RAMS Issues in Hotels Management

Vladimir Sklyar, Vyacheslav Kharchenko

National Aerospace University "KhAI", Kharkiv, Ukraine
v.sklyar@csn.khai.edu, v.kharchenko@csn.khai.edu

Abstract. The paper contains novel results obtained in area of cost effective hotel management based on qualitative analysis of Key Performance Indicators (KPIs). Five RAMS attributes (reliability, availability, maintainability, safety and security) and associated KPIs are considered as business critical. We also propose the new obtained Advanced Hotel Management Framework (AHMF) for case based business effectiveness assessment and assurance, as well as a taxonomy of KPIs for hotel management. Maintenance strategy for improvement of availability of a room is suggested.

Keywords: RAMS, hotel management system, reliability, availability, maintainability, Advanced Hotel Management Framework.

1 Introduction

Tourism, hospitality and hotel industries are growing economy branches. In accordance with United Nations World Tourism Organization (UNWTO) Report 2017, tourism consists 10% of the world economy in a sense of GDP (Gross Domestic Product).

From this point of view hotels are a core of hospitality industry and a core of tourism in general. Tourists spend in hotel the most part of travel time and it happens very often, when the main impression concerning a journey is formed subjectively on the base of the impressions about hotels. So guests oriented hotel management affects very much common tourism sustainability.

Modern scientists pay some attention to the hotel management. The most part of publication are devoted to economic issues [1,2], education issues [3,4], and managerial issues [5,6]. In these publications researchers mostly are focused on global hotel management factors which can be summarized in as named PEST-analysis, which takes into account political, economic, social, and technological aspects.

For example, for hotel management it is worth to consider such factors as the emergence of more modern hotels in the nearby area, construction and repair of roads, deterioration of weather conditions, changing the economic and political situation, the impact of new technologies on the economic efficiency of the hotel. However, such critical factors usually are taking into account before opening the business or during periodical review of the business efficiency when stakeholders make decision concerning reasons to continue or to stop of hotels operation.

Executive hotel management in daily activities usually is supported with lower level of analysis taking into account macro factors only periodically. In this paper we firstly propose an approach in operational hotel management, which is based on de-

pendability. There are not any known publications which discuss hotel management from the point of view RAMS attributes and indicators.

RAMS abbreviation means reliability, availability, maintainability, and safety [7,8]. These four attributes are used through decades to describe dependability of safety critical systems. Taking into account, all modern business environments are sensitive to security risks, in this paper we consider RAMS as a combination of four classic attributes plus security, so "S" in this abbreviation means "safety & security" together. Hotel safety is a matter for discussion, so there is a point of view, that hotels cannot be considered as a safety critical infrastructure. We argue that there are a lot of accidents when fires in hotels leaded to human deaths. From this point of view, a risk of a fire in a hotel is a safety indicator, which has to be considered as a part of RAMS.

So, our hypothesis is all RAMS attributes are critical in the hotel business, and our objective is to refine these relations. To achieve this paper objective, the following sections are included.

Firstly, in Section 2, we develop Advanced Hotel Management Framework (AHMF), taking into account a lack of methodical and scientist information as in hotel management area as well as in hotel applicable RAMS. AHMF structure is based on the author relevant experience. This big picture can also be used as case-based approach [9,10] for a hotel effectiveness assurance and assessment. Also we analyze issue related with implementation of Information Technologies (IT) and particularly Internet of Things (IoT) in hotel industry [6,11].

Secondly, in Section 3, we propose new taxonomy of the Key Performance Indicators (KPIs) for hotel management. This taxonomy covers economic and quality of service indicators, as well as green [12] and RAMS [13] related indicators. This taxonomy provides fundamentals for hotel management based on quantitative analysis of obtained results.

After that, in Section 4, we pay more attention to RAMS KPIs. Dependability of equipment affects hotel rooms' availability for guests, and that causes influence for all business profit. We consider one by one chosen RAMS KPIs and formalized optimization tasks, which should be formulated and resolved for cost effective and KPIs based hotel management. Cyber security of the hotel digital infrastructure also has to be taken into account [14].

2 Hotel Management: a "Big Picture"

2.1 General Framework for Hotel Management

The AHMF is presented on Fig. 1. Three the main parts of the AHFM include the following:

- Strategic Planning;
- Operation and Maintenance;
- Infrastructure Management and Assets Management.

In this paper we make some assumptions concerning a type of considered hotels. We consider a small hotel with capacity up to 20 rooms (40 people), which can be managed by a small group of staff, for example by one family. We do not take into

account internal telephone network since in the modern conditions it does not make a lot of sense for a small hotel. Also we do not consider some extra hotel features such as a swimming pool, a gym, etc.

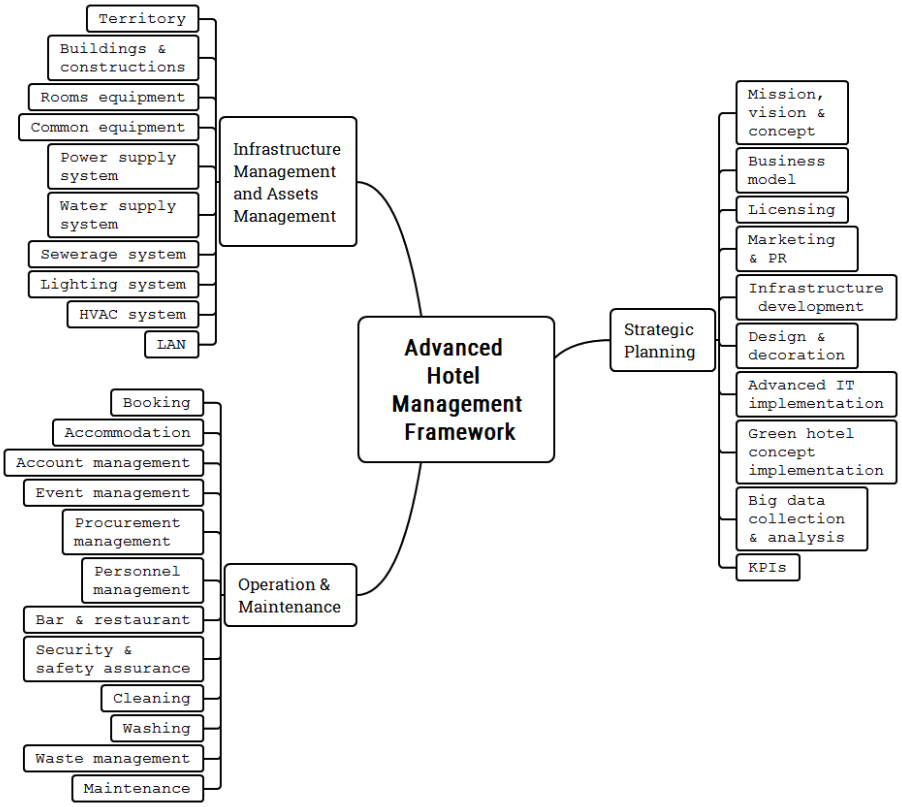

Fig. 1. Advanced Hotel Management Framework

We name the logical structure presented on Fig. 1 as a "framework" since it provides fundamentals for the entire main types of activities in operational hotel management. The AHMF can be considered as a kind "architecture" of the hotel managerial approach affecting all levels of decisions making. From the other hand, the AHMF provides the base for business case description for a target hotel.

2.2 Strategic Planning in Hotel Management

Eleven components are included in Strategic Planning partition on Fig. 1. Below we describe these components one by one.

Mission, vision & concept. Mission states the main objective, value and sense of the business. Vision is ability to find a way for implementation the mission trough any barriers. The concept explains a manner in which the hotel will be operated. Client

focus groups depend on the hotel concept. For example it can be hotel family with mini-club for children, or club hotel with some thematic events (fine arts, photo, cooking, etc.), or hotel for youngsters with parties and concerts, etc.

Business model defines how are money earned by the hotel including description of infrastructure, proposed services and values, target customers, relations, cost structure and revenue streams.

Licensing covers activities to get all needed permits and approval for the hotel, bar and restaurant operation in accordance with local laws and regulations, including local taxes payment.

Infrastructure development depends from the hotel concept. From the one hand, infrastructure is a part of the business model supporting the main service capacities. From the other hand, investment in infrastructure development can make the hotel for attractive for gests supporting sustainability of the business.

Marketing and Public Relation (PR) supports awareness of potential clients concerning values which the hotel proposes. In modern info-business it is important to maintain high quality content in social networks. Web-site or blog of the hotel should provide useful information not only about the hotel but also about local culture and history as well as about attractive places and events which could be reachable from the hotel site.

Design & decoration are focused to creating an attractive for gest environment which highlight the hotel concept. It should be performed periodically to prevent premises and areas dilapidation and obsolescence.

Advanced IT implementation considers opportunities to apply Information Technology to improve business efficiency. Since Internet of Things (IoT) is at the present one from the most rapidly developing IT area, a number of potential IoT application for hotel business is also growing. The main idea of IT-application is creation of a system of services under a concept of “a smart house” or “a smart hotel”. There are the following prospective areas of IoT applications in hotels, which are already implemented by industry leaders [6,11]:

- Guestroom automation is implementing trough adjustment of different types of profiles for room equipment such as air-conditioning, lighting, etc.;
- Predictive maintenance takes into account data of smart sensors network which is installed at modern parts of hotels systems such as power supply, water supply, etc. Such sensors are able to recognize a technical state of equipment and to provide signals and information for maintenance personnel in accordance with chosen maintenance procedure;
- Mobile engagement is in increasing of quantity of mobile services which are available for gests via mobile interface, for example, control of guestroom equipment or services ordering;
- Hyper-personalization means using authorized personal data to make more personalized attitude to gests from the memorizing of specific gests preferences. Location-based interactions provide for gests relevant information concerning the hotel environment and events;
- Natural user interfaces provide to gests opportunity to interact with room equipment or with reception by easier ways, for example, via, for of voice interface or TV interface;

- Application Programming Interface (API) and third party integration means a creation of large systems on the base of different platforms, software and equipment.

Green hotel concept implementation engages as named "green", i.e. sustainable and environmentally friendly values in hotels daily management [12]. There are many association which promote green values in hotel business, like "TripAdvisor Green Leaders", "Green Hotels Association", "Green Hotelier", and many other. The main criteria, which make a hotel recognized as a green, include energy management systems, bulbs with low energy consumption, motion sensors, water-saving equipment, waste recycling and application of materials without toxic ingredients in buildings as well as in daily services.

Big data collection & analysis allows investigate statistics on the market as well as in hotels operation. It is possible to make some prognosis and to direct resources for rofit increasing. In this case hotel management is based on KPIs, which is the next point of the Strategic Planning agenda.

KPIs provide the base of measurement of the hotel operation. KPIs analysis is performed in Section 3.

2.3 Operation and Maintenance in Hotel Management

Twelve components are included in Operation and Maintenance partition on Fig. 1. Below we describe these components one by one.

Booking service is one from the most important in the business since booking provides a steam of clients together with return of investment (ROI). Hotels can organize its own sell out system via web site, but the most effective today are global booking services like Booking.com, Agoda, TripAdvisor, AirB&B. and other. Booking service should be highly supported with marketing and PR efforts.

Accommodation service is responsible for rooms' distribution between gests, management of the rooms' preparation as well as for gests meeting at the reception and gests check-in. Accommodation service has to communicate with gests during all stay period until the check-out.

Account management is responsible for control of all financial flows, including all incomes and expenses.

Event management is responsible for creation and development of parties, festivals, etc.

Procurement management is responsible for delivery of different types of goods which are necessary for successful hotel Operation and Maintenance.

Personnel management is responsible for employers hiring and training.

Bar & restaurant can be a separated division of the hotel with different management team, however bar & restaurant shall support the hotel mission and concept.

Security & safety assurance in the hotel include many technical and organizational measures which are directed to decrease risks values for people and assets in accordance with ALARA (as low as reasonable applicable) principle [8]. We consider safety and security issues in Section 4.

Cleaning is daily activity to prepare room for guests stay. It is timely critical because if the hotel has fully booked load, all rooms cleaning shall be performed between check-out and check-in time.

Washing is daily activity to prepare linen for guestrooms. It shall be scheduled to provide clean linen for guestrooms before check-in time.

Waste management is highly related with green hotel concept. Recycling can reduce a volume of waste in some times. Recycling approach depends on country policy in waste management as well on policy of the main suppliers of the food and beverage. Any case it is worth to separate waste at least on the following fractions: metal cans, glass bottles, plastic, paper boxes, food waste, and other waste, which usually can be burnt. The last fraction can be also segregated under local conditions. In developing country with a not mature approach to waste recycling a not-toxic waste can be burnt at the special site. Food waste can be provided for nearest animal farms or animal shelter. It is critical to communicate to guest the hotel policy of waste management.

Maintenance is highly related with Infrastructure and Assets Management. Maintenance includes small daily repairing of room's equipment and the common hotel equipment as well as periodic testing and repair. Groups of maintained assets of hotels are considered in Subsection 2.4. As it was stated above predictive maintenance paradigm can be implemented with a large involvement of smart sensors.

2.4 Infrastructure and Assets Management in Hotel Management

Ten components are considered in Infrastructure and Assets Management partition on Fig. 1 including the following:

- Territory with enclaves, gates, gardens, ponds etc.;
- Buildings & constructions;
- Rooms equipment including furniture, TV sets, refrigerators, and room control system, etc.;
- Common equipment including reception equipment, bar and restaurant equipment, washing equipment, etc.;
- Power supply system;
- Water supply system;
- Sewerage system;
- Lighting system'
- Humidity, ventilation and air-conditioning (HVAC) system;
- Local Area Network (LAN) with Internet access.

3 Key Performance Indicators for Hotel Management

The proposed taxonomy of KPIs for hotel management (see Fig. 2) includes the following four groups:

- Economical KPIs estimate financial results of the hotel activities;
- Green KPIs estimate sustainability and environmental friendliness;
- Quality of Service KPIs estimate ability of the hotel to provide announced level of services in required loading conditions with available hotels resources;
- RAMS KPIs estimate appropriate attributes.

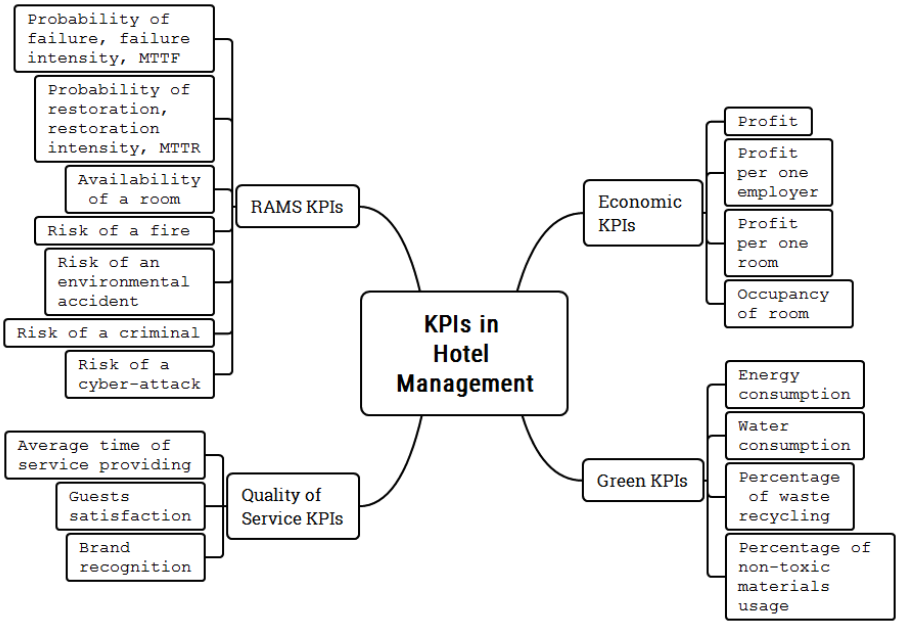

Fig. 2. Key Performance Indicators for Hotel Management

Below we consider one by one all KPIs those are presented on Fig. 2.

Profit is the main KPI of the hotel which is calculated as difference between all incomes and all expenses: Profit = ΣIncomes – ΣExpences.

Profit per one employer is calculated as relation between a profit value and number of the hotel employers: P employer = Profit / N employer.

Profit per one room is calculated as relation between a profit value and number of the hotel rooms: P room = Profit / N room. If a hotel has different kinds of rooms, this indicator also can be calculated as a differential: P room i = Profit i / N room i.

Occupancy of rooms for some time period, for example, per month, is calculated as a relation between a number of rooms, which have been occupied and paid during some time period, and general numbers of rooms, which have been available during this time period: Occupancy = N paid / (N rooms · N days). Number of available rooms is defined as multiplication of a number of rooms in a hotel and a number of days in a time period which is considered. For example, if we have a hotel with ten rooms and some month with thirty days and during this month 150 nights of stay have been paid by guests, then Occupancy = 150 / (10 · 30) · 100% = 50%. It is clear, that occupancy of rooms directly affects to profit, so monthly statistic for occupancy of rooms can be used for monthly profit prediction.

Energy consumption is a summary quantity of energy spent in the hotel during some time period, for example, during a month. Energy consumption can be calculated in energy units (for example, in n kilo-watts · hour) as well as in money units. Energy consumption calculation can be distributed between hotel units such as rooms, buildings, sites, etc. Through hotel operation different energy saving equipment and

measures can be implemented in a hotel and energy saving result can be measured as a difference in energy consumption.

Water consumption is a summary quantity of water spent in the hotel during some time period, for example, during a month. Water consumption can be calculated in volume units (for example, cubic meters) as well as in money units. Water consumption calculation can be distributed between hotel units such as rooms, buildings, sites, etc. Through hotel operation different water saving equipment and measures can be implemented in a hotel and water saving result can be measured as a difference in water consumption.

Percentage of waste recycling is calculated as a relation between a volume of waste, which is handled as recycled and general volume of waste: WR = Waste r / Waste · 100%. This indictor also affects profit since the hotel has to pay for transportation of not-recycled waste.

Percentage of non-toxic materials usage is calculated as a relation between a volume of non-toxic materials and general volume of materials: NTM = Materials nt / Materials · 100%.

Average time of service providing is calculated for each type of the provided service as arithmetical mean of time from a client order to the service performance: Ts = ΣTsi / N.

Guests' satisfaction is calculated in points of popular booking web-services like TripAdvisor or Booking.com. Qualitative assessment of guests' satisfaction can be performed in accordance with reviews content which provides quests via the same web-services. For example, in accordance with Booking.com scale, the main criteria of guests' satisfaction include the following: staff, facilities, cleanliness, comfort, location.

Brand recognition is defined as a popularity of a hotel. We propose to use quantity of external links in the web to the hotel site as an indicator of the hotel brand recognition.

Dependability indicators, such as probability of failure, failure intensity, mean time to failure (MTTF), probability of restoration, restoration intensity, and mean time to restoration (MTTR) are calculated as per Reliability Theory [8]. These indicators can be defined for systems (power supply system, water supply system, etc.) as well as for hotel units (room, building, site, etc.).

Availability of a room is calculated as probability of that all equipment in a room is in a working state at a random time: A = MTTF / (MTTF + MTTR).

Risk of a fire is a combination of a fire appearance probability and an average fire damage: Rf(t) = Pf(t) · Cf.

Risk of an environmental accident is a combination of an accident probability and an average accident damage: Ra(t) = Pa(t) · Ca.

Risk of a criminal is a combination of a criminal (the most common for hotel is a theft) probability and an average criminal damage: Rc(t) = Pc(t) · Cc.

Risk of a cyber-attack is a combination of a cyber-attack probability and an average cyber-attack damage: Rca(t) = Pca(t) · Cca.

4 Analysis of Tasks Related with RAMS Assurance

In this section we consider formalized RAMS tasks which affect hotel management in relation with hotel profit maximization. For that we need to analyze RAMS KPIs one by one establishing dependency between analyzed KPI and influence to profit.

In this paper we consider a general term of "a failure" which has to be defined for each kind of specific hotel. For example, it can be a failure of general-purpose household equipment (central heating, lighting or air-conditioning), or installed in a certain room. Also it can be a failure of utility system (gas, electricity, water, communications), or a furniture damage (damaged cupboard, broken window, a burned light bulb or a hairdryer). Some failures can happen randomly; however, some failures can be caused by hotel guests. Qualitative failure analysis can be performed specifically for any kind of hotel system and equipment. Human factor, such as wrong guests behavior has to be taken into account.

Increasing of MTTF value allows increasing profit because decreasing maintenance expenses. From the other hand, MTTF and reliability increasing is not free since it requires increasing of a hotel construction price. Therefore, it is applicable to state for a hotel a classical task of reliability assurance:

1) Assure the highest reliability level in conditions of a cost restriction: $MTTF \rightarrow \max$, $C \leq Cmax$;

2) Assure the lowest price in conditions of required reliability assurance: $C \rightarrow \min$; $MTTF \geq MTTFmin$.

It is worth to note, for the most critical systems (like power supply or power supply) the best results in reliability assurance for hotel systems can be obtained with diversity principle application [8] instead traditional redundancy. Failures of such systems dramatically decrease quality of service for a hotel. For example, installation of backup generator in power supply system provides the better effect than redundant power input from the same electrical company. Another example is when for water supply system is used regular water pipe with diverse underground water well. In such cases all benefits and withdraws of diversity have to be carefully analyzed. Diversity will increase capital and operational and maintenance expenses. For example, a hotel will need to invest money to buy backup generator, it will need to hire a person who can operate and maintain it, which stands idle if power outages happen not very often. Moreover, having diverse household equipment, for example, fridges, freezers, washing machines, boilers, etc. will potentially increase the maintenance costs. Then hotels would benefit more from implementing the unification principle and fleet affect rather than from diversity.

Decreasing of MTTR value allows increasing profit because decreasing maintenance expenses. From this point of view it is important to choice a cost-effective maintenance strategy. Maintenance strategy can be different depending on type of system, hotel unit, or time of operation, and includes the following approaches:

- Breakdown maintenance implements run-to-failure strategy, when maintenance includes mainly failures fixing after their appearance;
- Scheduled maintenance implements preventive strategy, when maintenance is performed in accordance with approved plans;

- Condition-based maintenance implements predictive strategy, when decision concerning maintenance performance is made on the base of actual technical state of equipment;
- Combined maintenance implements two or three from the above strategies.

Therefore, it is applicable to state for a hotel a task of maintenance strategy choice:

1) To choice a maintenance strategy to assure the highest reliability level in conditions of a cost restriction: MTTF $\rightarrow$ max, C $\leq$ Cmax;

2) To choice a maintenance strategy to assure the lowest price in conditions of required reliability assurance: C $\rightarrow$ min; MTTF $\geq$ MTTFmin.

Different maintenance strategies can be chosen for different systems or group of equipment.

Availability of room directly affects profit because guests pay money only for available room. In this paper we consider availability from a technical point of view, when all room equipment is in the working state. Since A = MTTF / (MTTF + MTTR), classical availability cannot reach value A = 1. However, if we apply the right maintenance strategy, we can improve availability of a room value (see Fig. 3).

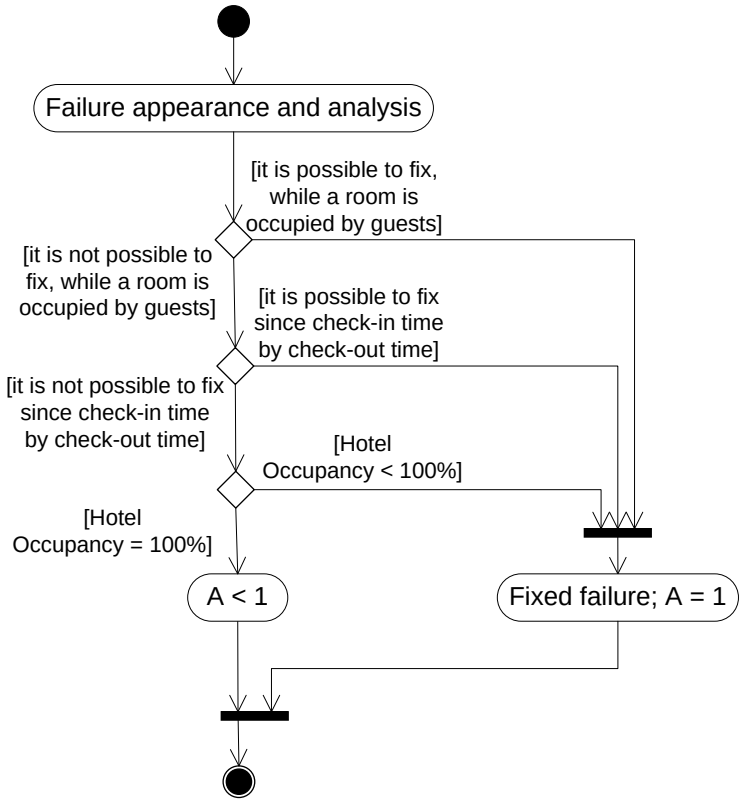

Fig. 3. Maintenance Strategy for Improvement of Availability of a Room

An idea is to organize maintenance in such manner that appeared failures are handled and fixed before failures become critical for guests. If failure happens when room is provided for guests, it is needed to perform failure analysis to conclude is it possible to fix with guests presence or while guests are absent in the room. If it is possible, then failure has to be fixed as soon as possible. In another case maintenance personnel will have some time between check-out and check-in. If this time is not enough for failure fixing, booking schedule shall be checked to understand does a hotel have a spare room to continue repair. It can be if occupancy of all hotel room on the day is less than 100%. In all the above cases we can consider a real value of availability of a room per request is still $A = 1$, so it complies with business needs. If a hotel have a booked room with failed equipment which is not fixed before check-in time, than $A < 1$. For this strategy implementation, maintenance personnel should be daily available.

To assess full hotel availability we need to take into account availability of all the rooms as well as availability of the relevant common equipment: $A = A_{common} \cdot \Pi A_i$.

For risks management we can state optimization tasks similar with reliability assurance:

1) Assure the lowest risk level in conditions of a cost restriction: $R(t) \rightarrow \min$, $C \leq C_{max}$;

2) Assure the lowest price in conditions of required risk level: $C \rightarrow \min$; $R(t) \geq R_{max}$.

For risks which are related with human health and life the second type of optimization task is applicable. For risk of a theft or of a cyber-attack it is appropriate to define damage value and to use it as a value of a cost range $C_{max} = \{C_c, C_{ca}\}$ for the first type of optimization task. There are many examples of cyber risk management for business critical domains [14], which can be applied for a hotel IT infrastructure.

For risk of a criminal, a hotel has to implement reliable security systems on the base of a balance between technical and organizational measures. The main task in security system is perimeter coverage with sensors and video cameras, as well as with security-guards. A task of perimeter coverage can be formalized from the above risks management tasks, since perimeter coverage metric can be associated with risk value:

1) Assure the highest perimeter coverage in conditions of a cost restriction: $Coverage \rightarrow \max$, $C \leq C_{max}$;

2) Assure the lowest price in conditions of required perimeter coverage: $C \rightarrow \min$; $Coverage \geq Coverage_{min}$.

5 Conclusions

In this paper we obtain the following results:

- Advanced Hotel Management Framework (AHMF);
- Taxonomy of the KPIs for hotel management;
- Optimization tasks for hotel management based on RAMS KPIs.

Concerning the last point it is worth to note the paper does not consider the priority of indicators. Indicators can have different weights and different effects on the effi-

ciency of the hotel. Also, their weights can change with time. Development of the approach which takes into account the above is one from the next research directions.

AHMF is a business case description based on Mind Map representation, what provides a useful basis for business effectiveness assessment and assurance. Detailed AHMF business case can be represented in a table view in accordance with Claim – Arguments – Evidence structure [10]. Such hotel management case description is a good communication for all the hotel stakeholders.

We propose the following practical development of the obtained results:

- Development a detailed structure of the AHMF;
- Preparation business case description for a target operated hotel on the base of the detailed AHFM;
- Preparation and implementation of hotel maintenance strategies based on RAMS KPIs for the target hotels.

References

1. Development of Tourism and the Hospitality Industry in Southeast Asia / Mandal P., Vong J. (Eds.) – Springler. – 2018. – 232 p.
2. Minazzi R. Social Media Marketing in Tourism and Hospitality. – Springler. – 2015. – 163 p.
3. Innovation in Hospitality Education: Anticipating the Educational Needs of a Changing Profession / Oskam J., Dekker D., Wiegerink K (Eds.). – Springler. – 2018. – 232 p.
4. Pongsathornwiwat N., Jeenananta C., Huynh V. Managing knowledge management competency by integrating with collaborative behavior into improving hospitality innovation capability // 2016 IEEE International Conference on Management of Innovation and Technology (ICMIT), Bangkok, September 2016. – P. 214-219.
5. Häusler N. Cultural Due Diligence in Hospitality Ventures: A Methodological Approach for Joint Ventures of Local Communities and Companies. – Springler. – 2017. – 252 p.
6. Yan-Li B., He-Feng H. Framework and management of competitive intelligence system for tourist hotels in the era of big data // 2016 2nd IEEE International Conference on Computer and Communications (ICCC), Chengdu, China, October 2016. – P. 60-64.
7. Avižienis A., Laprie J.-C., Randell B., and Landwehr C. Basic Concepts and Taxonomy of Dependable and Secure Computing // IEEE Transactions on Dependable and Secure Computing. – 2004. – no 1(1). – P. 11-33.
8. Nuclear Power Plant Instrumentation and Control Systems for Safety and Security / Yastrebenetsky M., Kharchenko V. (Edits). – IGI Global. – 2014. – 470 p.
9. Kelly T. Arguing Safety: A Systematic Approach to Managing Safety Cases, PhD thesis, Univ. of York, 1998.
10. Sklyar, V., Kharchenko, V. Assurance Case Driven Design based on the Harmonized Framework of Safety and Security Requirements // Proceedings of the 13th International Conference on ICT in Education, Research and Industrial Applications (ICTERI 2017), Kyiv, May 2017. – P. 670-685.
11. Gautam B., Asami H., Batajoo A., Fujisaki T. Regional Revival through IoT Enabled Smart Tourism Process Framework (STPF): A Proposal // 2016 Joint 8th International Conference on Soft Computing and Intelligent Systems (SCIS) and 17th International Symposium on Advanced Intelligent Systems (ISIS), Sapporo, August 2016. – P. 743-748.

12. Asadi S., Che Hussin A.R., Dahlan H.M. Organizational Research in the Field of Green IT: A Systematic Literature Review from 2007 to 2016 // Telematics and Informatics. – 2017. – no 34. – P. 1191–1249.
13. Sklyar V. Application of Reliability Theory to Functional Safety of Computer Control Systems // Reliability: Theory &Applications. 2017. – no 1 (44), vol. 12. – P. 26-37.
14. Holdsworth J., Apeh E. An Effective Immersive Cyber Security Awareness Learning Platform for Businesses in the Hospitality Sector // 2017 IEEE 25th International Requirements Engineering Conference Workshops (REW), Lisbon, September 2017. – P. 111-117.