
ESTABLISHMENT OF PERFORMANCE INDICATORS FOR WATER SUPPLY SERVICES INDUSTRY IN MALAYSIA

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Abstract: Performance Indicators (PIs) are widely used as an assessment tool to evaluate the performance of water supply services. Although the Malaysian Water Association (MWA) had introduced a list of PIs, these indicators do not include aspects of water resources, and emphasize very little on personnel aspects. Many other international organizations, such as International Water Association (IWA), The World Bank Group (WBG), Office of Water Services, United Kingdom (OFWAT) and the Indonesian Water Supply Association (PERPAMSI), have introduced their very own list of indicators to assess the performance of their respective water supply services industry. However, these indicators as suggested by the various organizations are tailored for different objectives and priorities and thus may not be readily applicable to the Malaysian context. This paper describes and discusses on the establishment of a new set of performance indicators that covers all six major aspects of water supply services industry, namely, the management of water resources, personnel, physical assets, operation, quality of service and financial, for water supply services in Malaysia. The final list of PIs has further enhanced the existing PIs by covering all six key aspects in water supply services besides classifying the PIs into three levels of information grading, i.e., for public assessment, internal assessment and decision-making.

Keywords: *Assessment Tool; Performance Indicators (PIs); Water Supply Services*

Abstrak: Petunjuk Prestasi (PIs) merupakan teknik penilaian yang digunakan secara meluas dalam perkhidmatan bekalan air. Set PI yang diperkenalkan oleh Persatuan Air Malaysia (MWA) tidak merangkumi aspek sumber air dan tidak menitikberatkan aspek sumber manusia. PIs yang dicadangkan oleh organisasi antarabangsa seperti International Water Association (IWA), The World Bank Group (WBG), Office of Water Services, United Kingdom (OFWAT) dan Persatuan Perusahaan Air Minum di Seluruh Indonesia (PERPAMSI) lebih menjurus kepada keperluan masing-masing dan memerlukan pengubahsuaian sebelum digunakan di Malaysia. Kertas kerja ini membincang pembentukan PIs baru yang merangkumi enam aspek utama dalam industri bekalan air di Malaysia, iaitu sumber air, sumber manusia, aset, operasi, kualiti perkhidmatan dan kewangan. Set PIs yang dicadangkan telah melengkapkan lagi PIs semasa dengan merangkumi enam aspek utama dalam industri bekalan air di samping menkategorikan PIs kepada tiga kumpulan, iaitu Petunjuk penilaian orang awam, Petunjuk penilaian dalaman syarikat yang menawarkan perkhidmatan bekalan air serta Petunjuk penilaian keputusan organisasi.

Katakunci: *Teknik penilaian; Petunjuk Prestasi (PIs); Perkhidmatan Bekalan Air*

1.0 Introduction

Water supply services in Malaysia is managed and operated by both state authority and concession companies following the privatization exercise in year 1987 (Lee, 2004). Some states have adopted a full privatization mode and/or corporatized their water supply services whilst some states only privatized certain aspects of water supply services, such as operations and maintenance of water treatment plants through concession agreements. In addition, the water supply services in a particular state might be operated and maintained by more than one private organizations. Having the services managed by different authorities and companies, it is difficult to monitor, compare and evaluate the performance of these organizations and the quality of services provided to consumers.

The water rates differ from state to state and are controlled by the state government. Raja-Zainal-Abidin (2005) concluded that the corporatization and privatization exercises do not turn out to be a successful solution to a better service quality due to capital shortage and problems in cost recovery. Moreover, the water supply services in most of the states were running at a loss and the average non-revenue water (NRW) was high, at approximately 40%.

Institutional framework also plays an important role in monitoring water supply services industry. Water supply services in Malaysia were previously under the responsibilities of a number of departments under four different Ministries, namely Ministry of Science, Technology and Environment, Ministry of Health, Ministry of Works and Ministry of Agriculture (MWA, 2003). After the cabinet reshuffle in March 2004, water management is now placed under the responsibilities of two main ministries, namely the Ministry of Natural Resources and Environment, and the Ministry of Energy, Water and Communication. The former is responsible for the management of water resources, while the latter is responsible for bulk water treatment, distribution of safe drinking water and the treatment of municipal wastewater (Prime Minister Office, 2004). The centralized water supply management system introduced after the cabinet reshuffle had brought a better coordination amongst the governing bodies. However, the water supply services as a whole still lacks an effective assessment tool to evaluate the performance of the water supply service providers.

In addition, the constitutional amendment in January 2005 had empowered the Federal Government to take over the responsibility for water supply services in Peninsular Malaysia. However, the responsibility of water resources management still resides with the State Government (MWA, 2005). These changes had thus shifted the management of water supply services towards a more centralized mode in terms of its regulatory and legislative aspects.

The absence of an independent regulatory body makes it difficult to assess the performance of the water supply service providers in promoting a more transparent system. The recently gazetted National Water Services Commission (SPAN) Act seeks to establish an independent regulatory body to assess the performance of service providers. A list of performance indicators that is effective and practical is now needed

as a tool to assess and monitor the performance of the water supply service providers (MWA, 2005).

One of the tools introduced by the Malaysian Water Association (MWA) in 1994 is the use of Performance Indicators (PIs) (MWA, 2004). However, the introduction of these PIs is not backed with any legislative governance. In addition, these PIs do not account for both water resources and personnel indicators. PIs for water resources are important to promote the sustainability of the water supply whilst PIs for personnel are vital in improving the output efficiency by job functions. Thus, the existing PIs require further improvement in meeting consumers' expectations.

PIs have been widely used as an assessment tool on water supply services (Alegre et al., 2000). Many organizations including International Water Association (IWA), The World Bank Group (WBG), Office of Water Services United Kingdom (OFWAT) and Indonesian Water Supply Association (PERPAMSI) have developed their very own list of PIs to suit their specific purposes related to water supply services. PIs suggested by these organizations are tailored for different objectives and priorities and thus may not be readily applicable to the Malaysian context.

IWA had suggested a list of 138 PIs. These PIs serve as basis from which water supply services worldwide can adapt local context for monitoring and benchmarking purposes (Alegre et al., 2002). The IWA-PIs emphasized on a complete system, operated by a single service provider rather than a fragmented system that involves different parties in operating the water intake to bulk production of clean water and distribution, as currently practiced in Malaysia. Thus, the PIs suggested by IWA in general cannot be readily used without adaptation for the Malaysian context or any other country for that matter.

The WBG has introduced a list of PIs which serve as the platform to formulate and supervise projects financed by the WBG. Indicators used by the WBG are more financial oriented and are used to assess the indicators from financial perspectives (WBG, 1996). These PIs promote competitiveness of the service providers in getting financial assistance as well as embarking into the international market.

OFWAT is a non-ministerial government department that acts as the economic regulator for water and sewerage services in England and Wales. OFWAT is entrusted with the responsibility to review the water price set by the water companies every five years (OFWAT, 2004). PIs system suggested by OFWAT is recognized as a successful model in yielding positive competition amongst the privatized water services operators. Thus, it is noteworthy to consider the PIs implemented by OFWAT in establishing a new list of indicators.

The PIs introduced by PERPAMSI aimed at promoting continuous improvements for the water utilities in terms of management and operation in line with the benchmarking exercise initiated by WBG (PERPAMSI, 2003). Indonesia is similar to Malaysia in terms of its water supply services. The water supply services in both countries are predominantly owned and operated by the government and have a large water supply network throughout the country. It would be reasonable and logical to refer to the PIs suggested by PERPAMSI in developing a PIs system for Malaysia. The objective of this study is to establish a new set of PIs for Malaysia that reflects

importance and practicality. The new set of PIs will cover the six major aspects of the water supply services industry, namely Water Resources PIs, Personnel PIs, Physical PIs, Operational PIs, Quality of Service PIs and Financial PIs. Water Resources PIs shall promote sustainability of water resources while Personnel PIs emphasize on efficiency by job function. The conditions of physical assets are governed by Physical PIs while Operational PIs concentrate on the operational aspects of the services. Quality of Service PIs are important to protect the consumers' interests and Financial PIs are used to safeguard the financial status of the service providers.

2.0 Research Design

The study was carried out using the Delphi Method which is a structured process of collecting and refining knowledge from a group of experts through survey instruments. The survey instruments used in this study were questionnaires and interviews. Cross impact analysis was adopted to measure the correlation between variables in analyzing the recommended PIs across several factors. Factor analysis was also used through weighting assignment in data analysis.

Table 1: List of Water Supply Service Providers Sampled

Item	Organization	Ownership
1	Kedah Public Works Department	Government
2	Labuan Water Supply Department	Government
3	Perlis Public Works Department	Government
4	Sarawak Public Works Department	Government
5	Kuching Water Board	Government
6	Sabah Water Department	Government
7	Melaka Water Corporation	Government
8	Negeri Sembilan Water Supply Department	Government
9	Pahang Water Supply Department	Government
10	Perak Water Board	Government
11	Perbadanan Bekalan Air Pulau Pinang Sdn Bhd	Government
12	LAKU Management Sdn Bhd	Private
13	SAJ Holdings Sdn Bhd.	Private
14	Sibu Water Board	Private
15	Syarikat Bekalan Air Selangor Sdn. Bhd. (SYABAS)	Private
16	Air Kelantan Sdn Bhd.	Private
17	Syarikat Air Terengganu (SATU)	Private

As the study involved a large geographical coverage, the data collection was carried out through self-administered mail survey. This could also help minimize the data collection cost and reduce interviewer bias (Fowler, 2001). All 17 water supply service providers across the nation were sampled. The full listing of respondents selected for this study are shown in Table 1.

The establishment of PIs was carried out in two stages. A list of pre-established PIs was first developed by combining PIs established by selected organizations which was later refined through a two-stage survey. The primary arguments for PIs establishment were based on the importance against practicality in implementation, confidentiality of collected data against information grading and the cost of implementation. The research design for establishing the PIs is summarized in Figure 1.

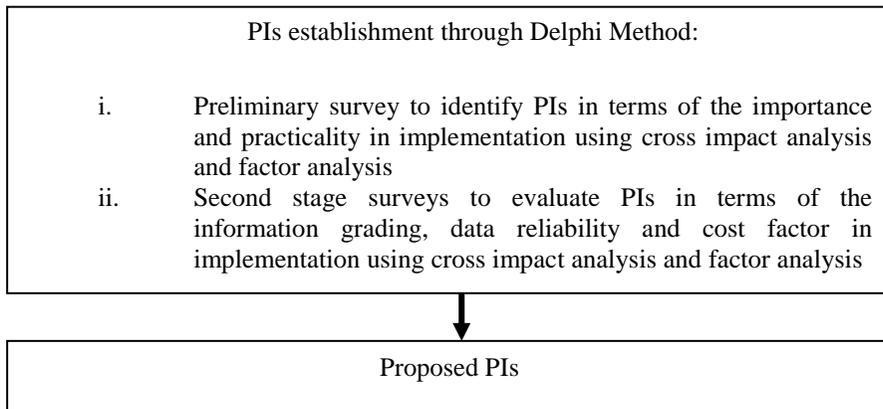


Figure 1: Procedure Adopted to Establish PIs for Water Supply Services Industry in Malaysia

3.0 Preliminary Survey

PIs introduced by MWA were reviewed and analyzed in order to identify its priority area and the coverage spectrum. These PIs were then compared with PIs suggested by IWA, WBG, PERPAMSI and OFWAT. The preliminary set of PIs was established by combining the PIs suggested by these organizations into six major aspects of water supply services industry. The full list of the PIs are available in Ong (2006).

Table 2: Ranking System Based on Level of Importance and Practicality

		Practicality				
		1	2	3	4	5
Level of Importance	1	D	D	C	C	C
	2	D	D	C	C	C
	3	B	B	A ₄	A ₃	A ₃
	4	B	B	A ₂	A ₁	A ₁
	5	B	B	A ₂	A ₁	A ₁

A preliminary survey was conducted to consolidate the numerous preliminary PIs. Respondents of the preliminary survey were selected amongst water supply service providers, which are the key players in the national water supply services. Respondents

were selected on the basis of their proven track records in their management performance and service quality as endorsed by the Federal Water Supply Department. A total of ten organizations were selected. During the preliminary survey, PIs were analyzed based on two arguments, i.e. ranking based on the level of importance versus its practicality in implementation and the willingness of the service providers in implementing the indicators. Table 2 shows the ranking system used in the preliminary survey. A scoring system as shown in Table 3 was used to select PIs that are important and practical.

Table 3: Scoring System Based on Level of Importance and Practicality

Ranking	Description	Score
A	Important & Practical :	
A1	very important & very practical	5
A2	very important & practical	4
A3	important & very practical	4
A4	important & practical	3
B	Important but Not Practical	2
C	Not Important but Practical	1
D	Not Important & Not Practical	0

Indicators were further analyzed by giving a score of two if the organizations are willing or plan to implement the indicators and a score of one if the indicators are not to be implemented in spite of their ranking. In the first stage of analysis, the cut-off score is set at five, which includes indicators that in average ranked higher than A4 as indicated by the shaded areas in Table 2 and those which respondents were willing to implement. PIs short-listed at this stage were deemed to be important, practical and likely to be implemented by the respondents. This set of PIs was used in the second stage survey.

4.0 Second Stage Survey

Table 4: Information Grading of Performance Indicators

Grading	Description of Information Grading
Grade 1	General information that represent the overall efficiency and effectiveness of the service providers and subject to public assessment
Grade 2	Information which provide better insight than Grade 1, serve as internal assessment within the organization
Grade 3	Specific information use at higher management level in decision-making

All 17 water supply service providers nationwide were included in the second stage survey. These organizations represent different states in Malaysia with the exception of Sarawak, which has four different water supply service providers. The second stage survey focused on the suitability of the indicators in terms of its information grading (Table 4).

Table 5: Reliability of Data

Confidence Factor	Description
Audited data	Data collected are of reliable source and audited
Reliable data	Data collected are of reliable source but not being audited
Uncertain data	Data collected are of unreliable source
Estimation	No data collection; estimation is made based on the best knowledge of the organization

Indicators were also rated based on the confidence factor of the data source as described in Table 5. Factor analysis was used to assign appropriate weights to the PIs based on the cross impact analysis between the information grading and data reliability. Details of the weighting assignment are shown in Table 6. Subsequent to that, the PIs were further evaluated based on the cost factor. Table 7 shows the weighting assignment for cost analysis. PIs scoring three in the cross impact analysis and have no significant and/or additional cost impact in the implementation were selected to be in the final list of the recommended PIs.

Table 6: PIs Weighting Based on the Information Grading and Data Reliability

Information/ Grading	Data Reliability			
	Audited Data	Reliable Data	Uncertain Data	Estimation
Grade 1	3	3	2	2
Grade 2	3	3	2	2
Grade 3	3	3	2	1

Table 7: Weights of PIs Based on Its Cost Implication

Additional/significant cost implication in implementing the indicators	Weighting
Yes	0
No	1

5.0 Results and Discussion

The preliminary survey received 40% responses. Results indicate that the private organizations in general have a greater concern over their performance and have greater exposure to performance assessment. On the other hand, the government organizations are quite reluctant to express their opinions and less sensitive to the performance assessment. Final conclusion on the position of government water supply service providers could not be made since only two government water supply service providers were involved in this preliminary survey.

Table 8: Average Score of 112 Screened Pis

Score	Key Areas						Total
	WR	PE	PH	OP	SE	FI	
7	0	3	1	8	11	8	31
6	4	3	6	11	9	20	53
5	2	7	2	6	5	6	28
TOTAL	6	13	9	25	25	34	112
WR – Water Resources		PE – Personnel		PH – Physical			
OP – Operational		SE – Quality of Service		FI - Financial			

Results of the preliminary survey showed that 69% of the PIs had scored higher than five which are categorized as important, practical and more likely to be implemented by the respondents. This strongly indicates that these pre-established PIs are suitable as the performance measure for water supply services industry in Malaysia. PIs were then weighted based on the organizations’ roles in the water supply services in calculating the average score. As a result, PIs were consolidated to a total number of 112 and categorized into the six major aspects as shown in Table 8.

The second stage survey yielded 53% of responses from both government and private water service providers nationwide. After further analysis and screening, the proposed new set of PIs comprised 86 indicators covering the six major aspects of the water supply services. It was observed that 66% of the PIs were grouped under Grade 2, followed by Grades 1 and 3, both at 17% (Figure 2). This distribution showed that 56 of the PIs were classified as Grade 2 information which are suitable for the benchmarking exercise. The numbers of PIs for both Grade1 and Grade 3 also adequately allow these PIs to be practically used for evaluation purposes.

The recommended set of PIs was also analyzed based on the coverage aspects. Table 9 presents the composition of PIs based on the information grading and the six major aspects. Results showed that the composition of PIs in Grade 1 consists of a high percentage of Quality of Service PIs. The absence of Water Resources PIs and Physical PIs in Grade 1 indicates that the majority of the respondents agreed that water resources and physical conditions of the water supply infrastructure are not of the public concern.

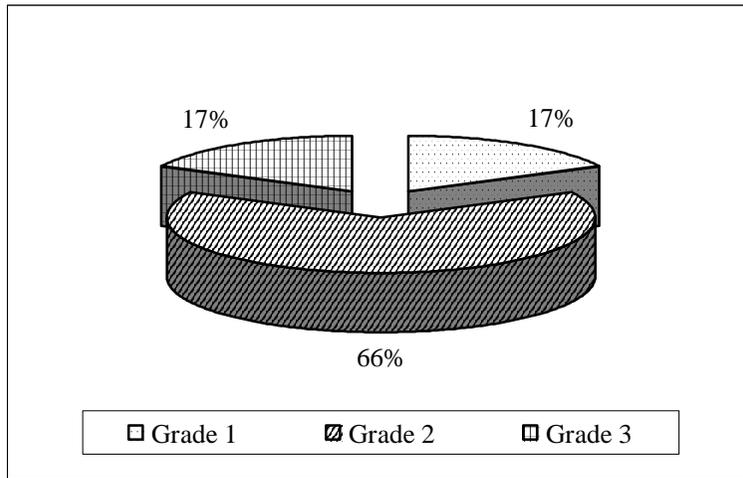


Figure 2: PIs Distribution Based on Information Grading

Table 9: Composition of PIs Based on Information Grading and the Six Major Aspects

Grade	WR	PE	PH	OP	SE	FI	TOTAL
1	0	1	0	1	12	1	15
2	3	11	4	10	8	20	56
3	1	0	1	0	2	11	15

WR – Water Resources PE – Personnel PH – Physical
 OP – Operational SE – Quality of Service FI - Financial

However, it will be beneficial to publish some of these indicators for public assessment. Water Resources PIs can better assist the consumers to understand water resources availability. Thus, promoting the awareness of water saving and river pollution prevention among the public. In addition, consumers may be more receptive to the needs for facilities upgrading and rehabilitation when the physical conditions are made known to them. The aging and the rate of deterioration of the facilities are examples of physical conditions that can be included in Grade 1.

PIs distribution in Grade 2 showed a rather balanced weighting in covering all the six major aspects. These PIs predominantly serve as internal assessment tool for the organization to identify the strengths and weaknesses in their management system.

PIs coverage in Grade 3 showed a relatively high percentage in financial indicators. Results indicate that most of the decision-making information is financial orientated to ensure the full cost recovery of the services.

6.0 Conclusion

PIs suggested by various organizations which were tailored for specific monitoring purposes were reviewed. The combination of these PIs resulted in a comprehensive set of PIs covering six major aspects in water supply services, namely Water Resources PIs, Personnel PIs, Physical PIs, Operational PIs, Quality of Service PIs and Financial PIs. The preliminary survey had resulted in a reduced set of 112 PIs. The reduction was based on the importance and practicality of the PIs. During the second stage survey, the reduced set of PIs was further assessed in terms of their reliability and confidentiality of data collected in establishing the proposed PIs.

The proposed 86 PIs cover all six major aspects in the water supply services industry. Of this, 37% are associated with Financial aspect and 25% are related to Quality of Services. The PIs for Personnel, Operational, Physical and Water Resources comprise 14%, 13%, 6% and 5% of the total PI, respectively. A management aspect with higher percentage is more important compared to those with a lower percentage. In terms of information grading, 17% of the Proposed PIs are classified as Level 1-PIs followed by 66% as Level 2-PIs and 17% as Level 3-PIs. Level 1-PIs can be made available to the public, while Level 2 and Level 3-PIs are used for making management and investment decisions, respectively by water supply service providers.

The final list of PIs covers all six major aspects in the water supply services. These PIs are deemed important, practical and can be implemented with minimum cost in the Malaysian context. In addition, the recommended PIs are categorized into three information grading to suit the purpose of evaluation. The implementation of these PIs should be monitored and be periodically updated to ensure the performance of the water supply service is always at a satisfactory level.

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