The Relationship between Water Management, Operational Performance and Competitive Advantage in Egyptian Hotels

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Abstract

Hospitality industry consumes large amounts of water. Water management in hotels is an important issue and it's impacted significantly on operational performance and competitive advantage. The aim of this research is to determine the best practices of water management as an important issue in the Egyptian hospitality industry. To attain this aim a self-administrated questionnaire employed as the data collection tool. This survey consisted of The 45 items, and these items categorized into nine groups, i.e., general practices (GP), kitchen (K), laundry (L), room service and accommodation (R), pool (P), gardens (G), operational performance (OP), competitive advantage (CA) and firm performance (FP). The questionnaire was directed to a randomly sample of employees in the investigated hotels. A number of 300 forms was distributed, among them 272 forms, representing a response rate of 90.6 % were completed and valid for analysis. The study hypotheses verified over structural equation modeling (SEM) using analysis of moment structure (AMOS v.25). On one hand, the findings showed a significant relationship among all groups with firm performance and competitive advantages except laundry with OP also gardens with CA. On the other hand, there is a significant between OP and FP and non-significant between CA and FP

Keywords: Water Management, Operational Performance, Competitive Advantage, Firm Performance, Structural Equation Modeling (SEM).

INTRODUCTION

Difficulties related to shortage of water were identified worldwide (Choong, 2011 and UNEP, 2012). The tourist water demand can generate big problems of sustainability (Tortella, and Tirado, 2011). According to Kuuder, *et al*. (2013), hospitality industry and the lodging in particular are consuming a massive quantity of water. One of the vital causes on behalf of higher consumption of water in the lodging segment relates to guest behavioral tendencies. Hotel guests incline to feel a pleasure approach to bath or shower, which increases the tendency to utilize more water than they habitually do at their home (Eurostat, 2009). Moreover, there are other number of explanations behind higher traveler water utilization in lodging establishments, as well as upkeep of gardens (water system), everyday rooms housework, washing in laundry daily, support of pools, and intense kitchen activities (Eurostat, 2009). Providing a good management for wastewater and clean is a difficult issue. Numerous issues including accessibility of fiscal resources, size of hotel and level of knowledge tend to regulate hotels' aptitude to implement clear water and wastewater practices.

Adopting green practices is beneficial for the hotel and tourism industry (Chou, 2014). According to Jeon, *et al*., (2015), tourists apparently expect the lodging industry to pay attention to environmental concerns, and to operate within water sustainability. The National Leisure Travel Monitor survey mentioned that around eighty five percent of vacation tourists consider themselves environmentally conscious (Crocker, 2008). There are some studies discussed the environmental issues in hotels but there are shortage in those related specially with water, Thus, this study aims to identify the best practices for managing water in Egyptian hotels and

showing the relationship between water management and both operational performance and competitive advantage.

LITERATURE REVIEW

Water Consumption in Hotels

Availability of clean water is a major issue of concern in many parts of the world (Kasim *et al*., 2014). Inns are mainly water users since guests incline to use extra water once they stay at hotels than they usually do at their home routine (Charalambous *et al*., 2012). Gossling (2012) expected that water consuming in lodging organizations at the worldwide level to be 1.3 km^3 per year. Charara, *et al*. (2011) presented that the inns consume a great water quantity especially in terms of liters per guest night when compared with international benchmark figures.

According to Eurostat (2009), there are some causes for using extra water as guest during stay in hotel than when at home such as sanitary issues in hotels (i.e. daily cleaning of guest rooms; everyday laundry operations); leisure events (needing water intensive upkeep of green areas and swimming pools) and a desire approach to food (more elegant food preparation), showers and baths. Bathrooms of hotels use around thirty to forty percent of hotel water usage (Dworak *et al*., 2007).

International Tourism Partnership (2008), indicate that wasteful usage for water can cause consumption of ninety liter per guest night being used for baths, and forty liter per guest night for toilets and faucets, whereas a drippy toilette can lose up to seventy hundred and fifty Liter per day, and a leaky tap up to seventy Liter per day. Moreover, Smith *et al*. (2009) guess that dripping faucets only can growth hotel water usage by five percent averagely. Barberan *et al*. (2013) considered that dripping fittings caused in water decreases of fourteen thousand liter per day to approximately one

hundred rooms in a hotel. According to AEA (2009) and Accor (2010), using laundry for towels and linen of bed can consume about one hundred liter for busy room per night, and round among twelve percent (Dworak *et al*., 2007) and forty seven percent (Deng and Burnett, 2002) of water usage in hotels.

Ecotrans (2006) expected that water consumption can be raised because indoor swimming pools by around sixty liter per guest night. In addition to Hof and Schmitt (2011), estimate that irrigation of landscape and pool water renewal usage around to nine hundred and one hundred liter per guest night, respectively. Although the information about water usage in kitchens is limited, Deng and Burnett (2002), found that twenty two percent of water uses in five-star hotels happened in hotel kitchen. Bohdanowicz and Martinac (2007) stated that usual water usage for dining is thirty five to forty five Liter per cover in hotels.

Water Management

Water is considering a vital natural source in lodging industry. In a hotel, saving water is extreme operative and widely ecological responsible practices meanwhile, similar numerous hotel activities, water is a main supply for hotel operation (Untaru *et al*., 2016). Water management is becoming increasingly important for hoteliers as it can reduce not only the total cost of actual water consumption (El Dief, and Font, 2012). Grey water as well as wastes and energy are considered the greatest thoughtful ecological fears resulting from the hotel business (Chan *et al*., 2009). Ecological expenses of water supply consumption, plus operational expenses, have been speedily being raised in the hospitality business (Chan *et al*., 2009).

According to Untaru *et al*. (2016), the consumption of water is taken great attention from hotel operations. Full efforts for management of water in different zones in hotel such as sewage reduction, laundry, rooms and gardens can get large merits to hotels in its operational performance like ecological, establishment performance and savings for operational cost. In this regards, Bruns-Smith *et al*. (2015) pointed that the common technique for water waste decrease in a hotel is replacing to present system to be water-efficient such as taps aerators, low-flow shower head, low or dual flush toilettes, and green laundry activities. Extra method is linked to recycling waste water over a grey water reusing structure. Page *et al*. (2014) and Untaru *et al*. (2016) added that hotels can decrease closely 23 percent of total water usage by the previous approaches. However, the utmost operative method is certainly stared as decreasing guests' water consumption.

According to Jorgensen *et al*. (2009), affirmed that dealing with outside water usage actions, including of water use in a hotel somewhat than home water consumption, is the first and vital stage once making behavior changing in water consumption. In often suitcases guests' water usage happens in hotel rooms which usually contains activities such as brushing teeth, shower taking, flush-toilet, wash, and changing rubs and towels totally below the control of individual lodger (Page *et al*., 2014; Untaru *et al*., 2016). The main motive for high consumption of water in the hotel rooms is owing to guests' behavior propensities. Hotel guests, mainly those residing at a luxury hotels, are likely to have pleasure-seeking tendencies behavior such as taking extended relaxing shower daily, that rise the usage of water, and therefore they are consuming extra water than they habitually do at home (Untaru *et al*., 2016). Depending upon the theoretic background

and the practical studies, the proposed hypotheses can be showed as follows (see Figure 1).

Hypo.1: There is a relationship between general practices and both operational performance and competitive advantage.

Hypo.2: There is a relationship between kitchen and both operational performance and competitive advantage.

Hypo.3: There is a relationship between laundry and both operational performance and competitive advantage.

Hypo.4: There is a relationship between room service or accommodation and both operational performance and competitive advantage.

Hypo.5: There is a relationship between pool and both operational performance and competitive advantage.

Hypo.6: There is a relationship between gardens and both operational performance and competitive advantage.

Hypo.7: There is a relationship between operational performance and firm performance.

Hypo.8: There is a relationship between firm performance competitive advantage.

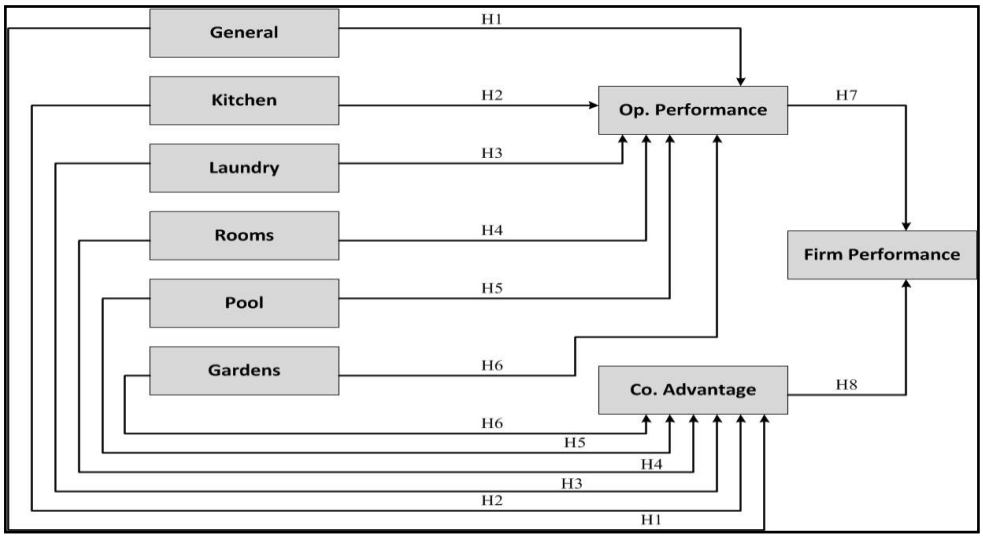

Figure 1: The proposed research model

METHODOLOGY

Survey Instrument

The study implements a survey as the data-gathering instrument and it has been used extensively for its capability to measure constructs (Cohen *et al*., 2000). The practices scale was adapted and revised from the Sustainable Business Associates developed by the State Secretariat for Economic Affairs (Zein, *et al*., 2008). Forms were discussed with many hotels employees.

The final survey was including 45 items on a five-point Likert type scale: "1= strongly disagree"; "2= disagree"; "3= neutral"; "4= agree"; and "5= strongly agree". The 45 items are divided into nine variables: general practices (8 items), kitchen (5 items), laundry (7 items), room service and accommodation (6 items), pool (3 items), gardens (7 items), operational performance (3 items), competitive advantage (3 items) and firm performance (3 items).

Population and Sampling Techniques

The study of population can be definite as the whole group under study, as stated through the aim and objectives of the study (McMillan, 2012). Sampling techniques provide a range of ways that enable one to decrease the quantity of data needed for a study by considering only data from a subcategory rather than all possible components (Saunders *et al*., 2009). There are two types of sampling: probability where the chances of each case being selected from the population is known and is usually equal for all cases, and nonprobability sampling - where the chances of each case selected from the total population is unknown (McMillan, 2012). A convenience sampling is assumed to be the most suitable form to make the

wanted answers (Leat and El-Kot, 2007). It is a type of non-probability sample in which subjects are selected based on their accessibility or convenience to the researcher (Ross, 2005). In this research, a convenience sampling technique has been adapted to select hotel employees who participated in the questionnaire forms. 300 questionnaire forms are dispensed, two hundred and seventy-two (*n*=272) valid surveys were returned and finished, therefore reaching a response rate of 90.6 percent.

Data Collection

The distribution process was very hard, as most of the hotels did not approve it and the researcher had to depend on friends and contacts who are working in the field of hotels. The process took around three months from December, 2019 to February 2020.

Validity and Reliability

Validity of the research refers to the accuracy and honesty of instruments, data and findings in the research. The validity of data is tied up with the validity of instruments so if instruments are valid then data should be valid (Bernard, 2017). Reliability refers to the stability, constancy, dependability, certainty, and accuracy of a research (Burns, 2000). These two are related because if a measure is valid then it is reliable (Bryman and Bell, 2003). Validity explains how well the collected data covers the actual area of investigation (Taherdoost, 2016).

Data analysis

A Software Package for Social Sciences (SPSS) version 25 was used for data analysis. Descriptive analysis was performed to analyze (45 items). Furthermore, the study data was screened and research hypotheses has been observed via SEM using Analysis of Moment Structures (AMOS)

version25, AMOS were used in order to explore the statistical relationships among the items of each factor and between the factors. The SEM technique reduces the measurement error problem related to the test of the mediating effects. This is because SEM method provides explicit estimates of the measurement errors and consequently considered to be a more superior method (Tarka, 2018).

RESULTS

Descriptive Analysis of Survey

The survey form was intended in this research to identify the best practices for water management in Egyptian hotels. Three hundred of questionnaires were distributed, two hundred and seventy-two (*n*=272) valid surveys were distributed and returned, thus achieving a response rate of 90.6 percent.

The survey was focused on some practices which related to different departments in the hotel such as kitchen, laundry, room service, pool and gardens. Meanwhile, there were some choices related with operational performance, competitive advantage and firm performance.

SPSS version 25 was used to analyze of water management practices (45-item, nine-factors) descriptively in table 1. It revealed that 40 items (88.8%) have mean scores exceeding 3.00, the Five items with high mean score are (Replacing defective seals and repair damage to water pipes M=4.61, Regularly maintaining plumbing fixtures and piping in order to avoid losses M=4.54, Green water activities improve company's image M=4.54, Checking the laundry room's equipment regularly to avoid leaks M=4.47, Avoiding leaving taps open unnecessarily M=4.41), only 5 items (11.1%) had mean scores below 3.00 (If possible, recovering the rinse water from relatively unsoiled loads for the next cycle's prewash and wash M=2.87, Not to melt the ice in the water, but leave it to dissolve in the air M=2.72, Collecting rainwater for watering the lawns M=2.70, Reusing the

pool's water to wash the floor M=2.64, Reusing the water that was used in the kitchen to wash fruits and vegetables for watering the garden M=2.58).

It is noticed that median score 32 items (71.1%) above 3.00. Moreover, 13 items (28.8%) had median scores less 3.00. The maximum standard deviation goes to practice "Lay out slopes so that water infiltrates the ground without causing erosion" by (SD = 1.554) but the lowest standard deviation belongs to practice "Replacing defective seals and repair damage to water pipes" by (SD = 0.645).

Table 1: A Descriptive Analysis of Water Management Practices (45 items)

No.	Department	Practices	Mean	Median	Mode	Std. Deviation
1	**General Practices**	Installing water meters in each department	3.79	4.00	4	1.068
2		Determining the monthly water consumption and its cost	4.37	5.00	5	0.800
3		Identifying activities and areas that cause high consumption	4.32	5.00	5	0.790
4		Installing water-saving devices in the appropriate places (flow regulators, Water flow sensors, self-closing taps, low-flush toilets, etc.)	4.28	5.00	5	0.970
5		Avoiding leaving taps open unnecessarily	4.41	5.00	5	1.016
6		Avoiding cleaning with high pressure hoses	3.60	3.00	3	1.029
7		Regularly maintaining plumbing fixtures and piping in order to avoid losses	4.54	5.00	5	0.670
8		Replacing defective seals and repair damage to water pipes	4.61	5.00	5	0.645

(Continued)

Table 1: A Descriptive Analysis of Water Management Practices (45 items) *(Continued)*

No.	Department	Practices	Mean	Median	Mode	Std. Deviation
1	**Kitchen**	The water flow is adjusted according to the type of cleaning to be done	4.03	4.00	5	0.962
2		Close the water while cleaning and rinsing	3.90	4.00	5	0.978
3		Soaking the dirty dishes before placing them in the dishwasher in order to shorten the prewash	3.99	4.00	5	1.063
4		Filling dishwashers to their maximum capacity in order to minimize the number of cycles	3.89	4.00	5	1.193
5		Not to melt the ice in the water, but leave it to dissolve in the air	2.72	3.00	3	1.170
1	**Laundry**	Sorting the laundry according to the degree of soiling, so that only the dirtiest items are washed intensively	3.62	4.00	5	1.361
2		Using the washing machines in "full load" mode in order to limit the number of wash cycles	3.94	4.00	5	1.056
3		Eliminating the prewash and use water-saving wash cycles	3.61	3.00	3	0.848
4		If possible, washing towels and linen at the request of guests rather than every day	3.13	3.00	4	1.326
5		Reducing water pollution by using less polluting detergents (phosphate-free, whitener-free, etc.)	3.86	4.00	4	0.806
6		Checking the laundry room's equipment regularly to avoid leaks	4.47	5.00	5	0.796
7		If possible, recovering the rinse water from relatively unsoiled loads for the next cycle's prewash and wash	2.87	3.00	3	1.226
1	**Room Service, Accommodation**	Installing flow regulators on the showerheads in order to decrease consumption	4.25	5.00	5	0.910

(Continued)

Table 1: A Descriptive Analysis of Water Management Practices (45 items) *(Continued)*

No.	Department	Practices	Mean	Median	Mode	Std. Deviation
2	Room Service, Accommodation	Installing timed (self-closing) faucets so that they do not keep running for a long time if left open inadvertently	3.48	4.00	5	1.443
3		Choosing water saving toilets flushes	3.40	3.00	3	1.338
4		Inviting – as far as possible – the guests to reuse the towels and bed-linen	3.24	4.00	4	1.338
5		Train the staff to respect the instructions concerning the reuse of towels and bed-linen	3.60	4.00	4	1.338
6		Distributing brochures and flyers, or post stickers and posters, inviting guests to save water	3.73	4.00	5	1.338
1	Pool	Covering the pool outside of the opening hours so that the water does not evaporate or get dirty	3.05	3.00	5	1.496
2		Reducing the use of chlorine in the water and /or choose other treatment systems (ozone, electrolysis, salt, etc.)	3.41	3.00	3	1.342
3		Reusing the pool's water to wash the floor	2.64	2.00	2	1.267
1	Gardens	Choosing plants that are suited to your region's climate and rainfall	3.27	4.00	4	1.510
2		Avoiding flower beds that quickly dry up	3.27	4.00	4	1.465
3		Watering lawns early in the morning and late at night to limit evaporation	3.37	4.00	5	1.529
4		Install automatic sprinkler systems and localized devices (micro-sprinklers, drip irrigation systems for roots, etc.)	3.87	4.00	5	1.400
5		Lay out slopes so that water infiltrates the ground without causing erosion	3.22	4.00	5	1.554

(Continued)

Table 1: A Descriptive Analysis of Water Management Practices (45 items) *(Continued)*

No.	Department	Practices	Mean	Median	Mode	Std. Deviation
6		Reusing the water that was used in the kitchen to wash fruits and vegetables for watering the garden	2.58	2.00	1	1.409
7		Collecting rainwater for watering the lawns	2.70	3.00	1	1.415
1	**Operational Performance**	Green water activities allow your organization to reduce its total operational costs	4.22	4.00	5	0.840
2		Green water activities allow your organization to reduce its water consumption	4.24	4.00	5	0.858
3	**Operational Performance**	Green water activities allow your organization to reduce the risk of accidents	4.28	5.00	5	0.873
1	**Competitive Advantage**	Green water activities improve company's image	4.54	5.00	5	0.753
2		Green water activities increase customer satisfaction	4.38	5.00	5	0.796
3		Green water activities increase employee satisfaction	4.12	4.00	5	0.930
1	**Firm Performance**	Sales have increased over the last 2 years as a result of water management	3.38	3.00	3	1.280
2		Profits have increased over the last 2 years as a result of water management	4.00	4.00	5	0.978
3		The occupancy rate has improved in the last 2 years as a result of water management	3.26	3.00	3	1.178

Note: Bolded items indicate means above 3

Structural Equatin Modelling

Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) was used to ration the validity and reliability of the model consisted of six exogenous variables (general practices, kitchen, laundry, room service or accommodation, pool and

gardens) as well (operational performance, competitive advantage and firm performance), as a three endogenous variables. Evaluation of the measurement model was showed the overall measurement model in which all the latent constructs were correlated with each other.

The calculation of composite reliability, and average variance extracted (AVE) and Cronbach's α showed adequate reliability at the construct level, using the conventional threshold criteria for Cronbach's α, composite reliability and AVE (Hair *et al*., 2013). The results revealed a strong and consistent relationship between each set of items and their latent variable see Table 2. Composite reliability was adapted alongside Cronbach's α to assess internal reliability as it has been argued that the Cronbach's α coefficient has numerous limitations whereas it is the greatest popular reliability' measure (Shook *et al*., 2004).

Composite reliability (CR) is a reasonable select because of its capability to draw on measurement correlation errors and the standardized regression weights for each item. Hence, the Cronbach's α and CR may not have the same value, but may prove the same thing (internal consistency) (Byrne, 2010). Practices were classified into general practices, kitchen, laundry, room service or accommodation, pool and gardens. Thirty six items were used as indicators for each of the latent contracts, general practices items was labeled as GP1and GP8, kitchen was labeled as K1to K5, laundry was labeled as L1 to L7, room service or accommodation was labeled as R1 to R6, pool was labeled as P1 to P3, and gardens was labeled as G1 to G7. In addition, operational performance was used three items as indicators for each of the latent contracts, was labeled as OP1 to OP3, also competitive

advantage was used three items as indicators for each of the latent contracts, was labeled as CA1 to CA3. Moreover firm performance was used three items as indicators for each of the latent contracts, were labeled as FP1 to FP3.

Confirmatory factor analysis was conducted to evaluate each construct‘s measure. Results showed that all items loaded positively high on their respective factor. Convergent validity was confirmed as composite reliability (CR) of all constructs were larger than it’s value of 0.7, AVE of each construct was greater than the cut off value of 0.5 and finally CR was greater than AVE, all these criteria indicated a good convergent validity for study measures (Byrne, 2010). All critical ratio values exceeded the minimum guideline of ±1.96, with all values significant at the 0.001 levels. Moreover, factor loadings ranges from 0.5 to .924. (Table 2) show that all composite reliability (CR) and Cronbach‘s alpha values for all constructs which exceeded the acceptable value of .70 which is indicating a good reliability level (George and Mallery, 2003).

Furthermore, Values of AVE for all constructs exceeded the acceptable value of .50 which is indicating respectable convergent validity (Hair, *et al*., 2013). This values of the average variance extracted (AVE) ranged for Practices from 0.55 to 0.84. While the (AVE) for operational performance value equal 0.86, the (AVE) for competitive advantage equal 0.81. Moreover, the (AVE) for firm performance equal 0.80. AVE of every construct was greater than the squared correlation of each couple of constructs, which is indicating respectable discriminant validity. Therefore, all the research constructs in the current study proved to be valid and reliable (Hair *et al*., 2013).

Table 2: Factor loadings, Validity Analysis and Reliability Test of The Measurement Model				
Constructs	**Factor Loadings**	**CR**	**α**	**AVE**
General Practices (GP)		0.85	0.721	0.66
GP1	0.555			
GP2	0.602			
GP3	0.703			
GP4	0.721			
GP5	0.629			
GP6	0.593			
GP7	0.720			
GP8	0.737			
Kitchen (K)		0.70	0.701	0.55
K1	0.501			
K2	0.555			
K3	0.592			
K4	0.579			
K5	0.533			
Laundry (L)		0.82	0.711	0.63
L1	0.761			
L2	0.589			
L3	0.616			
L4	0.671			
L5	0.512			
L6	0.559			
L7	0.706			
Rooms (R)		0.92	0.834	0.81
R1	0.780			
R2	0.805			
R3	0.854			
R4	0.738			
R5	0.831			
R6	0.880			
Pool (P)		0.87	0.778	0.83
P1	0.879			
P2	0.874			

P3	0.739			
Gardens (G)		0.94	0.929	0.84

(Continued)

Table 2: Factor Loadings, Validity Analysis and Reliability Test of The Measurement Model *(Continued)*

Constructs	Factor Loadings	CR	α	AVE
G1	0.913			
G2	0.908			
G3	0.916			
G4	0.602			
G5	0.888			
G6	0.772			
G7	0.850			
Operational Performance (OP)		0.90	0.838	0.86
OP1	0.873			
OP2	0.884			
OP3	0.851			
Competitive Advantage (CA)		0.85	0.724	0.81
CA1	0.784			
CA2	0.850			
CA3	0.811			
Firm Performance (FP)		0.84	0.729	0.80
FP1	0.924			
FP2	0.586			
FP3	0.872			

Note: CR = Composite reliability; α **=** Alpha reliability; AVE = average variance extracted. FL= All factor loadings were significant at ≤ .001

Construct Reliability and Average Variance Extracted

Lawson-Body and Limayem (2004) stated that if the composite reliability value (for standardized estimates) is 0.6 or higher the scale will have a suitable internal reliability. So according to the results presented in Table 2, all indicators revealed a good composite reliability values which ranged from 0.701 to 0.929. Consequently, as results' confirms the variables in the research are consistent in explaining the variance constituted in them as they are good reliable.

The average of variance extracted (AVE) for every construct is extra essential feature for construct reliability. Average variance extracted (AVE) is an estimation that concludes the average total of variances in indicators that are reflected for by the fundamental factor (Taylor and Hunter, 2003). When its AVE reaches .5 or extra the variable should be reliable (Fornell and Larcker, 1981). As it would be seen from Table 2, none of the variables had an AVE value below 50%. The lowest AVE is generated by kitchen construct, with a ratio of fifty five and the highest AVE is scored by operational performance construct with a ratio of 86%. Hence, it is suitable to complete that the model variables are reliable since this cut-off value confirm that at least fifth percent or more of the variances in the spotted variables are clarified by the set of indicators.

Discriminant Validity

Measuring discriminant validity needs to the square root of the AVE of each construct was compared with the correlation estimates between constructs. Discriminant validity is known by the square root of variance extracted values (AVE), especially whether or not it exceeds the inter-construct correlations related with that construct (Kline, 2011). As it could be seen in Table 3, all the constructs represent different concepts and the discriminant validity is achieved because the AVE of each construct is higher than its squared correlation (Hair *et al*., 2013).

Table 3 shows the comparing of the square root of AVE values on the diagonal with the inter-construct correlations for all constructs. As shown in Table 3, it can be noted that the square root of the AVE for each construct was higher than the correlation between that construct and other

constructs.

Table 3: Model of Discriminant Validity for the Measureme

Constructs	Variance for water management practices and operational performance, competitive advantage and firm performance scale.								
	GP	K	L	R	P	G	OP	CA	FP
GP	**0.66**								
K	0.433	**0.55**							
L	0.285	0.507	**0.63**						
R	0.011	0.205	0.535	**0.81**					
P	0.082	0.318	0.571	0.754	**0.83**				
G	-0.145	0.178	0.368	0.558	0.408	**0.84**			
OP	0.601	0.384	0.220	0.038	0.125	-0.197	**0.86**		
CA	0.370	0.266	0.074	0.076	0.001	0.041	0.461	**0.81**	
FP	0.192	0.311	0.569	0.640	0.662	0.194	0.262	0.166	**0.80**

Note: The values of AVE for the constructs are bolded values along the diagonal line, and the squared correlations for each pair of constructs are the other values.
GP = General Practices; k = Kitchen; L = Laundry; R = Rooms; P = Pool; G = Gardens; OP = Operational Performance; CA = Competitive Advantage; FP = Firm Performance.

Hypotheses Testing and Structural Models

A standardized path coefficient (ß) was used to check the proposed hypotheses in a fundamental diagrammatic as shown in Table 4. The findings revealed a relationship between general practices and operational performance, supported H1 ((ß= 0.646, $p < 0.001$). Findings revealed a relationship between general practices and competitive advantage, supported H2 (ß= 0.338, $p < 0.001$).

The findings shown a relationship between kitchen and operational performance, supported H3 (ß= 0.143, p < 0.001). The findings revealed relationship between kitchen and competitive advantage, supported H4 (ß= 0.194, p < 0.001).

The findings revealed no relationship between laundry and operational performance, not supported H5 (ß= -0.080, p < 0.001). The findings revealed a relationship between laundry and competitive advantage, supported H6 (ß= -0.184, p < 0.001). The findings revealed the relationship between room service or accommodation and operational performance, supported H7 (ß= 0.091, p < 0.001). The findings revealed the relationship between room service or accommodation and competitive advantage, supported H8 (ß= 0.244, p < 0.001). The findings revealed a relationship between pool and operational performance, supported H9 (ß= 0.095, p < 0.001).

The findings revealed relationship between pool and competitive advantage, supported H10 (ß= -0.172, p < 0.001). The findings revealed relationship between gardens and operational performance, supported H11 (ß= -0.194, p < 0.001). The findings show no relationship between gardens and competitive advantage, not supported H12 (ß= 0.055, p < 0.001). The findings revealed relationship between operational performance and firm performance, supported H13 (ß= 0.229, p < 0.001). The findings revealed no relationship between competitive advantage and firm performance, not supported H14 (ß= 0.061, p < 0.001).

Table 4: Research Hypotheses Testing for Direct Relationship

H	Path			Beta coefficients (ß)	Factor loadings	*t*-values	P	Results
H1	General	→	Op.Performance	0.646	0.339	15.026	***	Supported
H2	General	→	Co.Advantage	0.338	0.174	6.540	***	Supported

H3	Kitchen	→	Op.Performance	0.143	0.113	3.320	***	Supported
H4	Kitchen	→	Co.Advantage	0.194	0.151	3.759	***	Supported
H5	Laundry	→	Op.Performance	-0.080	-0.042	1.854	.064	Not Supported
H6	Laundry	→	Co.Advantage	-0.184	-0.095	3.565	***	Supported

(Continued)

Table 4: Research Hypotheses Testing for Direct Relationship *(Continued)*

H	Path			Beta coefficients (ß)	Factor loadings	*t*-values	P	Results
H7	Rooms	→	Op.Performance	0.091	0.034	2.105	.035	Supported
H8	Rooms	→	Co.Advantage	0.244	0.091	4.722	***	Supported
H9	Pool	→	Op.Performance	0.095	0.060	2.210	.027	Supported
H10	Pool	→	Co.Advantage	-0.172	-0.107	3.322	***	Supported
H11	Gardens	→	Op.Performance	-0.194	-0.049	4.520	***	Supported
H12	Gardens	→	Co.Advantage	0.055	0.014	1.060	.289	Not Supported
H13	Op.Performance	→	Fi.Performance	0.229	0.293	3.771	***	Supported
H14	Co.Advantage	→	Fi.Performance	0.061	0.079	0.996	.319	Not Supported

(H) = Hypothesis; *Absolute *t*-value > 1.96, p< 0.05; **Absolute *t*-value > 2.58, p< 0.01; ***Absolute *t*-value > 3.29, p< 0.001.

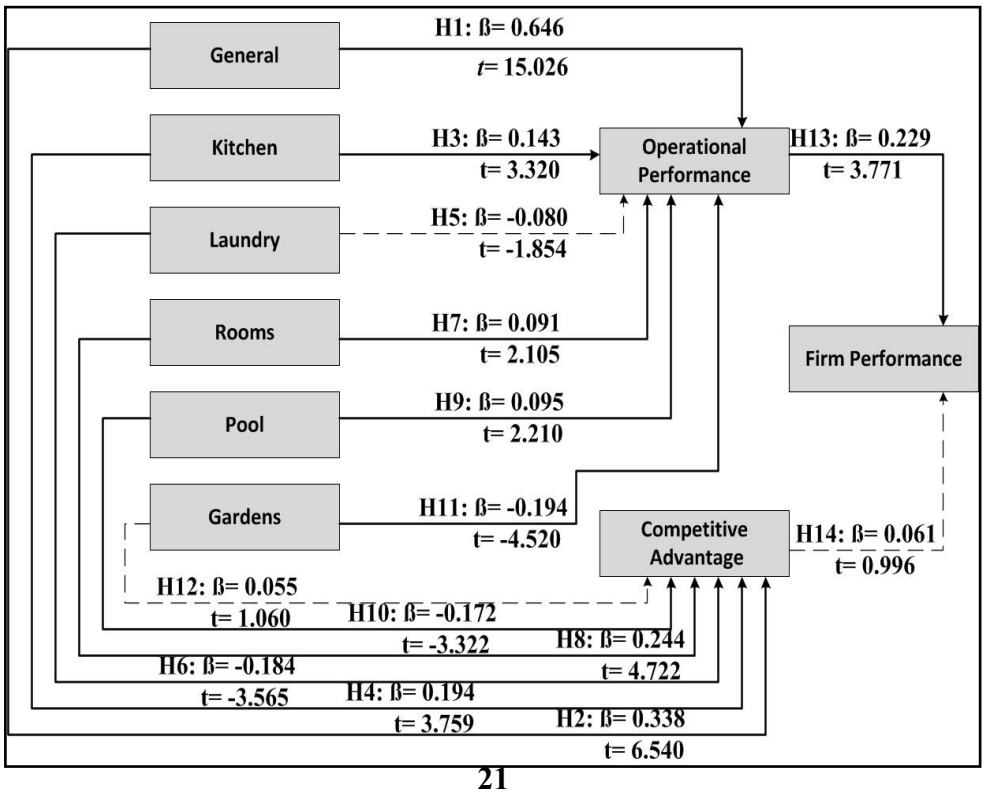

Figure 2: The modified final structure model of the research

Notes: bolds lines denote significant hypotheses; dotted lines denote non-significant hypotheses, (H) =Hypothesis; (ß) =Beta coefficients; (*t)* = *t* values

Discussion and Implication

The present study added to the limited literature on water management because research on water use, water assessment and management in the tourism and hotel industry is limited (Thomas, 2020). The outcomes of this research show that practices of laundry had no relationship with operational performance. In other words, laundry practices such as optimized laundry sorting and loading press and rinse water reuse and wash water recovery where economically viable. This is constant with other researches (i.e., O'Neill *et al*., 2002; Accor, 2010) which displayed that there is a correlation between operational performance in hotel and laundry operations. A possible explanation of this result that it's difficult to balance between laundry requirements and green water activities at the same times (Bohdanowicz and Martinac, 2007). Consequently, the present study suggests that hotels must pay more care to green laundry activities to minimize water consumption while laundry represents a major potential source of saving for water, energy and chemical consumption within accommodation organizations. For example, bedroom laundry comprises pillow cases, sheets, duvet covers, towels and bath mats, green procurement of efficient washing machines, installation of holding tanks and programe modification to reuse rinse water, optimized laundry sorting and loading, optimum washing machine programming to minimize water, chemical and energy consumption, measures to reduce energy consumption

during washing, drying and ironing (efficient equipment, heat recovery, etc.). Before laundry actions are optimized considerable savings can be achieved through the minimization of laundry volumes. Towel reuse and bed linen programs can reduce laundry volume by half (Smith *et al*., 2009).

Moreover, the study results revealed that practices of hotel green area had no relationship with competitive advantages. Frequently hotel managers believe gardens have no effect on improving hotel image especially it consumes more amount of water. This is consistent with a previous study (Gössling *et al*., 2012). This issue is very important in hotels. Therefore, this study suggest that planting of green areas with indigenous species to minimize irrigation requirements, installation and maintenance of efficient irrigation system, use of waste water for irrigation all of this previous practices can improve consuming of green areas for water (Gössling *et al*., 2012).

Additionally, the outcomes of this study revealed that competitive advantage had no relationship with firm performance. In other words, achieving a competitive advantage does not necessarily increase the performance of the hotel while some issue that achieves competitive advantage can take more cost. This is constant with previous studies (i.e., Seuring and Muller, 2008; Sarkis *et al*., 2011; Chan *et al*., 2012). This is really important in hotels where it is a difficult equation to spend more investment for delay profit (Chen, 2014).Hence, the present study suggests that hotel managers should give their care to green activities it may be costly but it's very useful on long term especially that is related to water.

Limitations and Suggestions for Future Research

The research possesses some limitations; it explores the best practices of managing water in hotels. In that sense, it is meaningful for further studies

to focus on energy, or waste management or it can concentrate on dissimilar sectors within the lodging industry such as restaurants, bars, cruise ships, resorts, hostels, etc... Likewise, this study investigated the hotel using a sample of five-star hotels in Greater Cairo, Egypt since it is higher in terms of cost, time and availability. Thus, in the further studies, it is worthwhile to focus on hotels in other towns such as red sea region, or Luxor. Besides the instruments limitations for this research is to usage of questionnaire. In Future studies can use quantitative approaches, including focus group or interviews. Moreover, sampling for this research was a small ratio of the hotels' employee's population; thus, further researches with a bigger sample size ratio would be required to ensure appropriate generalization of study findings. But, in despite of these limits, this research has valuable implications for both industry practitioners and hospitality scholars.

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Appendix

Name of Hotel: ……

***Note: (1) =** Strongly disagree; **(2)** = Disagree; **(3) =** Neutral; **(4) =** Agree; **(5) =** Strongly Agree.*

Please tick the number that best indicates your response.

Practices	Scale				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
General					
• Installing water meters in each department	1	2	3	4	5
• Determining the monthly water consumption and its cost	1	2	3	4	5
• Identifying activities and areas that cause high consumption	1	2	3	4	5
• Installing water-saving devices in the appropriate places (flow regulators, Water flow sensors, self-closing taps, low-flush toilets, etc.)	1	2	3	4	5
• Avoiding leaving taps open unnecessarily	1	2	3	4	5
• Avoiding cleaning with high pressure hoses	1	2	3	4	5
• Regularly maintaining plumbing fixtures and piping in order to avoid losses	1	2	3	4	5
• Replacing defective seals and repair damage to water pipes	1	2	3	4	5
Kitchen					
• The water flow is adjusted according to the type of cleaning to be done	1	2	3	4	5
• Close the water while cleaning and rinsing	1	2	3	4	5
• Soaking the dirty dishes before placing them in the dishwasher in order to shorten the prewash	1	2	3	4	5
• Filling dishwashers to their maximum capacity in order to	1	2	3	4	5

minimize the number of cycles					
• Not to melt the ice in the water, but leave it to dissolve in the air	1	2	3	4	5
Laundry					
• Sorting the laundry according to the degree of soiling, so that only the dirtiest items are washed intensively	1	2	3	4	5
• Using the washing machines in "full load" mode in order to limit the number of wash cycles	1	2	3	4	5
• Eliminating the prewash and use water-saving wash cycles	1	2	3	4	5
• If possible, washing towels and linen at the request of guests rather than every day	1	2	3	4	5

Practices	Scale				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
• Reducing water pollution by using less polluting detergents (phosphate-free, whitener-free, etc.)	1	2	3	4	5
• Checking the laundry room's equipment regularly to avoid leaks	1	2	3	4	5
• If possible, recovering the rinse water from relatively unsoiled loads for the next cycle's prewash and wash	1	2	3	4	5
Room Service, Accommodation					
• Installing flow regulators on the showerheads in order to decrease consumption	1	2	3	4	5
• Installing timed (self-closing) faucets so that they do not keep running for a long time if left open inadvertently	1	2	3	4	5
• Choosing water saving toilets flushes	1	2	3	4	5
• Inviting – as far as possible – the guests to reuse the towels and bed-linen	1	2	3	4	5
• Train the staff to respect the instructions concerning the reuse of towels and bed-linen	1	2	3	4	5
• Distributing brochures and flyers, or post stickers and posters, inviting guests to save water	1	2	3	4	5
Pool					
• Covering the pool outside of the opening hours so that the water does not evaporate or get dirty	1	2	3	4	5
• Reducing the use of chlorine in the water and /or choose other treatment systems (ozone, electrolysis, salt, etc.)	1	2	3	4	5
• Reusing the pool's water to wash the floor	1	2	3	4	5

Gardens					
• Choosing plants that are suited to your region's climate and rainfall	1	2	3	4	5
• Avoiding flower beds that quickly dry up	1	2	3	4	5
• Watering lawns early in the morning and late at night to limit evaporation	1	2	3	4	5
• Install automatic sprinkler systems and localized devices (micro-sprinklers, drip irrigation systems for roots, etc.)	1	2	3	4	5
• Lay out slopes so that water infiltrates the ground without causing erosion	1	2	3	4	5
• Reusing the water that was used in the kitchen to wash fruits and vegetables for watering the garden	1	2	3	4	5
• Collecting rainwater for watering the lawns	1	2	3	4	5

Water Management Practices Survey *(Continued)*

Practices	Scale				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Operational Performance					
• Green water activities allow your organization to reduce its total operational costs	1	2	3	4	5
• Green water activities allow your organization to reduce its water consumption	1	2	3	4	5
• Green water activities allow your organization to reduce the risk of accidents	1	2	3	4	5
Competitive Advantage					
• Green water activities improve company's image	1	2	3	4	5
• Green water activities increase customer satisfaction	1	2	3	4	5
• Green water activities increase employee satisfaction	1	2	3	4	5
Firm Performance					
• Sales have increased over the last 2 years as a result of water management	1	2	3	4	5
• Profits have increased over the last 2 years as a result of water management	1	2	3	4	5
• The occupancy rate has improved in the last 2 years as a result of water management	1	2	3	4	5

Thank you for Taking the Time to Complete this Survey ☺