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Cost Effectiveness of Maintaining an Integrated Management System for A Philippine Waterworks

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Abstract

The paper bids to show the cost effectiveness of maintaining IMS for a water utility in the Philippines. The researcher used a single case study and descriptive approach to fulfill the objectives. Five (5) years of data was extracted from the water utility's archives. The company has implemented an Integrated Management System (IMS) starting 2005. Since then, it has undergone several surveillance audits, and by 2018, has transitioned to the 2015 versions of the standards. Findings show that IMS costs grew by 383%, starting from Php121k spent in 2013, to Php 1.3M by 2018. The total expense incurred was Php 3.81M. For benefits, value drivers with operational metrices were identified and were then converted into monetary units. The total benefits amounted to Php 112M. Largest came from water sales worth Php59M followed by value-added services amounting to Php46M. Additional benefits came from service expansion and efficiency. The study concluded that IMS was indeed cost-effective but there are certain variables that can question whether these benefits are attributable to IMS. The study recommends the ff: First, is to take on a wider base to know if there will be variances for the expenses and benefits gained. Second, is for researchers to supplement this paper by including operational indicators besides those listed here and Last, is to include other ways of translating perceived benefits to actual monetary value.

Keywords: Cost Benefit, ISO, IMS, NRW, Savings, Water Utility

1.0 Introduction

The concept of Integrated Management System (IMS) revolve in the proper alignment of multiple management systems and standards into a single "Integrated System"[1]. It has been said that implementing an IMS influences a firm's performance positively. Companies that implement Quality Management (QM), focus on improving the level of satisfaction of clients by meeting their needs and expectations and improving the efficiency of processes. Continuous improvement of processes and product quality leads to increased revenues and reduced costs [2,3]. Similar is the case for the other two most popular family of standards; Environmental Management (EM) and Health and Safety Management (OHSAS). Both give a positive impact as pollution prevention and provision of a safe working environment. Each give a competitive advantage thru savings in input and energy consumption and minimizing risks of downtimes and production delays[4].

In the Philippines, there is a major heed on the implementation of Executive Order No.

605. Government institutions including major water utilities are now pursuing ISO accreditation in the hopes of improving their service and satisfying more customers [5,6,7,8,9,10]. However, setting up and maintaining an IMS is not without cost. Unless a company have a grant, nor obtain significant profits from such system, it is unlikely that they will commit to acquiring even a single certificate. Couple this with the perceived intangibles e.g. enhanced company image, customer satisfaction etc. We will have the water utilities (who are natural monopolies) run for the hills. It is in this context, that the paper attempt to bring into fore the costs related to keeping an IMS and quantifying its benefits.

This single case study was conducted in a local waterworks. The name of the company is kept anonymous in conformity with the requirements of research ethics and is referred to as either "waterworks", "firm" or the "company". The company is a private concessionaire and a subsidiary of known conglomerate. The waterworks is an exclusive provider of water and wastewater services for industrial, commercial establishments and residential customers within its concession area. The company also supply its surplus to other nearby water utilities. The company started its IMS journey in 2005, wherein it was able to secure triple ISO certification covering aspects on ISO 9001:2000 for Quality Management System (QMS); ISO 14001:2004 for Environmental Management System (EMS); and OHSAS 18001:2007 for Occupational Safety and Health Management System (OHSAS). By 2012, the company has gone through a second surveillance audit. The successful audit has retained the waterworks' certifications for QMS with and upgraded version 2008, EMS and OHSAS. The third recertification was done in 2015 and it also marked its 10th year as an ISO certified company. Recent certification was done in June 2018. The firm took it up a notch by securing the latest version of the standards, ISO9001:2015, ISO14001:2015 and a recertification of BS OHSAS 18001:2007 [11].

The focus of this research is to determine to the highest extent possible the cost effectiveness of maintaining a triple ISO certification using existing data over a period of five (5) years from 2013 to 2018. The specific objectives of this paper are to:

1. To list down the cost of maintaining an IMS for a waterworks company
2. To list down value drivers and operational indicators that gives the company its competitive edge
3. To quantify benefits of IMS by translating the changes measured by the indicators in no.3 into financial terms and
4. To establish the IMS cost effectiveness whether the benefits outweigh the costs for the local waterworks

2.0 Methodology

In this single case descriptive research, data were collected through the waterworks' archive records and documents. Data associated to the cost of implementing and maintaining an IMS were extracted from the waterworks' SAP™ application. Information gathered was matched alongside the data extracted from the firm's operational records. These come in the form of cost of managing IMS, consultancy services, audit costs, cost of transition to newer ISO versions, and costs for other related activities. Audit finding reports were also compiled and tabulated as well. This is to determine the costs for corrective actions of Non-Compliances (NC's) which can trigger a certificate revocation if left unchecked. These were taken from the reports of both internal and external audits.

As for the benefits, identifying the impact of IMS is carried out through interview and tabletop discussions with a number of experts from internal and 3rd party auditors, and a few

members of the company's Business Operations Department. The identified impacts were assessed by choosing the appropriate operational indicators and measuring the changes shown by these indicators. Quantification of the impacts is performed by translating the changes measured by the indicators into financial terms.

In addition to those data, details about the company's revenue and profit before tax were collected for the years 2013 to 2018. All these data were analyzed accordingly using trend analysis.

The study made use of a simple input-process-output model as show in Figure 1.

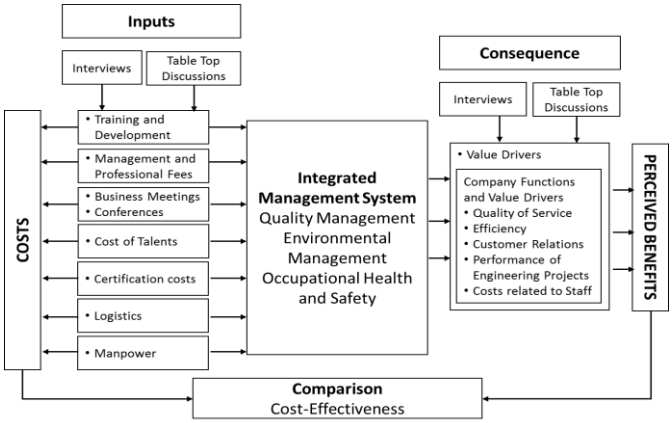

Figure 1: *Research Framework*

The study will serve as a guide for executives and senior managers alike who are venturing to get their companies certified. With this, decision makers can have a peak on a real-life situation and help them choose whether these standards are worth implementing/maintaining or not. In addition, the work can be used in teaching to explain better the costs and benefits involved in IMS. This study will also help bridge the literature gap and aid fellow researchers looking into the cost-effectiveness of standards as there are only handful of published papers that convert ISO benefits in monetary terms [2,12,13,14].

It is to be noted that IMS standards do not refer to performance metrics that measure the quality of a firm's products and services or a firm's environmental results; rather, these are standards setting out the need to systematize and formalize corporate processes within a set of procedures, and to document such implementation. Such have become a de facto for quantifying IMS benefits for many firms [2,15]. For this paper, such perceived benefits and performance gains will be credited to the IMS.

Another delimination would be the information gathered from the firm itself. The researcher is limited to the information received in terms of visual and auditory. Despite the comprehensiveness of data, some i.e. salaries of talents involved, the possible regulatory fines, were assumed. It is also possible that some expenses were not imparted here like the man hours spent for IMS. Likewise, other expenses may have been improperly tagged and debited from other section's budget. The same can be said for the perceived benefits. The IMS may have indirectly affected other operational indicators aside from those listed in this paper.

3.0 Results and Discussion

Data collected from the firm's archives relating to IMS were analyzed in order to generate the total cost of implementing and maintaining a multiple management system. Each

section's title reflects the name as it was tagged in SAP™ by the firm's accounting department. Details are discussed in below:

Table 1. *Total expenses incurred in Php millions*

	2013	2014	2015	2016	2017	2018
Business Meetings & Conferences	0.00	0.01	-	0.01	-	0.02
Corporate Programs- Employee Activities	-	-	-	-	0.01	-
Mgt. & Prof Fees	0.12	-	0.08	0.19	0.15	0.25
Miscellaneous Overhead	-	-	-	-	0.01	0.01
Semi-expendable Items	-	-	0.01	-	-	-
Training & Development	0.00	0.01	0.17	0.05	0.08	0.02
Transportation & Travel	-	-	-	0.02	-	0.00
Manpower	-	-	-	0.59	0.99	1.04
Audit Findings	-	-	-	-	-	-
TOTAL	0.12	0.01	0.26	0.86	1.24	1.33

Business Meetings and Conferences represent the annual costs incurred costs for the management review and the internal audit's opening and closing meetings. Corporate Programs- Employee Activities include meals, office supplies and other expenses consumed during Auditor and IMS awareness workshops while Mgt. & Prof Fees cover the expenses incurred for the professional fees and consultancy services. Miscellaneous Overhead comprise of hotel accommodation services of the consultants during the multi-day seminar workshops conducted. Training and Development on the other hand, is comprised of training fees for; Risk Management, Business Continuity and IMS Refresher course. It also includes the toll fees, meals of the 3rd party trainers, and meals for the trainees. Transportation & Travel represent the car rental services provided for the 3rd party auditors. Manpower include new talents hired for the role of Business Development Manager (BDM) and for the vacant company nurse. The former focuses on adding revenue for the firm thru new business initiatives. He scours the market for possible business opportunities and he also commercialized the company's value-added services. Some notable projects for the value adding services are; after-the-meter services such as installation of new water and new wastewater services connections, laboratory testing, water delivery, and other wastewater services including pipe flushing and siphoning. Table shows the annual estimated salaries given to the new talents. Each role's salary grade was used in lieu of their actual salaries. Moreover, the Philippines' inflation rate was incorporated in their salaries for the years 2017 and 2018.

Audit findings comprise of costs in resolving Observations and NC's found during the audits. Overall, the company got a total of 42 minor NC's from the various audits conducted starting 2013 to 2018. Among the 42 NC's, 2 necessitates additional operating expense to be resolved while the rest only require either documentation, process revision or personnel training. The first NC was given by the internal auditors in 2013 for a dog bite incident. The company was not able to present any form of documentation that guard dogs were vaccinated against rabies. The company is therefore not in accordance with the Section 5 of RA 9482 "Anti-Rabies Act of 2007" wherein all pet owners are required to have their dogs vaccinated and maintain a registration card[16]. In response, the management decided to avail of the free dog vaccination of the local government unit to dodge the additional expense to the company.

The 2nd NC finding was in 2017 which is associated to the growing number of talents of the company. According to the requirements of Rule 1963.02#1-b, for small scale industries where number of workers lie within the 51-99 range, the employer shall provide the services of a part-time occupational health nurse[17]. A HR-specialist with a concurrent function as company nurse was then hired following this audit. Since the new talent's main role is HR it is debatable whether the salary will be part of IMS [18].

Total expenses incurred within the study period is Php7,611,077.34. Bulk of the expense (68.73%) was due to the additional talents. Second is the Management & Professional Fees rendered for the 3rd party auditors represent 20.46% of the total expense. The next highest is the Training and Development (8.54%) for internal auditors.

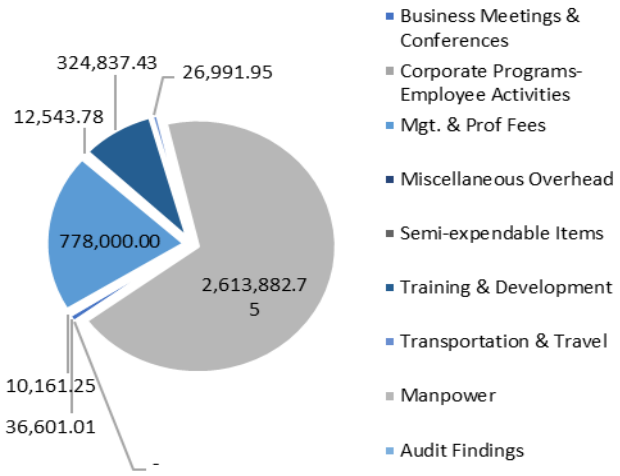

Figure 2. *Total Expenses Incurred for IMS 2013-2018*

Determining the benefits of IMS for a waterworks company presents certain challenges due to the fact that it is not easy to quantify such management programs with somewhat abstract benefits. With the guidance of the seasoned internal and 3rd party auditors, operational indicators with available data were listed. Quantification of benefits is performed by translating the changes measured by the indicators into financial terms. Table 3 show the operational indicators that will be used to measure the economic benefits of maintaining the IMS.

Table 2. *Operational indicators to measure impact of IMS*

Value Drivers	Related Activities	Standards Used	Operational Indicators
Quality of Service	Water Production	ISO9001	Billed Volume
	Non-Revenue Water	ISO9001 ISO14001	% NRW<5%
	Water Quality	ISO9001 ISO14001	% Rating of compliance vs PNSDW
	Wastewater Quality	ISO9001 ISO14001	% Rating of compliance vs DAO 35
Efficiency	Energy Efficiency Water	ISO9001	Power use per cu.m of water produced
	Energy Efficiency Wastewater	ISO14001	Power use per cum of wastewater treated
	Value-added services	ISO9001 ISO14001	Php revenue generated
Customer relations management	Collection	ISO9001	% Collection efficiency
	No. of Clients	ISO9001	Number of clients
	Customer Satisfaction	ISO9001	% Customer satisfaction
	Customer Complaints	ISO9001	Resolved complaints within time limits
Performance of Engineering Projects (expansion of network)	Water Coverage	ISO9001	Number of connections
	Wastewater Coverage	ISO9001	Number of connections
Costs related to staff	Human Resource	ISO9001 OSHAS	Number of talents
	Safety Audits	OSHAS	Number of Safe Man hours

The cumulative billed volume (BV) for the year 2018 is 14.13 million cubic meter

(mcm). This is short by 2.81% when tallied against 2017's BV. The decline can be pointed to the cutback in the bulk water supply mainly because of the water shortage that happened during the summer of 2018. Overall, the company posted an average annual growth of 6.8%. Around 8% of the total increase was due to a rise in consumption of existing accounts[19].

Table 3. *Water Production and Sales*

	2013	2014	2015	2016	2017	2018
BV	9.82	11.54	12.83	13.40	14.53	14.13
Inc		1.72	1.28	0.57	1.13	(0.4)
% Inc	10.0%	17.5%	11.1%	4.47%	8.42%	-2.7%

Yearly non-revenue water for 2013 to 2018 varied from 4.90% of production in 2013, 4.40% in 2015, to 5.81% in 2018. Average during the 5-year stint was 4.98% of production. The company maintained its very low level of NRW which far exceeds that of the international standard of 20% and even of the concession agreement of 10%. The company's year-on-year OTP for NRW level is 5%[20].

Table 4. *Yearly NRW levels*

	2013	2014	2015	2016	2017	2018
NRW %	4.90%	5.20%	4.40%	4.14%	5.41%	5.81%

Optimization efforts within the company's operations have resulted in significant savings in operating expenses particularly in power. For water supply, it managed to attain a 0.7Kwh per cu.m of water produced for years 2014 to 2017 but this efficiency started to slip lower in 2017 because of high demand. For the wastewater operations, (aside for 2014) the company was able to maintain its power efficiency within its target[21].

Table 5. *Water and wastewater energy efficiency levels*

	2013	2014	2015	2016	2017	2018
			Water			
Target	0.70	0.70	0.70	0.70	0.70	0.70
Actual	0.72	0.70	0.68	0.67	0.71	0.73
			Wastewater			
Target	0.130	0.125	0.125	0.110	0.105	0.103
Actual	0.125	0.129	0.110	0.107	0.092	0.101

Despite the impressive savings in power, the company's wastewater treatment plant consistently removed the biochemical oxygen demand (BOD5) below the limits required by the DENR. The Philippine government has a strict "Polluter's Must Pay" policy[22,23]. In a sense, the lower the effluent BOD, the lower the payment will be for the discharge permit. DENR's effluent discharge limits require that no single measurement shall be above 50mg/L. BOD5 and the volume of wastewater being discharged are the primary parameters used in computing the annual discharge permit.

Table 6. *Annual WWTP BOD levels*

	2013	2014	2015	2016	2017	2018
Ave. BOD5 (mg/L)	22.91	29	14.73	15.44	8.38	14.73

Given the year-on-year percentage drop in billed volume, additional sources of revenue through VAS was a key strategy to maintain profitability, while also delivering the benefit of enhanced customer intimacy and focus. Headed by the new BDM, the company started

commercializing its water quality testing, and other after the meter pipelaying services. For the period 2016-2018, VAS generated total revenues of PHP 46M[24].

Table 7. *Generated revenue for value added services (VAS)*

	2013	2014	2015	2016	2017	2018
VAS	-	-	-	9,578,897	20,571,194	15,887,271

For 2016, the company diversified its payment methods and shifted to a "cashless business office" by partnering with 3rd party financial and payment facilities. Customers are now enjoying the various payment options available. Moreover, the business operations section created an official monitoring process for possible delinquent accounts. Following these standard procedures, notices are sent to delinquent accounts with clear warning of punitive measures for late payment. Both translated to an almost 100% collection efficiency from 2016 onwards. For the recent CSAT 3rd party survey, one driver of satisfaction of locators/customers includes the availability and convenience in paying their water bills.

Table 8. *Yearly collection efficiency (%)*

	2013	2014	2015	2016	2017	2018
Collection Efficiency	95.0%	98.0%	99.0%	100.1%	99.1%	100.0%

The company maintained an almost 100% service coverage for water supply. Service coverage for wastewater likewise improved from 90% in 2013 to 99.9% in 2017[25]. These connections directly affect that of the company's billed volume.

Table 9. *Water and wastewater service coverage*

	2013	2014	2015	2016	2017	2018
			Water Coverage			
No. of Connections	1,971	1,976	1,963	1,993	2,048	2,061
% Coverage	99.8%	99.9%	99.9%	99.9%	99.9%	99.9%
			Wastewater Coverage			
No. of Connections	1,768	1,794	1,780	1,876	1,912	1,933
% Coverage	90%	92.3%	94.8%	98.02%	99.69%	99.7%

The CSAT Survey serves as an indication on how satisfied our customers were with the company's services, and specifically what drives their satisfaction. There are two (2) types of survey being conducted; a) internally and b) thru a 3rd party service provider. Over the years, the internal CSAT Survey showed significant improvement, from 90% in 2013 to 100% in 2018. On the other hand, the 3rd party survey also shows promise, from 91% score in 2014 which up by 7 points 98% in 2017 [25].This means that the customers within the franchise area are satisfied with the company's – from water availability and reliability, to after-the-meter services, to billing and collection, to managing customer complaints, to payment facility availability – which all contributes in increasing customer loyalty and preference.

Table 10. *The company satisfaction ratings*

	2013	2014	2015	2016	2017	2018
Type of Survey	In house	3rd party	In house	In house	3rd party	In house
Rating	90%	91%	99%	99%	98%	100%

There was a total of 240 valid complaints for 2013. The following year, complaints went up by 13.67% and totaled 278. By 2015, the company managed to bring down the number of complaints to 240 – a 15.83% reduction as compared to 2014. As for the next consecutive years, the total number of customer complaints was lower from 203 (18.23% reduction) in 2016

to 202 in 2017 (0.5% reduction vs 2016). However, in 2018, customer complaints spiked by 54.81% increasing to a total of 447 complaints [25]. According to the company archives, the major spike for 2018 can be attributed to the increase in no water incidents, low pressure and water quality complaints. These were mostly caused by low level of tanks due to source breakdowns, water line bursts damaged by contractors and prolonged water interruption due to delays in interconnection works.

Table 11. *Annual no. of valid customer complaints*

	2013	2014	2015	2016	2017	2018
Complaints	240	278	240	203	202	447

On top of its OHSAS 18001 certification, the company was also able to receive awards of commendation for achieving 94,230.5 safe man hours without lost time accident in 2013 and a Perfect Safety Record for 2017. It is unfortunate though, that the number of safe man hours was reset to 0 in 2015. By end of 2018, the company has achieved a total of 397,954 safe man hours.

Table 12. *Cumulative safe man hours*

	2013	2014	2015	2016	2017	2018
Hrs	94,230	124,208	-	86,532	236,051	397,954

Operational indicators from **Table 2** were selected and used to calculate the economic benefits obtained by the company. Calculating the aggregate benefits of IMS could be extremely difficult especially for natural monopolies such as the water utilities. Computations can likewise be impeded because of confidentiality, absence of data and interference of many other variables.

The company's billed volume registered an average year-on-year growth of 8.13%. According to the Billing Manager, approx. 60% of this is due to increased consumption of existing commercial and industrial customers within the franchise area[26].
The use of IMS (primarily ISO9001) has contributed to this performance by:

a) Consistent implementation of OTPs lead to improved operations ensuring in 24-7 supply thru additional facilities and service expansion
b) customer satisfaction – thru enhanced customer relations management, opening up additional business opportunities

Because 60% represent the increased consumption of existing customers and attributable to standards, the impact of IMS can be calculated as follows:

$$XOF = \sum (Annual\ increase\ in\ BV\ \times\ Php\ Ave.Water\ Tariff) \times \%\ due\ to\ increased\ cons.$$

$$XOF = \sum Annual\ increase\ in\ BV\ \times \frac{Php23}{cum} \times 60\% \qquad (1)$$

The company managed to maintain its NRW levels at 4.98% within the study period. The figure is a bit lower than the company's IMS OTP target of 5%.

Therefore, the impact of the use of IMS can be calculated via the difference between the current NRW level and target level multiplied by the ave. water tariff:

$$XOF = (Target\ NRW - Ave.Actual\ NRW) \times \sum Water\ Production\ \times Php\ Ave.Water\ Tariff \qquad (2)$$

The company managed a consistent single digit BOD levels in its effluent. By comparing it with the DAO 35 standard level of 50, we can compute the IMS impact thru savings from the wastewater discharge fee.
Computation for XOF is as follows: Subtract the actual ave. discharged BOD vs the DAO standards and then multiplying it by DENR's formula in computing the discharge fee 1[27].

$$XOF = [(Std.BOD - Ave.Actual\ BOD) \times net\ waste\ load] \qquad (3)$$

Where:

$$Net\ waste\ load\ (L_n) = \left(C_f - C_a\right)\left(Q_f \times N_f\right) \times 0.001$$

Application of ISO14001 paved the stricter control of kWh/cu.m – OTPs undertaken since 2013 including monthly reports on energy consumption during IMS meetings have led to 1.54 % savings in energy costs.
The resulting impact within the study period is estimated as follows:

$$XOF = \sum\left(Electricity\ Bill\ if\ target\frac{kWhr}{cum}\ was\ used - Actual\ Electricity\ Bill\right) \qquad (4)$$

Reduction of power consumption due to several OTP's led to an average of 0.11 for the whole study period. This is lower than the average target of 0.116.
Due to this, the impact can be calculated similar to equation 4:

$$XOF = \sum\left(Electricity\ Bill\ if\ target\frac{kWhr}{cum}\ was\ used - Actual\ Electricity\ Bill\right)$$

Thru ISO 9001, the company drafted an official monitoring process for possible delinquent accounts. An account will be tagged under the company's delinquent watchlist if it failed to settle his bill within 30 days.

Notices are sent to delinquent accounts with clear warning of punitive measures for late payment, following standard procedures.

$$XOF = \sum(Paid\ delinquents) \qquad (5)$$

The 2015 version of ISO now requires the organization to seek out opportunities for proactive improvement. These new versions also highlight the "risk-based thinking" prompting the company to use SWOT analysis that opened up additional revenue streams [27].
By 2016, the company formally commercialized it's after the meter services and labelled them as VAS for added revenue. Projects under VAS include:

- Installation Services (NWSC, WWSC, and after-the-meter services)
- Laboratory Testing
- Water Delivery
- Other Services (Flushing Fee, Desludging, etc.)

$$XOF = \sum(Revenue\ from\ VAS) \qquad (6)$$

[1] $L_n = [(C_f - C_a)(Qf \times Nf)] \times 0.001$
Where:
C_f – average daily effluent concentration (mg/L) for priority pollutant parameter (BOD)
Q_f – average volumetric flow rate measurement or final discharge effluent (cu.m/day)
N_f – total number of discharge days in a year (days/year)
C_a – average water quality concentration for primary pollutant parameter (BOD) or abstract or intake water (mg/L)

Thru IMS (specifically ISO9001), the company has established an effective complaints management system and focused on minimizing the timeframes in resolving - and in general, reduce the total number of customer complaints. Through the consistent implementation, the company managed to bring down its customer complaints by an average of 11.5% from 2015 to 2017. However, the no water complaints continued to rally up from 2013 to 2015 and again from 2017 to 2018. From the 1,610 complaints recorded from 2013 to 2018, 508 are of no water complaints. The only time the company managed to reduce the no water complaints was in 2016 wherein it reduced the number by 13.

Amongst the valid complaints, the no water complaints directly affect the company's BV and revenue. According to the CS Manager, a no water complaint typically persists for 4 to 6hours before the service is restored. For most instances, these complaints coming from the residential and commercial accounts.

To have an estimate for XOF, the opportunity cost for no water incident was computed. For each no water incident that lasts for 6 hours, the following data were used for the computation

A residential customer consumes an average of 1. 5cu.m/day (0.0625 cu.m/hr) commercial account consumes 17.5 cu.m/day (0.729 cu.m/hr). Php32.05 ave. tariff. (ave. water tariff for sewered accounts)[19].

To simplify further, the number of no water complaints was split between the residential and commercial. Thus, to compute for the opportunity losses:

$$XOF = \left[\frac{\left(\frac{Residential\ cons}{hr}\right)+\left(\frac{Commercial\ cons}{hr}\right)}{2}\right] \times 6hours \times Php\ Ave.Water\ Tariff \times No.of\ no\ water\ complaints \quad (7)$$

Consistent implementation of OTPs lead to increased customer base (number of customers) which translated to increased BV.

The total increase in customer base since 2013 is 90 or 4.56%. With this data, the impact of IMS can be estimated as follows:

$$XOF = (Annual\ ave.increase\ in\ BV \times Php\ Ave.Water\ Tarif\ without\ sewer) \times \%\ due\ to\ increase\ in\ customer\ base \quad (8)$$

Similar with the water service coverage, the consistent implementation of OTPs and continuous expansion of sewer lines lead to increased no. of customers connected with the sewer network. Reckoned from 2013, the no. of sewered accounts grew by 165 or 9.33%. The company charges 40% of the water tariff for its wastewater fee. From this, we can assume financial impact by:

$$XOF = \left[\left(Annual\ ave.increase\ in\ BV \times \left(Php\ Ave.Water\ Tariff\ with\ sewer - \frac{Php\ Ave.Water\ Tariff\ with\ sewer}{140\%}\right) \times \%\ increase\ of\ sewered\ accounts\right)\right] \quad (9)$$

The no. of talents grew by 22%, from a total of 66 employees in 2013 to 77 in 2018. This is in line with the company's enhancement for customer management. The company beefed up its Customer Services and hired additional 4 talents to handle Key Account and Territory Management. (contrary to ISO9001)

Non-compliance with DO198-18 could have resulted in violations of at least Php

40,000 in violation of the OSH standard. A separate Php 100,000 administrative fine shall also be imposed for violations that expose a worker to serious injury or illness[28].

This section of data analysis shows the cost effectiveness of IMS of the company under study. This is demonstrated by comparing the costs vs the perceived benefits to the company as shown in Table 13.

Table 13: Cost-Effectiveness Summary

Costs		**Perceived Benefits**	
Business Meetings and Conferences	Php 36,601.01	Water production and Sales	Php59,188,925.38
Corporate Programs-Employee Activities	Php 10,161.25	% NRW	Php 421,101.25
Mgt. & Prof Fees	Php 778,000.00	Rate of compliance vs DAO35	Php 1,021,080.15
Miscellaneous Overhead	Php 12,543.78	Power use per cu.m of Water produced	Php 969,432.00
Training and Development	Php 324,837.43	Power use per cu.m of Wastewater treated	Php 2,061,439
Transportation & Travel	Php 26,991.95	Collection	Php 866,625.51
Manpower	Php 2,613,882.75	VAS	Php 46,037,362
Audit Findings	Php 0.00	Customer Complaints (No Water)	Php 989.54
		Water Coverage	Php 900,896.89
		Wastewater Coverage	Php 689,490.52
		Safe Man hours	Php 140,000.00
TOTAL	Php 3,803,018.17	**TOTAL**	Php 112,297,342.24

Based on the details in the previous section, the cost of maintaining IMS for the years 2013 to 2018 is equivalent to Php 3.80M while the value of its counterpart benefits amounted to Php 112.30M. Based on this alone, we could easily conclude that IMS is indeed beneficial for the waterworks. However, it should again be noted that the company have been implementing other management programs simultaneous with the IMS. Moreover, there are certain archives2 that tell that the company have already made significant gains from improved performance levels both in terms of effectiveness and efficiency even prior to IMS certification. Thus, there lingers the question of whether these performance gains could all be attributed to IMS.

The real costs could be much higher if the other expenses were available and are individually tagged to IMS. Examples of the missing data are; a) the office supplies consumed during the 5-year study period, b) transportation costs of both trainers and trainees for the years 2013, 2014,2015 and 2017, c) hotel accommodations under misc. overhead for the auditors starting 2013 through 2016 d) Mgt. & Prof Fees for the skipped 2014 surveillance audit and e) the manhours spent for IMS. Also, there are some talents that identify IMS as a costly and cumbersome venture while referring to extensive documentation requirements [30]. Costs can also go the other way since the company nurse's role is a concurrent function of the HR Specialist.

On the other hand, the perceived benefits can be much lower. Take for example the water production and sales. Provision of water is perceived as a fundamental right and there exist a natural increase in its demand thus, raising another question whether IMS has anything

[2] 2008 Susdev report

to do with the increase in water sale. Nevertheless, even if we omit the water sales as an operational parameter, the benefits would still overwhelm the expenses by a ratio of 13:1.

4.0 conclusion

The primary scope of the paper is to bring into fore the costs related to keeping an IMS running and demonstrate whether or not the IMS is cost effective especially for waterworks companies. Conclusions from this paper can be summarized as follows:

The expenses needed in maintaining IMS include but not limited to a) Business Meetings b) Corporate Programs – Employee Activities, c) Mgt. & Prof fees d) Mis Overhead e) Training & Development, f) Transportation and Travel g) Manpower and h) the costs associated with the Audit Findings. These costs grew by an average of 383%, from Php121k in 2013, it shoots up to Php 1.3M by 2018 with the largest chunk coming from the additional manpower (BDM and HR).

Operational indicators that gives value and competitive advantage to the company can be categorized under four business functions a) Quality of service b) Efficiency c) Customer relations d) Performance of engineering projects (service expansion) and d) Costs related to staff.

Changes and perceived benefits from the operational indicators above were converted into monetary terms. The biggest benefit came from the increased water sales amounting to Php59M followed by the value-added services worth Php46M, other benefits came from service coverage expansion, operations efficiency (NRW and power) and wastewater quality.

The implementation of IMS is clearly paying off. The perceived benefits overwhelm the expenses incurred by more than Php108M.

From the considerations above, we can easily conclude that IMS is indeed cost-effective and that the company under study have gained significant gains throughout the study period. While the paper sheds a positive insight, one can argue whether these benefits are indeed attributable to IMS. Future studies could analyze and dissect the benefits further to determine credit where credit's due. Also, the output of this paper may not be generalized to other waterworks as it is only based on a single company.

The researcher recommends studying a similar topic but with a wider base of subjects to know if there will be variances in the expense incurred and benefit gained. Future studies can supplement this paper by including operational indicators besides those listed here. Further, it would be interesting to know other ways of translating abstracts and perceived benefits to actual monetary value.

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References

[1] Yousaf M. and Khajehalalijani M., *Design & Implementation of Integrated Management System*, Thesis (Master's) School of Sustainable Development of Society and Technology Malardalen University Sweden, 2011. Available https://www.diva-

portal.org/smash/get/diva2:448278/ATTACHMENT01 [Accessed: August 2017]
[2] Perry Johnson Certifications Pvt. Ltd. (2018) *What is ISO9000?* [Online] Available https://www.pjrcert.com/standards/iso-90012008/benefits-of-iso-9000 [Accessed: December 2018]
[3] Braun, B. (2005). Building global institutions: the diffusion of management standards in the world economy – an institutional perspective, in Alvstam, C.G. and Schamp, E.W. (Eds), Linking Industries Across the World, Ashgate, London, 3-27
[4] Kayaga, S. and Mugabi, J. and Kingdom, W., Can ISO 9001 Certification of Water Utilities in Developing Countries Be Used to Evaluate Institutional Sustainability? (December 30, 2014). OIDA International Journal of Sustainable Development, Vol. 7, No. 9, pp. 35-70, 2014. Available at SSRN: https://ssrn.com/abstract=2550993
[5] [DOE] Department of Energy (2006, October 5) Department Administrative Order No. 605, Institutionalizing the Structure, Mechanisms and Standards to Implement the Government Quality Management Program Amending for the Purpose Administrative Order No. 161, S. 2006. Retrieved March 22, 2019, from: https://www.doe.gov.ph/executive-order-no-605
[6] [CWD] Casiguran Water District, *CWD ACQUIRES ISO 9001:2015 CERTIFICATION* [Online] Available https://casiguranwd.gov.ph/cwd-acquires-iso-90012015-certification/ [Accessed: January 2021]
[7] [MTWD] Metropolitan Tuguegarao Water District, *MTWD is now ISO Certified* [Online] Available https://mtwd.gov.ph/mtwd-is-now-iso-certified/ [Accessed: January 2019]
[8] [BWD] Attestation Binmaley Water District [Online] Available http://binmaleywaterdistrict.gov.ph/wp-content/uploads/2019/11/Iso-Cert-Attest.-Award.pdf [Accessed: January 2019]
[9] [CWD] Calumpit Water District, *Calumpit Water District is now ISO Certified* [Online] Available http://calumpitwd.gov.ph/calumpit-water-district-is-now-iso-certified/ [Accessed: January 2019]
[10] Sunstar Pampanga (2018), *Water District gets ISO Certification* [Online] Available https://www.sunstar.com.ph/article/1780300/pampanga/local-news/water-district-gets-iso-certification [Accessed: January 2019]
[11] P. San Diego, [Personal Communication], December 2018
[12] Delmas, M. (2001). Stakeholders and competitive advantage: the case of ISO 14001. Production and Operations Management, 10, 343-58. http://dx.doi.org/10.1111/j.1937-5956. 2001.tb00379.x
[13] Tari, et al. (2012). Benefits of the ISO9001 and ISO14001 standards: A literature review. Journal of Industrial Engineering and Management, JIEM, 2012 – 5(2): 297-322 – Online ISSN: 2013-0953 – Print ISSN: 2013-8423. Retrieved from http://dx.doi.org/10.3926/jiem.488117(1), 34-41.
[14] Ng, T. Palaneeswaran E. and Kumaraswamy M. (2012). Costs and benefits of ISO9001-based quality management systems to construction contractors. The Australasian Journal of Construction Economics and Building (Vol 8, No2). Retrieved March 29, 2019, from https://pdfs.semanticscholar.org/a52f/121788253f5a2aa341283db92ab9e6895b6c.pdf
[15] Mendel, P.J. (2006). The Making and Expansion of International Management Standards: The global Diffusion of ISO 9000 Quality Management Certificates, Oxford University Press, New York.
[16] Republic Act No. 9482 "Anti Rabies Act of 2007" Retrieved from https://paws.org.ph/downloads/ra9482_anti_rabies_act_of_2007.pdf [Accessed: February 2019]

[17] [DOLE] Department of Labor and Employment (1990), Occupational Safety and Health Standards as amended, [Online] Available https://www.dole.gov.ph/php_assets/uploads/2019/04/OSH-Standards-2017-2.pdf [Accessed: February 2019]
[18] A. Sarmiento, [Personal Communication], February 2019
[19] E. Pascua, [Personal Communication], February 2019
[20] M. Argillo, [Personal Communication], February 2019
[21] M. Anasco, [Personal Communication], February 2019
[22] Republic of the Philippines (1999), The Clean Air Act of 1999 (RA8749) Ch.1, Art.1, Sect.2.
[23] Krupnick, et al. (2003). Air Pollution Control Poliocy Options for Metro Manila, Resources for the Future, Washington, DC [Online] Availablefile:///C:/Users/manalamp/Downloads/dp030030.pdf [Accessed: February 2019]
[24] A. Rivera, [Personal Communication], February 2019
[25] A. Baluyot, [Personal Communication], February 2019
[26] L. Concepcion, [Personal Communication], February 2019
[27] What is risk-based thinking? (n.d.). Retrieved from https://www.360training.com/blog/what-is-risk-based-thinking [Accessed: February 2019]
[28] [DENR] Department of Environment and Natural Resources (2016) *Providing for new fees and charges for various services of the environmental management bureau* [Online] Available https://emb.gov.ph/wp-content/uploads/2020/08/AO-No.-2016-28-Fees-and-Charges-dated-12-1-2016.pdf [Accessed: January 2019]
[29] Department of Labor and Employment Department Order No. 198 Series of 2018, *Implement Rules and Regulations of Republic Act No. 11058 Entitled "An Act strengthening Compliance with Occupational Safety and Health Standards and providing penalties for violations thereof",* Republic of the Philippines [Online] Available https://bwc.dole.gov.ph/images/Issuances/DepartmentOrder/DO198_18_IRR_of_RA_11058__AnACtStrengtheningCompliancewithOSHSandProvidingPenaltiesForViolationsThereof.pdf [Accessed: January 2019]
[30] N. Delos Reyes, [Personal Communication], February 2019