AN INVESTIGATION OF DATA MANAGEMENT AND PROPERTY MANAGEMENT SYSTEMS IN HOTELS

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Abstract
The purpose of this paper is to investigate the role of Property Management Systems (PMS) for data management in hotels. The main objectives are to investigate; the awareness of different PMS software and their functionalities, the key determinants of the choice of a specific system and the effective data integration for decision making. The methodology is quantitative and examines the key dimensions of the PMS systems and their functionality. The method employed here is an online questionnaire which is deployed to property level contacts and completed by 95 hotels mainly in Europe. The findings show that, despite the availability of a range of PMS software and functionalities, the market in Europe continues to be led by a handful of providers. More PMS functionalities are used by the Rooms division whereas Human Resources use the minimal amount of functionality. Data collected is often not used for managing and reporting. The main barrier regarding the exploitation of data within the PMS systems is revealed here as a lack of training. The unique contribution of this paper is in empirically exploring, for the first time, the issues associated with the critical, core technology for the hospitality sector, i.e. the PMS.
Keywords PMS, Data Management, Data Optimisation, Decision Making

INTRODUCTION

For most hotels the key technology is the Property Management Systems (PMS) which is defined as "a set of application programs that directly relate to the hotel front office and back office activities e.g. revenue management, reservation management, room and rate assignment, check-in & out management, guest accounting, folio management, account settlement and room status management" (Kasavana & Cahill, 2003, p.4). Consequently, the PMS collects significant amounts of data that may be used to improve operational, tactical and strategic decision making. Additionally, hotels gather data from other sources e.g. customer relationship and loyalty programs, electronic point of sales (EPOS) at food and beverage outlets, online from their websites and those of 3rd party distribution websites. Data management is critical for both customer facing activities and internal management. For the hospitality sector "knowing your guest" is crucial and, furthermore, Tiedermann, van Birgele & Semeijn, (2009) claim that the level of data sharing is directly related to customer responsiveness. The Property Management System (PMS) is the central data infra-structure of the hotel, handling the administration of all of the guests, their profiles and bookings, as well as their stay, the revenues generated, etc. Recent research (Kokaz & Murphy 2008, 2009) shows that almost all hotels have a property management system

however the data used by the PMS is not always "visible" or available for cross functional activities and requires a level of investment in interfaces to fully maximise the benefits of the PMS data and related data sources e.g. Central Reservation System (CRS), and other relevant data sources. Law and Jogarathan (2005) highlight that many hotels fail to exploit data in their business strategies. Most hotel operators are unaware of the wealth of data, related to both customer and management that are available from the software that they use every day and lack not only "a single data view" of the customer but also a "single view of operations".

The main objectives of this paper are; 1) to investigate the awareness of PMS systems and the decision factors for the choice of system and the cross-functional data management capacity of these PMSs, 2) to examine the managerial perception of the range of functionalities of the PMS, 3) to discover the outputs from the PMS and explore the format (e.g. via reporting) of data sharing at cross functional levels, 4) to expose the major issues with respect to data management at property level from the perspective of the hotel operators.

LITERATURE REVIEW

The Structure of Hotels

The structure of the hotel itself determines somewhat the management capacity, the exploitation of technology and cross functional data sharing (Law & Jogarathan, 2005; Tiederman et al, 2009; Gil-Padilla & Espino- Rodrigues, 2008). Other authors also support the rationale that organisational structure impacts on successful exploitation of technology and data (DeLone & McLean 1992; Bharadwaj, 2000). Hotels have a mostly hierarchical, functional structure. The main functional departments of a full service hotel include, according to Lashley and Lee-Ross (2003); *Rooms* (Front Desk, Housekeeping, Security & Maintenance), *Food & Beverage* (restaurant/food production, room service, convention & catering), *Sales & Marketing, Human Resources* (employee recruitment, training, benefits, payroll) and *Accounting* (controller, credit system, purchasing / inventory management, audit).

The Property Management System (PMS)

The PMS is often referred to as the single-most important IT application for hotels by researchers (Murphy, 2007) and suggests that the PMS is the most important current and future IT application in the hotel industry, followed by 'point of sale' (POS) and 'central reservation systems' (CRS). Bardi et al. (2003) illustrates the typical hotel PMS system (in Figure I). The same author defines the hotel PMS as a network of various hardware and software applications used to manage an hotel i.e. sales & marketing, night audit, accounting, human resources management, electronic mail, security, reservations, front desk, call accounting, housekeeping, maintenance and food & beverage.

Figure I: Typical Hotel PMS System
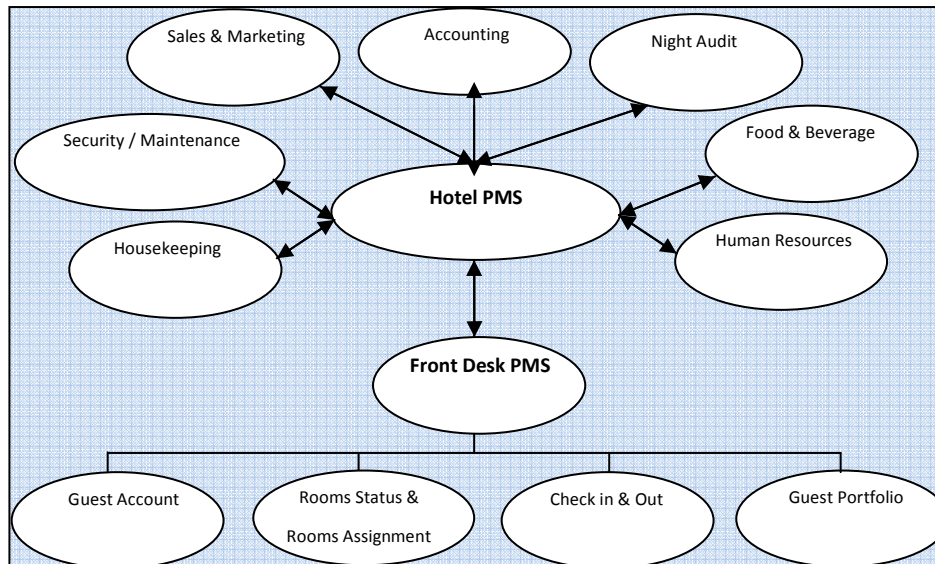
Source: adapted from Kim et al., 2007; Kasavana & Cahill, 2003; Bardi, 2003

There are already many PMS providers available on the markets that provide various solutions with a large number of functionalities based on the changing needs of hotels. The Capterra website evaluates 201 such PMS software providers (Capterra, 2010) and, in addition to these PMS software, the JazdHotels website (JazdHotels, 2010) has 27 more, totaling 228 PMS software evaluated through these two websites. There are many providers for all sizes of hotels, more specifically for SMEs, and available all around the world. There seems to be fierce competition as the big players are present globally and offer a wide range of similar features according to demand (see Figure II). Most of the PMS software, i.e. 70%, is available for the Windows operating system and/or web-based. A study by Daghfous and Barkhi (2009) also shows that Windows is the most widely used operating system in four and five star hotels in UAE and Fidelio is the overall preferred PMS system and has highest market share worldwide. The leasing of software (via the web) is not new, albeit only recently a practice adopted by the hotel industry. Till recently, the hotel industry preferred to develop and "own" their PMS software.

Figure II: Features Offered (Functionality) by Different PMS Providers (out of 45 different features listed) highlighting European and non-European PMS providers
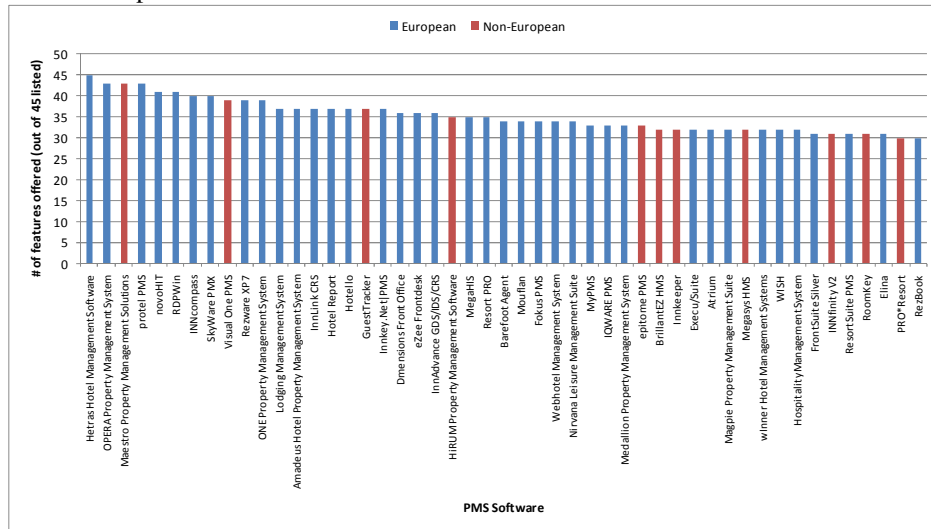
Data Integration - Specific Challenges for the Hotel Sector

Chathoth (2006) reaffirms the critical importance of IT to hotel operations. The PMS is central to everything that goes on in a hotel operation with multiple mission-critical operational processes. It has progressed beyond the single process of check-in, reservation, check-out to a multiple-function software that integrates revenue management, links to loyalty programs, manages online distribution channels, "pushes and pulls" rates to third party online travel agents (OTA), performs inventory management and allocates human resources. However, some of the most critical processes, e.g. setting price and choosing distribution channels, are often performed without complete data, e.g. hotel revenue management (RM) solutions rely not only on the historic data on price and demand but also on the ability to "read the market". To support the PMS there has to be processes and procedures that integrate data into a more holistic picture for supporting competitive decisions, at strategic, tactical and operational level. Unfortunately, "no common integration method allows the installed systems to work together to effectively create, store, retrieve, and present information that may exist across them" (HTNG, 2010, 7). There is, however, recent movement towards harmonization in data standards and integration. Hotel Technology Next Generation (HTNG, 2010) was conceived 8 years ago to facilitate the provision of industry standards in data interfaces and provide certification to suppliers who comply with HTNG standards. In the wider context of travel, the Open Travel Alliance (OTA) has worked for over a decade to produce a platform that software and hardware suppliers can adhere to in order to facilitate data integration. However, not all stakeholders participate in these voluntary initiatives, nor comply with the standards and guidelines that emanate from the workshops and agreements (HTNG, 2010). Law & Jogaratnam, (2005) note the reluctance to invest in full integration of IT systems and

the lack of inter-sharing. This is further confirmed by Tiedemann et al. (2008) in their sample of 50 Spanish hotels, who state that 3-4 star hotels are less likely to share information than the upscale hotels. They also discover that a market/customer orientation is directly linked to both cross-functional and inter-organisational sharing in hotels.

Can Data Management Support Business Objectives/ Strategic Thinking? Bharadwaj (2000) states that reinventing IT systems, e.g. being a first mover and integration of IT, all promote the creation of "value" in IT systems. Other authors confirm that the "value chain" is fed by effective distribution of data and information (Bensaou & Venkatraman, 1996; Tarn & Wen, 2002). Many authors advocate data integration for improved performance, organisational and financial in other business sectors (Strassman, 1990; Bharadwaj et al. 1999). "Organizational performance is driven by internal resources...applications to support management and programs to support decision-making in the hotel, all favor financial performance" (Gil-Padilla, 2008, 38-9). However, there are few studies that examine performance and data sharing/integration that focus on the hotel sector specifically, though Sunny et al. (2005) establish the relationship between IT investments and performance improvements in the hotel sector at five levels; enhanced annual sales, reduced operating costs, increased occupancy rate, greater level of repeat business, and enhanced positive word of mouth. They identify a significant positive impact on performance in all but guest-related interface applications. Marchand (2005) confirms that 25% of the business value of IT lies within the deployment and investment whereas 75% of the business value is in fact in factors related to the usage of the information. However, there is little research carried out regarding the successful exploitation of the data shared at property level, in particular, exploiting the data in the PMS.

METHODOLOGY

A research survey best fits the main objective of this study. For this purpose an online questionnaire is developed, piloted and deployed. This questionnaire drew from the existing literature and framework (Figure I). The validity and reliability of the questionnaire were ensured by basing the questions on previous research (Kokaz & Murphy 2008, 2009) and the literature review on PMS software. A detailed review of the questionnaire was carried out by two IT professors at EHL as well as a Director of one major PMS vendor. The population examined here is composed of hotel managers (including General Managers, Operations Directors, Marketing Directors, Front Office Managers, Owners and Revenue Managers) of upscale and midscale hotels. This population is extracted from the email lists of contacts from hotels (the alumni database of a large hotel school and other hospitality networks) and is representative of the European upscale and midscale hotel properties. An email with the web link to the questionnaire was randomly sent to about 1300 contacts on the merged list. The online questionnaire was created using the MrInterview suite of SPSS statistical software. After refining the email lists of contacts, e.g. extracting multiple contact emails and "bounce back" emails, the link reached about 700 hotels. Due to the very complex and comprehensive structure of the questionnaire, it took respondents on average 27

minutes (excluding the two outliers) to complete it. As a result, there were only 59 fully completed surveys that will be analysed in detail and 36 incomplete surveys that will be analysed partially. This yields a response rate of about eight per cent, which limits generalisations about the research findings.

The structure of the questionnaire is in sections as follows: 1) general hotel characteristics e.g. number of rooms, type of management, occupancy et cetera, 2) PMS in use and reasons for the choice, 3) Awareness of other PMS, their functionalities and appreciation of these functionalities by department, 4) Data collection sources, data types, integration, analysis, and reporting. There were both open ended (for example asking about reasons of choosing or changing for another PMS) and closed ended questions (yes/no questions, some specific information requests, and some ranking questions). A 5-point Likert scale was also used to discover the rating of different functionalities of the hotel PMS software used. Both qualitative and quantitative analysis is performed and the most significant results are shown in the figures below.

RESULTS

The questionnaire sample consists of 95 hotels (59 fully completed surveys and 36 partially completed ones). Most of the responses came from European hotels belonging to 4 to 5 star category, with slightly more independent / family owned hotels compared to chain / affiliated hotels, and generally with less than 250 rooms. The hotels in the sample reported an average daily rate (ADR) of 195 Euros and an occupancy rate of 63.5% in the year of 2009.

Information Systems Used: For different outlets (F&B, spa, golf, etc.) hotels use different POS systems, which are not linked with one another. Among the *POS systems* listed by the hotels, Micros is a clear leader with 43 out of the 95 hotels using a Micros software version. As a CRS system, once again Micros is the leader with 31 hotels, 2 hotels use Protel and all other CRS systems mentioned are only used by one or two hotels. 27 of the hotels reported having no CRS. Throughout our sample, the market seems to be dominated by Micros for *PMS systems* with 54 hotels out of the 95 hotels mention having a version of Opera or Fidelio. Protel follows with 6 hotels, Medialog and Amadeus each was listed by 2 hotels (in addition Hogatex listed by 1 hotel which is now called Amadeus) and 12 hotels report that they do not have a PMS, while others use manual systems created by them for this purpose as they were "too small to invest in a PMS system".

Reasons for chosen PMS: It seems hotels stay with their current PMS system until it is imperative to change. The main reasons given for changing a PMS system are; 1) upgrading to a newer version, as the old system is obsolete, not developed or not supported anymore (mentioned 26 times), 2) the old system is insufficient due to renovations/construction when more rooms were added (mentioned 2 times), 3) headquarters takes the decision for the chain (mentioned 8 times), 4) going from DOS to windows based system (mentioned 4 times), 5) better reporting and more performance in forecasting and analysis (mentioned 4 times), 6) "price" is mentioned

only once along with "having been bought by another hotel chain" and "too difficult to use". It also appears that many hotels stay loyal to a PMS provider's software for an extended time (5 to 20 years).

Awareness of PMS systems: The hotels are aware of mainly the following PMS systems: Micros Opera (75%), Micros Suite 8 (57%), Protel PMS (27%), Rezware XP7 (11%), ONE Property Management System (7%), MyPMS (6%), and Barefoot Agent (3%). For the analysis of awareness, the top 3 PMS software is used (see Figure III). Micros Opera is recognised more by upper scale hotels, particularly those that are affiliated and bigger (i.e. large number of rooms) hotels, whereas Micros Suite8 is more familiar to lower category/ independent hotels. Protel is familiar to all star category hotels but more commonly known to independents. Micros has less awareness in France and Protel has higher awareness in Germany and Austria.

PMS functionalities: The most common brand of PMS software used by the hotel sample is Opera (22 hotels), Fidelio (14 hotels) and Protel (3 hotels). A total of 22 functionalities were listed in the questionnaire within Rooms, F&B, HR, Sales & Marketing, and Accounting departments. The respondents utilised a minimum of 7 of these functionalities and a maximum number of 22 functionalities for the Opera PMS software (see Figure IV). Most of the hotels deploy the functionalities related to the Rooms department, followed by the Accounting department, but very few of them use HR related functionalities (see Figure V). The functionalities used more (i.e. more hotels have them, see Figure V) are the ones that are rated more (higher weighted average of appreciation, see Figure VI). The Rooms Management department has access to all software held by the hotel, however, this is less so for Sales & Marketing and Accounting departments. F&B Management have the most access to the POS and PMS but rarely to the CRS. HR Management is the department that has the least access to the software and therefore any data held by the hotel. The bigger the hotel, the more PMS functionalities they have and the higher RevPar they reported. Chain hotels appear to have PMS software with more functionality.

Figure III: Demographic Characteristics of Sample (out of the 95 hotels)
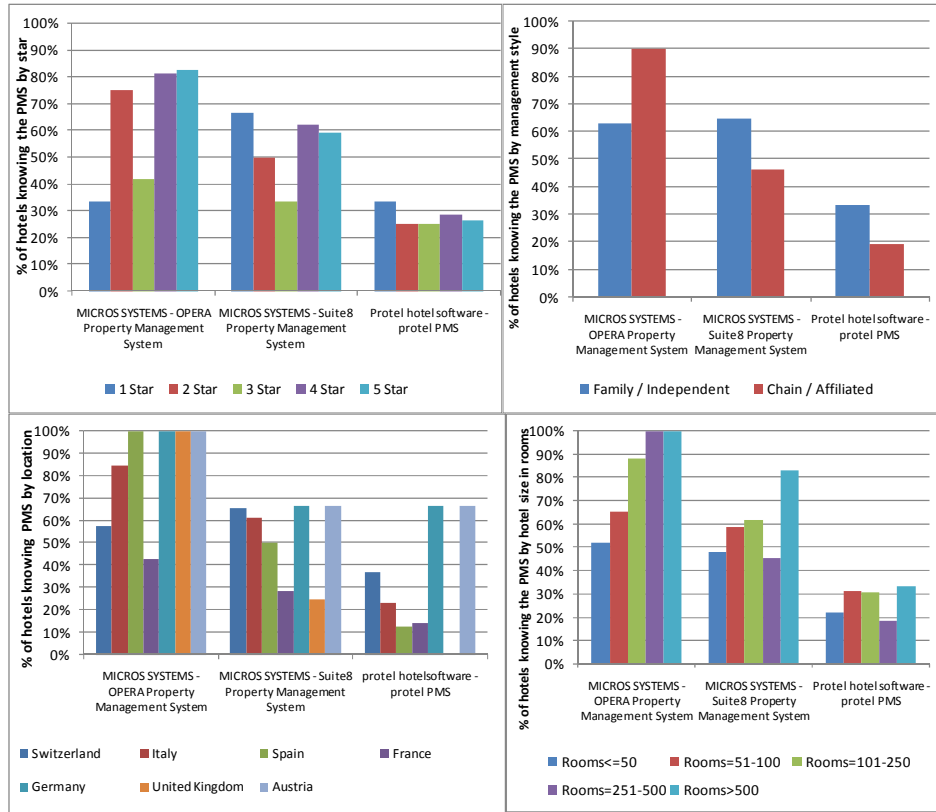

Figure IV: Total Number of Functionalities by PMS as given by the hotels (out of 51 hotels with PMS, and max # of functionality listed in questionnaire = 22)
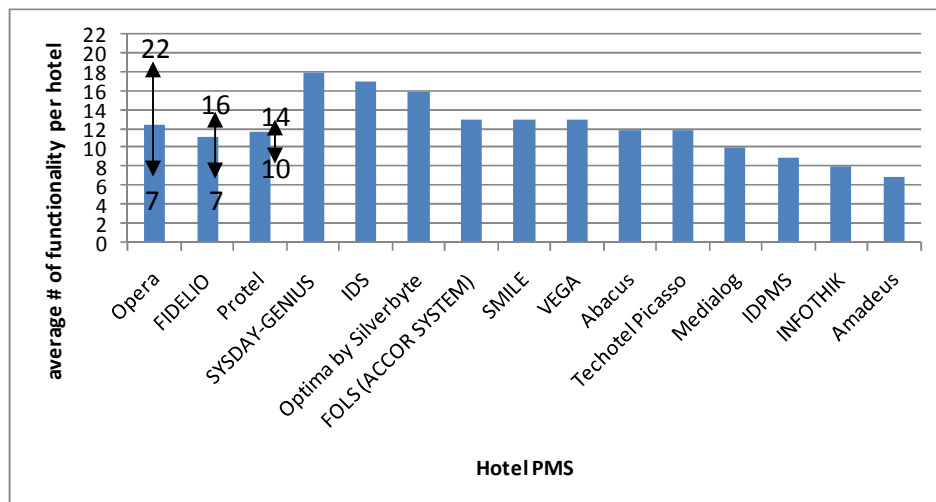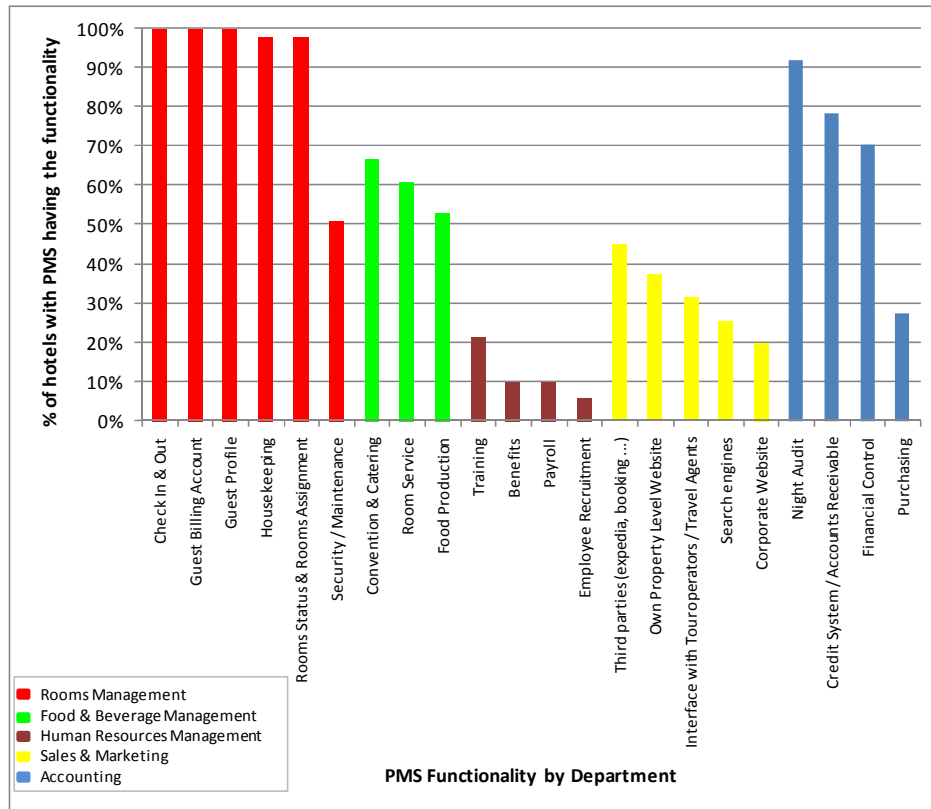
Figure V: PMS functionality by department (out of 51 hotels with PMS)

Data Collection, Sharing and Reporting: More than 90% of hotels collect both customer-related and operational data on a real time or daily basis for all functions of Rooms Management. In the F&B Management division, most data is collected regarding the convention/conference and catering function (54% of hotels), where more operational data rather than customer-related data is collected and this is done mostly on a real time or daily basis. There is almost no data collection within the HR Management division; the highest amount of data collected is with respect to the HR training function (24%). The Marketing & Sales Division also collects little customer and operational data (a maximum of 37% of hotels), on a real time, hourly, daily or weekly basis. The Accounting Division is the second department after Rooms Division that collects large amounts of data, 57% to 84% of hotels. In Accounting, only the data about the purchasing function are collected in a minority of the hotels (21.5 %). Most of the data is collected in real time or on a daily basis with some functions like the Credit System / Accounts Receivable and Financial Control also collected weekly.

Figure VI: Appreciation of PMS functionality by department (out of 51 hotels with PMS)
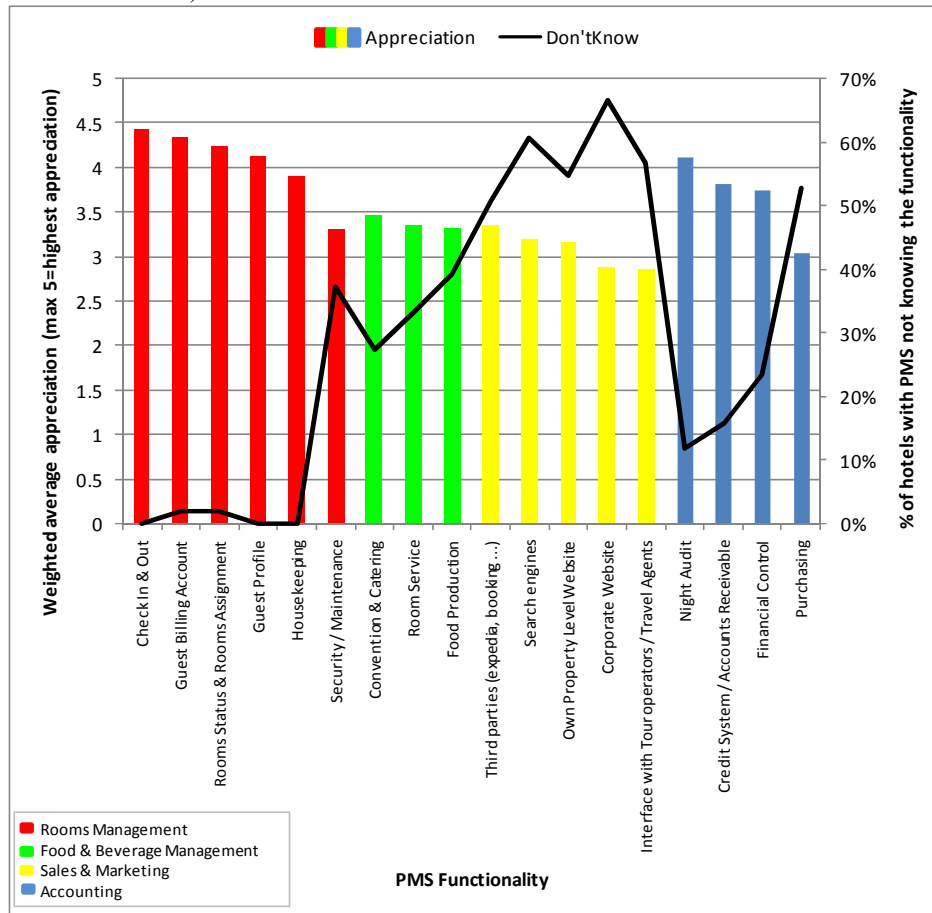
Only 42% of the hotels create regular reports linked to their business objectives. The average hotel RevPar of these hotels is higher (133Euros) compared to the 58% of hotels who do not generate reports (109Euros). There is little difference in creating reports across hotel categories. (Table I).

Data collected by the hotels include the following; room rates, occupancies, guest comments/scores/questionnaires, random checks, mystery shopper, guest email addresses, financial statements, competition rates, feedback from bookers / companies, employee turnover %, employee exit interviews. Analysis is restricted to simple historical comparisons or calculating/summarizing of facts & figures.

Hotels use mostly the PMS and Excel to create reports related to their business objectives. A variety of different reports related to revenues, costs, booking statistics and guest complaints are created. Data collected for these reports mainly include revenues, occupancies, ADR, daily cancellations/no shows, and guest complaints.

Most of the data is collected daily. These reports are mostly created and received by the Management, Accounting department and the GM.

Table I: Hotels Creating Regular Reports Linked to Business Objectives

	Total # of hotels	# of Hotels creating reports	# of Hotels NOT creating reports
Family / Independent	36	17	19
Chain / Affiliated	23	8	15
1Star	1	1	0
2Star	4	0	4
3Star	8	6	2
4Star	24	8	16
5Star	22	10	12
Rooms <= 50	16	8	8
Rooms 51-100	17	7	10
Rooms 101-250	18	8	10
Rooms > 250	8	2	6

The main issues with respect to data management: The main concerns cited by the hotels with regards to data management at property level are as follows; training of the employees with respect to the use of the IS (inputting and interpretation of results), not one system doing it all, the different systems are not linked, the costs of a "good" PMS are high, these systems are too technical and only IT people can use/understand them. This results in the under usage of the systems by the managers, with only the default reports generated (there are few/no IT experts in small companies). Other concerns are; that these systems are not customised, low speed of the operation of the software, poor stability of the system (power supply, LAN bugs, crash, interconnection with different version of OS, viruses and security access), reports are not tailored to needs / difficult to extract and data is collected but not analysed properly. It seems the one recurring major issue is TRAINING!

CONCLUSIONS & RECOMMENDATIONS

In relation to *general awareness of the range of PMS*, this research shows awareness focused on Micros, and to some extent Protel, with Micros products confirming their market share/leadership in PMS providers. It is also clear that the property managers do not see the PMS as a strategic data resource, only upgrading when exogenous factors dictate, i.e. when specific PMS support is discontinued etc. They do not appear to be pro-active in seeking upgrades, perhaps viewing the PMS solely as a technology issue. This may be due to the long held dominance of Micros in the European market and /or acceptance of the limited capabilities and capacities they have to manage it as a strategic business resource.

It is clear that not all *functionalities of the PMS* are used by the properties. It seems the original, core functionality i.e. that of room allocation and accounting/guest billing continues to be the dominant. This, of course, indicates that at property level there is a large under-utilisation of the range of the PMS functionalities. This may be explained by the lack of training, as indicated, or could be explained by lack of access to other data/functionalities (perhaps, controlled by other departments) or the complexity, albeit "perceived complexity", in extracting cross-functional /departmental data.

In terms of data *collection, sharing and reporting,* there seems to be little data sharing between departments and this often fails to support the business objectives. This may be due to the silo based management structures that are prevalent in hotels. There appears to be a slight bias towards higher RevPar hotels that are more likely to generate reports, indicating there may be some association between RevPar and the availability of reports that support business objectives.

Generally most of the reports generated are simplistic, using the report writing in the PMS or generated in Excel i.e. not using some of the more sophisticated reporting add-ons. These reports are "department oriented" with very little cross functional sharing reported. It is the GM and the Accounting department who typically use these reports, indicating a more financial focus than a customer or inter-departmental orientation. The frequency of the data collection, which is daily, also may suggest a mostly operational utilisation of the data.

In conclusion, there is a domination and a heavy reliance of the market on Micros, whether it is actually the "best –fit" for all the internal data functions in the hotel or not. Additionally, a lack of awareness and exploitation in the full range of PMS functionality is reported in this research, which is exacerbated by lack of inter-operability, training and the perception that data management is more of an IT function due to the perceived high technical nature of these systems.

There are obvious limitations in this research, e.g. the sample returned is small and may not be representative of all hotel properties. The complex and comprehensive structure of the questionnaire is also a limiting factor, as it proved time consuming to complete and consequently may introduce a level of selection and response bias. Nonetheless, the complex nature of hotel departments and data structures does not easily lend itself to investigation and this is the first empirical study of this subject and hopefully, future researchers will be able to build on the methodology, methods and results published here.

Notably, this research highlights the lack of exploitation of data at property level, particularly the existing data in the PMS. It is recommended that managers should promote, first of all, the availability and awareness of data, invest in tools and processes that promote cross functional optimisation of data and link business objectives to data resources. Training is crucial to the successful exploitation of all these recommendations. To explore this further, this research will proceed to a qualitative stage of investigation using focus groups, to determine the prevailing barriers and issues in more depth that hinder the profitable exploitation of data sources at property level.

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