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A Cost – Effectiveness Analysis**

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Compliance with Quality Standard System in Maritime Schools: A Cost – Effectiveness Analysis

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ABSTRACT

The need for quality in maritime education and training has long been recognized. The provisions of the 1978 STCW Convention explicitly recognizes this need for quality. However, the levels of training and assessment were left “to the satisfaction of the Administration,” so that there were as many standards as there were signatory countries. This situation necessitated a major revision of the 1978 STCW convention and gave birth to the 1995 amendments which now require proof of quality in education and training within a credible quality standards system.

The Philippines as a signatory to the STCW 11978 convention is obliged to comply with the standards set by this international covenant, which by legal precept, is now part of our domestic laws. Thus, pursuant to Regulation 1/8 Section A of the STCW Code which requires the adoption of a Quality Standards System to monitor all trainings, assessment of competence including qualifications and experience of instructors and assessors, the Commission on Higher Education (CHED) issued CMO No. 51 s 1997 which directed all maritime schools in the country to establish/adopt a Quality Standard System on or before August 1, 1998.

More than 20 maritime institutions in the country have established formal quality systems based on the popular ISO 9000 series of standards. Many of them have maintained their quality systems for five years or more. In light of an increased focus on quality, it is best to raise the question: Are quality-based efforts worth their cost? In other words, how can we determine the cost effectiveness of the program?

Since there are some quality indicators that are not expressed in financial terms and difficult to quantify such as prestige of the school for being QSS compliant, this paper seeks to work on the cost-effectiveness analysis. To serve this purpose this paper provides several methods of quantification of data and matrix of measurable quality parameters that will enable the institution to measure quality.

I. WHAT PRICE TEACHING QUALITY?

What price teaching quality? This is one question which this writer believes is often taken for granted. While CHED is now working on its proposal for a quality assurance system anchored on outcomes- based approach, the questions on what kind of regulation is best suited to secure teaching quality and what cost is involved have remained a question to ponder upon.

As the United Kingdom government said in its White Paper in 2003 on the future of higher education:

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“Society is changing. Our economy is becoming ever more knowledge-based- we are increasingly making our living through selling high-value services, rather than physical goods. These trends demand a more highly-skilled workforce.”

Apparently, the need for quality in maritime education and training has long been recognized. The provisions of the 1978 STCW Convention explicitly recognizes this need for quality. However, the levels of training and assessment were left “*to the satisfaction of the Administration*” so that there were many standards as there were signatory countries. This situation necessitated a major revision of the 1978 STCW Convention and gave birth to the 1995 Amendments which now require proof of quality in education and training within a credible quality standard system.

The Philippines as a signatory to the STCW 1978 Convention is obliged to comply with the standards set by this international covenant, which by legal percept, is now part of our domestic laws. Thus, pursuant to Regulation 1/8 Section A of the STCW Code which requires the adoption of a *Quality Standards System* to monitor all trainings, assessments of competence including qualifications and experience of instructors and assessors, the Commission on Higher Education (CHED) issued CMO No. 51 S. 1997, which directed all Maritime Schools in the country to establish /adopt a Quality Standard System (QSS) on or before August 1,1998.

II. LESSONS OF EXPERIENCE

In the process of implementing the Quality Standard System, this writer has observed how the maritime schools have seriously dealt with huge investments, oftentimes in dollars in purchasing equipment and paying the cost of quality assessment conducted by certified external auditors. The emergence of global like ISO 9000 quality series has prompted many organizations with no choice but to follow and follow through in order to get certified and be among the world class organizations in terms of providing quality education.

Drawing upon experience, it is understood that Quality Standard System is a systematic, structured and continuous attention to quality maintenance and quality improvement. What Vroeijensstijn (1995) said, “ that QSS captures the dual nature-fitness for purpose and continuous enhancement” added more pressure to the cost of compliance.

Aware of such lessons, this paper presenter seeks to encourage maritime institutions which have complied with the QSS requirements and were certified as such to determine the cost in maintaining QSS on the part of the students and the academic institutions and to determine the levels of effectiveness. This attempt could be better supported by the following questions:

1.How much will it cost to comply and maintain a Quality Standards System?

1.1STUDENTS

Tuition and Fees	Private Purchases of Books, Uniforms and Others
Incidental Expenses	Board and Lodging
Earnings Foregone	Transportations

1.2 MARITIME INSTITUTIONS

1.2.1 *Capital Outlay*

Building	Machineries, Equipment and Materials
Land	Others

1.2.2 *Operating Costs*

Salaries and Wages	Accreditation
Fringe Benefits	QSS Certification
Faculty Benefits	Research
Repair and Maintenance	Community Extension
Energy Cost	Others

2. What are the levels of effectiveness associated with such compliance?

2.1 *Students*

Competence (Knowledge and Skills)
Scholarships from Shipping Industry

2.2 *Maritime Education*

Increased Enrollment
Legitimate Increase in Tuition and fees
Institute and Manning / Shipping Industry Linkages

3. What policy implications will be derived from the answers to the foregoing questions?

III. STATISTICS ON UPGRADING OF MARITIME EDUCATION –DOES NUMBER MATTER?

Despite CHED CMO No. 51 s. 1999, statistics show that only 25 out a total of the 118 maritime schools in the Philippines were QSS certified. Based on the CHED CMO No. 34 s. of 1999, which is also listing the successful maritime schools, 55 schools with BSMT and 50 offering BSMarE were in the waiting line. There was a need for them to catch up in terms of some criteria such as the following: Faculty teaching professional subjects must have a minimum one-year shipboard experience; Operational GMDSS and RADAR stimulators for deck department and boiler and diesel engine for engine department must be available.; ARPA stimulator must be available by June 2000 and must have at least a rating of 10 points for their Quality Standard Systems (QSS).

The Tinig Ng Marino (Jan.-Feb. 2000) cited that the maritime sector, in particular, has been allocating huge amounts, spreading as much as \$20,000 in the case of the maritime schools to tap the services of the international assessment and accreditation companies.

After a lapse of five years, the total number increased to 62 schools that complied with the QSS requirement, which is not yet an encouraging figure. Is this an implication that shows cost having a considerable impact on the non-compliance of maritime schools with the QSS requirements? Or does it imply that in spite of the mandate, there are still some schools, which could not afford to shoulder the

cost of the QSS requirements, or if they had tried they might have not met the ISO 9000 requirements.

IV. THE COST OF QUALITY FRAMEWORK

Cost effectiveness analysis was first introduced to clinicians by Weinstein and Stason in 1977. It is one of the techniques of economic evaluation designed to compare the costs and benefits of an intervention to assess whether it is worth doing. When the more effective innovation is also that more costly, the decision maker must decide if the greater effectiveness justifies the cost of achieving it. This is done by calculating an incremental cost-effectiveness ratio, which is the difference in costs divided by the difference in outcomes (Weinstein et al, 1996).

The appropriate method of analysis in determining the effectiveness of the compliance with the QSS is the typical “*cost – effectiveness*” analysis. The focus of cost – effectiveness analysis proposed in this paper is to identify the levels of achievement of the QSS compliance from the viewpoint of the students, schools, and from a broader perspective, the society. The cost estimation begins with an exhaustive listing of all the “*inputs*” or resources required by the QSS in as detailed as possible.

This paper proposes the measurements of the cost variables as reflected in the schematic program (Fig.1) which are the working concepts in the preparation of the questionnaires. The following gives a description of the costs involved:

1. Cost on the Part of the Students

Tuition Fees and Incidental Expenses are the actual cost a regular IME student pays to the school. These costs can be obtained from the assessment office of the concerned school. For each geographical location, these costs are categorized into *high, middle and low*. These are derived from the difference between the highest and lowest cost indicated divided by three. This cost includes “*cost of clientele*” such as *earnings foregone by enrolling in IME, private purchases of books, school materials, uniforms, transportation, etc.*

2. Cost on Capital Outlay (Maritime Schools)

Cost on Infrastructures are infrastructures associated with the physical or material foundation of the IME School which include *cost of buildings, land acquisitions and improvements, roads, wall wharf construction*, and the like. Likewise, for each geographical location, costs for infrastructure will be categorized as *high, middle and low*. These cost items can be obtained from the budget of the school or from its expense data. The cost is based on its book value (purchased value) not on market value.

Cost of machineries, equipment, materials, furniture and fixtures refer to costs attached to a building for practicum training, audio visual instruments, equipment and machineries such as GMDSS simulators, RADAR-ARPA Simulators, scientific instruments, computers, tools, instructional materials, books and others such as blackboards, whiteboards, tables, chairs, fixtures, etc. that facilitate instruction and learning in the IME school. The estimation of the cost is based on book value (purchase or acquisition cost).

3. **Operating Costs**

This item Includes *Salaries and Wages, Fringe benefits, Faculty Development, Repair and Maintenance, Energy Cost, Accreditation, QSS Surveillance Visits, Research, Community Extension, Others*. These costs can be obtained from the expense data of the school or from its financial statements. These costs can be categorized as *high, middle, and low*.

4. **Levels of Achievements / Outcomes (Students)**

Employment is a conservative estimate of the number of IME students who are employed both local and overseas. This estimate is based on the available data of the concerned school. If and when the data are not available, the estimate will be based on the data kept by the National Labor and Employment, NSO and other related agencies located in the area. Employment can be categorized as *employed and unemployed*. If employed, it can further be categorized as *domestic and overseas*. This can also be supplemented by an estimate of the demand of Filipino Seamen both local and overseas.

Competency (Knowledge and skills). The extent to which the students learn and acquire the competence of their field of specialization can be obtained from the existing records of the Registrar's Office of the concerned school. The school administrators will be asked to indicate the percentage distribution of IME graduates on the various competency level on a year to year basis.

Probability of Passing Licensure Examination is ratio between the number of IME students who pass the licensure examination. This ratio will then be compared with the national average.

Scholarships from Shipping Industry refer to the number of student – recipients of study grants from the concerned school and from shipping industry both local and overseas. This can be obtained from the School's Memorandum of Agreement (MOA) with shipping industries both local and overseas, or from whatever arrangements the concerned school has from the shipping industries.

5. **Levels of Achievements (IME Maritime Schools)**

Increased Enrollment is the total number of IME students enrolled the whole year round. The percentage rate increase in enrollment will be made on a year –to-year basis.

Legitimate increase in tuition fees, and incidental expense are the increase in the tuition fees and incidental expense of the IME which the student body and parents find consistent and in accordance with the legal provisions. Such increase shall be indicated in peso on year-to-year basis. This can be categorized as *high, middle, and low*.

Linkages to Institute and Maritime/Shipping Industry are the number of institutions and organizations both local and overseas which are the concerned school has linkages and tie – ups and other arrangements concerning the supply

of IME graduates for overseas employment, training programs, as well as the study grants. This can be done by the concerned school through a complete listing of its linkages corresponding with the nature of such linkage.

The Compliance of QSS may result into varying outcomes at different levels of effectiveness, hence, allows one to make comparison through ranking. However, from cost – effectiveness vantage point, ranking the programs via their varying outcomes, is ambiguous. For instance, QSS compliance designed to increase knowledge of skills of students may also influence their chances of passing in the licensure examination and their employability. Cost – effectiveness alone will not provide a sound basis of determining which program with multiple outcomes is more effective based on cost. The best way to solve this shortcoming is to express the value of the outcomes in common units. This can be done by assigning arbitrary weights to the outcomes so that they can be aggregated into an effective index. This however, requires one step to make use of normative judgment to assess the cost – effectiveness ranking of the programs change as outcomes being prioritized change. *Azzi and Cox (1973)*, suggested that the weights assigned to each outcome should be sensitive to the subsequent ranking and one should be able to detect the deviations between the two. If that is attained, the weights assigned to the outcome should be sensitive to the subsequent ranking and done should be ale to detect the deviations between the two. If that is attained, the weights assigned to the outcomes can be translated into a composite effectiveness score for each of the programs.

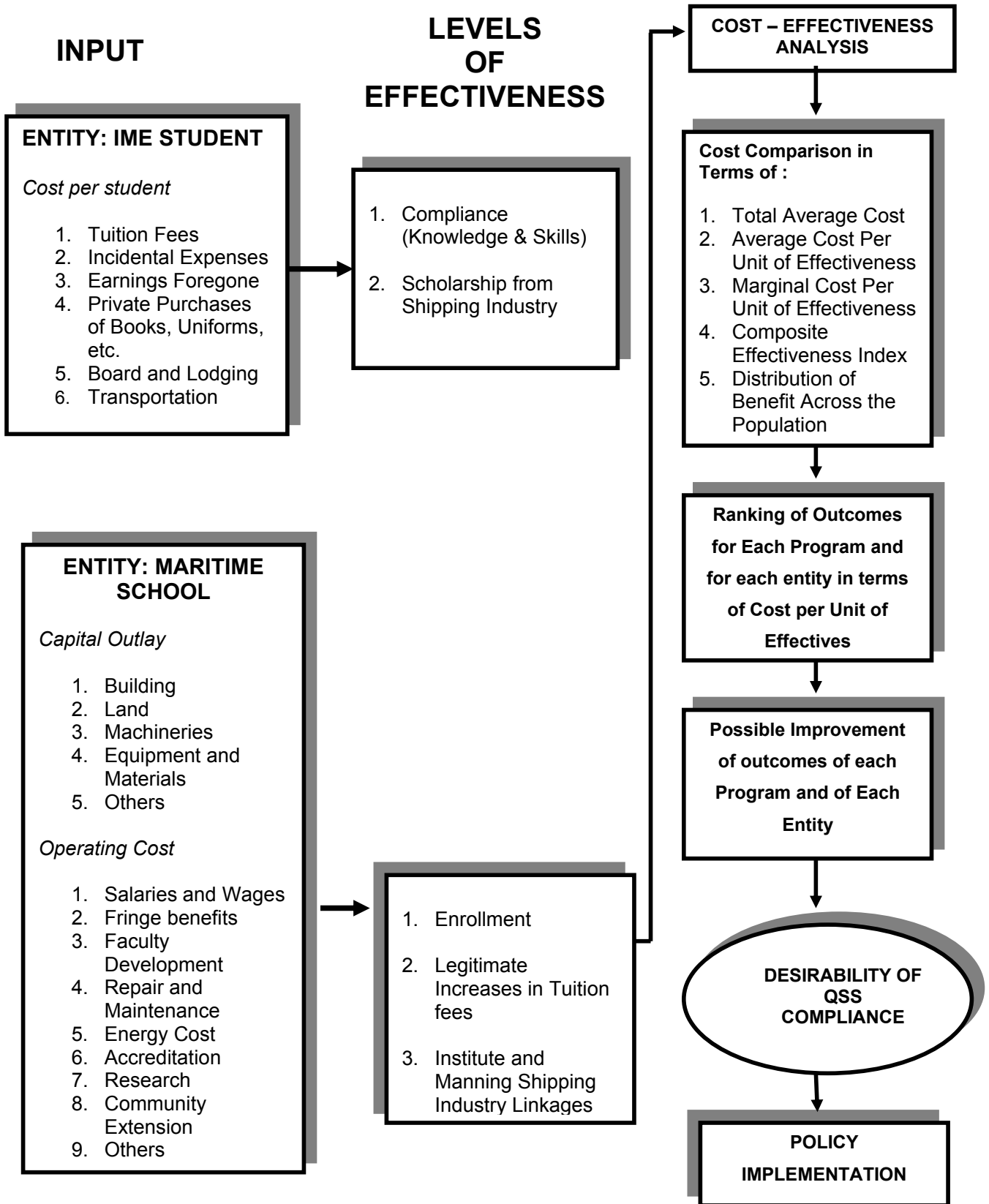


Fig.1 . The Schematic Diagram

V. MEASURING COST EFFECTIVENESS

The cost – effectiveness analysis is not a “hypothesis testing” type of research. It is not concerned with the relationship of variables. Basically, it intends to use the cost-data for problem solving rather than hypothesis testing. Hence, it does not require highest statistical treatment of data. However, the analysis requires a rigorous and tedious systematization and calculation of the sums, differences and average of all traceable cost items (see schematic diagram) which are helpful in determining whether the compliance of QSS requirements is fact accomplishing the desired outcomes as efficiently as possible such as – increased students competency, increased scholarship and linkages with shipping industries, increased enrolment, etc. Thus the cost – effectiveness analysis on the compliance of the QSS requirements is not merely concerned with the cost estimates per se, but more than with the extent how the costs have produced certain level of effectiveness. This is owed to the fact that the “inputs” of QSS compliance from the standpoint of students and the maritime schools are measurable in physical terms. To serve that purpose, the study will make use of the following methods of qualification of data:

Total Average Cost Per Student refers to the average of all costs borne by the students enrolled in maritime education in a particular maritime school in a particular geographical location. The formula to be used is:

$$\text{TACS} = \frac{\sum X_{ij} + \sum X_{jk}}{2}$$

Where: TACS = Total Average Cost Per Student
 $\sum X_{ij}$ = highest sum of all cost items (see schematic diagram) borne by the students in a particular school in a particular geographical location.
 $\sum X_{jk}$ = lowest sum of all cost items borne by a student in a particular maritime school within a particular geographical location

Total Average Cost Per Maritime School is the average of all the cost of inputs incurred by a maritime school within a particular geographical location (see schematic diagram). The formula

$$\text{TACM} = \frac{\sum X_{ij} + \sum X_{jk}}{2}$$

Where: TACM= Total Average Cost Per Maritime School
 $\sum X_{ij}$ = highest sum of all cost borne by a maritime school within a particular geographical location.
 $\sum X_{jk}$ = lowest sum of all cost borne by a maritime school within a particular geographical location.

Average Cost Per Unit of Effectiveness refers to the cost per unit increase in the desired outcomes such as: *competence, scholarship from shipping industry*, or for a maritime school, *the is the cost per additional enrollment, unit increase in tuition fees and shipping linkages*.

$$\text{A. ACEC} = \frac{\text{TACS}}{\text{GGPA}}$$

Where **ACEC** = Average Cost Per Unit of effectiveness in terms of Student's Competence (Knowledge and Skills)
TACS = Total Average Cost Per Student
GGPA = General Grade Point Average of the Students in Professional Subjects

$$\text{B. ACES} = \frac{\text{TACS}}{i/j}$$

Where **ACES** = Average Cost Per Unit of effectiveness in terms of Scholarships
i = Number of Students Who Passed or received scholarship or Training from Shipping Industry in a Given Year
j = Total Number of Students Enrolled During the same Year

C. Average Cost Per Unit of Effectiveness in Terms of Enrollment.

$$\text{C. ACEE} = \frac{\text{TACM}}{\text{TE}}$$

Where **ACEE** = Average Cost Per Unit Of Effectiveness in terms of Enrolment.
TACM = Total Average Cost Borne by A maritime School During the Year
TE = Total Enrolment of A Maritime School During the Same Year

$$\text{C.2 ACET} = \frac{\text{TACM}}{\text{TE}}$$

Where **ACET** = Average Cost Per Unit Of Effectiveness in terms of Tuition Fee Increases
TACM = Total Average Cost Borne by A maritime School During the Year
AIT = Amount of Increase in Tuition Fees

Marginal Cost Per Unit Of Effectiveness refers to additional cost per unit increase in the desired outcomes mentioned earlier. For instance, the marginal cost per unit of effectiveness in terms of enrollment can be calculated as follows

$$MCEE = \frac{TACM_0 - TA}{TE_0 - TE_1}$$

Where: *MCEE* = Marginal Cost Per Unit of Effectiveness in Terms of Enrolment

TACM₀ = Total Average Cost from the Standpoint of Maritime School of the Current Year

TACM₁ = Total Average Cost of School During the Previous Year

TE₀ = Total Enrolment of the Current Year

TE₁ = Total Enrolment of the Previous Year

This procedure can be carried forward on to the other desired outcomes for BSMT and BSMarE Programs.

Composite Effectiveness Index refers to the comparison of effectiveness in the various desired outcomes for BSMT and BSMarE programs based on the assigned weights. The weights are based on the normative judgment of the researchers. The hypothetical composite index illustrates the way it can be quantified:

Program	Competency	Scholarship	Enrollment	Tuition Fee Increase
BSMarE	2	2	3	1
BSMT	1	1	3	4

The numbers represent of effectiveness per unit of cost. It appears that BSMarE program is cost – effective in terms of competency and scholarships while BSMT is cost – effective in terms of enrollment and tuition fees. Which one is preferable from the cost – effectiveness vantage? Apparently, there is no prior answer to this; hence, a normative weighting scheme will be necessary.

Distribution of ***effects across the population*** refers to the evaluation of the effectiveness as to who receives the benefits of the QSS compliance. This will determine whether there is quality of outcomes across the population, say from among the students of from among the ,maritime schools, of from the programs. This can be determined by calculating the variances of cost – effectiveness which will indicate whether the variances are moving toward equality.

When all the calculations is made, the study can then rank the outcomes both for the students and maritime schools in terms of their respective cost per unit of effectiveness. As such, the possibility of improving the outcomes as well as the programs can be made and ultimately determine the desirability of the QSS requirements necessary for CHED policy options.

VI. END NOTES

The 1995 Amendments to THE 1978 STCW Convention created new requirements for ship owners, maritime administrations and academies which compelled them to comply with the Quality Standards System. Since this entails costs, there is a need to conduct a study on the cost effectiveness of QSS compliance. Such information will enable CHED and the maritime schools to make comparisons and to seek out cost-reduction measures when costs are out of line. It will also serve as a guide for CHED to compile cost-effectiveness data surrounding the QSS compliance, the averages which will indicate why other maritime schools have complied and why others did not. The availability of such information will also help CHED to set up a policy option with respect to the future operation that may be owed to the improvement of technology by replacement of equipment and modernization It will provide information that is vital in promoting interschool relations whereby the independent school concerned, when operating as a unit can have a mutual concession and promote growth in maritime industry.

As a whole a study on Cost-Effectiveness will contribute to knowledge on the effectiveness of the Quality Standard System in supporting the mission – vision and objectives of the maritime schools and in translating the dreams and aspiration of students who submit their fate to the school management into a beautiful reality.

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