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The Impact of Organisational Size on the Relationship between Government Policy and Medical Waste Management Practices

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To examine the influence of organisational size, as a moderating variable, on the relationship between government policy and Medical Waste Management Practices (MWMP) among public hospitals in Libya, this study approaches the subject from a theoretical viewpoint by developing hypotheses. It is anticipated that organisational size (number of skilled and knowledgeable employees) influences hospital groups that are in charge of medical waste. In this regard, the Libyan authorities have adopted World Health Organisation (WHO) guidelines on proper waste segregation and disposal. This can only be achieved when health authorities employ a skilled and knowledgeable workforce able to adequately manage medical waste. This study used the stratified random sampling technique to select and collect data from respondents such as top management officials, heads of departments, administrators and doctors who work in all the hospitals located in the southern part of Libya. The current study findings suggest that government policy and compliance with medical waste regulations are not perfectly in tune with WHO's recommendations. That is to say, the hired numbers of skilled employees are seldom provided with adequate information required for the safe management of medical waste and the application of standard operating procedures. However, the number of knowledgeable employees has a positive moderation on the relationship between government policy and MWMP. The findings, therefore, suggest that, apart from the improvement of all procedural practices at these hospitals, further research and attention should focus on the management practices of the growing number of healthcare providers in Libya. This is urgently needed so as to ensure a system that is economically sustainable, and a

system that protects human health and other livings creatures on this planet.

Key words: *Government policy, medical waste handling, and regulations, organisational size as a moderating variable.*

Introduction

The policy environment that governs waste management is mainly reflective of the legislation enacted at the provincial level and decisions made in relevant case law. Improper management of medical waste is a great problem for several medical institutions in developing countries. This situation has resulted in health hazards and environmental pollution (Kofoworola, 2016). These environmental and public health issues arise from the daily generation of waste and the process of handling and disposing of medical waste. Globally, considerable studies have been conducted in recent years calling for the establishment of adequate management of medical waste, so as to greatly minimise the negative impact on the health of the public (Chauhan, Singh, & Jharkharia, 2018). The mismanagement of medical waste not only results in colossal disposal cost (Botelho, 2012), but also in serious public and environmental hazards. In Libyan policy and regulations (Ministry of Health and Ministry of Environment, 2007), the main guidelines formulated by the aforementioned ministries include the segregation, reduction, handling, identification, treatment and final disposal of medical waste, while the technical specifications for the implementation of each step are well expanded in separate technical guidelines. These well-established guidelines emphasise the proper application of segregation, good administration and, importantly, the active participation of trained and informed staff (WHO, 2005a) rather than technologies of waste treatment and disposal to ensure correct waste identification and segregation (Zahra, Waseem, Fiaz, & Farhan).

A healthy environment depends largely on the level of compliance with regulations and policies of medical waste (Botelho, 2012). However, there has been no evidence of adequate information about the level of compliance exhibited by medical waste management teams within the Libyan healthcare facilities (Baaki, Baharum, & Ali, 2019). The lack of adequate information has serious implications, particularly for the southern regional state hospitals of Libya. Hence, it is not sufficient for all the key stakeholders (government, hospital, and waste managers) to ensure only a well-established policy on medical waste management. They should also ensure that there is proper execution of medical waste management directives. This can be implemented by constantly monitoring how each medical care facility carries out its responsibilities in ensuring safe and clean systems of healthcare waste management and disposal, with minimum threat to handlers, the public and the environment (Kofoworola, 2016). Therefore, whether these hospitals have trained, skilled and knowledgeable workers

that will comply with proper waste segregation and handling practices is a matter of public concern (Botelho, 2012). This study utilised data gathered from a field survey conducted in Libyan hospitals located in the southern part of Libya. The study aims to examine whether the number of skilled employees influences the relationship between government policy and medical waste management practices, and to identify relevant sources of variability in the compliance rate.

Regulations and Policies Provision in Libya

From the early 1980s, several environmental decrees and laws were passed to guide the activities of medical waste disposal in Libya. Such major requirements included the Rule of Environment No. 7 (1982), the regulation of atmosphere and air protection (1992), and the law of the transportation of hazardous materials (2005). These legal directives covered municipal waste and pollution control but did not extend their mandates to include the management of medical waste. Consequently, Libya has no clearly defined regulations concerning the appropriate management and safe disposal of medical waste.

However, some years back, the Environmental General Authority in Libya worked with the Ministry of Health to create regulations and instructions for healthcare waste management. But these regulatory guidelines are still in their early stages due to insufficient information available on generation (quantities and compositions), handling and dumping of hospital waste. Therefore, a thorough assessment of the present conditions concerning medical waste management in Libya is necessary for the design of good regulatory policies.

Since the Ministry of Health and Ministry of Environment of Libya adopted WHO's recommendations for medical waste delivered from different healthcare facilities, these recommendations should outline the rationale of legislation, national aims and the main steps toward the achievement of these aims. Late in 2007, both ministries (Ministry of Health and Ministry of Environment) formulated guidelines for medical waste laws and regulations which are summarised as follows:

- Health and safety descriptions resulting from mismanagement of medical waste
- Precise reasons for safe medical waste management practices in different healthcare facilities
- Methods being used for the treatment and disposal of each waste category
- Clear warnings for unsafe practices, such as disposal of hazardous waste in municipal landfills
- Responsibilities of management inside and outside health care establishments
- Appraisal costs of medical waste management
- The main essential steps of medical waste management: segregation, minimisation,

handling, identification, treatment, and final disposal, technical specifications for the implementation of each step should be expanded in separate technical guidelines
- Record-keeping and documentation
- Requirements needed for training
- Protection rules for the safety and health of workers

Literature Review and Hypothesis Development

Relationship between Organisational Size (Number of employees) and Medical Waste Management Practices

According to Ban (2016), Baumann and Kritikos (2016), and Bhattacharya (2018), organisational size can be measured through several dimensions. These are turnover, number of employees and the workforce. In the present research, we focus on the second dimension (number of employees) as organisational size is the indicator most likely to be related to waste management. Following on from Grandia, Farshidian, and Dosovitskiy (2019), the number of employees selected in the current research is a measure of hospital size (number of employees). This decision was taken for two reasons. Firstly, the targeted hospitals are public, so are not profit-oriented. Secondly, the number of employees seems to be relatively more stable where there is adequate management which allocates certain people to specific tasks (Tucker & Sharkey, 2016). This can clearly be seen when a worker is given multiple job responsibilities. A delay of crucial steps with regard to proper medical waste management practice will accrue and later on affect the efficiency of the system.

Furthermore, a smaller population is easier to convince and also to control regarding the adoption of the MWMP. This situation is more evident in small hospitals than in large ones. However, lack of staff could also influence MWMP since it is partly determined by behavioural attitudes. For example, the segregation of medical waste by untrained workers would result in mixing hazardous and non-hazardous components, thereby leading to environmental issues and air pollution. Dealing with medical waste without protective gear would also potentially expose waste management parties to medical problems such as HIV or HCV and so on. Based on the literature, we have developed the following hypothesis.

H1: *Organisational size has a significant impact on waste management in Libya*

The Relationship between Government Policy and Medical Waste Management Practice of Libyan Public Hospitals

Government policy refers to the creation or review of standards and guidelines for organisational processes and organisational member behaviours (Basheer, Hafeez, Hassan, & Haroon, 2018; Predajňa, Benediková, & Candresse, 2017). Typically, government policy will

have a significant impact on new ideas in different manners (Popovic, 2018). The fundamental elements of government policy contain identifying processes that can be standardised and used to develop standard operating procedures. Creating standards and guidelines may also be the first step in the organisation's quality assurance processes, for example in laboratory testing or surgical room procedures. Strategies in this area will be most effective when there is an agreement between the best practices for particular organisational tasks, based on scientific evidence or on ethical or legal grounds. This strategic area is, therefore, closely associated with disciplines from the natural sciences, law, and ethics. Examples include the clinical care pathways and standardised procedures for tasks such as record-keeping, staff, and patient safety, and procurement (Predajňa et al., 2017). Again, in the absence of standards and guidelines for organisational processes and organisational member behaviours, different types of toxicity may result. For instance, when waste is deposited in pits or locations close to water sources, contamination may occur in the water bodies. Similarly, the burning of health-care waste in an open site or in an incinerator with no emission control (which is a common scenario with most incinerators in many developing countries) could lead to the release of different poisonous chemicals such as dioxins, furans, and other toxic air pollutants (WHO, 2005).

Government regulation and control could be in the form of policies that encourage and reward organisations. As the system is to be developed by a governmental body, it translates in the form of tools, strategies or other public decisions (Yong'an, Zhe, & Jie, 2016). National legislation comprises a basis that has to be drawn on to improving the practices of waste treatment in a country. National medical waste management plans have been prepared by several countries. Within this context, the Global Alliance for Vaccines and Immunisation (GAVI) has been financing a project in collaboration with WHO since 2006. This is aimed at helping different countries to adopt a policy and strategic plan for waste management produced in different activities at medical institutions.

The management of medical waste could be considered as industrial symbiosis since it aims to encourage self-business among organisations that are ready to cooperate to improve their economic and environmental performances (Basheer, Siam, Awn, & Hassan, 2019; Hafeez, Basheer, & Rafique, 2018). Therefore, the adoption of such cooperative strategies is linked to the increased costs of waste management, which are governed by policy and legislative requirements (Murakami, Sulzbach, & Pereira, 2015).

Government policies are also deemed to be capable of influencing several factors (Yoon & Nadvi, 2018). Fundamental elements of government conditions contain identifying processes that can be standardised and developed into standard operating procedures. On the other hand, in the absence of standards and guidelines for organisational processes and organisational member behaviours, different types of toxicity may occur. In this paper, the

medical waste management practice refers to any dangerous substances or objects of waste that pose a hazard to both the environment and human beings. They are generated from various therapeutic activities that are intended to or, must be, disposed of according to the provisions of the local regulations and policies for medical waste. In line with past organisational waste management research, the current study proposes that external organisational factors will influence medical waste management practices (Baaki et al., 2019).

H2: *Government policy regarding waste management has a significant impact on waste management in Libya*.

Organisational Size as a Moderator Variable

Organisational size has long been suggested as a significant macro-variable in organisational behavioural literature (Girod & Whittington, 2017; Tolbert & Hall, 2015). However, literature has advocated some contextual factors that may affect the quality of management implementation. Mesgari et al. (2017), for instance, studied organisational size as a contingency factor by stating that the fit of Total Quality Management Practices (TQMP) and the structural relationship between the TQMP vary between small and medium-size organisations and large ones. Cohen (2016) contended that the organisational size is one of the important factors that has an influence on the quality system from one level to a higher and more sophisticated level. In the field of healthcare waste management (Baaki et al., 2019), Raila (2015) associated organisational (hospital) size with hospital waste management as a factor in implementing hospital waste management in public and private medical institutions in Thailand.

Organisational size in the present research is defined as the total number of employees working in an organisation who have direct or indirect contact with medical waste in each hospital under review. This conceptualised definition is appropriate for the current purpose because it is inclusive of different educational levels across organisations. Annarelli and Nonino (2016), state that all sizes of organisations in the world, whether small, medium, or large, are operating in dynamic, complex and unpredictable environments.

To justify the potential role of the number of skilled employees as a moderator variable in this research, the propositions of earlier studies of Cohen (2016) and Raila (2015) were considered. The number of knowledgeable or skilled employees has been noted to have a noticeable influence on the processes and outcomes of both new and established organisational procedures. According to Tucker and Sharkey (2016), the number of employees seems to be relatively more stable where there is adequate management, which allows allocation of certain employees to one specific task.

H3: *Organisational size moderates the relationship between government policy regarding waste management and waste management in Libya*.

Methodology

This research uses a combination of both descriptive and inferential statistical methods. The Smart PLS Structural Equation Modelling (SEM) is used to test the relationships between the constructs in its conceptual model. SEM, which is recognised as a second-generation approach, is a powerful alternative to first-generation approaches such as multiple regressions. While the multiple regressions allow only one dependent variable in the model, SEM can simultaneously handle multiple dependent variables (both techniques allow the inclusion of multiple independent variables) (Tam & Oliveira, 2016). SEM, which is very popular among behavioural science researchers (Etemad-Sajadi, 2016), offers researchers the ability to incorporate latent (unobserved) variables in the analysis and to perform path-analytic modelling with them (Tam & Oliveira, 2016). Latent variables are those concepts that cannot be directly observed and measured in the study and which need to be approximated by other measures (also called items or indicators). All of the constructs in this research are latent and they need to be measured via their indicators. SEM couples a structural model (also called an inner model) with a measurement model (also called an outer model) (Tam & Oliveira, 2016).

Sampling is considered appropriate as the research method for selecting suitable members of the population for the study (Scuotto, Ferraris, & Bresciani, 2016). The present research prefers to adopt the probability sampling design. Furthermore, the probability sampling is preferred rather than the non-probability sampling for each of the elements in the population. A conclusion can be drawn from the population based on the characteristics of the sample chosen which can be generalised. This means the findings of this research will represent the characteristics of waste management organisations in Libya overall. In this study, the sampling method adopted entails the processes below. Hence, using the guidelines for stratified random sampling following Susanti and Gunawan (2019), the research population was divided into mutually exclusive groups.

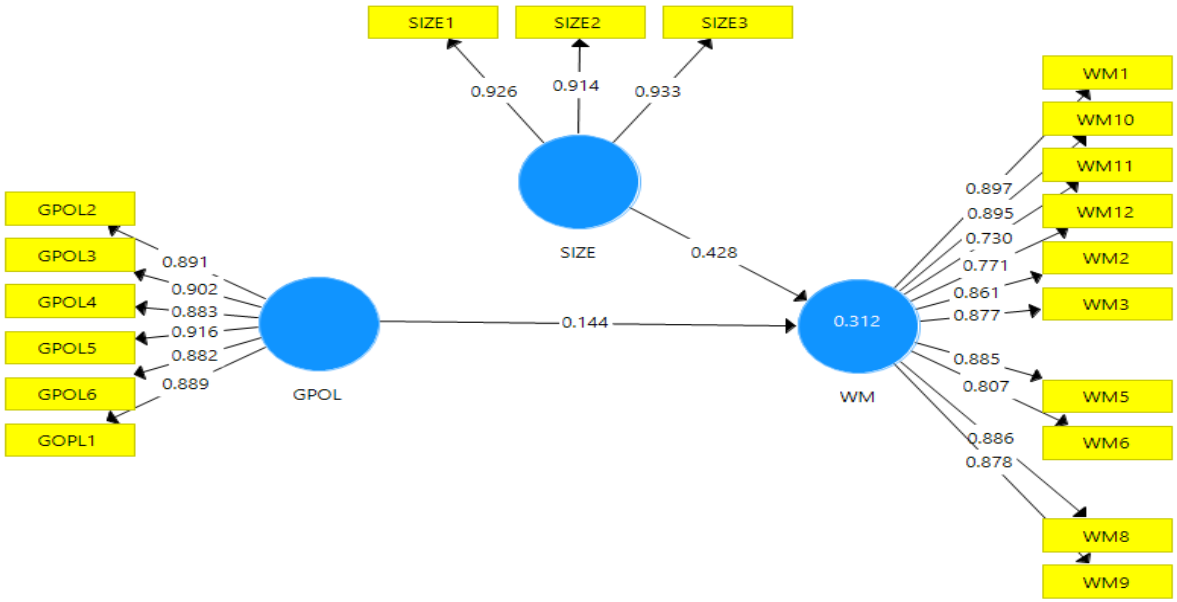
Proportionate sampling has an equal percentage of a set of strata. Out of a total of 450 construction organisations registered with Cooperate Affairs Commission Abuja, based on the study of Pulley (2018) the logic of sampling, 60% of the list in each of the categories of the construction organisations was randomly selected and they were given the questionnaire to complete (Scuotto et al., 2016).

With regard to government policy for construction waste management, the seven items used to measure government policy were adopted. The 12 items used to measure construction waste management were adapted from Nasidi, Barau, and Nuhu (2018). And three items are used to measure the size of firm.

Results

SEM-PLS comprises of two steps firstly, the measurement model and the structural model. The first step is to access the measurement model which is shown as follow in figure 2

Figure 1. Measurement Model



Davcik and Sharma (2016); Hair, Sarstedt, and Hopkins (2014) pointed out that the individual item reliability was assessed by examining the outer loadings of each construct's measure. Items with loadings between .40 and .70 should be retained (Hair et al., 2014), it was realised that out of 21 items,2 were deleted because they presented loadings below the threshold of 0.70.

Table 1: Outer loadings

	GPOL	SIZE	WM
GPOL2	**0.891**		
GPOL3	**0.902**		
GPOL4	**0.883**		
GPOL5	**0.916**		
GPOL6	**0.882**		

SIZE1		**0.926**	
SIZE2		**0.914**	
SIZE3		**0.933**	
WM1			**0.897**
WM10			**0.895**
WM11			**0.730**
WM12			**0.771**
WM2			**0.861**
WM3			**0.877**
WM5			**0.885**
WM6			**0.807**
WM8			**0.886**
WM9			**0.878**
GOPL1	**0.889**		

Convergent validity indicates that multiple indicators of the same construct hang together and act alike or convergent (Mert & Aksoy, 2018). Content validity is shown "when each measurement item correlates strongly with its assumed theoretical construct" (Moon, Choi, & Armstrong, 2018). In other technical terms, convergent validity is evidenced when each of the measurement items is loaded with a signed t-value on its corresponding construct. Moon et al. (2018) suggested that this t-value should be significant, at least at the 0.05 alpha protection levels. In other words, the t-value should be equal to, or greater than, 1.96 to reveal the significance at the alpha level of 0.05. Additionally, Tzempelikos and Gounaris (2017) asserted that a construct is convergent when its Average Variance Extracted (AVE) is at least 0.5 and the standardised loading of each individual measure is above 0.7. This study examines the reliability of the instrument by calculating Cronbach's alpha coefficient test to measure internal consistency reliability. Therefore, different acceptable levels of reliability have been suggested by the literature; however, Hair, Hult, Ringle, and Thiele (2017) suggested a reliability of higher than 0.7 as the recommended level. Also, reliability can be used as a criterion for selecting or excluding indicators (Agrawal & Jain, 2019). In cases where removing an indicator improves the reliability of a construct, particularly if the reliability of a construct is less than 0.7, Agrawal and Jain (2019) suggested removing that indicator from the analysis.

Table 2: Reliability

	Cronbach's Alpha	**rho_A**	**CR**	**(AVE)**
GPOL	**0.950**	**0.951**	**0.960**	**0.799**
SIZE	**0.915**	**0.918**	**0.946**	**0.855**
WM	**0.957**	**0.960**	**0.963**	**0.723**

Discriminant validity tests whether measures and constructs that are supposed to be theoretically unrelated are, in fact, unrelated. Discriminant validity is revealed "when each measurement item correlates weakly with all other constructs except for the one with which it is theoretically associated" (Moon et al., 2018). In terms of statistics, discriminant validity is achieved when the loadings are higher than cross loadings.

Table 3: Validity

	GPOL	SIZE	WM
GPOL	0.894		
SIZE	0.878	0.824	
WM	0.720	0.754	0.851

The next stage is the assessment of the structural model after ascertaining the measurement model in the present study. The procedure for the bootstrapping through a number of 5000 bootstrap samples and 273 sample size to assess the significance of the path coefficients was applied (Hair et al., 2017; Hair et al., 2014). T-value: a statistics program used to identify the significance of the relationship between two factors. A t-value above 1.96, 2.58 and 3.29 indicates the significance of the relationship at alpha protection levels of 0.05, 0.01 and 0.001 respectively.

Figurer 2. Structural Model

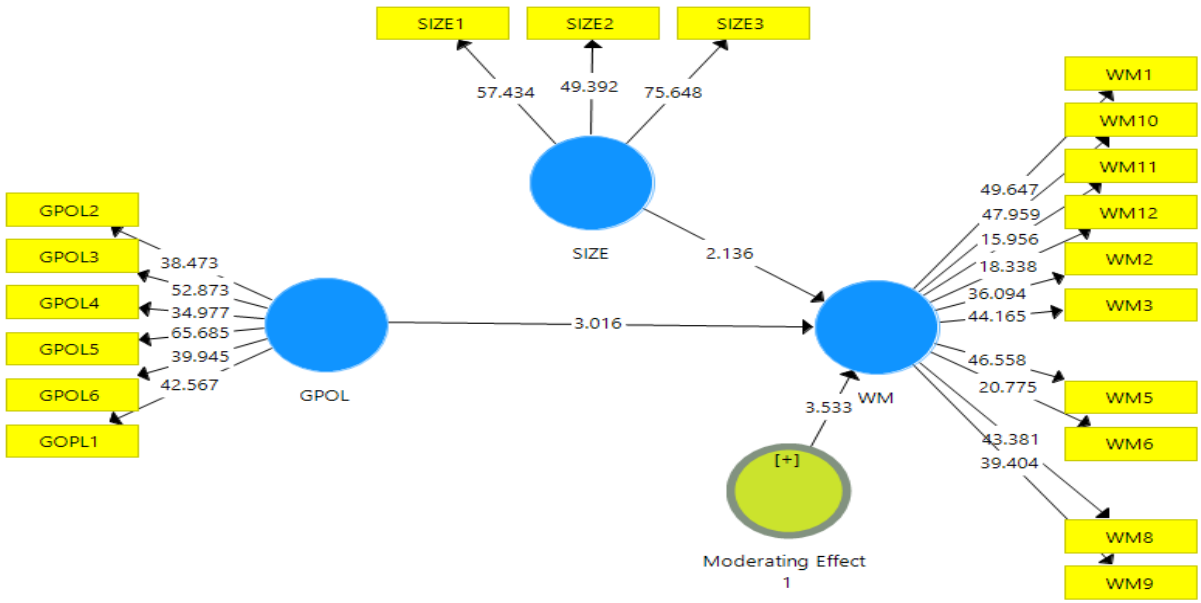


Table 4: Direct and Moderating effect

	(O)	(M)	(STDEV)	T Statistics	P Values
GPOL -> WM	0.456	0.458	0.151	3.016	**0.001**
Moderating Effect 1 -> WM	0.276	0.280	0.078	3.533	**0.000**
SIZE -> WM	0.302	0.305	0.141	2.136	**0.016**

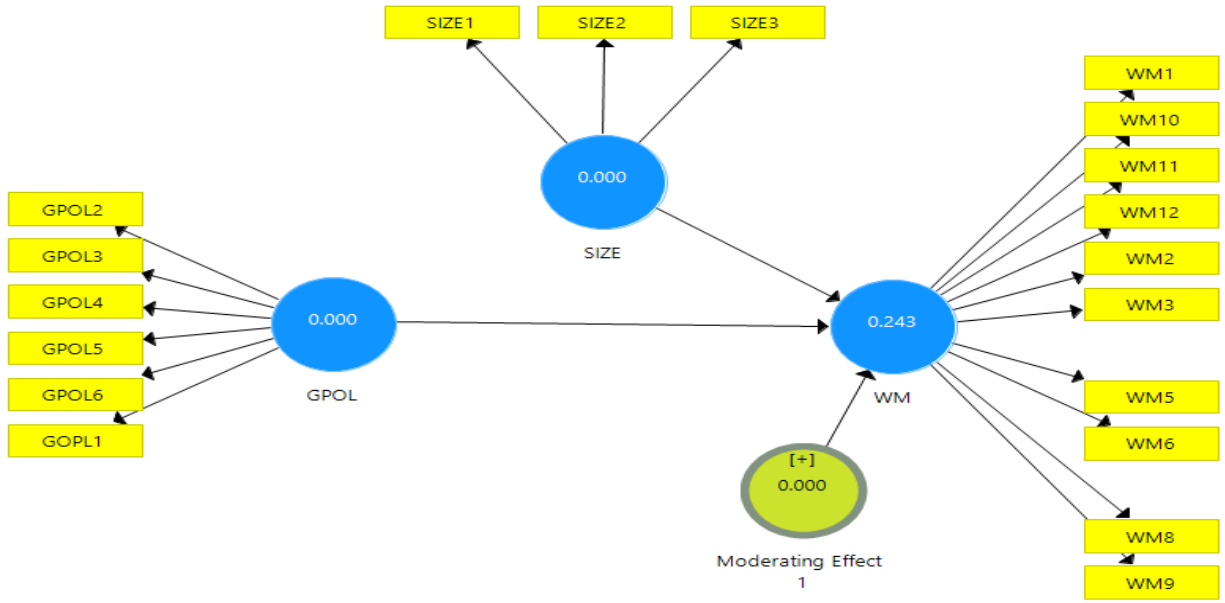
This research examines R2 and path coefficients, together with internal consistency, convergent validity and discriminant validity to indicate how well the model fits (the criteria for examining internal consistency (reliability), convergent validity and discriminant validity have been previously discussed). In addition, there are some debates in the literature about the absence of a formal global fit index in PLS (as is the case with $\chi 2$ and related indexes in covariance-based SEM).

Table 5: R-square

	R Square
WM	0.312

A cross-validated redundancy measure (Q^2) was used in measuring the predictive relevance of the research model (Hair et al., 2014; Ringle, Wende, & Becker, 2015). According to these authors, the benchmark for measuring how fit a model predicts the cases of misplaced data is referred to as Q^2.

Figure 3. Blindfolding



The research model with Q2 statistic (s) greater than zero is considered to have predictive relevance (Henseler, Ringle, & Sarstedt, 2015).

Table 6: Q-square

	SSO	SSE	Q^2 (=1-SSE/SSO)
GPOL	1,302.000	1,302.000	
Moderating Effect 1	217.000	217.000	
SIZE	651.000	651.000	
WM	2,170.000	1,643.178	0.243

Conclusion

This study finds that government policy has significant relationships with construction waste management, CWM. In answering the third research question, one research hypothesis was formulated and tested using PLS path modelling (i.e., H3). It will be recalled that the hypothesis stated government policy (GP) to be significantly related to construction waste management (CWM). The finding provides support for the hypothesis. In this study, it is found that the implementation of waste reduction policy and the control of land to prevent illegal waste dumping in Nigeria, leads to an effective performance of the organisation. The current findings provided empirical support for the hypothesis and are, thus, consistent with past studies (WDO, 2003). In 1989, a Waste Reduction Framework Plan was launched by the Hong Kong government (WRFP, 1989; Waste Disposal Ordinance, 2003). The aim of the plan was to improve the awareness of waste reduction among the stakeholders. The programmes were set out to minimise and avoid waste recovery promotion, waste reuse and recycling of materials, prolong the life of landfill in existence, increase the cost, treatment and disposal of waste transportation. Therefore, the suggestion on various waste reduction measures can be incorporated by different economic sectors into their business practice. It is expected that it will bring about changes in the old method of waste collection and transportation to the recent method of prevention and reuse of waste material. In this regard, the Libyan authorities have adopted WHO on proper waste segregation and disposal. This can only be achieved when health authorities hire hospital personnel who are skilled and knowledgeable in the adequate management of medical waste. Using stratified random sampling in selected hospitals located in the southern part of Libya from which data were collected, the current study finds that government policy and compliance with medical waste regulation is far away from WHO recommendations. This means that information regarding the safe management of medical waste and the application of standard operation procedures are seldom provided to both the newly employed and more established workforce members in the various hospitals. However, the number of knowledgeable employees was found to positively moderate the relationship between government policy and MWMP (Basheer,

Hameed, Rashid, & Nadim; Hameed, Nawaz, Basheer, & Waseem, 2019). The findings therefore suggest that, apart from the improvement of all behavioural practices at these hospitals, further research should focus on the management practices of the growing number of healthcare providers in Libya.

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