


EFFECTS OF APPLYING BPM CRITICAL PATH AND STATISTICAL PERT ANALYSIS ON CFM PRACTICES AND PROFIT MAXIMIZATION IN HOTEL INDUSTRY

Abstract

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Purpose – The study aims to improve management practices of accounts receivable and payable as a necessity for improved financial performance of hotel enterprises using BPM approach and focusing on applying CPM and statistical PERT analysis to financial processes in order to increase CFM efficiency and maximize hotel's profit.

Design/methodology/approach – The methodology of this research begins with a review of BPM theory and both of CPM and PERT analysis literature studies. Then, the paper focuses on applying the theory on a real-life case of 9 international chain five-star hotels in Egypt using a semi-structured interview technique.

Findings – The paper develops a generic framework for hotel financial processes using BPM approach to improve the structural configuration of SOPs in the hotel sector. Utilizing CPM and statistical PERT analysis, hoteliers can enhance their understanding of financial processes by entering CPM and PERT analysis into BPM procedures which make process measurements can be made in a proper sense and process deficiencies can be identified, and thus corrected more quickly.

Practical implications – In light of these findings, the paper discusses the practical implications and focuses on recommendations on how the two main components of CFM in the hotel sector are to be managed in a more effective way using BPMCP and statistical PERT analysis.

Originality/value – The paper presents CPM and PERT analysis as an integral part of BPM approach and suggests recommendations that will assist to recover the problems of credit collection delays and eliminate deficiencies of CFM practices in hotels. There are also future research recommendations to enhance the knowledge of CFM practices in the hotel sector.

Keywords BPM, CPM, PERT Analysis, CFM, Hotel Sector

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INTRODUCTION

Hotel operations management is crucial for increasing revenues and improving occupancy levels by providing an exceptional guest experience and maintaining cost control (Filimonau & Naumova, 2020; O'Fallon & Rutherford, 2015; Hayes et al., 2017; Sainaghi, 2010). As organizations face competitive pressures, Hân et al., (2020); Pinto & dos Santos, (2020); Schönreiter, (2018) and Meredith et al., (2017) referred that more companies are focusing on efficient management practices for quick decisions, fast information transfer, and shorter cycle times. In order to achieve this, Nolle et al., (2022); Ubaid & Dweiri, (2020); Tari et al., (2007) supposed that the focus needs to be shifted from managing functions to managing processes for a smooth operation of business activities and process deterioration prevention which actively helps to control quality outcomes and identify opportunities for continuous improvement. The process-based orientation, rooted in the evolving quality movement, emphasizes the importance of learning business processes' capabilities and monitoring performance using data and facts to evaluate improvement actions (Idogawa et al., 2023; Shahul et al., 2022; Chalupa et al., 2021; Ahmad & Van Looy, 2020; Srinivasu et al., 2011).

A process-based perspective is crucial for hotel management systems to modernize the classic model and achieve high efficiency (Skobkin et al., 2017; Krstić et al., 2015). The authors Chalupa et al., (2021); Chalupa & Petricek, (2020); Özdemir et al., (2019) and Yesipova & Burak, (2013) indicated that BPM which of a major determinant focus on business processes (BPs) can be implemented by hotel industry as a new way and effective approach to achieve a high level of service quality and attain a competitive advantage by reducing errors in hotel operations, eliminating non-value adding activities and improving customer satisfaction. The use of a process approach to management according to Fuhrken, (2022); Hân et al., (2020) and Yevheniia et al., (2021) is an important direction of effective functioning of hotel business for a better, deeper and more comprehensive understanding of processes and identify problematic areas or inefficiencies in hotel operations. Process-based perspective is used by several quality management systems, including ISO 9001:2000, EFQM and MBNQA, as basic prerequisite to enhance corporate performance (Benner & Veloso, 2008; Balzarova et al., 2004; Biazzo & Bernardi, 2003). Eriksson and Garvare (2005) further mentioned that 160 points of SIQ (Swedish Institute for Quality) model for performance excellence are accounted for by management by process. Process-aware management and related methods and techniques continue to be highly popular globally, and CIOs (Chief Information Officers) around the world rank BPM strategy as their top business priority (Gartner, 2009).

However, the application of BPM principles in the hospitality industry is weakly examined by researchers and only a few studies focusing on this topic can be found. In addition, management literature report relatively limited instances on the potential applications of BPM in the hotel industry and there has not been much empirical research on the impact of a process-oriented management practices on hotel business performance and service quality.

There are three dimensions of hotel business performance were identified by Sainaghi (2010) after reviewing 101 academic papers on hospitality management, which are financial, operational, and organizational. It is a known fact that poor financial performance and insufficient cash flow management (CFM) practices could be the primary causes of business failure collapse, which could be due to its significant impact on the organization's profitability as well as business liquidity (Ollor & George, 2020; Eton et al., 2019; Kaketo et al., 2017). Therefore, financial managers must properly and effectively manage the components of working capital to ensure business success and maintain financial stability (Ollor & George, 2020). If hospitality and tourism firm administrators implement proper WCM and effective financial performance analysis, Günay & Ecer (2020) and Ollor & George, (2020) stated that effective performance would be promoted, which aids firms with effective decision-making, planning and auditing activities. Accounts receivable and accounts payable (Ahmed, 2022; Yu, 2018; Likalama et al., 2017), which are closely linked to material and service flows, are the basic indicators that can be used to draw conclusions about the quality of financial management and CFM practices. In their study to examine the relationship between profitability and CFM, Baafi et al., (2024); Alvarez et al., (2021) and Nimal & Anandasayanan, (2015) referred that companies can enhance profitability and their financial position by keeping both accounts receivable and accounts payable within optimal levels.

In relation to using BPM approach to improve the processes of CFM in hotel industry, Gitobu & Kimathi, (2015) referred that the standards cover all types of financial instrument, including receivables, payables, investments in bonds and shares, borrowings and derivatives. As it has become evident that all organizations are composed of business processes (Dumas et al., 2018; Dijkman et al., 2016; Škrinjar et al., 2008), a process-oriented approach can be applied to all enterprises' operating activities, including financial ones. Based on reviewing the output of previous studies that conducted to evaluate the implications of BPM practices in the hotel sector, including (Yesipova & Burak, 2013; Krstić et al., 2015; Özdemir et al., 2019; Chalupa & Petricek, 2020; Chalupa et al., 2021; Hân et al., 2020), there may be recent prominent research begin to flow in BPM and process configuration in the hotel industry but none of them dealt with mapping hotel's financial operating processes and its impact on financial performance of hotels and improving profitability. This paper aims to restructure hotels' financial operating activities as a new approach for securing optimal levels of receivables and payables, using BPM principles and methods. An increase in management procedures effectiveness increases the probability of having effective accounts receivable management by 0.281 times (Ngugi et al., 2017).

In the same context, using the appropriate tools and techniques for understanding variability in process characteristics and making informed-decisions is important to avoid operation errors and prevent deficiencies in business processes which may result in reliability problems and a lack of process consistency (Zuhaira & Ahmad, 2021; Gupta et al., 2015; Hensley & Utley, 2011; Antony, 2004). This means that the adoption of BPM program must be accompanied by the use of appropriate tools and techniques to effectively monitor process performance and avoid process deterioration based on statistically-derived decisions. Critical Path Method (CPM) according to Putra, (2023); Hamza et al., (2015) and Santiago & Magallon, (2009), is an important tool for efficient project management and performance optimization which can be applied to all forms of businesses which involve interdependent activities that must be completed within specific deadlines, and PERT analysis is essential to assess business variations in CPM (Ba'Its et al., 2020; Agyei, 2015). The contribution of our study is the verification of BPM effectiveness in increasing the efficiency of CFM practices in hotel industry using CPM and PERT analysis to maintain financial processes stability.

The paper is structured as follows: the next section reviews the relevant literature on BPM in the hotel sector, hotel financial processes and the two project management methods: CPM and PERT analysis. The third section outlines the research methodology used to arrive at the results followed by the fourth section that discusses research results and findings. The final section concludes the entire article and provides its practical implications on CFM practices in the hotel sector.

1. LITERATURE REVIEW

Business Process Management (BPM)

Business Process Management (BPM) is a widely used management approach for efficient corporate operations (vom Brocke et al., 2021; Lahajnar & Rožanec, 2016). It involves planning, analysing, administering, and improving fundamental activities to achieve high performance in key business processes (Gudel et al., 2021; Gabryelczyk et al., 2016; Evans & Lindsay, 2011). Despite uncertainties and operational challenges, Joshi et al., (2022) and Syed et al., (2018) referred that the need to focus on business processes is widely recognized and accepted. According to dos Santos et al., (2024); Wang et al., (2023); Senkus et al., (2021); Palmberg, (2009) and Muehlen & Ho, (2005) the association of the term business process with "a set of interrelated activities" and "transformation of inputs into outputs" can be found in many definitions advanced in both the academic and management literature. In the current study, we adopt the second approach of process definition which defined a business process as a chain of activities that arranged in a structured way with the purpose of producing a pre-defined or a range of specific outcomes actualize business objectives.

The above theory suggests that organizations can optimize their business processes by providing a detailed description of their operations using an appropriate process model. (Wirtz, 2020; Marjanovic & Freeze, 2012). Holweg et al., (2018); Jeston, (2014) and Dijkman et al., (2016) defined process design as an organized overview of business activities with their relations and guidelines that outline how they must be implemented in the most efficient and organized manner. As well, the construction of hotel operating processes is one of the key elements of BPM success in hotel industry, and the detailed description of operation processes can also be used to educate or train new staff (Hán et al., 2020). Yevheniia et al. (2021) emphasize the importance of analysing and enhancing business processes in hotel enterprises to reduce financial and time resource costs. Recently, there are a number of studies (Chalupa et al., 2021; Chalupa & Petricek, 2020; Özdemir et al., 2019; Krstić et al., 2015) that have been conducted to visualize and model hotel operating processes using BPM approach by a detailed description for major operating processes in a graphical representation which can represent the meaningful division of related activities of each process and the workflow of execution. The authors aimed to improve operational processes to be more efficient and effective when provided to hotel guests. However, there are no previous studies conducted to map and model hotel financial processes to develop a generic framework of financial activities in the hotel sector and improve the related management practices using the appropriate tools and techniques.

Hotel Financial Processes

Hospitality companies face significant pressure to generate sufficient operating cash flow to pay debt commitments due to their capital-intensive structure, low operating margins, and sensitivity to economic changes (Jang et al., 2011; Karadeniz et al., 2009). As stated earlier, the two main components of working capital (**a**) accounts receivable and (**b**) accounts payable must be maintained within optimal levels to enhance financial performance and improve business profitability. The most common way to measure business financial risk or distress is to obtain accounting measures based on what stated by Kim, (2018) and Aziz & Dar, (2006). Accounting information may help managers to understand their tasks more clearly and reduce uncertainty before making their decisions as a result of a lack of information compared to what a decision-maker needs to make a decision (Chong, 1996; Galbraith, 1974). It helps to evaluate how objectives might be achieved by quantifying the financial impact of each alternative available to the decision (Jawabreh & Alrabei, 2012). Hotels also need to apply the accounting information system like any sector by improving quality of services by planning, controlling and make different decisions by managers (Khudiyeva, 2023; Jawabreh & Alrabei, 2012). However, accounting information is an imperfect representation of the underlying decision problem, since not all aspects involved can be quantified perfectly in financial numbers (Jagels, 2006).

Therefore, it is an imperative prerequisite of any business success to understand the business's working capital accounts to be able to use them efficiently and make sure that all procedures are followed correctly (Alkhaja et al., 2022; Gill et al., 2011). Hotels usually deal with a high volume of working capital and failure to effectively manage working capital accounts has been a great undoing to hotels and affects negatively daily operations of a hotel (Murigu et al., 2018; Ngugi et al., 2017). Thus, the study of both accounts receivable, accounts payable and related practices are important to achieve their perceived efficiency (Frankel et al., 2020; Defranco & Schidgall, 2020), and essential for improving financial indicators and business profitability (Taurigana & Afrifa, 2013). This requires a clear methodology and specific stages to manage both accounts receivable and accounts payable (Ilyash & Dmytrenko, 2018), as using only accounting information is an imperfect tool because not all aspects involved can be quantified perfectly in financial numbers (Jagels, 2006). Moreover, no universal approach to accounts receivable management in companies has been designed yet (Krylov, 2020). As BPM discipline is an effective tool for optimizing all fundamental business activities of enterprises, it should be considered as a new approach of sustaining the efficiency of CFM practices in hotels using CPM and PERT techniques aiming at solving problems that cannot be solved by the existing tools specific to this area of activity and maximizing hotel's profits. The current study focuses on the potential applications of BPM principles and methods within hotels with special concern on CFM and its two essential components of receivables and payables. The lack of recent research shows the need for a deeper understanding of this topic.

The main purpose of PERT analysis and CPM is to plan and schedule all business activities and tasks that must be completed to accomplish any business process. In the current study, the researchers choose to combine PERT analysis and CRM to better visualize hotel operating activities and tasks, where they fall into order, and how long they are expected to take. In addition, the researchers will use statistical control limits of hotel financial processes as three estimated times required for PERT technique to analyse the process capability of the studied financial processes using CPM and PERT methods. This is what supported by Sliz, (2018) in order to get better results. The goal of process capability analysis is to evaluate the process flow as a function of the tolerance interval. Vries & Reneau, (2010) referred that variation is the key to statistical process control and the extent of variation in a process indicates whether a process is working as it should or not. Deming teaches that variation which occurs both in tangible products and services has two sources: normal and abnormal (Evans & Lindsay, 2011; Besterfield et al., 2004). Causes of variability are also called common causes or special causes (Srinivasu et al., 2011; Vries & Reneau, 2010). The process could be fundamentally improved when a process control is achieved through the elimination of special causes, and a process improvement is accomplished through the reduction of common causes (Besterfield et al., 2004; Vries & Reneau, 2010). To summarize, the process is considered capable if its distribution falls between the upper and lower tolerance limits (UCL and LCL), and if the difference between them is more than 6 standard deviations due to the process's unpredictability (Kumar et al., 2022).

Despite CPM and PERT analysis has been mentioned by many authors as a powerful tool gained widespread commendation and acceptance in the developed countries due to its positive impacts on maximizing work efficiency (Cynthia, 2020; Atin & Lubis, 2019; Hajdu & Bokor, 2016; Aliyu, 2012; Trietsch & Baker, 2012), it not included as one of the basic tools of BPM that can be to increase the efficiency of business processes and gain better results compared to the traditional methods. CPM according to Santiago & Magallon, (2009), is an important tool instrument for efficient process management that can be applied to all forms of businesses which involve interdependent activities that must be completed within specific deadlines in order to achieve optimal results and ideal process performance. The appropriate planning of business process is closely related to the CPM's goal of completing any task on time, within budget, and in accordance with the established quality standards—all while staying within the limits of allocated resources (Nafkha & Wilinski, 2016; Young, 2006). However, CPM technique and statistical PERT analysis as management tools that can be used in business planning and performance control is yet to gain any appreciable acceptance for practical implementation on operational processes in the hotel sector, especially on financial operating processes.

Therefore, this study describes a specific case study with real data for an application of CPM and PERT method in hotels, especially financial processes to improve CFM practices and maximize profits. The paper aims also to sustain the efficiency of CFM practices using BPM approach, and with the aid of CPM and PERT analysis aiming at solving problems that cannot be solved by the existing tools specific to this area of activity. This may lead to incorporating the principles of BPM approach and CPM and PERT analysis which form an integrated approach and effective management strategy used to increase the efficiency of CFM practices and maximize hotel's profitability through improving the core processes of financial instrument, including receivables and payables aiming to avoid delays and cost overrun, which in turn maximize hotel's profits.

2. RESEARCH METHODOLOGY AND DATA COLLECTION

After giving the theoretical background of the defined problem, the theory applied to a real-life case. To achieve research objectives, the authors conducted the study on 9 case studies that were limited to only international five-star chain hotels in Egypt to allow the results of this work to be generalized to the hotel sector globally. The rationale was to approach hotels with the number of resources in terms of finance, people, facilities and time that required for effective implementation of management programs and applications such as BPM approach, and which enable hotels to use statistical methods and relevant techniques to improve the capabilities of operation processes; and whose managers are able to provide relevant information about BPM projects and quality activities in their organizations. Therefore, it was decided to exclude hotels with a star rating less than five-star from the selected sample of research because these hotels represent a too small part of the workforce and it not seen as typical utilizers of a process-oriented approach (BPM) and the value of process-oriented services in such settings is not as prominent. It worth noted that we avoided including both local chain hotels (LCHs) and independent hotels (IHs) in the study, so as not to have different business operating activities with various management practices that complicate the application of CPM and PERT analysis and make confusion when to put the results into practice.

Selection of research sample was not a random process as this would not have served the research purpose, and the use of non-probability sampling as a method of selecting units from the population using a subjective (i.e., non-random) method (Cooper & Schindler, 2011) may also not be effective due to the difficulty of assessing whether the assumption is correct and there is no way to estimate the probability of any one element being included in the sample. Therefore, the research sample comprised all international chain hotels (five-star) located within the Greater Cairo area, so that we can generalize the results to the global hotel sector, noting any exceptional activities or specific management procedures mentioned by financial managers in the selected hotels that may affect process performance and its critical path. The total number of ICHs in the Greater Cairo area is thirteen (13) hotels based on the latest hotel census conducted by Ministry of Tourism and Egyptian Hotel Association. After excluding hotels belonging to the same chain (4) so as to avoid getting repeated information and save time, the number of hotels becomes nine (9) hotels.

In order to collect in-depth opinions from the participants, a semi-structured interview technique was employed. This makes interviews much more rigidly structured to provide greater control for the researcher, essentially becoming questionnaires where responses are verbal rather than written (Barrett & Twycross, 2018). Therefore, the data collected by means of a semi-structured personal interview based on using a combination of closed questions plus a set of open questions which allowed the researchers to clarify certain points or explain specific issues. This approach allowing direct communication between interviewers and interviewees can help ensure that the latter are clear about interview questions (Lai & Choi, 2015) and, where necessary, former can provide clarification for any queries that interviewees may have (Harrell & Bradley, 2009). The applicability of survey was excluded because interviewees were not allowed to ask questions if they did not understand the survey questions due to the depth and accuracy of the data required.

One of the most important tasks in the study design phase is to identify appropriate participants. According to Varpio et al., (2020); Sargeant (2012) and Reeves et al. (2008), the decision regarding selection of research participants based on research questions, theoretical perspectives and evidence informing the study. Given the nature of the formulated questions, the study was addressed to financial managers who were asked to be interviewed and fill out the questionnaire and answer relevant clarifying questions themselves or assign a competent person within their hotels to conduct the interview with him. **Table (1)** gives a summary of interviewees' personal information.

Table 1: An Overview of Selected Sample

ICHs	Interviewees	Experience
Case 1	Financial Manager	12
Case 2	Financial Accountant	10
Case 3	Financial Manager	15
Case 4	Financial Manager	14
Case 5	Purchasing Manager	18
Case 6	Room Division Manager	20
Case 7	Financial Manager	15
Case 8	Financial Accountant	8
Case 9	Financial Manager	16

Source: Created by authors

In order to set the scene and make clear the role of financial managers in BPM expertise in the hotel sector, the first question (1), “Please describe your role in relation to BPM experience?” was created. Question (2) was posed to identify the common CFM practices in the hotel industry and determine the core activities of payment and receipt processes (list of activities, standard time for each task and the dependency between activities), and to further question (3) to identify the major issues of managing the core processes of both accounts receivable and accounts payable within hotel contexts. The data related to the core processes of accounts receivable and payable in the hotel sector are analysed using CPM and PERT analysis as explained in section 4. Results and Discussion. At the end of analysis, all of research objectives have been achieved, and some suggestions will be promoted to help hoteliers better manage the two components of WCM in the future.

3. RESULTS AND DISCUSSION

Through this section, researchers were able to identify three distinct sets of outcomes. First, the two main processes of accounts receivable (AR) and accounts payable (AP) with their interrelated accompanying activities which are used to develop the generic framework of financial processes in the hotel sector. Second, the research design allowed the researchers to gain insights into the common practices of CFM in hotels and the main causes of performance deficiencies with describing the core activities of both payable and cash receipt processes, including (list of required activities, the dependency between these activities, and the standard time for each task as planned by the owning company). Lastly, as the main focus of this study, the authors gained an understanding of the major issues of managing the core processes of both accounts receivable and accounts payable within hotel contexts and identified the practical implications of applying CPM and statistical PERT analysis on improving performance of hotel financial processes and related activities to be executed on time and at a lower cost, together with the apparent criticality of those matters of concern.

3.1. BPM Experience In Hotels

In this regard, the interview was conducted with hotel's CFOs, who all demonstrated a full understanding of BPM approach and related key concepts such as business process (BP) as a set of interrelated activities or tasks that implemented to achieve specific outputs within specific time. They referred that a process-oriented management has adopted within their hotels as new management approach rather than focusing on functional roles and hierarchical structures in order to get better results and improve service quality. However, their awareness of standard operating procedures (SOPs) of hotel operating processes and the workflows of business activities, as well as the strict and specific preparation of all essential components and requirements needed to implement these operational standards in its proper sense, is the extent of BPM competence in the selected hotel. All CFOs indicated that planning of hotel business activities and service operating processes, which are necessary to prepare the pertinent interrelated standard execution steps (SOPs) to transform inputs (hotel resources) into desired outputs (valuable results), are not handled or formulated by operation managers in their hotels, and only prepared and designed by the owning company. This management policy means that the owning companies prepare the SOPs of hotel operating processes and provide hotel managers with a set of interrelated activities of each process and procedures of process execution in the form of written texts to which the change or amendment does not apply and required to be implemented in its current form. This policy may influence how operation processes are implemented, the manner in which hotel objectives are achieved, how operation errors and process deterioration monitored and assessed and how process performance is optimized.

3.2. Developing A Generic Framework of Financial Processes in Hotels

Financial information is particularly useful in highlighting strengths and weaknesses of a hotel performance, as well as the potential for growth through financial analysis, which is necessary because it might be used by hotel executives to make informed-financial decisions. Therefore, the role of financial analysis should not be limited to verifying the accounting data of financial activities in hotels, but should be extended to exploring the real performance dynamics of financial processes and its

critical path over time through adopting the appropriate control measures and the relevant financial analysis. The primary objective is to sustain hotel income and control expenses in accordance with the adopted management policy and procedures. Thus, the study integrates BPM principles into the area of financial activities in the hotel sector using the general guidelines of BPM and the core components of process structure as presented in the management literature.

Complete financial processes of hotels comprise a set of interrelated activities that should be executed in a specific sequence within standard time to get the desired outputs. Despite the high interest in BPM approach among all businesses with different purposes, hotels are still in the early stages of adopting an integrated BPM initiative. At the present time, many hotels have standard operating procedures (SOPs) that are used to describe the workflow of business activities with the primary purpose of processing task inquiries and controlling the output of activities (Chalupa & Petricek, 2020; Ferreira & Silva, 2018; Bogetić et al., 2015). For more effective results, Chalupa et al., (2021) and Hán et al., (2020) supposed that a process-focused view can provide a deep understanding of these standardized procedures and relevant problematic areas and deficiencies in all hotel's operating processes. Furthermore, Czvetkó et al., (2022); Závadský, (2021) and Adamides & Karacapilidis, (2006) also referred to the utmost importance of viewing all business activities from a process-based perspective, which automate internal and external activities in an effort to boost efficiency and functional interconnectivity.

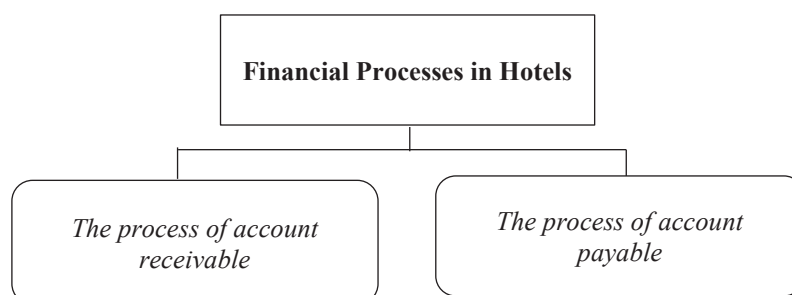
Modelling of business processes has always been the essence of BPM activities which used to improve business performance and optimize process outcomes (Gudelj et al., 2021; Becker et al., 2013). As previously noted, all hotel's owning companies carefully examine its business operations and construct the primary operating processes with execution standard procedures and the relevant service features that meet pre-determined needs and specifications. In this context, financial managers observed that they are not given graphical models for hotel processes and the owning company only prepares textual documents of SOPs that clarify the execution workflow of standard procedures and assign responsibilities of hotel staff. SOPs include the following core elements which consider the structural elements of each process in hotels as declared by managers:

- a. standard operating procedures (SOPs) of financial processes;
- b. detailed descriptive sub-steps for each standard procedure;
- c. specific workflow or the systematic sequence of procedures;
- d. a standard time of execution (time restrictions);
- e. roles and responsibilities of employees who perform a process; and
- f. resources needed to implement SOPs of financial activities.

Process modelling is necessary for organizations to be able to understand, describe, configure and document its processes in a more consistent manner than with plain text (Kesari et al., 2003) considering the need to continuously re-design existing business processes models to stay competitive as stated by Aldin & de Cesare, (2011) and Mykityshyn & Rouse, (2007). Process design planning is the first step in process execution where all product and/or service attributes that contribute value to customer need to be addressed and properly shaped using accurate information (Globerson & Zwickel, 2002; Goldstein et al., 2002). In addition, narrowly-defined business processes and incomplete documents of organization structure and graphical process design reported by Özdemir et al., (2019) and Ahadi, (2004) as one of the major reasons for BPM failure that are found in the majority of literature. However, the owning company failed to model and map hotel business processes and decided to not provide graphical representations of work operation activities, which could be viewed as a drawback when implementing BPM initiatives in the hotel sector because the knowledge of business processes (BPs) must be converted into descriptive and graphical models in order to offer an increased understanding of business operating processes (BPs) and expand the knowledge of BPM principles and rules.

This restricted view of BPM approach in the hotel sector is due to hotel managers' lack of understanding and awareness of BPM and related key concepts, and they have only committed to implement the SOPs of hotel processes and operation activities as designed by the owning company, with no alterations or restructure. This may leave managers perplexed about what needs to be done, the appropriate tools and techniques required to achieve the desired outcomes and what business goals need to be met. Another gap in BPM efforts in hotels, there are no graphical models of hotel processes that can be used as an effective guide for implementation as a key success factor of BPM initiatives. To remove these obstacles to a successful BPM program in hotels, it seems that there is an imperative need to transform from the written textual documents of hotel business activities to graphical representation of each process and modelling the workflow of standard procedures of execution.

Figure 1: **Financial Processes in Hotels (Created by authors)**

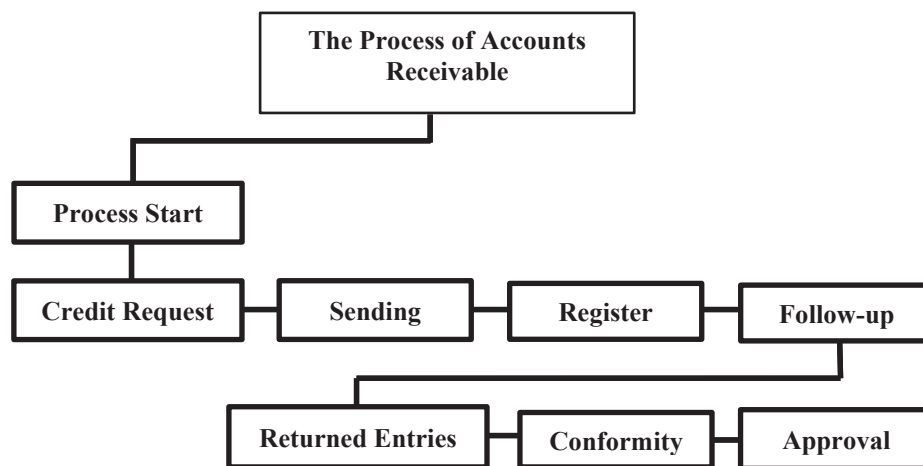


Within this work, the authors used three different levels in restructuring hotel financial processes and their analysis: (a) a general overview model of financial processes involved in finance department in the hotel sector; (b) the process of accounts receivable and accounts payable with accompanying activities and the standard time of implementing for each activity; and (c) the application of CPM algorithm and statistical PERT analysis to hotel financial processes. The first level (Figure 1) introduces an overview of the two basic groups of financial processes in hotels as discussed in literature review. The second level describes the process structure which represents the interrelated activities and the specific sequence of these activities. The third level is the results of applying CPM and PERT analysis on CFM practices through analysing the critical path of hotel financial processes and related activities to detect the activities path which can lead to performance deterioration if not properly controlled and the efforts of potential improvement. The following section is a detailed description of the operational activities of the two financial processes: (a) receivables and (b) payables as reported by financial managers in ICHs:

The process of accounts receivable is an essential part of the financial activities in the hotel industry. In hotels, the term "accounts receivable" (AR) describes the billing and collection procedure that takes place after a guest or business checks out in exchange for supplying goods and/or services to clients that haven't yet been paid for. Thus, to reduce the risk of losses and any resulting issues with financial management, proper receivables monitoring and management are necessary. This refers to the significance of the adopted accounts receivable policy and procedures, as well as the core activities of accounts receivable (AR) process and the relevant sub-steps or tasks, in order to attain its perceived efficiency. To guarantee that receivables are collected on time and at the lowest cost, a hotel's credit policy and collection process procedures have to be planned and controlled in a more systematic and effective manner. As a result, credit rules and collection practices are crucial and have an impact on how much cash hotels have to operate and run business.

Within the process of accounts receivable, it is possible to identify the following activities based on the responses obtained from interviewed financial managers in the selected hotels (Figure 2): the process start with a guest's request to use hotel's services and/or products on account and pay later, then the activity of approving the credit request submitted by the guest by requesting the necessary documents to ensure his ability to fulfil the obligations, the activity of sending the invoice to the guest to review and notify any errors or differences, the activity of registering the invoice in the accounts by matching the account with the guest, indicating the differences in the invoices and ensuring its registration (it is ensured that guests receive and sign a copy of the invoice), the activity of following up the guest feedback and responding any queries, the activity of monitoring returns from the guest, the activity of conforming the payment process by matching payments with invoices, the activity of approving the guest's account by sending a letter to the guest directed by the audit office to approve the account balance in the hotel's books and documents.

Figure 2: The process of credit collection with accompanying activities



Source: Created by authors

To get a better understanding of CFM practices in hotels, the researchers designed the following question: "What are the activities of credit collection process in your hotel, their specific order and the perfect time allocated for each activity?" which reformulated again during the real interview to "What are the SOPs of credit collection process in your hotel, the standard sequence of these procedures and standard time of each procedure as designed by the owning company?" to be consistent with the obtained information in the previous discussion included in theme 1 (4.1). Through the obtained answers to this question, the authors were able to identify SOPs of credit collection process in the selected hotels/ the dependency between these activities or procedures/ the fixed or standard time for each procedure that presented in Table (2).

Table 2: SOPs of credit collection process

Activity ID	Tasks	Duration	Dependency
A	Process Start	0	-
B	Credit Request	11 days	A
C	Sending	22 days	B
D	Register	37 days	B
E	Follow up	37 days	C
F	Returned Entries	37 days	C
G	Conformity	30 days	D
H	Approval	30 days	E

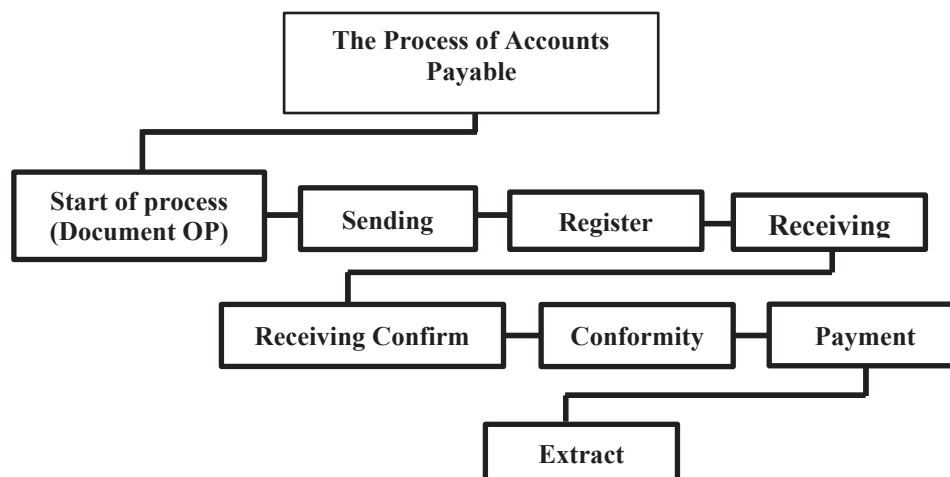
Source: Created by authors

The financial managers who interviewed in ICHs emphasized that the previous data (Table 2) include the SOPs of cash receipt process and the standard time for each activity or procedure as defined by the owning company in order to give effective results and achieve their perceived efficiency. They also added that this does not mean that there is an objection to agreeing with clients/companies on other payment periods through written contracts if there is an urgent need for that. This is consistent with what stated by Ngugi et al., (2017) that there are management procedures in place to guarantee that billings are created and sent on time after the sale of provision of services, unless another interval is specified in a signed contract. Credit risk according to Jebessa, (2020); Gebremedhin, (2013); Murigu et al., (2018) and Mwirigi et al., (2018), is the peril if the company would incur a loss resulting from a borrower's failure to repay a loan or meet contractual obligations. In this case, the management needs to assess financial performance using financial ratios that are directly related to the receivables (Defranco & Schmidgall, 2020). Jindal et al., (2017) considered the turnover ratio of accounts receivable to be one of the most important indicators of the efficiency of receivables management. Therefore, the current study deals with only the standard procedures of accounts receivable and their standard time as designed by the owning company to apply BPM approach and determine process deficiencies using CPM and PERT analysis which aims to achieve the highest ratio of receivable turnover and reduce the length of time required to convert hotels' receivables into cash after being billed.

The process of accounts payable is an essential part of the financial activities which is considered the most important factor for maintaining liquidity and profitability of business companies. Accounts Payable (AP) is the amount of money due a hotel owes to its suppliers for the use of their goods/services. Efficient and proper management of accounts payable is vital for the monetary health of all hotels, regardless of kind and size to ensure that a hotel has the ability to fulfil short-run liabilities adequately and on time. This clarifies the common argument that effective account payables (AP) management is vital to accomplish the organization's primary goals and improve business profitability. The final result of applying BPM approach to financial payable activities in the hotel industry is to improve the organizational structure of financial activities and management practices of CFM through identifying the value-added chain of critical activities and danger points.

Within the process of accounts payable as reported by financial managers in hotels, it is possible to identify the following activities based on the responses obtained during the interview (Figure 3): the activity of documenting the purchase order (PO) as the starting point of the process, the activity of sending PO to the supplier as an initial stage in the accounts payable process to begin the purchasing process, the activity of registering all details of PO and noting any information on the quality and quantity discrepancies of purchasing process, the activity of receiving the purchases in agreed quantities and quality level, the activity of verifying the data on the received invoices and make any queries to confirm the process of receiving purchases, the activity of confirming the details of purchasing process by matching/conforming the purchase order (PO) and invoices to get payment authorization, the activity of approving the execution of payment dues of the received purchases to suppliers, the activity of obtaining a statement that confirm the payment of dues.

Figure 3: The process of account payable with accompanying activities



Source: Created by authors

To get a deep understanding of CFM practices in the selected hotels, the researchers designed the question: “*What are the activities of accounts payable process in your hotel, specific order and the time allocated for each activity?*” which reformulated again during the real interview to “*What are the SOPs of accounts payable process in your hotel, the standard sequence of these procedures and standard time of each procedure as designed by the owner company?*” to be consistent with the obtained information in the first discussion. Through the obtained answers to this question, we were able to identify the SOPs of the payment process (AP) in hotels/ the dependency between these procedures or activities/ the standard time for each procedure. At the end of the payment process, the amount that was “due” in the first step will no longer be considered as a liability as presented in Table (3). As noted previously, the authors decided to deals with only the standard procedures of accounts payable and their standard time as designed by the owning company to apply BPM approach and determine process deficiencies using CPM and PERT analysis. In the event of any changes in the process procedures and related standard times based on the signed contracts, financial managers can apply CPM and PERT analysis by using other periods agreed upon in the contracts to obtain the same results which given by CPM and PERT analysis as discussed below. Because the idea of the research is to know how to apply CPM and PERT analysis and interpret the obtained results for process control.

Table 3: SOPs of accounts payable process

Activity ID	Tasks	Duration	Dependency
A	Process Start	0	-
B	Sending	11 days	A
C	Register	11 days	A
D	Receiving	11 days	B
E	Receiving Confirm	3 days	B
F	Conformity	7 days	C
G	Payment	30 days	D
H	Extract	1 days	E

Source: Created by authors

3.3. BPMCP and PERT Analysis

Organization must undertake certain activities to achieve business objectives (Kožíšek & Vrana, 2017) and business processes (BPs) are comprised of activities that must be executed in a certain systematic way in order to fulfil the business goal (de Oca et al., 2015; Snoeck et al., 2000). It is the perfect way by which an organization can uses all of its resources in a reliable, repeatable and consistent manner in order to obtain its objectives and maintain performance over time (Zairi, 1997). Therefore, developing a generic framework of financial processes in the hotel sector is the first step to improve the practices of CFM and enhance the knowledge of the structural configuration of these processes which can help hoteliers and decision-makers to identify strengths and weakness spots of performance dynamics and prevent process deterioration.

According to Bandara et al. (2007), organizations can guarantee the completeness and consistency of BPM solutions through incorporating the notion of specific standard procedures for all business activities into their strategy to align BPM processes with important compliance requirements. Lack of business standards mentioned by (Ko et al., 2009; Ghalimi & McGoveran, 2004) as one of the major obstacles to the success of BPM initiatives. As demonstrated by many authors (Cynthia, 2020; Atin & Lubis, 2019; Bishnoi, 2018; Nafkha & Wilinski, 2016; Aliyu, 2012; Santiago & Magallon, 2009; Cottrell, 1999), the application of CPM and PERT techniques needs to construct a specific model of business operations that includes the following components (**a**, **b**, and **c**). This refers to the importance of integrating the standard workflow procedures of operation activities into the structural configuration of hotel operating processes to support the potential application of such methods and tools into hotel services as an integral part of BPM approach and to drew attention to its necessity for the success of BPM efforts within organizations, especially hotels.

- A list of all activities required to complete the process
- The time (duration) that each activity will take for completion
- The dependencies between the activities

The previous three components (**a**, **b** and **c**) which have been identified by many researchers as an essential requirement to apply both CPM and PERT analysis, can be achieved through applying the principles of BPM approach and adopting the concept of business process as set of interrelated activities that must be executed in a systematic manner within specific time. Therefore, BPM provide the foundation for effective implementation of both CPM and PERT analysis which means that BPM is considered as an essential requirement for using CPM and PERT method in organizations in order to get better results based on pre-defined standard procedures with an execution workflow for all business activities, which enable managers to determine the critical path of standard procedures through the different stages of a process and reduce performance deviation. In the same context, using CPM and PERT analysis to improve business performance requires organizations to be as a process-oriented business instead of placing emphasis on functions and hierarchical structures which not serve the purpose of CPM algorithm and statistical PERT analysis as declared in the next sections. Before applying CPM and statistical PERT analysis to hotel financial processes, the next section introduces the major problematic issues of managing CFM and the two main components of WCM in hotels as reported by financial managers in the selected hotels.

3.4. The Major Issues of CFM Practices in Hotels

To properly use the BPM concept and implement it in its proper sense, it is necessary to consider an appropriate and effective management approach for business processes. The only effective way to manage business operating processes (BPs) correctly and conveniently according to Vries & Reneau, (2010) and DeVor et al., (2007), is by continuously monitoring process performance for the reasons of inefficiencies and removing the underlying causes of performance variability in order to recover the desired level of performance and return the process to its regular and normal operating mode. Therefore, in order to control process performance and produce predicted business improvements, Srinivasu et al., (2011); Bisgaard, (2008) and Zhang, (2000) referred that organizations must give priority to the methodical and structural analysis of their business processes. In addition, various studies stressed the importance of implementing an efficient management procedures using control tools, rules, and procedures executed by a company to reduce insolvency and liquidity risks and avoid errors such as duplicate payment (Alkhaja et al., 2022; Enow & Kamala, 2016). Management accounting system play an important role as tools to achieve these operational objectives (Ibrahim, 2020; Jaradat et al., 2011).

The collected data revealed that financial managers in the hotel sector were unable to manage the hotel financial processes in its proper manner because their primary focus on monitoring the standard procedures of each process and determining the degree to which staff members were able to apply each procedure with no missing steps and within the specified time during the actual implementation, as specified by the owning company, and all of which were completed on time and without any detected errors or deviations in performance. This is the first goal of financial managers in the hotel finance department to ensure the accurate implementation of SOPs considering time restrictions and the execution workflow without recording significant or major mistakes. It was obvious that financial managers in the selected hotels are unaware of the concept of process deficiencies and performance variation as a critical component and essential measure of process control and performance improvement. This may be due to that there is a general lack of process understanding and the main purpose of BPM approach and what can provide for hoteliers, the lack of the core elements of service process structure in hotels, and the lack of knowledge among hotel managers in regard to how, when and why BPM is being implemented.

In the selected hotels, financial managers monitor the performance of their accounting processes through the continuous follow-up of employees and reviewing the results of business reports. The use of follow-up method of process performance and reports indicators alone is not enough to make accurate managerial and operational decisions that can lead to acceptable level of process variance and accurately identify potential improvements. This is further supported by the findings of authors Vries & Berneau (2010), who referred that the primary issue in management and leadership is that operators often make mistakes and ineffective operational decisions when interpreting operation errors and performance variation in observations without the proper aids of appropriate tools and techniques of process control. The idea is to establish a process knowledge base that will help managers identify the necessary measures of unusual actions and the serious or critical procedures that impacting the process performance and take immediate corrective actions and prevent any increase in the variability of a process (Rai, 2008; Oakland, 2007). Therefore, applying CPM and statistical PERT analysis to financial processes is necessary to improve management practices related to CFM and enhance hotel business performance.

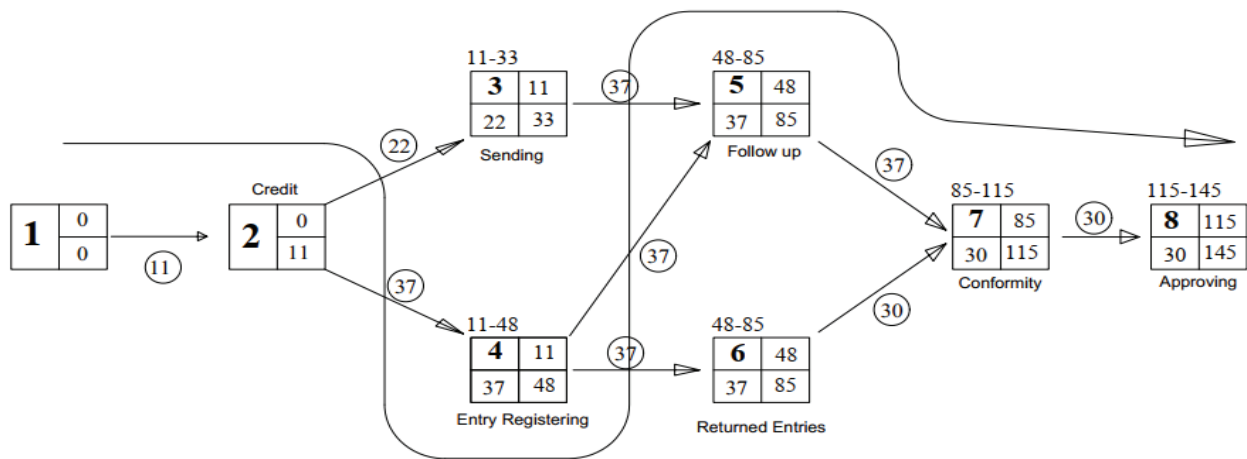
3.5. The Results of CPM and PERT Algorithms Application

The CPM and PERT analysis are essentially algorithms and statistical methods for making-decisions. Based on the start time of a process, activity duration, and finish time of each activity, these algorithms determine which tasks are most important and critical to the process completion on time. CPM as a process management tool can be used to organize tasks and schedule operation activities in the hotel sector to assist in determining the appropriate and perfect sequence of tasks and process activities that are essential to the successful completion of business processes on time and at a lower cost. There are five steps for using CPM algorithm determined by Aliyu, (2012) and Chen & Hsueh, (2008), namely identifying all process activities, calculating forward time, calculating backward time, calculating float/slack and establishing a process network diagram. The first step in applying CPM and statistical PERT analysis to financial processes which includes the identification of process activities, relationships between activities and the duration of each step and task can be seen in **Table (2)** for the process of accounts receivable and **Table (3)** for the process of accounts payable.

3.5.1. The Critical Path of Accounts Receivable Process: Application Case

There are eight activities *viz.* A, B, C, D, E, F, G and H that must be implemented in a specific order to accomplish the process of accounts receivable (AR) in hotels, and which used to fulfil the precedence requirement to establish the network diagram of process activities. The following network diagram indicate the sequence of activities of collection process and their dependencies graphically using CPM. It illustrates the sequence in which tasks and their connections are completed and the standard time required for the completion of each activity. In general, a network diagram consists of arrows to show dependencies and nodes to represent actions or activities. The critical path of AR can be identified and the process flow is visualized with the help of the following network diagram. Plotting of Early Start (ES) is done on the top box in the first left corner. Early Finish (EF) is also mapped on the box in the upper right corner.

Figure 4: The network diagram of credit collection process with CPM



Source: Created by authors

Critical Path Method (CPM) can assist in process management (PM) and performance optimization in two different ways: (a) Forward pass and (b) Backward pass. The forward pass is calculated and summarized in table (4) below, where the initial activity, A1 = 0 and the final activity, A8 = 145 as illustrated in row (1) align with column (5) and row (9) align with column (5) respectively. The forward pass entails knowing when each task on the network diagram of the credit collection process should start and finish. The early start (ES) of an activity on the diagram is the sum of the early finish time (EF) of its previous activities, along with the overall process duration, are calculated. The length of the activity is added to the earliest start time to determine the earliest finish time. Putting a zero in the first activity's early start (ES) slot initiates the calculating procedure. An activity's ES is equal to the EF of its predecessor, and CPM formula: $EF = ES + t$ (where t is the activity length) can be used to determine an activity's EF. The estimated time needed to finish the entire process based on the forward pass calculations is indicated by the EF of the final task.

Table 4: Forward pass computation

Activity ID	Dependencies	Duration	Early Time	Max.
A	-	0	0	0
B	A	11	0 + 11	11
C	B	22	11 + 22	33
D	B	37	11 + 37	48
E	C	37	48 + 37	85
F	C	37	48 + 37	85
G	D	30	85 + 30	115
H	E	30	115 + 30	145

Source: Created by authors

After the forward pass computation, the earliest completion and the latest completion of each activity are obtained from the backward pass computation. The Late Start (LS) and Late Finish (LF) values are computed through this stage of backward pass computation, which obtained as shown in table (5). Begins by identifying the last activity's earliest finish as its latest finish. Then, CPM formula to calculate the LS is $LS = LF - t$ (where t is the activity length). For the prior activities, the LF is the shortest of the start times for the activity that comes next.

Table 5: Backward pass computation

Activity ID	Dependencies	Duration	Latest Time	Min.
H	E	-	145	145
G	D	30	145 - 30	115
F	C	30	115 - 30	85
E	C	30	115 - 30	85
D	B	37	85 - 37	48
C	B	37	85 - 37	33
B	A	22	33 - 22	11
A	-	11	11	0

Source: Created by authors

The third step in CPM calculations is to subtract the early start time from the late start time (or the early finish time from the late finish time) for each activity to find the total float/slack. Total float, also known as slack, is the amount of time that can pass between tasks and process activities without impacting the process's final completion date. Thus, the process completion schedule will be directly impacted only by any delays in the key path activities, which have zero total float/slack. Activities with float can be delayed without affecting the process duration.

Table 6: Slack values of process activities

Activities	1	2	3	4	5	6	7	8
Latest Time	0	11	48	48	85	85	115	145
Earliest Time	0	11	33	48	85	85	115	145
Slack Value	11	0	15	0	0	0	0	0

Source: Created by authors

Through analysing the previous data (Table 6) to determine the critical path of the credit collection process (AR) by identifying the sequence of activities with zero total float/or slack, the study reveals that there is only an activity in the process of credit collection in hotels which has no zero total float or slack which means any delay in this activity will no directly impact the process overall duration. This activity is (A3) which refers to the activity of sending the invoice to the guest to review and notify any written errors or differences.

Thus, the critical path of the process of credit collection in hotels include the critical activities of A1, A2, A4, A5, A6, A7 and A8, excluding A3 which has total float = 15. It means that A3 can be delayed up to a maximum total time = 15 days without any direct impact on the process overall duration. In the same context, the critical activities of A1, A2, A4, A5, A6, A7 and A8 have zero total float or slack which means any delay in these activities will directly impact the process overall duration. As a result, it must be the first priority for financial managers if they want to represent the shortest possible duration of credit collection process should be to meet deadlines of all critical activities which can impact on the process completion time, which can achieve the purpose of collection process in accordance with business objectives. The first importance of CPM in managing CFM is identifying all of activities or standard procedures that actually required to effectively accomplish the process of accounts receivable, and which of these procedures must be completed on time, and which can be delayed if necessary, and how much time can be delayed. This is a strength point with financial processes whose efficiency depends on being completed in the shortest possible time, and business profitability relates to the ratio of its turnover.

Determining Critical path/ Process Duration

Path 1: $\sum_i^j (D_{i,j}) = 130$ days

$i = 1 + 2 + 3 + 5 + 7 + 8$ and $j = 0 + 11 + 22 + 37 + 30 + 30$

Path 2: $\sum_i^j (D_{i,j}) = 145$ days

$i = 1 + 2 + 4 + 5 + 7 + 8$ and $j = 0 + 11 + 37 + 37 + 30 + 30$

Path 3: $\sum_i^j (D_{i,j}) = 145$ days

$i = 1 + 2 + 4 + 6 + 7 + 8$ and $j = 0 + 11 + 37 + 37 + 30 + 30$

If all the activities are done at their normal times, the process duration (length of the longest path) will be 145 days. By Comparing the required times for the three paths, maximum of {130, 145, 145} = 145 days, which refers to path 2 and path 3 have the maximum time of 145 days. Therefore, path 3 (A1, A2, A4, A5, A7 and A8) and path 4 (A1, A2, A4, A6, A7 and A8) are the critical path of the process of credit collection. This means that the critical activities of the accounts receivable process are A1, A2, A4, A5, A6, A7 and A8. Then, A3 is non-critical activity. Time for path (1) - Time for path (2, 3) = 130 - 145 = 15 days. Therefore, the non-critical activity (A3) can be delayed up to a maximum of 15 days, without delaying the completion of the whole process of collection in hotels. However, path 2 and path 3 refers to the importance of the activity of "registering" (A4) as an the most critical step in the path of process activities because it consumes a lot of time, and may lead to delaying the receivables up to 15 days, if it is not controlled and completed within a shorter time.

3.5.2. Statistical PERT Analysis Using Control Limits

The concept of process management (PM) according to Sharma & Kharub, (2014); Rai, (2008); Caivano, (2005) and Halevi, (2003) require to establish operational limits for acceptable process variation and apply appropriate methods to gather information and analyse it to inform the operator when the process is out-of-control before making decisions on any action to be taken. However, the results of this study revealed that there is no a real application of statistical methods (SMs) in the selected hotels with the underlying purpose of monitoring process performance dynamics over time and preventing business performance deterioration. Therefore, the overall mean of the data collected using Likert scale was (1), with a standard deviation of (0). As a result, it was a serious limitation at this point of the research to obtain the three statistical parameters of the credit collection process in hotels regarding the statistical control limits, which include: (a) CL which refers to the most likely estimate; (b) LCL which considered as optimistic estimate; and (c) UCL as pessimistic estimate. This would be due to the fact that the lack of required knowledge on BPM initiative and then how to properly manage these financial processes with the absence of the concept of process variation among hotel managers as the key aspect of monitoring the statistical process capability and performance improvement.

In addition, it was practically impossible to perform these calculations ourselves because this required repeating the process more than once to obtain these statistical parameters, which means waiting for a long time to obtain the desired results, which demonstrated by many authors Evans & Lindsay, (2011); Besterfield et al., (2004); Mitra, (2016) and Wood, (1994) that samples of about 5 have been found to work well in detecting process shifts of 2 standard deviations or larger, whilst larger sample sizes of 15 to 25 must be used to detect smaller shifts in the process mean that the control limits will become closer to the central value, and more sensitive to small variations in the process average. Using the data obtained from financial managers based on their extensive experience in dealing with these processes, there are three estimated times for each activity in the credit collection process as presented in table (7). While a process analysis using PERT is based on optimistic estimates (a), most likely estimates (m), and pessimistic estimates (b), analysis using CPM was based exclusively on the most likely estimate (m). Therefore, the mean (μT) and variances (V) for each activity are calculated by using the stated equation (1) and equation (2) respectively as follows:

$$\text{Mean, } \mu T = \frac{(\alpha + 4M + \beta)}{6} \quad (1)$$

$$\text{Variance, } V = \left(\frac{\beta - \alpha}{6} \right)^2 \quad (2)$$

Table 7: Mean and variance of credit collection process

Activity ID	Precedence	Duration			$t_e(\text{mean})$	Earliest		Latest		TF	Var. σ^2
		A	M	B		S	F	S	F		
A		1	3	5	3	0	3	0	3	0	0.444
B	A	5	11	16	11	3	11	3	11	0	3.361
C	A	15	22	23	21	11	26	32	47	15	1.777
D	a, b	35	37	39	37	11	47	11	47	0	0.444
E	d, b, a	35	37	39	37	47	84	47	84	0	0.444
F	d, b, a	35	37	39	37	47	84	47	84	0	0.444
G	a, b, d, e, f	23	30	31	29	84	113	84	113	0	1.777
H	a, b, d, e, f, g	27	30	33	30	113	143	113	143	0	1

Source: Created by authors

X = Total time required for the completion of the collection process using CPM

$$X = 145 \text{ days}$$

$\Sigma \mu T$ = Total time required for the completion of collection process using PERT analysis (only critical activities)

$$\Sigma \mu T = 143 \text{ days}$$

Using the following equation (3), the probability of completing the process of credit collection in 143 days (the minimum time to complete the process) can be calculated and identified which help to re-schedule the process if required...

$$Z = \frac{(X - \Sigma \mu T)}{\sqrt{v}} \quad (3)$$

$$\text{Var. } \sigma^2 = 0.444 + 3.361 + 0.444 + 0.444 + 0.444 + 1.777 + 1 = 7.914$$

$$Z = \frac{(X - \Sigma \mu T)}{\sqrt{v}} = \frac{(145 - 143)}{\sqrt{7.914}} = 0.7109$$

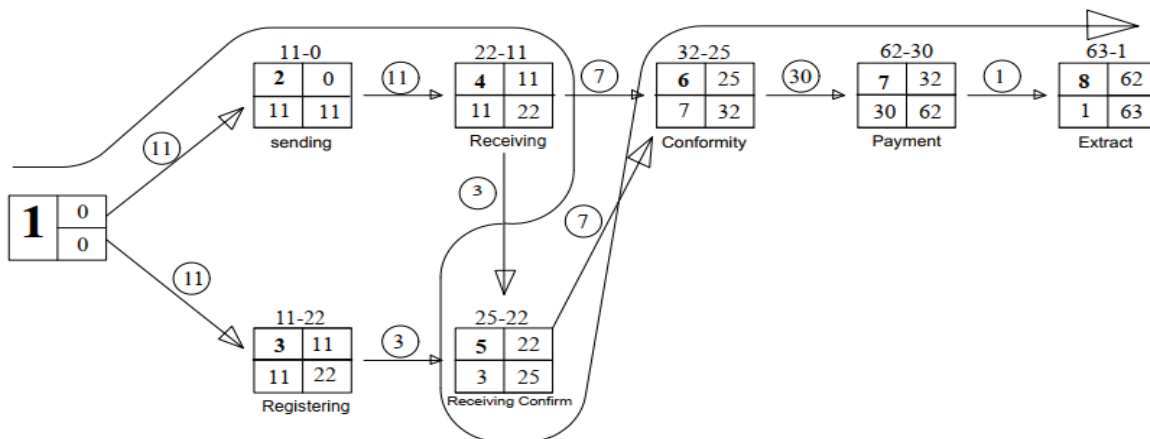
$$\text{prob. } (Z \leq .71) = 0.76.11 = 76.11\%$$

This implies that the probability that the process of credit collection can be completed in 143 days (the minimum time to complete the credit collection process) is 0.7611 = 76.11%. This means that the possibility of completing the collection process on time is 76.11%. Based on this result, in order to complete the process of credit collection within 143 days at 90% = $1.28 = x - 143/\sqrt{7.914} = 2.53$ days. To complete the process of credit collection within 143 days at 99% = $2.53 = x - 143/\sqrt{7.914} = 2.8$ days, which refers to the importance of starting the collection process about 3 days earlier in order to be completed within 143 days as an early finish without any potential delays with a probability of 99%, which in turns can lead to completing the process of credit collection in a shorter time and at a lower cost. If interest rate is 22% then lost interest = 0.18% per 3 days to deduct from profit.

3.5.3. The Critical Path of Account Payable Process: Application Case

There are eight activities *viz.* A, B, C, D, E, F, G and H that must be implemented in a specific sequence to accomplish the process of accounts payable (AP) in the hotel sector as reported by financial managers, and which used to fulfil the precedence requirement as showed in figure (5). The following network diagram shows a graphical representation of the core activities of accounts payable (AP) process in hotels, the dependencies of these activities and the standard time or duration of each activity. A network diagram of the accounts payable process often has nodes to represent the core activities of a process and arrows to indicate dependencies. Plotting of Early Start (ES) is done on the top box in the first left corner. Early Finish (EF) is also mapped on the box in the upper right corner. In the application case of implementing CPM and PERT analysis on the process of accounts payable, the researchers passed the three steps of forward pass, backward pass and float/slack calculations because the purpose for which it was used no longer exists. The three critical paths of accounts payable process calculated by using the graph that depicts a number of different “arrow paths” from Start to Finish.

Figure 5: The network diagram of accounts payable process with CPM



Source: Created by authors

Determining Critical path/ Process Duration

$$\text{Path 1: } \sum_i^j (D_{i,j}) = 60 \text{ days}$$

$$i = 1 + 2 + 4 + 6 + 7 + 8 \text{ and } j = 0 + 11 + 11 + 30 + 30 + 1$$

$$\text{Path 2: } \sum_i^j (D_{i,j}) = 52 \text{ days}$$

$$i = 1 + 3 + 5 + 6 + 7 + 8 \text{ and } j = 0 + 1 + 3 + 30 + 30 + 1$$

$$\text{Path 3: } \sum_i^j (D_{i,j}) = 63 \text{ days}$$

$$i = 1 + 2 + 4 + 5 + 6 + 7 + 8 \text{ and } j = 0 + 11 + 11 + 3 + 30 + 30 + 1$$

If all the activities are done at their normal times, the process duration (length of the longest path) will be 63 days. By Comparing the required times for the four paths. Maximum of {60, 52, 63} = 63 days, which refers to path 3 has the maximum time of 86

days. Therefore, path 3 (A1, A2, A4, A5, A6, A7 and A8) is the critical path of the process of accounts payable (AP) in the sampled hotels. This means that the critical activities of the accounts payable process are A1, A2, A4, A5, A6, A7 and A8. Then, A3 is non-critical activity. Thus, Time for path (3) - Time for path (2) = 63 - 52 = 11 days. Therefore, the non-critical activity (A3) can be delayed up to a maximum of 11 days, without any direct impact or delaying the overall duration required for the completion of the whole process of payment in hotels.

Table 8: Mean and variance of payable process

Activity ID	Precedence	Duration			$t_e(\text{mean})$	Earliest		Latest		TF	Var. σ^2
		A	M	B		S	F	S	F		
A		1	3	5	3	0	3	0	3	0	0.444
B	A	9	11	13	11	3	11	3	11	0	0.444
C	a, b	9	11	13	11	0	11	0	22	11	0.444
D	a, b	9	11	13	11	11	22	11	22	0	0.444
E	d, b, a	1	3	5	3	22	25	22	25	0	0.444
F	d, b, a	5	7	9	7	25	32	25	32	0	0.444
G	a, b, d, e, f	23	30	31	29	32	61	32	61	0	1.777
H	a, b, d, e, f, g	1	1	3	1	61	62	61	62	0	0.111

Source: Created by authors

$$X = 63 \text{ days}$$

$$\Sigma \mu T = 62 \text{ days}$$

$$\text{Var. } \sigma^2 = 0.444 + 0.444 + 0.444 + 0.444 + 0.444 + 1.777 + 0.111 = 4.108$$

$$Z = \frac{(X - \Sigma \mu T)}{\sqrt{v}} = \frac{(63 - 62)}{\sqrt{4.108}} = 0.4933$$

$$\text{prob. } (Z \leq .46) = 0.6915 = 69.15\%$$

This implies that the probability that the process of credit collection can be completed in 62 days is 0.6915 = 69.15%. Based on this result, to complete the process of debt payment within 62 days at 90% = $1.28 = x - 62/\sqrt{4.108} = 1.8$ days. In addition, to complete the process of payment within 62 days at 99% = $3.69 = x - 62/\sqrt{4.108} = 2.01$ days, which means that it is important to start the payment process about 2 days earlier in order to complete the payment process within the critical time of 62 days and on time to avoid any potential delays. The completion of payment process 2 day earlier may be more profitable if a hotel is offered a discount for early payment. In conclusion, integrating CPM and statistical PERT analysis in the area of hotel financial activities using BPM approach is effective to get better financial results and vital for improving CFM practices and making more efficient managerial decisions. CPM help financial managers to determine the critical standard procedures of each process that cannot be delayed to avoid process deterioration, and PERT analysis allows them to identify the variation in CPM and the potential improvement that can be taken to get better results.

Critical path method (CPM) and PERT analysis has been mentioned by many authors as a powerful management tool gained a widespread acceptance due to its positive impacts on maximizing work efficiency. However, it is not included as one of the basic tools of BPM that can increase the efficiency of management practices of BPs and help hotel enterprises to gain better business results compared to the traditional methods. Based on the calculations made, the critical paths and slack values of the accounts receivable process were identified using both statistical PERT analysis and CPM technique which means that in the area of hotel financial activities, both the CPM and PERT systems are successful and efficient. The results show that CPM and PERT analysis can save process time and alert financial managers to produce a critical path of the process activities that can be used as a guide for the financial process implementation so that the process can be completed on time with a shortest cycle, less cost and more efficiency. This encourages and support the usage of CPM and PERT analysis to help financial managers in hotels to determine the deviation in process performance and give an indication of how the process performance varies over time and provide the requisite information which support making informed decisions rather than depending on assumptions and gut feelings. Both the two techniques of CPM and PERT analysis can be also an excellent tool to improve BPM practices and increase the accuracy of business process dynamics in the area of financial activities which leads to detect undesirable execution changes, prevent any further process deterioration and identify required improvements. CPM and PERT techniques are effective tools to improve process performance and increase its effectiveness.

Using CPM and statistical PERT analysis, financial managers in the hotel sector can establish a detailed process schedule which provides a timeline for each activity within the process to indicate the optimal start and finish date and help to identify any potential delays can be made and the appropriate corrective actions should be taken to keep the process within an acceptable level. The results should contribute more thorough information about whether and to what extent the results of using CFM and PERT in the hotel enterprises is influenced by the related management practices and execution procedures of financial process as planned by the owning company. Therefore, applying BPM principles to improve the structural elements of financial processes is also vital to increase the employees' knowledge and awareness of the process path. In addition, CPM and PERT

analysis provide a comprehensive analysis for the activities chain into business process (BP) and determine the most important path for these activities to achieve the desired outputs in the most effective and systematic manner, which support importance of the new concept of Business Process Management Critical Path (BPMCP) supported by statistical analysis of PERT to get business results.

Based on the results obtained, (1) The design of hotel financial processes should not only be described in written texts, with the necessity of having graphical models that shows sequence of financial process activities and quality parameters for each step to evaluate and control. This is vital to increase staff awareness of critical process features and attributes that enable financial managers to deal with sudden accidents, and identify decision points for urgent situations and unplanned operating conditions, (2) Hotel managers should be well-trained in order to improve their knowledge of service design techniques and related statistical tools including both CPM and statistical PERT analysis in terms of how to use these methods and the various considerations that need to be taken into account when using these techniques to design and monitor hotel operating processes, and (3) Using CPM and statistical PERT analysis must be strengthened and enhanced within hotel operation management with considering it as a main requirement for process management efforts and BPM initiative in hotels in order to allow hotel managers rely on statistical data and graphical analysis of hotel operating processes before making any managerial decision for corrective actions.

CONCLUSION AND FUTURE RESEARCH

The conclusion in this study is that BPM approach can be used in the area of financial activities in the hotel sector through developing a generic framework of hotel financial processes with accompanying activities that ordered in a specific sequence and standard time for each activity. This developed framework of financial processes is an attempt to help transform the traditional organization structure of hotels to a process-based orientation rather than emphasizing roles and hierarchical frameworks. In addition, CPM and PERT analysis can be a reference for financial managers in the hotel sector in order for the process to be finished on time and less cost. Hotel financial managers can use CPM in determining the most important standard activities of each process that must be implemented on time in order to avoid process deterioration and other activities that can be delayed, while PERT analysis allows them to detect variations in the activities path and potential improvements that can be employed. This paper focused only on applying BPMCP and statistical PERT analysis to the area of hotel financial activities, which refers to the need for conducting further research on the evaluation of other factors that may be effect on the critical path of financial processes in hotels in order to get better results and improve profitability.

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