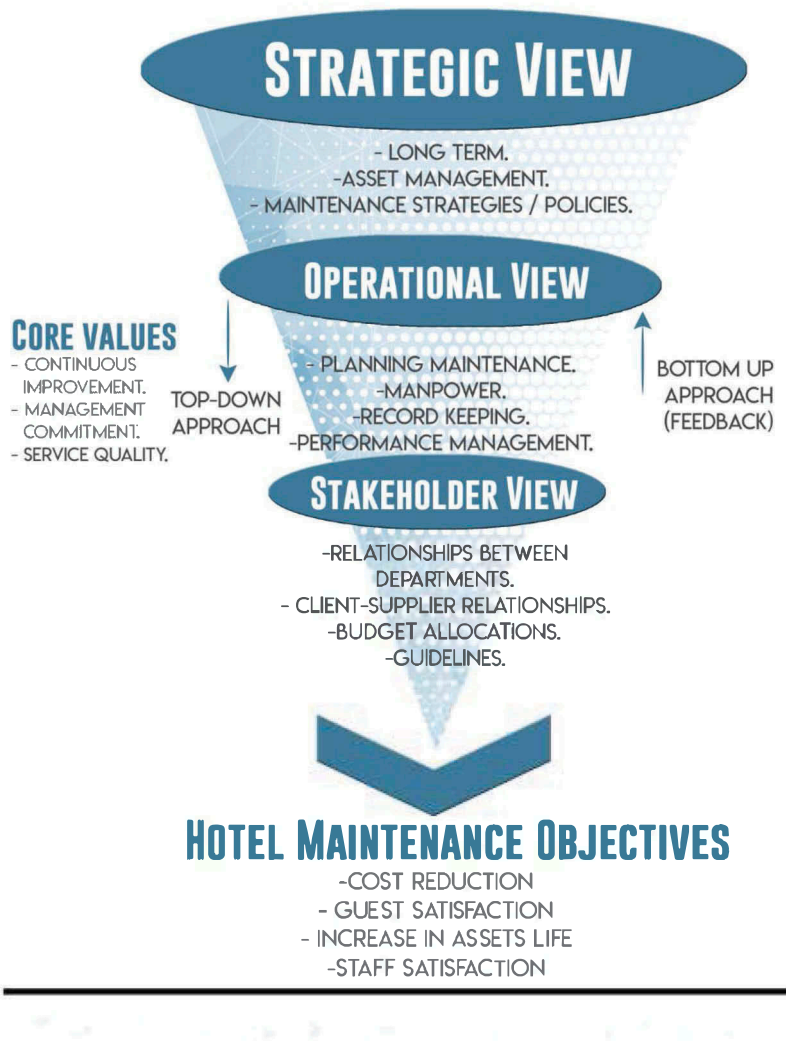
This section also addresses issues regarding the day-to-day operation. First, it looks at optimal allocation of human resources, an area in which a research gap exists. Also worthy of investigation are the specifics of job descriptions and person specifications of maintenance personnel. In addition, areas regarding record-keeping were examined but show need for research in this context. Finally, as part of the operational view of maintenance management, the topic of performance management was discussed. Chan et al. (2001) produced interesting research on performance indicators in the hotel context. However, probing the topic in other geographical areas and other hotel environments appears to be necessary.

Finally, this literature review looks at maintenance management from a wider perspective in which the hotel is perceived as a system with different stakeholders. The dynamics of these relationships and of specific pain points in these relationships such as budgets were discussed. All of this does not appear to be addressed in hotel maintenance related papers, hence it is another area in need of research. This summary leads to the following research objectives (ROs):

- RO1: To analyze maintenance strategies, policies and practices and the reasons behind these choices.
- RO2: To investigate issues regarding staffing of the hotel maintenance function in terms of staffing levels, scheduling work, skills and qualifications of maintenance personnel.
- RO3: To analyze practices regarding record-keeping in hotel maintenance management.
- RO4: To examine the application of performance management systems and indicators for the hotel maintenance function.
- RO5: To explore issues regarding relationships between the maintenance function and other departments, in general and also the particular issue of budgets.

## Methodology

To know the issues that the hotels faced related to maintenance management, a workshop in which there were 23 participants of 16 hotels located in Quito, Ecuador was organized by “Universidad de Las Americas”. Interaction with the participants led to eliciting themes and developing a research framework upon which to first investigate the relevant literature on the topic, and secondly helped to develop an interview guide for researching the issues



**Figure 2.** Management system for hotel maintenance.

brought up by the participants of the research. This research framework is titled the “A Management system for Hotel Maintenance”, based on the literature review. This framework looks at hotel maintenance management from three viewpoints:

- The strategic view
- The operational view
- The stakeholder view

The practical issues surrounding maintenance management, that is, issues with the operation or with relevant stakeholders in any context affect how the strategic view is approached. By the same token, how the management of the hotel approaches maintenance management strategically will influence the operational and stakeholder views. This relationship is summarized in [Figure 2](#).

### ***Data collection methods***

The research utilized the most widely used method in the built environment research: the interview (Amaratunga, Baldry, Sarshar, & Newton, 2002). The selection of a qualitative research was based on two main motives. Firstly, it needed an in-depth analysis of the issues. Secondly, novel topics in engineering research like this (in context and approach) are more suitable for qualitative research methods (Chileshe, Rameezdeen, & Hosseini, 2016). Sample size was carefully considered for analysis, following Malterud, Siersma, and Guassora (2016) information power tests. Firstly, the aim of the study is deemed to be narrow, as there is a number of eleven focused questions related to hotel maintenance management. Secondly, the sample is purposive and limited to hotel maintenance managers of large 4–5 star hotels. Finally, a strong relationship between the researcher and the respondents developed over a number of visits. For example, telephone calls and more than one visit was commonplace. This data was co-constructed with great participation from respondents. This facilitated strong and clear communication. This may be deemed as a small sample, for the quantitative-minded observer. However, the information was enlightening and complied with the precepts of an interpretivist approach in which data saturation should be reached. Indeed the researcher followed an adaptive approach (Sim et al., 2018). The themes that emerged from the 13 hotels were recurrent and extending that to the whole population of 4–5 star hotels in Quito did not offer additional benefits. The sampling frame for the research was provided by the association of Hotels in Quito, Ecuador. Hotels that qualify for the research are 4–5 star hotels with a minimum of 30 rooms with a maintenance department. That initial sampling frame consisted of 21 hotels, of which 16 participated in the workshop discussed in section 2.1. Of these 16 hotels, 13 agreed to take part in the research, six (6) are 4-star hotels and seven (7) are 5-star hotels. Due to the small sample; and for preserving confidentiality, of paramount importance for the hotels involved, just aggregate data (both for hotels and respondents) is provided so as not to facilitate possible identification of the participating hotels. The researcher does have a table with all the hotel characteristics. However, it was agreed with respondents that this information that may lead to their identification is not provided. Nonetheless, some of the characteristics can be revealed:

- Ownership/Management arrangements: 7 Franchises, 3 Management Contract, 3 Independent.

- Accommodation capacity (rooms): 156.8 (mean), 147 (median).
- Age of property (years): 24.2 (mean), 22 (median).

The respondents were mainly the maintenance managers of these hotels, except for one hotel where the General Manager acts as a sort of Executive Maintenance Manager (without the title). The profile of the respondents is as follows:

- Eight (8) are engineers, four (4) are technicians and one (1) is a hotelier with more than 30 years' experience in hotels, including ample experience and training in hotel maintenance.
- Seven (7) engineers have worked in their hotels between 5 and 20 years, so they have ample experience in hotel maintenance (but in their hotels only).
- A very experienced respondent, an engineer with over 20 years' experience in plant maintenance (manufacturing). Hired as hotel maintenance manager about a year before the interview took place.
- The four technicians reached the rank of maintenance manager after working in their hotels for over 7 years (currently maintenance managers). Three (3) have taken training within their companies. One of them is more hands-on and has almost the role of a supervisor (although officially he is a maintenance manager).
- Ten (10) of the respondents have a hands-one approach to maintenance. Two (2) of them have more of an executive role, depending on technicians or a maintenance supervisor for the daily tasks and even supervision.

Consequently, an interview guide was prepared for conducting semi-structured interviews. This interview guide is informed by existing literature and explored the following issues:

- (1) Maintenance policy. What policy is used? Results.
- (2) Maintenance work. Planning and scheduling. How do you organize work? Connection with management cycle.
- (3) Staff issues.
- (4) Training.
- (5) Maintenance records.
- (6) Budgeting.
- (7) Outsourcing v. In-house. What type of work is conducted in-house or outsourcing? Rationale? Who made the decision?
- (8) Maintenance strategies.
- (9) Performance Management.
- (10) Liaison with other departments.



### Qualitative data analysis

The interviews were recorded in Spanish, transcribed and translated into English by the researcher whose mother tongue is Spanish and has been educated in both English and Spanish. The author of the report shares the view of Larkin, Dierckx de Casterle, and Schotsmans (2007, p. 474). These authors asserted that in the cases of translation of interviews “an outright rejection on positivist thought on validity might do a disservice to qualitative research”. Following this suggestion, careful consideration has been made when translating the interviews. The analysis of themes was facilitated using Nvivo 9. A thematic analysis was used to identify the main issues or themes, most of them based on prior research or on theoretical perspectives. It is complemented with some interesting insights provided by the respondents, mainly related to the realities experienced in hotel maintenance in Ecuador. This analytical approach is considered a hybrid approach of qualitative methods of data analysis (Fereday & Muir-Cochrane, 2006). The themes were then coded and sub-coded. It is mainly deductive as the codes are chosen a priori (Crabtree & Miller, 1999). This is because the approaches to maintenance management are mainly generic, and it is the application in this particular context that is less explored. Indeed, there is well established theory in maintenance management, with some contribution in the way that this literature can be framed in the hotel context. Likewise, the research objectives are well-served with this analytical approach. Some codes are data driven or inductive

**Table 2.** Analytical approaches with examples of codes/sub-codes.

Code/Sub-code	Type of code	Explanation
Maintenance Strategy/ Back-up systems	Inductive	Back-up systems were considered to be part of the operational view of maintenance strategy. For that reason, it is deemed to be a sub-theme of maintenance strategy. Interesting aspect when literature consulted refers to “redundant systems”.
Maintenance Strategy/ Predictive maintenance	Deductive	As in LR
Maintenance Strategy/TPM Parts	Deductive Inductive	As in LR This was considered to be separate theme. In Ecuador, constant repairs and part replacements are a routine part of the maintenance operation. This effectively extends the life of many assets. Because of its uniqueness, this is considered an interesting aspect, with great importance in the context of Ecuador.
Parts/Parts stockholding	Inductive	Respondents brought to the fore the aspect of parts, the difficulty of sourcing them, their quality etc. This led to a sub-theme, namely the whole aspect of managing stocks of parts (parts stockholding). This is an area relevant to the context of Ecuador.

(Boyatzis, 1998). Therefore, some new insights were found. These inductively-derived insights were very particular to the Ecuadorian context. An excerpt of the list of codes/sub-codes, linking them to the interview guide (where applicable), can be seen in [Table 2](#).

The data was collected and analyzed by the researcher, a PhD holder who has worked in hotels, with academic experience and education in both facilities management, engineering and the hospitality industry. A key aspect to ensure rigor in the research was the research design itself. Tracy and Hinrichs (2017) provided a number of tests to check trustworthiness of qualitative research. It is considered that rigor is proved using these tests. For example:

- (1) The research took five (5) months contacting, interviewing, collecting data and getting to know the respondents. This is sensitive confidential data in many cases and for that reason there is a need to build rapport with respondents, and contacted them twice.
- (2) The sample is very appropriate for the study. Results are deemed transferable because they refer to the realities of running a hotel maintenance operation. The researcher once worked in a management position and identified himself with these issues which are mirrored in hotel maintenance management literature.
- (3) Appropriate procedures were taken, including recording of interviews and expert translation by the researcher conversant in both languages.
- (4) There is thick description and discussion of issues, rather than the restricted answers to closed questions, as is typical of quantitative research. In-depth illustration is provided with carefully chosen quotes in this paper.

## **Analysis and discussion of findings**

Following the proposed “Strategic-Operational-Stakeholder” or “SOS” research framework, this section will look at three different perspectives separately and the relationships between them will be examined in the section of conclusions and implications.

### ***The strategic perspective***

Most of the hotels use planned preventive maintenance with a great deal of success. Firstly, it has helped extend the life of equipment and resulted in savings for the hotels. This planning follows schedules but also includes a degree of flexibility, combining it with predictive maintenance as one of the interviewees put it:

“Well, we know how to discover the maintenance that is needed. If there is a noise, then I know I need to stop that piece of equipment. I inform operations that that equipment needs to undergo maintenance, and then we plan the time that it is not going to be operative. Immediately afterwards we start working on it.”

Secondly, it increases reliability of equipment as it reduces unexpected break-downs. It has been noted that those hotels have a clear identification of MISs, conducting criticality analyses. It is important to highlight that equipment of 30, 40 or 50 years is still working due thanks to the ingenuity of the maintenance teams and a proper application of planned preventive maintenance techniques. This level of ingenuity and professionalism varies from hotel to hotel. Other managers are starting to apply concepts from their industrial experience in hotels, managing change from a poorly run operation to a skilled maintenance operation, using efficient engineering techniques. However, hotels differ in the type of equipment that is under the responsibility of the maintenance department.

A great deal was discussed in terms of break-down maintenance. It appeared that one of the hotels interviewed seemed to focus on emergency maintenance, having a much looser approach to a criticality analysis, and a not too clear maintenance strategy. This is because according to the maintenance manager “there is no budget for replacing equipment” and it can be interpreted as continuous firefighting and establishing priorities in a sort of ad-hoc fashion by the maintenance manager. In this case, although there are schedules for planned preventive maintenance, if a breakdown occurs (and they do on a regular basis), then it obviously takes priority. It implies a sort of vicious circle, where the lack of maintenance increases the number of breakdowns. Although that was beyond the scope of the investigation, it can be interpreted that constant breakdowns affect customer satisfaction and hence sales. That affects the amount of available time for maintenance and equipment replacement. This hotel rates poorly compared to the hotel with a great focus on planned preventive maintenance (Trip Advisor reviews). Breakdowns have given hotels the opportunity to prevent breakdowns occurring again and one hotel uses techniques such as the fish-bone diagram to investigate in depth the possible causes of a break-down. Another hotel reports the application of Kaizen to avoid recurrent emergency maintenance. A manager provided the example of operators of an industrial dishwasher who were working on the effects (a wet floor) rather than the causes that the dishwasher was not draining. He applied the fish bone techniques and found that the problem was that the operators were not trained on how to use the dishwasher properly.

A few hotels reported the use of predictive maintenance for equipment that is considered critical for the operation. Systems such as AC systems use automated fault detection and diagnosis, which according to Hou, Lian, Yao, and Yuan (2006) have the potential to reduce energy consumption and maintenance costs with enhanced comfort and reliability. Predictive maintenance was reported as

a strategy in critical electrical systems as well as with the use of infrared thermography. Several hotels use informal predictive systems such as noise detection. It was reported that some staff are well trained in identifying noises. The experience of those professionals may be shared so that those skills are transmitted to their peers working in hotel maintenance.

Only one hotel reports the use of Total Productive Maintenance, although not referred to it by its name. The GM has immense experience in rooms department and hotel maintenance. He explained his approach to maintenance this way:

“... if you are a chambermaid, you do not call maintenance to remove stains in a room; but do it yourself with the right equipment that is provided to them. Only if she could not remove the stain then the maintenance function is called in. The receptionists and maintenance supervisor are trained to repair and change batteries of the electronic door locks. That reduced the cost from \$80 (outsourced service) to only \$10”. Maintenance is always second option.”

In this hotel, the maintenance manager holds a “supervisory, not an executive position”. This is because in his job description he must be involved in basic maintenance functions such as unblocking a drain, painting and also writes administrative reports. Most of the maintenance functions in the hotel are outsourced and this maintenance supervisor- who was involved in the hotel construction- is supported by all these contractors. This hotel reported the highest levels of customer satisfaction when Trip Advisor reviews were read. It seems that a culture of TPM apparently leads to success stories like this. However, as the GM put it, it is challenging to change a culture and easier when you start with this approach in a brand-new hotel.

With regard to maintenance policies, only one of the hotels surveyed has a maintenance policy issued by their head office. Policies related to replacement of equipment vary from hotel to hotel. Some follow a repair limit policy connected with the cost of replacing new equipment. They are offered as a percentage of the cost of conducting the maintenance compared to the cost of new equipment. The percentages offered were 50%–60% and even 75%. Such high percentages can be explained by cash flow problems in those hotels. Most hotels follow an age-dependent maintenance policy. Most hotels start with a periodic preventive maintenance policy, and once they are more familiar with the equipment, they adjust the maintenance schedules accordingly.

On the other hand, the degree of outsourcing maintenance tasks versus keeping them in-house differs greatly. However, it is revealed overall that most tasks are kept in house (except one hotel). A large hotel (over 101 rooms) stated that “95% is done in house and 5% is outsourced, mainly for overhauls which require a warranty certificate. That 5% is about main assets such as cooling towers, lifts, etc.” The percentage of work being done in house depends greatly on the experience of the staff, this is consistent with

the human asset specificity (Lamminmaki, 2005). Other reasons influencing the outsourcing decision are: the number of years of the maintenance manager in the hotel, and on the trust that is being placed on contractors. The latter being an issue brought the fore by an interviewee who examined carefully the outsourcing issue in hotels. In the first place, he examined the prevailing view of selecting contractors based on price. He put it this way:

“If a pump maintenance contractor is good and solved our problem and I do not have the cash flow to keep it as my contractor, I may lose a good contractor. Finally, I may end up with another one who leaves a damaged pump, the most common outcome in these cases”.

However, he warned that even good contractors must be subject to regular monitoring: “when you find a contractor who is enthusiastic and eager to do the work, they must be audited and supported.”

A theme emerging from the interviews was back-up systems. These are also called redundant systems (Sheu & Krajewski, 1994). These authors deem it as a very costly maintenance policy. Having backup systems is found to be a strategic decision that some hotels have taken with relatively good success, confirming research on effectiveness of backup systems for reducing the severity of breakdowns (Elsayed & Dhillon, 1979; Lambert, Walvekar, & Hirmas, 1971). It was found that having back-up systems for small appliances when a good piece of equipment has broken down is very effective. This is effective when coupled with a complete criticality analysis. This success story was told by one of the most experienced hotel maintenance managers interviewed:

“We have a kneading machine, a beauty, a German machine in need of an overhaul. Then the decision was to repair the machine, but it was going to take some time until we had it working. Then we bought a new machine, as a back-up system. Then we have two machines, for almost the price of just one”.

### ***The operational perspective***

In the hotels staffing level is between 13 to 19 rooms per maintenance staff member (except the one with the TPM approach). This number varies according to the level of outsourcing in each property. Recruitment policies vary from property to property and only one property follows stringent corporative guidelines for staff selection. Most managers agree that staff must be multi-functional and that they can be trained as per the needs of the property. The level of education varies but it was found that it is preferable to have technicians with electrical skills, and then trained them in mechanical tasks, rather than otherwise. Maintenance staff are even trained to do plumbing and painting tasks, while some properties have painters, plumbers and even carpenters on their payroll. The maintenance managers interviewed are very hands-on, fully involved in the maintenance tasks, with only one having more of an executive role.

Training is conducted regularly, in most cases, in-house training is provided by the maintenance managers with some courses provided by equipment suppliers. One of the hotels has a daily routine of a minimum of 15 minutes of training daily. Training is found to be a key activity in most of the hotels, as they prefer to recruit graduates and young staff than experienced staff. The reasons provided were that hotel maintenance is a task that is different from property to property, and that some experienced staff may not be willing to learn new tasks as needed. The in-house training sessions are mostly informal. The maintenance managers serve as role models with a can-do approach to work. Just one hotel has a standard operating procedures manual for the maintenance department, and two hotels are making progress toward developing theirs. The development of these manuals is evidence of the initiative and professionalism of managers who understand the need to standardize procedures.

Regarding work orders and records, there are many differences in how this is carried out. There are hotels using a fully manual, pen-and-paper system with logbooks and files for equipment or areas. At the other extreme, there are fully automated systems, using highly efficient systems like HotSOS ©. There are also intermediate systems that use Excel macros, or simple Excel spreadsheets. In some cases, the filing system is highly reliant on the experience of the maintenance manager who has developed the system over the years. In hotels with a tight budget, the use of Macros was very cost-effective and there were linkages between different worksheets. In manual systems, linking a work order with a logbook could be a time-consuming experience. In one of the hotels interviewed, record keeping was so poor that when there was a change in ownership, the maintenance manager had to start the records from zero. The number of man-hours employed in this task was considerable. In addition, this manager may face serious difficulties as he would not know whether that equipment has undergone critical maintenance, with potential safety problems as well. However, most of the hotels interviewed do not have a record of the time that maintenance of certain pieces of equipment takes. Two hotel managers recognized the importance of keeping detailed time records, the need to have aggregate information, and the use of engineering tools such as Pareto analysis, histograms, and several statistics. Again, only one hotel keeps strict time records.

One of the key differences between hotel maintenance and other contexts is the fact that the hotel is a continuous operation and that is reflected on how the maintenance work is organized and scheduled. Again, all hotels report different ways of scheduling their work, which correspond to their individual needs. However, some practices worthy of consideration are identified. In several cases, work is scheduled according to the equipment to be maintained and a trained member of staff is allocated to work on the shift, or even more oddly the maintenance is scheduled according to which member of staff is on that shift. Some hotels have maintenance of a piece equipment scheduled for a certain month or a certain week. If schedules are planned weekly (the common pattern

in these hotels) and maintenance is planned monthly, then the manager tries to get that maintenance done in the first week, or, if not possible in the second week, and so forth. There is slightly less flexibility if maintenance is planned on a 52-week schedule. However, in both cases flexibility is built into the system. In both cases, the planned maintenance of that week may be postponed due to other priorities or emergency calls. Most of the hotels reported a rotating 8-hour shift schedule, with other hotels working two shifts a day, with a member of staff “on-call”, also reporting that it has resulted in being more cost-efficient for them than the three-shift pattern.

An area where it was found that most hotels need to work on is on managing their performance. Other managers are in favor of implementing a performance management system but complain that other priorities and time limitations have hindered progress on that front. One of the hotels argued that an urgent repair index could be implemented but found that implementation is challenging. However, two hotels use a traffic-light system. In a hotel, if tasks are undertaken as scheduled 90–100% of the times, it is performing well (Green), 80–89% (amber), less than 80% (red). Interestingly, the other hotel considers that green is above 75%, and as such, it is the minimum required and their last score of 79% was acceptable. Some hotels use indirect measures of performance, like customer satisfaction surveys or even Trip Advisor reviews. Another hotel uses environmental measures which are needed for other purposes as an indirect performance measure, such as energy consumption. That information is compared against a benchmark of other hotels in the chain.

Finally, another emerging theme from the interviews was found to be of particular importance in the context of Ecuador. That is part inventory management. They reported that the difficulty in finding and acquiring parts for their equipment affected their operation significantly. Those parts needed to be imported and difficulties in finding the parts, high tariffs, etc. meant trying to find the required part or, alternatively, a part that could work although not the one they would like to have for their equipment. That calls for a reflection on what restrictive practices may represent for the hotel service, especially in a country where tourism is a key industry.

### ***The stakeholder perspective***

The development of budgets is included here as budget development must be coordinated with other departments. This section will discuss both operative (day-to-day) budgets and investment budgets. The way budgets are managed relates to the organization’s culture and the number of years that the maintenance manager has been in charge, or how experienced the maintenance manager is. For example, it was found that the maintenance department in one of the hotels in the sample is not in charge of their budget and just issues



requests for major maintenance. This reflects on the status that the department has, and on its ability to deliver an efficient and effective service. In hotels where corporate guidelines are followed, it was found that assets and their maintenance are more highly valued. The head office has a tighter control on maintenance expenditure. Just in one hotel a clear guideline was found, and the maintenance budget is considered as a percentage of total hotel sales. In independent or franchised hotels, investors oversee capital investment budgets. It was found that in most hotels budgets are revised monthly. Just in one hotel the monthly budget includes big overhauls to equipment. Another common practice is the adjustment of the operative maintenance budget as per the annual rate of inflation. Devoting time and care to the budgets has proved very effective. Most experienced managers report that they do not overspend and keep their budgets well under control. Another experienced manager considers that the hotel departments should administer their own maintenance budget. This manager considers that each department should be a cost center, with a budget to maintain their own equipment. Again, the organization culture was found to greatly influence staff behavior and the way they perceive maintenance.

In terms of relationships with other departments, again it varies from hotel to hotel. In some hotels, maintenance works closely with housekeeping. This is because most of the requests for maintenance, especially in rooms come from housekeeping. These departments have a good, collaborative relationship. Another evidence of relationship between departments is the pattern of the interdepartmental meetings, and the status of the maintenance department in these meetings. In one of the hotels, maintenance is part of the executive team and is a key decision maker. In many hotels monthly interdepartmental meetings are held. Another hotel has a quality manager and if customer feedback in facilities is low, there are meetings with the maintenance manager for analyzing the causes of poor feedback.

## **Conclusions and practical implications**

### ***Managerial implications***

To start with general managers should be conversant with hotel maintenance management. This is because effective hotel maintenance should be viewed strategically. GMs are the ones leading the maintenance strategy. Big hotel chains follow this top-down approach successfully. However, it is important to gather constant feedback from stakeholders and from the maintenance managers on a constant basis (bottom-up approach). As a matter of fact, it was found that maintenance managers appreciate the support provided by their GMs. Maintenance managers want to be heard and this paper aims to give a voice to those hard-working maintenance managers.

The research confirmed the findings of Arenas and Colina (2010) on the preference of preventive maintenance as the maintenance strategy in hotel management. However, preventive maintenance should be complemented with the strategy of predictive maintenance. This may simply take the form of informal predictive systems which one of the hotels interviewed reported as highly effective. Using informal predictive systems represents an important skill that employees could share with other hotels. A lesson to be learned is not to fall into the vicious circle of breakdown maintenance as reported in one hotel. It is also recommended that management tools and techniques are more broadly used. It was found that some hotels employ techniques like Cause-Effect diagrams to find root causes of equipment failure with good success. On the other hand, it was found that TPM was employed in one of the hotels, and the results are indeed positive. It is acknowledged that in a new property, with new staff the TPM strategy can be easier to implement than in hotels where employees and departments are set in their ways. However, as some maintenance managers have commented, a change of culture may be needed, and departments should be actively involved in maintenance efforts. The success of TPM in that hotel may motivate other hotels to consider a TPM approach, as it was achievable in the same challenging, Ecuadorian context. The practice and degree of outsourcing varies greatly in these properties. This variation may be understandable, but outsourcing should be perceived as a strategic decision, which should not be taken by the maintenance department in isolation. Well-thought criteria need to be considered when allocating maintenance activities in-house or outsourcing them. One of the interviewees reported good relationship and management of maintenance contractors. It evidences mutually beneficial supplier-client relationships, a key quality management principle. Another interesting finding was the good practice of having back-up (or redundant) systems which in many cases can save good pieces of equipment and bring benefits to the hotel operation.

Interestingly, this context shows that hotel maintenance requires highly versatile, multi-functional staff, and that on-the-job training of that staff has created very strong maintenance departments, with dedicated staff who in most cases have worked in the hotel sector for many years. It was found that attitude and willingness to learn was more appreciated by hotel maintenance managers than previous qualifications. However, most of the hotels do not have written details of standard operating procedures, either for training or for most of the hotel's maintenance management activities. They rely on the knowledge and presence of their maintenance managers, who in many hotels have developed a great deal of experience. It is recommended though that the good practice of two of the hotels in the study is followed. One already has a manual, the other is developing one. It was found that some hotels have developed their own systems for keeping records and files for maintenance. It was found that the lack of owning a sophisticated software system does not affect the maintenance operation, but the lack of a good system does indeed give cause for concern. This problem was found by one of the

hotel managers who, when given the position, found no proper record-keeping system, with all the negative consequences that this can have. Another area where findings show a need for most of the hotels in the study to work is that of performance measurement. One of the hotels has a very clear system, and hotel maintenance is very well organized, following corporate guidelines. Indeed, it allows managers to focus on important aspects of the operations as measurements reinforce what is important for the hotel. As Catasus, Ersson, Grojer, and Yang Wallentin (2007) put it: what you measure and talk about is what gets done, particularly if those measures are numerical. It was also found that sadly, some hotels do not confer the maintenance department the status they deserve. The importance of the department is critical as the hotel's financial performance depends greatly on the proper management of its physical assets. The staff and management of this department have the difficult task of keeping a hotel fully functioning 24 hours every day of the year.

### ***Theoretical contribution***

The first theoretical contribution of this research is the research framework. The framework shows that a hotel organization should first be guided by strong core values. These core values are enablers of effective hotel maintenance management, for example, a strong service quality culture. The framework shows that maintenance management should have very clear objectives. In order to achieve the objectives, hotel maintenance management should have both a top-down as well as a bottom-up approach. It should start with clear definition of a strategic plan from the onset. This strategy is then operationalized by the maintenance management department, who in turn liaise with other departments, other stakeholders and top management as well. Likewise, feedback from those stakeholders should be considered as they are affected by hotel maintenance outcomes. This bottom-up approach is important to strengthen or modify the strategy and operation of hotel maintenance as required. This framework aims to aid the understanding of hotel maintenance for general managers or managers of other hotel functions.

This research also demonstrates the complexity of the task that hotel managers and their staff face and the challenges and issues when managing the maintenance function. It extends the view that only preventive maintenance management is the only way forward but that practices like TPM or predictive maintenance can also be used successfully. Thirdly, it investigates in depth the real practice of maintenance management in a country where hotel maintenance is labor-intensive and mostly conducted in house. The analysis of practices and the challenges that maintenance management has in developing countries is deemed to be another theoretical contribution of this paper.

### **Areas for further research**

There are many areas for further research as this is an area insufficiently studied. In the first place, a cost-benefit analysis of redundant systems, an emerging theme, appears as practical and necessary. Another issue brought to the fore by a respondent is whether a change of approach to having departments that are responsible of aspects of the maintenance function, and overseeing their own maintenance budgets would a feasible strategy. That implies investigating the culture within a hotel and the perception that the General Manager, functional managers and staff from other departments have about the maintenance function. And lastly, the aspect of performance measures that are more relevant and practical to implement in the hotel context.

### **Research limitations**

This study shares the same difficulties experienced by Lai and Yik (2012), in terms of the sort of data to be collected and how it would be analyzed. The researcher shares the view of Arenas and Colina (2010) which considers that maintenance management is not only related to facilities and equipment, but also connected broadly to the hotel's operation, hence needing a holistic approach. The researcher also acknowledges that a larger, cross-sectional study across several cities would have provided the research with more insights in other contexts. Nonetheless, this is considered to be an exploratory study which fully achieves the research objectives and it is considered to be a starting point for further research in hotel maintenance management.

### **Acknowledgments**

The author is indebted to Asociación de Hoteles de Quito Metropolitano and to Universidad de las Americas (Escuela de Hospitalidad y Turismo) for their full support in making this paper possible. Also to the respondents in the research who are passionate about hotel maintenance and excellent hotel service.

### **ORCID**

Pedro Longart  <http://orcid.org/0000-0001-8595-5778>

### **References**

- Al-Hassan, K., Chan, J. F. L., & Metcalfe, A. V. (2000). The role of total productive maintenance in business excellence. *Total Quality Management*, 11(4–6), 596–601. doi:10.1080/09544120050007931

- Al-Najjar, B. (2007). The lack of maintenance and not maintenance which costs: A model to describe and quantify the impact of vibration-based maintenance on company's business. *International Journal of Production Economics*, 107(1), 260–273. doi:10.1016/j.ijpe.2006.09.005
- Al-Najjar, B., & Alsyouf, I. (2004). Enhancing a company's profitability and competitiveness using integrated vibration-based maintenance: A case study. *European Journal of Operational Research*, 157(3), 643–657. doi:10.1016/S0377-2217(03)00258-3
- Alsyouf, I. (2009). Maintenance practices in Swedish industries: Survey results. *International Journal of Production Economics*, 121(1), 212–223. doi:10.1016/j.ijpe.2009.05.005
- Amaratunga, D., Baldry, D., Sarshar, M., & Newton, R. (2002). Quantitative and qualitative research in the built environment: application of “mixed” research approach. *Work Study*, 51(1), 17–31. doi:10.1108/00438020210415488
- Arenas, E. F., & Colina, N. V. (2010). The planned preventive maintenance in hotel facilities: an undeferrable priority. *Retos Turísticos*, 9(1), 45–47.
- Asociación Chilena de Seguridad. (2005, August). *Evolución del Mantenimiento en la gestión hospitalaria* [Evolution of hospital maintenance management]. Asociación Chilena de Seguridad. Retrieved from <http://www.medianetworks.cl/hospitalaria1/aprobados/enriquebernhardt.pdf>
- Boyatzis, R. (1998). *Transforming qualitative information: Thematic analysis and code development*. Thousand Oaks, CA: Sage.
- Campbell, J. D. (1995). *Strategies in excellence in maintenance management*. Portland Ore: Productivity Press.
- Campbell, J. D., & Jardine, A. K. (2001). *Maintenance excellence: Optimizing equipment lifecycle decisions* (Campbell JD, Jardine, A.K., Eds.). New York, NY: CRC Press.
- Catasus, B., Ersson, S., Grojer, J. E., & Yang Wallentin, F. (2007). What gets measured gets ... on indicating, mobilizing and acting. *Accounting, Auditing & Accountability Journal*, 20(4), 505–521. doi:10.1108/09513570710762566
- Cesarotti, V., & Spada, C. (2009). A systemic approach to achieve operational excellence in hotel services. *International Journal of Quality and Service Sciences*, 1(1), 51–66. doi:10.1108/17566690910945868
- Chan, K. T., Lee, R. H. K., & Burnett, J. (2001). Maintenance performance: a case study of hospitality engineering systems. *Facilities*, 19(13/14), 494–504. doi:10.1108/02632770110409477
- Chan, K. T, Lee, R. H. K, & Burnett, J. (2003). Maintenance practices and energy performance of hotel buildings. *Strategic Planning for Energy and The Environment*, 23(1), 6–28. doi:10.1080/10485230309509628
- Chileshe, N., Rameezdeen, R., & Hosseini, M. R. (2016). Drivers for adopting reverse logistics in the construction industry: a qualitative study. *Engineering, Construction and Architectural Management*, 23(2), 134–157. doi:10.1108/ECAM-06-2014-0087
- Crabtree, B., & Miller, W. (1999). A template approach to text analysis: Developing and using codebooks. In B. Crabtree & W. Miller (Eds.), *Doing qualitative research* (pp. 163–177). Newbury Park, CA: Sage.
- Crespo-Márquez, A., Moreau de Leon, P., Gómez Fernandez, J. F., Parra Márquez, C., & López Campos, M. (2009). The maintenance management framework: a practical view to maintenance management. *Journal of Quality in Maintenance Engineering*, 15(2), 167–178. doi:10.1108/13552510910961110
- De Groote, P. (1995). Maintenance performance analysis: a practical approach. *Journal of Quality in Maintenance Engineering*, 1(2), 4–24. doi:10.1108/13552519510089556
- Delmar, S. (1995). *Mantenimiento de Hoteles: la Seguridad y comodidad del huésped* [Hotel Maintenance: Guest comfort and security] (2nd ed.). Mexico City (Mexico, DF): Trillas.

- Desmet, P. M., Guiza Caicedo, D., & Van Hout, M. (2009, October 22–24). *Differentiating emotional hotel experiences*. International Hospitality and Tourism Educators EuroCHRIE Conference, Helsinki, Finland.
- Elsayed, E. A., & Dhillon, B. S. (1979). Repairable systems with one standby unit. *Microelectronics Reliability*, 19(3), 243–245. doi:[10.1016/0026-2714\(79\)90341-X](https://doi.org/10.1016/0026-2714(79)90341-X)
- Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods*, 5(1), 80–92. doi:[10.1177/160940690600500107](https://doi.org/10.1177/160940690600500107)
- Fraser, K. (2014). Facilities management: the strategic selection of a maintenance system. *Journal of Facilities Management*, 12(1), 18–37. doi:[10.1108/JFM-02-2013-0010](https://doi.org/10.1108/JFM-02-2013-0010)
- Galar, D., & Kumar, U. (2017). *EMaintenance: Essential electronic tools for efficiency*. London: Academic Press.
- Garcia-Garrido, S. (2003). *Organización y Gestión Integral de Mantenimiento* [Integrated Maintenance Organization and Management]. Madrid (Spain): Diaz de Santos.
- Garg, A., & Deshmukh, S. G. (2006). Maintenance management: literature review and directions. *Journal of Quality in Maintenance Engineering*, 12(3), 205–238. doi:[10.1108/13552510610685075](https://doi.org/10.1108/13552510610685075)
- Hassanain, M. A., Assaf, S., Al-Hammad, A. M., & Al-Nehmi, A. (2015). A multi-criteria decision making model for outsourcing maintenance services. *Facilities*, 33(3/4), 229–244. doi:[10.1108/F-01-2013-0003](https://doi.org/10.1108/F-01-2013-0003)
- Hou, Z., Lian, Z., Yao, Y., & Yuan, X. (2006). Data mining based sensor fault diagnosis and validation for building air conditioning system. *Energy Conversion and Management*, 47(15–16), 2479–2490. doi:[10.1016/j.enconman.2005.11.010](https://doi.org/10.1016/j.enconman.2005.11.010)
- Johansson, K.-E. (1993). *Driftsakerhet och underhall* [Operations and Maintenance]. Lund, Sweden: Studentlitteratur.
- Khalili, S., Hosseini-Nasab, H., & Moobed, F. (2015). Optimal assignment of human resources for maintenance departments using fuzzy queuing systems. *International Journal of Production Research*, 53(15), 4583–4593. doi:[10.1080/00207543.2014.998791](https://doi.org/10.1080/00207543.2014.998791)
- Khazraei, K., & Deuse, J. (2011). A strategic standpoint on maintenance taxonomy. *Journal of Facilities Management*, 9(2), 96–113. doi:[10.1108/14725961111128452](https://doi.org/10.1108/14725961111128452)
- Kimes, S. E. (2001). How product quality drives profitability: The experience at Holiday Inn. *The Cornell Hotel and Restaurant Administration Quarterly*, 42(3), 25–28. doi:[10.1016/S0010-8804\(01\)81021-1](https://doi.org/10.1016/S0010-8804(01)81021-1)
- Kostek, R. (2010). Computerized maintenance management systems. *Studies and Proceedings–Polish Association for Knowledge Management*, 35, 277–281.
- Kumar, U., Galar, D., Parida, A., Stenstrom, C., & Berges, L. (2013). Maintenance performance metrics: A state-of-the-art review. *Journal of Quality in Maintenance Engineering*, 19(3), 233–277. doi:[10.1108/JQME-05-2013-0029](https://doi.org/10.1108/JQME-05-2013-0029)
- Labib, A. W. (2004). A decision analysis model for maintenance policy selection using a CMMS. *Journal of Quality in Maintenance Engineering*, 10(3), 191–202. doi:[10.1108/13552510410553244](https://doi.org/10.1108/13552510410553244)
- Lai, J. H. (2013). An analysis of maintenance demand, manpower, and performance of hotel engineering facilities. *Journal of Hospitality & Tourism Research*, 37(3), 426–444. doi:[10.1177/1096348012436380](https://doi.org/10.1177/1096348012436380)
- Lai, J. W. H., & Yik, F. W. H. (2012, May). A probe into the facilities maintenance data of a hotel. *Building Services Engineering Research and Technology*, 33(2), 141–157. doi:[10.1177/0143624411401840](https://doi.org/10.1177/0143624411401840)



- Lam, T., & Han, M. X. (2005). A study of outsourcing strategy: a case involving the hotel industry in Shanghai, China. *International Journal of Hospitality Management*, 24(1), 41–56. doi:[10.1016/j.ijhm.2004.04.002](https://doi.org/10.1016/j.ijhm.2004.04.002)
- Lambert, B. K., Walvekar, A. G., & Hirmas, J. P. (1971). Optimal redundancy and availability allocation in multistage systems. *IEEE Transactions on Reliability*, 20(3), 182–185. doi:[10.1109/TR.1971.5216123](https://doi.org/10.1109/TR.1971.5216123)
- Lamminmaki, D. (2005). Why do hotels outsource? An investigation using asset specificity. *International Journal of Contemporary Hospitality Management*, 17(6), 516–528. doi:[10.1108/09596110510612158](https://doi.org/10.1108/09596110510612158)
- Larkin, P. J., Dierckx de Casterle, B., & Schotsmans, P. (2007). Multilingual translation issues in qualitative research: Reflections on a metaphorical process. *Qualitative Health Research*, 17(4), 468–476. doi:[10.1177/1049732307299258](https://doi.org/10.1177/1049732307299258)
- Li, H., Ye, Q., & Law, R. (2013). Determinants of customer satisfaction in the hotel industry: an application of online review analysis. *Asia Pacific Journal of Tourism Research*, 18(7), 784–802. doi:[10.1080/10941665.2012.708351](https://doi.org/10.1080/10941665.2012.708351)
- Lofsten, H. (1999). Management of industrial maintenance-economic evaluation of maintenance policies. *International Journal of Operations & Production Management*, 19(7), 716–737. doi:[10.1108/01443579910271683](https://doi.org/10.1108/01443579910271683)
- Losekoot, E., van Wezel, R., & Wood, R. C. (2001). Conceptualizing and operationalizing the research interface between facilities management and hospitality management. *Facilities*, 19(7/8), 296–303. doi:[10.1108/02632770110390775](https://doi.org/10.1108/02632770110390775)
- Maletič, D., Maletič, M., Al-Najjar, B., & Gomišček, B. (2014). The role of maintenance in improving company's competitiveness and profitability: a case study in a textile company. *Journal of Manufacturing Technology Management*, 25(4), 441–456. doi:[10.1108/JMTM-04-2013-0033](https://doi.org/10.1108/JMTM-04-2013-0033)
- Malterud, K., Siersma, V. D., & Guassora, A. D. (2016). Sample size in qualitative interview studies: guided by information power. *Qualitative Health Research*, 26(13), 1753–1760. doi:[10.1177/1049732315617444](https://doi.org/10.1177/1049732315617444)
- Marquez, A. C., & Gupta, J. N. (2006). Contemporary maintenance management: process, framework and supporting pillars. *Omega*, 34(3), 313–326. doi:[10.1016/j.omega.2004.11.003](https://doi.org/10.1016/j.omega.2004.11.003)
- Mattila, A. S., & O'Neill, J. W. (2003). Relationships between hotel room pricing, occupancy, and guest satisfaction: A longitudinal case of a midscale hotel in the United States. *Journal of Hospitality & Tourism Research*, 27(3), 328–341. doi:[10.1177/1096348003252361](https://doi.org/10.1177/1096348003252361)
- Mobley, R. K. (2002). *An introduction to predictive maintenance* (2nd ed.). Amsterdam (Netherlands): Elsevier.
- Moubray, J. (1997). *Reliability centered maintenance* (2nd ed.). New York, NY: Industrial Press.
- Muchiri, P., Pintelon, L., Gelders, L., & Martin, H. (2011). Development of maintenance function performance measurement framework and indicators. *International Journal of Production Economics*, 131(1), 295–302. doi:[10.1016/j.ijpe.2010.04.039](https://doi.org/10.1016/j.ijpe.2010.04.039)
- Murthy, D. N. P., Atrens, A., & Eccleston, J. A. (2002). Strategic maintenance management. *Journal of Quality in Maintenance Engineering*, 8(4), 287–305. doi:[10.1108/13552510210448504](https://doi.org/10.1108/13552510210448504)
- Narayan, V. (2012). Business performance and maintenance: How are safety, quality, reliability, productivity and maintenance related? *Journal of Quality in Maintenance Engineering*, 18(2), 183–195. doi:[10.1108/13552511211244210](https://doi.org/10.1108/13552511211244210)
- O'Fallon, M. O., & Rutherford, D. G. (2011). *Hotel management and operations* (5th ed.). Hoboken, NJ: John Wiley & Sons.



- Parida, A., Kumar, U., Galar, D., & Stenstrom, C. (2015). Performance measurement and management for maintenance: a literature review. *Journal of Quality in Maintenance Engineering*, 21(1), 2–33. doi:10.1108/JQME-10-2013-0067
- Pintelon, L., Pinjala, S. K., & Vereecke, A. (2006). Evaluating the effectiveness of maintenance strategies. *Journal of Quality in Maintenance Engineering*, 12(1), 7–20. doi:10.1108/13552510610654501
- Pitt, M., Cannavina, D., Sulaiman, R., Mahyuddin, N., & Wu, C. (2016). Hotel maintenance management in Sanya, China. *Journal of Facilities Management*, 14(4), 304–314. doi:10.1108/JFM-12-2015-0034
- Poduval, P. S., Pramod, V. R., & Raj, J. V. P. (2013). Barriers in TPM implementation in industries. *International Journal of Scientific & Technology Research*, 2(5), 28–33.
- Richard, C. M., Tse, P., Ling, L., & Fung, F. (2000). Enhancement of maintenance management through benchmarking. *Journal of Quality in Maintenance Engineering*, 6(4), 224–240. doi:10.1108/13552510010373419
- Salonen, A., & Bengtsson, M. (2011). The potential in strategic maintenance development. *Journal of Quality in Maintenance Engineering*, 17(4), 337–350. doi:10.1108/13552511111180168
- Sarkar, A., Panja, S. C., & Sarkar, B. (2011). Survey of maintenance policies for the last 50 years. *International Journal of Software Engineering & Applications*, 2(3), 130–148. doi:10.5121/ijsea.2011.2310
- Shah-Ali, A. (2009). Cost decision making in building maintenance practice in Malaysia. *Journal of Facilities Management*, 7(4), 298–306. doi:10.1108/14725960910990044
- Sheu, C., & Krajewski, L. J. (1994). A decision model for corrective maintenance management. *The International Journal of Production Research*, 32(6), 1365–1382. doi:10.1080/00207549408957005
- Sim, J., Saunders, B., Waterfield, J., & Kingstone, T. (2018). Can sample size in qualitative research be determined a priori?. *International Journal Of Social Research Methodology*, 21(5), 619–634. doi:10.1080/13645579.2018.1454643
- Soderholm, P., Holmgren, M., & Klefsjo, B. (2007). A process view of maintenance and its stakeholders. *Journal of Quality in Maintenance Engineering*, 13(1), 19–32. doi:10.1108/13552510710735096
- Stenstrom, C., Parida, A., Kumar, U., & Galar, D. (2013). Performance indicators and terminology for value driven maintenance. *Journal of Quality in Maintenance Engineering*, 19(3), 222–232. doi:10.1108/JQME-05-2013-0024
- Stipanuk, D. M. (2006). *Hospitality facilities management and design* (3rd ed.). Lansing, MI: American Hotel & Lodging Association.
- Swanson, L. (1997). Computerized maintenance management systems: a study of system design and use. *Production and Inventory Management Journal*, 38(2), 11–15.
- Swanson, L. (2001). Linking maintenance strategies to performance. *International Journal of Production Economics*, 70(3), 237–244.
- Thumann, A. (1999). *Plant engineers and managers guide to energy conservation*. Lilburn, GA: Fairmont Press.
- Torres Rodríguez, R., & Góngora Medina, R. (2009). Mantenimiento por diagnóstico: factibilidad de aplicación en hoteles de sol y playa. [Predictive Maintenance: feasibility of application in sun-and-beach hotels]. *Revista Retos Turísticos*, 8(1), 2–7.
- Tracy, S. J., & Hinrichs, M. M. (2017). Big tent criteria for qualitative quality. In J. Matthes, C. S. Davis, & R. F. Potter (Eds.), *The international encyclopedia of communication research methods* (pp. 1–10). Hoboken, NJ: John Wiley & Sons.
- Tsang, A. H. (1998). A strategic approach to managing maintenance performance. *Journal of Quality in Maintenance Engineering*, 4(2), 87–94. doi:10.1108/13552519810213581

- Tsang, A. H. (2002). Strategic dimensions of maintenance management. *Journal of Quality in Maintenance Engineering*, 8(1), 7–39. doi:[10.1108/13552510210420577](https://doi.org/10.1108/13552510210420577)
- Waeyenbergh, G., & Pintelon, L. (2002). A framework for maintenance concept development. *International Journal of Production Economics*, 77(3), 299–313. doi:[10.1016/S0925-5273\(01\)00156-6](https://doi.org/10.1016/S0925-5273(01)00156-6)
- Williamson, O.E. (1985). *The economic institutions of capitalism*. New York (NY): The Free Press.
- Williamson, O.E. (1988). Corporate finance and corporate governance. *The Journal Of Finance*, 43(3), 567–591. doi:[10.1111/j.1540-6261.1988.tb04592.x](https://doi.org/10.1111/j.1540-6261.1988.tb04592.x)
- Williamson, O.E. (1991). Comparative economic organization: the analysis of discrete structural alternatives. *Administrative Science Quarterly*, 36(2), 269–296. doi:[10.2307/2393356](https://doi.org/10.2307/2393356)
- Xiang, Z., Schwartz, Z., Gerdes, J. H., & Uysal, M. (2015). What can big data and text analytics tell us about hotel guest experience and satisfaction? *International Journal of Hospitality Management*, 44(1), 120–130. doi:[10.1016/j.ijhm.2014.10.013](https://doi.org/10.1016/j.ijhm.2014.10.013)
- Xu, X., & Li, Y. (2016). The antecedents of customer satisfaction and dissatisfaction toward various types of hotels: A text mining approach. *International Journal of Hospitality Management*, 55, 57–69.
- Xu, J. & Xu, L. (2017). Maintenance Decision Support. In Xu, J. & Xu, L. (2017), *Integrated health management: perspectives on systems engineering techniques* (pp. 377–432). London: Academic Press