Development programme of QA mechanisms in the maritime higher education institutions in China

Jing Xue
WMU

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DEVELOPMENT PROGRAMME OF QA MECHANISM IN THE MARITIME HIGHER EDUCATION INSTITUTIONS IN CHINA

By

XUE JING
The People’s Republic of China

A dissertation submitted to the World Maritime University in partial fulfillment of the requirements for the award of the degree of

MASTER OF SCIENCE

in

MARITIME EDUCATION AND TRAINING (ENGINEERING)

1996

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DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

XUE Jing
Oct. 15, 1996

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ACKNOWLEDGEMENTS

I would like to express my profound gratitude and sincere thanks to Professor Kenji Ishida for his excellent support, valuable advice and stringent supervision during the process of my studies and the preparation of this dissertation at World Maritime University.

I am greatly indebted to Professor K. Hara, from Kobe University of Mercantile Marine, and Professor B. S. Butman, from US Merchant Marine Academy, for their assessing this dissertation.

I am very grateful to Professor P. Muirhead and Lecturer M. Swanson for their valuable lectures and guidance, which were beneficial to my dissertation.

I would like to thank Mr. Gao Deyi and Mr. Lu Ming, who are my colleagues at Shanghai Maritime University, and Mr. Li Hongying, who is an official from the Ministry of Communications of China, for providing me with valuable information to my studies.

I should specially express sincere appreciation to the Canadian International Development Agency (CIDA) for providing me with the fellowship, which made my studies at WMU possible.

I should also express my gratitude to Ms. Inger Battista, a lecturer of the English language at WMU, for her linguistic corrections of my dissertation.

My final gratitude goes to my parents and my wife for their on-going encouragement and support in all aspects during the period of my studies at WMU.

Without help from all those whom I mentioned above, it would not have been possible for me to finish my studies and this dissertation.
ABSTRACT

Based on the investigation and analysis on the external and internal environment of the Chinese MET system, considering the characteristics of maritime education, this dissertation is an initial study of the establishment of the Quality Assurance Mechanism adaptable to maritime education, particularly to Chinese maritime institutions.

A brief look is taken at the national economy and maritime transportation. A brief introduction of the Chinese MET institutions and the historical developments behind them is made. A brief investigation into SMU is conducted. The existing quality control measures in the Chinese MET system are briefly reviewed. The deficiencies in the MET system are examined.

The characteristics of maritime education are analysed. The challenges for MET, in particular, the impact of the new STCW Convention, are remarked. The potential of development for the MET institutions is presented.

By using Deming Cycle, which is the crux of ISO standards, the principle of QA mechanism is introduced. The adaptation of QA mechanism for maritime education is then developed.

Taking into account the reality of the Chinese MET system, the application and development programmes of the QA mechanism, such as lines of responsibilities, evaluation criteria and instruments, as well as qualification requirements for personnel concerned, are established.

Recommendations are finally made for the establishment and implementation of the QA mechanism in Chinese maritime education.
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<table>
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<th>Description</th>
</tr>
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<tbody>
<tr>
<td>IMO</td>
<td>International Maritime Organisation</td>
</tr>
<tr>
<td>STCW</td>
<td>Standards of Training, Certification and Watchkeeping</td>
</tr>
<tr>
<td>GNP</td>
<td>Gross National Products</td>
</tr>
<tr>
<td>RMB</td>
<td>RenMingBi (* Chinese Currency)</td>
</tr>
<tr>
<td>ISO</td>
<td>International Standard Organisation</td>
</tr>
<tr>
<td>ISL</td>
<td>Institute of Shipping Economics and Logistics</td>
</tr>
<tr>
<td>MET</td>
<td>Maritime Education and Training</td>
</tr>
<tr>
<td>ARPA</td>
<td>Automatic Radar Plotting Aids</td>
</tr>
<tr>
<td>GMDSS</td>
<td>Global Maritime Distress and Safety System</td>
</tr>
<tr>
<td>TEU</td>
<td>Twenty-feet Equivelent Unit</td>
</tr>
<tr>
<td>SMU</td>
<td>Shanghai Maritime University</td>
</tr>
<tr>
<td>ISM</td>
<td>International Safety Management</td>
</tr>
<tr>
<td>IACS</td>
<td>International Association of Classification Societies</td>
</tr>
<tr>
<td>MSC</td>
<td>Maritime Safety Committee</td>
</tr>
<tr>
<td>BIMCO</td>
<td>the Baltic and International Maritime Council</td>
</tr>
<tr>
<td>ISF</td>
<td>International Shipping Federation</td>
</tr>
<tr>
<td>QA</td>
<td>Quality Assurance</td>
</tr>
<tr>
<td>QAM</td>
<td>Quality Assurance Mechanism</td>
</tr>
<tr>
<td>BSI</td>
<td>British Standards Institution</td>
</tr>
</tbody>
</table>
It is well known that the international maritime industry has undergone an unprecedented technological revolution during the past few decades. Today's ships are highly automated with complex and sophisticated equipment on board.

In the face of the major technological changes in the maritime industry, it was logical to assign vital importance to the establishment of minimum standards of education and training for seafarers. This was recognised when the 1978 STCW Convention was adopted under the auspices of IMO. However, despite its broad global acceptance, it was realised in the late 1980s that the Convention was not achieving its purpose.

In July 1995, with substantial amendments to the STCW/78, the new STCW/95 was adopted at an IMO Diplomatic Conference. Obviously, the radical changes made in the revised STCW Convention will bring about a tremendous impact on the parties to the Convention, particularly on the maritime institutions in terms of education and training. In response to the new STCW/95 Convention, and the changing maritime industry arisen from new technology as well, one of the major tasks facing the maritime institutions will be to establish a Quality Assurance Mechanism in order to ensure high quality of maritime education and training.

Evidently the national economy growth usually maintains close correlation with maritime transportation and in turn maritime education. Ever since the Chinese government began to undertake the so-called Opening-Policy in the late 1970s, the
Chinese economy has started to grow steadily. The GNP rose to 856.8 billion RMB yin in 1985 from 358.8 billion RMB yin in 1978 (World Bank, World Tables, 89-90 edition). In the foreign trade sector, particularly, import and export volumes also rose steadily, which directly pushed the increase of seaborne trade volume and in turn speeded up the development of the national merchant fleet.

In contrast to the sluggish world economy, the Chinese economy has continued to grow with unprecedented high rate since 1991. Meanwhile, the total value of exports and imports has risen dramatically with an average rate of 20% each year in the last decade, which has been a drive for the steady expansion of the national merchant fleet and maritime transportation.

In response to the rapid growth of the national economy and the maritime industry, the size of the Chinese maritime institutions has been nearly tripled in the past decade. The over-expansion in size and over-fast growing of the student population have inevitably raised concerns over the quality issue.

Quality and Quantity, which one should be the top priority at present in Chinese maritime education? It seems to be a burning issue. Nevertheless, by means of investigation and analysis in chapter 2, the author will present his personal opinion on the quality issue. In short, the quality issue regarding maritime education and training should be placed on the top agenda, particularly in the current situation when the size of Chinese maritime institutions is being under over-expansion.

The Quality Assurance Mechanism in the industry context has been proved a successful instrument in quality management. It has been adopted world-wide in both the production and service industries. However, it remains a newly developing idea in the field of application to maritime education. Because the new STCW Convention did not, and nobody else could, adopt or provide a standard model, such as the 1987-ISO 9000 that provides a framework for any type of organisation to assure customers of compliance with claimed objectives. In other words, there is no
such a standardised model of Quality Assurance Mechanism that can be suitable for all maritime institutions.

In this regard, based on the investigations and analysis on the overall background of Chinese maritime education, considering the characteristics of maritime education, this dissertation made an initial study and an attempt to develop a Quality Assurance Mechanism that is suitable for the Chinese maritime higher institutions.

This dissertation is broken down into six chapters:

Chapter 1 is a general introduction.

Chapter 2 presents the overall background of Chinese maritime education and analyses its weaknesses.

Chapter 3 discusses the characteristics of maritime education and studies the challenges facing Chinese maritime education in the current situation and its potential of development.

Chapter 4 introduces Quality Assurance Mechanism in general, then analyses its significance and major factors affecting maritime education quality, and finally, by means of Deming Cycle, the Quality Assurance Mechanism suitable for maritime education is developed.

Taking into account the reality of the Chinese MBT system, Chapter 5 introduces the application and development programmes of the Quality Assurance Mechanism in Chinese maritime institutions, such as lines of responsibilities, evaluation criteria and qualification requirements.

Chapter 6 makes final conclusions and recommendations for the establishment and implementation of the QA mechanism in Chinese MET.
CHAPTER 2
BACKGROUND OF MET IN CHINA

2.1 External Environment

—The National Economy and Maritime Transportation Background

It is well known that economy growth usually maintains close correlation with maritime transportation. Before discussing the theme of this dissertation, it is thus necessary to get a profile about the national economy as well as maritime transportation, for which maritime education is to serve and upon which maritime education may survive.

The year of 1978 is a milestone for the Chinese economy. Following the implementation of the so-called Opening Policy in the late 1970s, the Chinese economy began recovering and growing steadily. GNP rose to 856.8 billion RMB yuan in 1985 from 358.8 billion RMB yuan in 1978 (World Bank, World Tables, 89-90 edition). The performance was sustained by a strong increase in industrial production, large gains in manufactured exports, and an improvement in agricultural output, as well as by strong consumption expenditure. In the foreign trade sector, import and export volumes also rose steadily, which directly pushed the increase of the seaborne trade volume and in turn drove the development of the national merchant fleet.

In 1988, however, concerning the overheated economy, the Chinese government initiated a three-year austerity programme which aimed at curbing the high inflation
Table 2.1 shows the Economy Growth Rate in recent years in eight developed and developing countries including China.
Table 2.2 shows Chinese foreign trade volume (billion US dollars) in the past decade.
Table 2.3 shows the number of Chinese merchant ship (over 500grt) and its seaborne trade volume (billion Ton x km).

The above tables roughly show the correlation between the national economy growth and the maritime industry development in terms of the national merchant fleet and its seaborne trade volume. To forecast the maritime markets in coming years, however, there are many uncertainties.

1) Positive Viewpoint
   - Massive inflows of foreign direct investments, which have in the past been concentrated in coastal areas, are now directed to inland regions, and are expected to give a further impetus to the growth of the Chinese economy. The maritime market is thus expected to expand further.
   - The international crew market is expected to expand with the recovery of the world economy.

2) Negative Viewpoint
   - Similarly as in 1988, the Chinese government began to undertake a so-called 16-point austerity programme in the late 1993 to provide more effective and stricter macro-economic control, aiming at curbing a continuous rise in the rate of inflation and slowing down the overheated economy growth. This programme has achieved some success, which is likely to hamper the expansion of the maritime market.
   - The new Land-Bridge connecting Europe and Asia has been completed and in use, which would be a potential competitive rival of maritime transportation.
   - The so-called anti-dumping policy in trade protectionism pursued by some countries is likely to hamper further increase of Chinese exports in coming years.
No matter which viewpoints above could more precisely predict the future maritime market, it is certain that the maritime market and in turn the quantity demand for maritime personnel would fluctuate with the fluctuation of the economy growth rate and many other variables. The quality requirement, however, is increasingly becoming a dominant role in both the short term and the long run.

In this context, facing options currently of either quantitative or qualitative demand as a priority in policy-making in maritime education, the answer is fairly clear: the quality issue should no doubt be put on the top agenda.

2.2 MET yesterday and today
The history of Chinese maritime education can be dated back to the beginning of this century. In 1909, Wusong Mercantile Marine School, which was the first nautical school in China, was set up in Shanghai. The purpose of this marine school was to provide students with specialised marine skills and knowledge, and thus supplying the newly born merchant fleet with qualified crew.

In 1920, another nautical school, called Jimei Nautical School, was established in Jimei located in the south-east China. These two schools have been regarded as the cradle of Chinese navigators. They formed the foundation of the Chinese maritime education and for its later-on development, although they were at a low level in terms of size, course depth and comprehensiveness as well as quality standards at their inception.

In 1953, Dalian Maritime University, which is one of the largest maritime institutions of higher learning in the world, was formed in Dalian by the amalgamation of three establishments: the Northeast Navigation College, Shanghai Nautical College and Fujian Navigation School. In 1958, the second largest maritime higher institution in China, Shanghai Maritime University, was established. Meanwhile, several other nautical schools were established in different areas.
In the late 1970s, the Chinese government began to pursue opening-policy, which has brought about a tremendous impact on the maritime industry and in turn the maritime education system. With the steady growth of both domestic and international trades, the national fleet was also expanding steadily. As a result, it created the needs for the massive maritime personnel, not only for ship officers on board, but also for ship operators ashore.

In order to meet the growing needs of the maritime industry, more and more students were recruited into the maritime institutions, and the sizes of the maritime institutions were thus becoming larger. Meanwhile, with the entry into force of the STCW/78 Convention in 1984, the maritime education policy and standards were revised correspondingly and raised to a higher level than ever before.

In the last decade, like everything else in China, maritime education has been developing rapidly. The maritime institutions like Dalian Maritime University, Shanghai Maritime University and Jimei Navigation Institute have had in their possession training vessel which are highly automated ships with complex and sophisticated equipment as well as advanced training facilities. The navigational Radar simulators, ARPA, GMDSS training simulators as well as Engine Room simulators have been applied in the educational activities and training courses.

It is estimated that over 20,000 (no official statistics) maritime personnel have been educated in the last decade from the above three major maritime institutions. Among them over 50% are ship officers. The total student population studying in these institutions last year was over 10,000. The number of graduate students has so far reached 2,500 yearly.

The over-expansion in size and the fast growth of student population have raised a series of problems within the institutions, such as shortage of financial and human resources necessary for supporting the expansion of the institution size, as well as the inadequacy of newly equipped laboratory and teaching facilities. Consequently, it has raised concerns about educational quality.
Quality and quantity, which one should really be the top priority today in maritime education in China? The author strongly believes that quality should always have priority. Considering the reality of the present circumstances in China, in which the quantity also seems to be necessary, a reliable way to ensure the quality, but not a compromise between quality and quantity, should be found out.

The Quality Assurance Mechanism in the industrial context has been a successful instrument in quality management and has been adopted world-wide in both production and the service industries. If it could be applied to maritime education through appropriate adaptation, it would be a reliable solution to the quality issue and beneficial to the maritime education system. The principle of Quality Assurance Mechanism in general and its adaptation for maritime education as well as its application and development programmes in practice will be presented in detail in chapter 4 and chapter 5.

2.3 Internal Environment

——Introduction of the Maritime Institutions

2.3.1 Brief Introduction of the Maritime Institutions

In addition to some other marine academies and training schools, there are three major maritime institutions of higher education within the maritime education system in China: Dalian Maritime University, Shanghai Maritime University, and Jimei Navigation Institute, located in the north-east, the east, and the south-east of China respectively. Under the jurisdiction of the Chinese Ministry of Communications, they play leading roles in maritime education in China.

Dalian Maritime University is a comprehensive maritime university. It was formed in 1953 by the amalgamation of three establishments. It has now six colleges, including the Colleges of Navigation, Marine Engineering, Shipping Management, Market Economics and Law, International Business, as well as Adult Education. It also has five faculties, including the Faculty of Social Science, Basic Science, Technical Foreign Language, Physical Education, and Postgraduate. It currently
provides 22 BSc. programs, 9 MSc. programs, 4 PhD. programs, as well as 12 Professional Diploma programs. It possesses a marine radar simulator, a planetarium, an engine room simulator, an electronic technology centre, a computer station, an audio-visual teaching centre, as well as 56 laboratories for satellite navigation communications, and marine engineering. It also has three 10,000-ton class ocean-going training vessels, a water-front activity centre, three workshops that serve teaching and scientific research, a publishing house and a library. The university currently has 2247 staff members including 81 professors, 273 associate professors, 326 lecturers and others as well. The number of registered students is 4939, including 11 PhD Scholars, 142 Master Scholars, 3299 undergraduates, 974 sub-undergraduates for Professional Diploma and 513 correspondence students.

Shanghai Maritime University is another comprehensive maritime university founded in 1958. In addition to 3 independent departments and 2 divisions, there are 3 colleges in which 5 departments are included. All of the 8 departments include 16 specialities, among which all 16 specialities can issue BSc degrees, 9 of them are authorised to offer MSc degrees, and 3 of them are expected to be authorised to offer PhD degrees. The university possesses a variety of laboratories, an audio-visual teaching centre, a computer station, a library, as well as several research institutes. It also owns three 10,000-ton class ocean-going training vessels, an aquatic training base, a navigation laboratory centre equipped with radar simulator and planetarium, as well as an automated machinery space. The university has now totally 3700 students and 1939 staff members among whom nearly 600 are teaching staff.

Jimei Navigation Institute, up-graded in 1989 as a senior institution of higher learning approved by the State Education Commission, has become one of the Chinese major bases for training senior seafarers. The institute now has 7 teaching units and 2 research institutes. It has over 20 labs, which incorporate navigational simulators, ARPA, a GMDSS training simulator and an automated engine room. In addition, the institute has in its possession a 5000dwt ocean-going ship, a 400dwt
coaster and a 158TEU container ship. There are 2200 students and nearly 800 staff
members among whom 249 are teaching staff.

2.3.2 A Brief Investigation into Shanghai Maritime University

Table 2.4 shows the total graduate number each year and the respective graduate
number by department for ship officers in the past decade. Table 2.4 indicates that
the total number (922) of graduates in 1995 was 2.43 times as much as compared
with that of 1985 (378), and more significantly, the number of ship officer
graduates (474) in 1995 is 3.06 times as much as that of 1985 (155). It was the first
time in 1995 that the percentage of ship officer graduates was over 50% in the total
graduates.

Table 2.4 Profile of the Graduates Number of SMU

<table>
<thead>
<tr>
<th>year</th>
<th>85</th>
<th>86</th>
<th>87</th>
<th>88</th>
<th>89</th>
<th>90</th>
<th>91</th>
<th>92</th>
<th>93</th>
<th>94</th>
<th>95</th>
</tr>
</thead>
<tbody>
<tr>
<td>naut.dep</td>
<td>63</td>
<td>90</td>
<td>92</td>
<td>102</td>
<td>83</td>
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<td>98</td>
<td>92</td>
<td>183</td>
<td>144</td>
<td>203</td>
</tr>
<tr>
<td>eng.dep</td>
<td>58</td>
<td>67</td>
<td>60</td>
<td>58</td>
<td>58</td>
<td>90</td>
<td>175</td>
<td>98</td>
<td>127</td>
<td>140</td>
<td>200</td>
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<td>electr.dep</td>
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<td>33</td>
<td>30</td>
<td>29</td>
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<td>30</td>
<td>32</td>
<td>61</td>
<td>63</td>
<td>71</td>
</tr>
<tr>
<td>sub.total</td>
<td>155</td>
<td>186</td>
<td>185</td>
<td>190</td>
<td>170</td>
<td>218</td>
<td>303</td>
<td>222</td>
<td>378</td>
<td>347</td>
<td>474</td>
</tr>
<tr>
<td>univ.total</td>
<td>378</td>
<td>402</td>
<td>483</td>
<td>528</td>
<td>654</td>
<td>688</td>
<td>713</td>
<td>630</td>
<td>799</td>
<td>703</td>
<td>922</td>
</tr>
<tr>
<td>sub/tot %</td>
<td>41%</td>
<td>46%</td>
<td>36%</td>
<td>36%</td>
<td>26%</td>
<td>33%</td>
<td>42%</td>
<td>35%</td>
<td>47%</td>
<td>49%</td>
<td>51%</td>
</tr>
</tbody>
</table>

Source: Shanghai Maritime University

However, the expansion of the faculty members meanwhile did not correspond to
that of the student number. Table 2.5 shows the profile of the faculty members. It
indicates that the total number of the faculty members (551) in 1995 was only 1.16
times compared with 1985 (475), although many lecturers were promoted to
associated professors and assistants to lecturers meanwhile.

Table 2.5 Profile of the Faculty Members of SMU

<table>
<thead>
<tr>
<th>year</th>
<th>85</th>
<th>86</th>
<th>87</th>
<th>88</th>
<th>89</th>
<th>90</th>
<th>91</th>
<th>92</th>
<th>93</th>
<th>94</th>
<th>95</th>
</tr>
</thead>
<tbody>
<tr>
<td>prof.</td>
<td>60</td>
<td>57</td>
<td>153</td>
<td>127</td>
<td>147</td>
<td>143</td>
<td>138</td>
<td>144</td>
<td>177</td>
<td>193</td>
<td>232</td>
</tr>
<tr>
<td>lecturer</td>
<td>255</td>
<td>260</td>
<td>325</td>
<td>270</td>
<td>299</td>
<td>286</td>
<td>331</td>
<td>332</td>
<td>354</td>
<td>303</td>
<td>260</td>
</tr>
<tr>
<td>assistant</td>
<td>160</td>
<td>147</td>
<td>327</td>
<td>261</td>
<td>256</td>
<td>253</td>
<td>205</td>
<td>214</td>
<td>108</td>
<td>59</td>
<td>59</td>
</tr>
<tr>
<td>total</td>
<td>475</td>
<td>484</td>
<td>805</td>
<td>658</td>
<td>702</td>
<td>692</td>
<td>674</td>
<td>690</td>
<td>839</td>
<td>555</td>
<td>551</td>
</tr>
</tbody>
</table>

Source: Shanghai Maritime University
In 1995, the Mercantile Marine College was formed in Shanghai Maritime University by amalgamation of two departments, viz. Navigation Department and Marine Engineering Department. It is expected to be concentrating on the education of ship officers and facilitating the implementation of the revised STCW Convention. Table 2.6 shows the profile of the faculty members in the Mercantile Marine College.

Table 2.6 Profile of the Faculty Members in Mercantile Marine College of SMU

<table>
<thead>
<tr>
<th>Academic Titles Distribution</th>
<th>professor</th>
<th>assoc prof</th>
<th>lecturer</th>
<th>assistant</th>
<th>others</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16</td>
<td>47</td>
<td>88</td>
<td>42</td>
<td>15</td>
<td>208</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Age Distribution</th>
<th>&lt;36</th>
<th>36~40</th>
<th>41~45</th>
<th>46~50</th>
<th>51~55</th>
<th>56~60</th>
<th>&gt;60</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>84</td>
<td>29</td>
<td>29</td>
<td>15</td>
<td>14</td>
<td>26</td>
<td>11</td>
<td>208</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Certificates Distribution</th>
<th>Master&amp;CE</th>
<th>C.M&amp; 2nd E</th>
<th>2ndM&amp;3rdE</th>
<th>3rdM&amp;4thE</th>
<th>others</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
<td>9</td>
<td>51</td>
<td>6</td>
<td>138</td>
<td>208</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Academic Degree Distribution</th>
<th>Ph.D.</th>
<th>MSc</th>
<th>BSc</th>
<th>others</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7</td>
<td>54</td>
<td>113</td>
<td>34</td>
<td>208</td>
</tr>
</tbody>
</table>

Source: Shanghai Maritime University

In Table 2.6, the main concern is the qualifications regarding sea-service experience. Among a total of 208 faculty members, 136 (65%) do not have competency certificates. With respect to the age distribution, young staff under the age of 36 accounts for a considerable proportion (40%) out of all 208 members. It is advantageous for the development of the college in the long term. It is, however, disadvantageous in the short term due to the current shortage of teaching staff at the age of between 46 ~ 55, who have been considered at the golden age for being a college teacher.
2.4 Current Quality Control Measures in the MET system

The maritime education quality has been the core issue in Chinese maritime education for the relevant maritime administration authority. In fact, the two major maritime institutions, Dalian Maritime University and Shanghai Maritime University, have been a part of the Chinese Higher Education System since their establishment in the early 1950s. They are under supervision of the State Education Commission as a part of Chinese Higher Education System. As a sort of specialised professional higher education, they are also under supervision of the Ministry of Communications. Theoretically, such double supervision should play an important role in education quality control, although it may not have been functioning well in practice due to many other reasons. The quality control was mainly carried out by the following means:

1) the National Examination for Admission

The yearly National Examination for Admission to Universities has been designed to test the basic and necessary knowledge of candidates who intend to go to university for further studies after finishing basic education in secondary high schools. The examination is organised, coordinated and harmonised nation-wide by the State Education Commission.

It is compulsory to sit the examination for every candidate who wishes to become a university student. The average ratio of enrolment is approximately 1:4. In other words, 75% of the candidates will be disqualified by the examination. Compared with some other countries in which universities do not have entrance examinations, the National Examination for Admission to Universities is really tough and strict for every candidate. It has ensured high quality of freshmen enrolled in universities year after year. The candidate students for the maritime institutions are of course without exception. They have to pass through the National Examination if they want to become students at maritime institutions. In this regard, the initial quality of students in maritime institutions is satisfactory.
2) Recruitment of teaching staff & their Qualification Assessment

The qualifications of teaching staff are fairly important in ensuring educational quality in universities. The minimum qualification requirements for teaching staff in general universities and maritime institutions are specified by the relevant rules set by the State Education Commission. Anyone who is to be or is a university teaching staff member must at least have a bachelor's degree.

Qualified teaching staff are in most cases recruited from graduates and postgraduates in teacher training colleges and in a few cases from graduates in non-teacher training colleges when necessary. In the latter case only those who have excellent grades can be recruited through deliberated selection by the relevant academic councils.

In addition, qualification assessment of teaching staff is usually periodically carried out by the academic councils of universities or the State Education Commission. Based on the qualification assessment, the promotion of teaching staff is largely dependent on their academic records including teaching performance, published academic thesis, and achievement in relevant scientific research fields.

3) Thesis Presentation & Award of Academic Degrees

There are three levels of academic degrees available in the Chinese higher education system, viz. Bachelor, Master, and Doctorate degrees. The two major maritime universities have been authorised by the State Education Commission to award BSc. and MSc. degrees in all specialities, as well as Dr. degree in a few specialities, such as Maritime Law and Ship Automation.

After finishing studies on relevant courses and passing examinations on all subjects, every student pursuing any levels of degree must submit a thesis to the course professor. The thesis should be relevant to the particular subject. Furthermore, the student must pass the subsequent presentation including oral examination of the thesis. The thesis presentation programme is organised and supervised by the academic committees of the universities or relevant authorities approved by the academic committees. As a compulsory requirement, fail to pass any one of the
required examinations or failure of the thesis presentation will result in students not being awarded the degree pursued.

4) Periodical External Audit

As a major part of education quality control procedures, external audits sponsored by the State Education Commission and the Ministry of Communications have been carried out periodically since 1979. The quality audit programme has been conceived to assess the institutional policies, educational strategies and plans including curriculum, as well as quality management procedures in universities. Such an audit programme, which has been controlled by the government, has played in practice an important role in improving overall educational quality in Chinese higher education. The maritime universities have benefited from such audit programmes.

2.5 Deficiencies in the Maritime Education System

In this section the existing deficiencies in the maritime education system are discussed. This does not necessarily mean that the existing MET system would be negated or reconstructed. It is only theoretically or academically to probe into the problems that would be obstacles for quality management and the implementation of the quality assurance mechanism in the existing maritime education system. The major deficiencies concerned are as follows:

- Organisational Structure
- Financial Difficulties
- Documentation Management
- Teaching Facilities and Accessories
- Performance and Function of Library
- Textbooks
- Teachers' Sea-service Experience
Organisational Structure
Traditionally, the maritime institutions have been under double jurisdiction of the Ministry of Communications and the State Education Commission. A double supervision system is, in positive viewpoint, advantageous to keep and raise quality standards. However, it could cause some adverse effects in negative viewpoint. Firstly this has resulted in an overall complex and unwieldy administrative structure. The overlap of organisational structures and responsibilities sometimes causes a waste of financial and human resources.
Secondly, the maritime institutions have to keep a close link with two superiors at the same time, which may cause difficulties for them in policy or decision making. Within the institution itself, the same administrative structure problem remains due to many other reasons. The administrative organisations of the maritime institutions are so huge that the number of administrative and logistical service personnel in the major three institutions accounts for more than two thirds (see section 2.3.1) of the total staff members. As the top administrator within the institution, the president has to pay more attention to the administrative organisation itself, rather than educational activities. Moreover, this over-sized organisation has brought about a series of problems, such as:
- Difficulties in management or manipulation
- Difficulties in communication both horizontally and vertically
- Huge expenditure on running costs
- Overlap of responsibilities or and unclear responsibilities
- Lower working efficiency

Financial Difficulties
The maritime institutions have been embarrassed by the shortage of financial resources since the beginning of their rapid expansion in the early 1980s. Due to the free Chinese education system, the financial resources of each maritime institution
are available merely by appropriation from the Ministry of Communications. The average expenditure per student yearly by the appropriation budget is around 2,000 RMB ($240). Counting the continuously rising inflation rate, the actual amount of appropriation has been reduced in recent years. However, the ceaseless increase of students created the growing needs for a corresponding expansion of student dormitories, laboratory equipment, as well as teaching staff.

The severe shortage of financial resources has caused a series of problems, such as:

- Shortage of money for upgrading of teaching facilities and accessories, as well as laboratory equipment
- Shortage of money for updating textbooks and informational sources
- Shortage of funds for scientific research
- Low salaries for teaching staff, which caused them lose their motivation and creativity

Obviously, all these problems would have adverse impact on the educational quality and are likely to be the major obstacles in preparation for implementing the quality assurance mechanism.

**Documentation Management**

As a major component in the organisational management and the quality assurance mechanism as well, documentation at different levels within the MET system with respect to lines of responsibilities, policies, plans, curriculum, performance records and evaluation reports should play an important role.

However, it remains a weak area in the Chinese MET system, particularly within the maritime institutions. Little attention has been paid to the matter of documentation because it is in most cases regarded as red-tape. There is no special division or department responsible for the collection and filing of various documents, and there is no systematic measures to conduct documentation management, for instance, raw data collection, statistic's analysis, document filing and preservation which are ready to be accessed or searched for reference when required.
As far as the documentation management is concerned, the major problems within the maritime education system are presented as follows:

- There is no distinction in documented educational policies that are suitable for different maritime education units at different levels, for instance, university, academy, as well as vocational training school.
- Due to lack of communication resulting from the colossal organisation within institutions mentioned before, there is no centralised management at institutional levels on a variety of documents issued by different departments.
- Changes and revisions with respect to policies, plans and curriculum are sometimes not reflected in official documentation.

**Teaching Facilities and Accessories**

Due to historical reasons, Chinese higher education, and without exception maritime higher education as well, has always focused on theoretical learning. Most educational activities, such as the teaching and learning programmes, are carried out in classrooms. Blackboard and chalk have long been the dominant teaching instrument. With the development of world-wide science and technology, advanced teaching facilities have been introduced into classroom activities, such as audio-visual appliances, projectors, as well as micro-computers, which can improve the education and training effectiveness considerably.

However, these facilities that are available nowadays in almost every institution in China could not be widely employed in the educational activities as expected because of inadequacy in numbers. Moreover, getting things worse, even the facilities available could not be employed efficiently due to traditional attitudes and ignorance of human beings. In other words, human beings are not aware of potential benefit from modern teaching facilities to educational effectiveness.

Practical skills of graduate students from the maritime institutions in China have been the major concern and are not to the satisfaction of shipowners, despite their sound theory foundation. Obsolete laboratory equipment and inadequate practice
hours in the laboratory are some reasons for the weaknesses in practical skills. Most of laboratories and their facilities in the maritime institutions, except for those latest simulators, were established in the late 1970s and are obviously obsolete. They need not only to be upgraded or renewed, but also enlarged in order to match the growing number of students. Unfortunately, the institutions can not afford the cost due to financial austerity. With respect to practice hours in the laboratory, although more laboratorial hours, i.e. 141/2800 for engineering, and 58/2800 for nautical students, have been arranged than before, the training effect remains unsatisfactory.

Performance and Function of Library

The library should have been the information centre within the institution. However, the library does not play an important role as an information centre due to both financial and managerial reasons. Taking the library of Shanghai Maritime University (SMU) as an example, Table 2.7 indicates a profile on the realities of libraries within the maritime institutions in China.

Table 2.7-(a) Profile of the library of SMU (Date: 31-12-1994)

<table>
<thead>
<tr>
<th>Appropriation USD/year</th>
<th>% in total edu. expenditure</th>
<th>Circulation vol (Vol.xTime)</th>
<th>Total Volume</th>
<th>Number of readers</th>
</tr>
</thead>
<tbody>
<tr>
<td>64592</td>
<td>4%</td>
<td>90985</td>
<td>655738</td>
<td>5670</td>
</tr>
</tbody>
</table>

Table 2.7-(b) Computer Application in library management at SMU

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Terminal</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Circulation System</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Procurement System</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Editing System</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Periodical Management</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Searching System</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Financial Management</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Personnel Files</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Statistics Analysis</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Internet</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Campus NET</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
From Table 2.7-(a) the volumes in circulation during one year period are only 90985 (vol. x time). In other words, circulation volume per month per reader is merely 1.3 (vol. x time). It accounts only for nearly 14% of the total volumes held by the library. The major reason for the low efficiency can be found out in table 2.7-(b). Since a computer searching system is under establishment, searching for required information is still done manually in a forest of open shelves, which restrains the readers’ desire to borrow books and in turn lower the circulation rate. From Table 2.7-(b), except for Editing System and Circulation System, which is limited to check-in and check-out, no other computer managerial systems are available at present. This degrades the performance and function of the library.

Needless to say, the financial problem is the another main concern. From Table 2.7-(a), for such a big library which has 5,670 readers and holds 655,738 volumes of books, the total amount of the appropriation obtained from the institution is 538,700 RMB($64,592) per year. It is equivalent to 95 RMB($11.4) per reader for each year. It accounts merely for 4% of the total educational expenditure of the institution. Severe shortage of money brings about a series of problems, mainly:

- Lack of financial support to set up a complete computer managerial system which comprises all the necessary items listed in Table 2.7-(b) for the operation of a library with high efficiency.
- Shortage of financial resources to hold a wide range of periodicals, conference proceedings and books regarding the latest maritime information.

All of these problems could have indirect impact on maritime education quality.

Textbooks

International shipping has undergone an unprecedented technological revolution during the past two decades. Textbooks, which are the major sources to systematically acquire subject knowledge for students, should and must be updated periodically, and thus keep abreast with the development of science and technology.
Many textbooks being used in the maritime institutions in China are of the 1980s' edition or even earlier. They are obviously out-dated and need to be re-edited. However, this is easier said than done. The first problem is that few teachers are willing to do re-editing work of the obsolete textbooks, since there is very little reward paid. The second difficulty lies in no managerial plan and fund on part of the administration in the institutions for updating textbooks. A great deal of attention should be paid to the problems of textbooks on part of both administrators and teaching staff, because the quality of textbooks would have direct impact on educational quality.

**Teachers Sea-service Experience**

Traditionally, most teaching staff have been recruited direct from undergraduate students and postgraduate students in universities, but rarely recruited from ship masters or chief engineers. Meanwhile, few masters or chief engineers have been willing to leave the sea to teach. Therefore, as far as teachers' qualifications are concerned, the major problem is their sea-service experience.

Statistics result in section 2.3.2 shows that 136 out of a total of 208 faculty members in the Mercantile Marine College of SMU do not hold any certificates of competency. Among all 71 staff who hold certificates of 3rd Officer or 4th Engineer and above, only 6 of them have got certificates of Ship Master or Chief Engineer. For a Mercantile Marine College which mainly focuses on the education of ship officers, the above figures are not satisfactory and not enough to maintain the education standards in future programmes.
3.1 The Characteristics of Maritime Education

Before introducing the quality assurance mechanism adaptable to maritime education, it is necessary to understand the characteristics of maritime education.

3.1.1 Definition of Maritime Education

According to Collins Cobuild English Language Dictionary (1987) the following definition is given:

- **Maritime** is used to describe things relating the sea and to ships.
- **Education** is the gradual process by which people gain knowledge and understanding through formal and systematic training or study.

In this context, the definition for maritime education can be described as follows:

*The gradual process by which people acquire intellectual ability and knowledge as well as skills pertaining to the sea and ships through formal and systematic training or study.*

The phrase “maritime education” has, for many years, been closely identified with the training of ship operators, i.e. the seafarers. Nevertheless, with the development of maritime technology, maritime education has changed in recent years and will continue developing not only in terms of its depth, but also in terms of its adaptability and comprehensiveness arisen from the changing maritime industry. In other words, maritime education should no longer be defined narrowly as the training of seafarers only. Rather, it should also include education and training of shipping
managers, port operators, shipping brokers, insurers, ship surveyors, and etc. who are indispensable personnel for the shipping industry.

3.1.2 the Characteristics of Maritime Education

Compared with general higher education, maritime education has its particular features in some specific areas. They are described briefly as follows:

**Function of Maritime Education**

Traditionally and historically, maritime institutions in most developed maritime nations like the U.S.A. and the U.K., have long been performing a double function in maritime education. These institutions have been on the one hand constrained to equip students to become ship’s officers with highly specialised skills and knowledge and, on the other hand, have been pressed to offer both educational experience and academic credentials that would allow the seafarer to enter into land-based jobs that bear some relation to the four years or more of specialised training he has undergone. While nautical students enter a highly specialised and temporary career as a seafarer, there is increasing expectation that their education will give them both occupational skills and social status. Their skills and social status may be carried into the society of landsmen after they leave seafarer career.

Paradoxically, functions of social mobility and social stratification seem to predominate where there is a declining market for ship’s officers, whereas the needs of the national collectively appear to be the dominant force where there is an open and expanding market for merchant marine officers. The current maritime education in China typifies the latter situation.

With its expanding merchant fleet and the international seafarer labour market, nautical education and training for ship officers is restricted in its applicability to shipboard service with little opportunity to re-enter land-based society because the graduates from maritime institutions are regarded as a precious resource supporting the national fleet. Due to lack of social mobility for ship officers, Chinese maritime
Education is facing increasing conflict in performing the double functions, viz. service aboard ships and social status on land. This conflict has led to the difficulties in recent years in recruiting students for ship officers.

**Reality of Maritime Education and Its Market**

Educational institutions are general resources which can be mobilised and utilised to maximise the interests of a variety of potential beneficiaries. Two distinct and easily recognisable beneficiaries of maritime education are the national economy and the students.

As in a number of other nations, the merchant fleet in China is generally regarded as the symbol of the national interest and image because the political and economic fortunes of China nowadays are so dependent upon the international trade and commerce. From this perspective maritime education can be viewed as an instrument for a national purpose. At the same time, maritime education can also be viewed as a resource designed to satisfy the interests of the students who expect to realise their social status by acquiring higher maritime education.

Clearly, each maritime education system is linked both to the economic realities of the market for which it is training students, and to distinctive systems of external control and accountability. Maritime institutions in all countries are thus confronted with their own unique sets of problems in adapting to the peculiarities of their market economies. Due to fluctuations of the market, however, a maritime institution may in some cases be totally incapable of making what might appear to be an easy and optimum adjustment to a clearly understood and easily discernible market contingency. The operation of a maritime education system is thus more sensitive to the national economy and more adventurous than other educational institutions.

The Chinese maritime education system is currently facing such a critical moment as to how it could make adjustments to adapt to the changing market. The conflict between quality and quantity is just one of the critical issues arisen from the changing maritime industry.
Occupational Characteristics of Ship Officers

Ship officers in navigating department on board ships are responsible for the general supervision of the movement of the ship from port to port; for the legalities involved in entering and departing foreign and domestic ports; for the maintenance of shipboard order; and for the loading, storage, unloading of cargoes. The basic scientific knowledge demanded of these officers is mainly in the fields of mathematics, physics, and communications technology, which become translated into practical technologies of navigation, ship manoeuvring, cargo handling and other duties.

Ship officers in the engineering department are in charge of the operation, maintenance, and repair of the ship's engines and other auxiliary equipment. Again, the theoretical-scientific base for this work must be translated into basic engineering skills suitable for the specific tasks of marine engineers.

In this context, it is obvious that the acquisition of practical skills for ship officer candidates should be dominating in the process of maritime education. This is one of the major reasons behind the revision of the STCW/78. In essence, the revised STCW/95 has changed from knowledge-based to competency-based certification.

Operational Involvement by Teaching Staff in the Shipping Industry

Operational involvement by teaching staff in the shipping industry is another particular feature of maritime education. This aspect is, in essence, an aim of quality control. An issue that is often identified by employers and trainers alike is the problem of teaching staff being out of touch with industrial development. To assist academic staff in maintaining a modern industrial profile, maritime institutions should have a policy to encourage teaching staff to be involved in industrial research and consultancy.
Compulsory Requirements by International Conventions

Navigation activities of human beings at sea have been regarded as a risky and adventurous undertaking ever since it turned up in the early fifteenth century. It still remains a dangerous profession although its safety and reliability have been greatly improved due to the development of modern science and navigation technology.

The Lloyd’s Register of Shipping Casualty Returns for 1958 — the year before the IMO Assembly met for the first time — showed that 16 per cent of the merchant shipping tonnage lost that year resulted from collisions and a further 32 per cent from groundings or striking wrecks. The vast majority of these casualties — nearly half the total for that year — were caused by navigational error. (Focus on IMO, Feb. 1990)

It is hardly surprising, therefore, that IMO has always paid great attention to the improvement of navigational safety. Since 1959 a whole series of measures have been introduced, in the form of conventions, recommendations and other instruments. The best known and most important of these measures are conventions, three of which are particularly relevant to navigation. They are: the International Convention for the Safety of Life at Sea, 1974; the Convention on the International Regulations for Preventing Collisions at Sea, 1972; and the International Convention on Standards of Training, Certification and Watchkeeping for seafarers, 1978. Each state that ratifies or accedes to a convention is obliged to put it into effect by making its requirements part of its own national law.

All of the above three conventions, particularly the STCW/78 Convention, have brought about a tremendous impact on maritime education since they were ratified by the Chinese government and came into force in the early 1980s. No educational institutions in China other than the maritime institutions are legally bound and obliged to carry out educational activities by the international conventions and corresponding national law. It is indeed a salient feature of maritime education.
Diversification of Maritime Education

With the rapid development of maritime technology, there has been over recent years an irreversible tendency world-wide towards diversification in maritime education. Maritime education is no longer constrained to the training of ship officers. Rather, with the adoption of new maritime technology in the shipping industry, such as computerised integrated management, containerisation, and fully automated ships, there is a growing need for education and training of land-based managerial personnel, such as shipping managers, port operators, shipping brokers, insurers, and surveyors. These land-based specialised personnel are of no less importance than ship officers in view of the safety of shipping. Many new courses regarding shipping management, maritime law, logistics, computer science, etc. have been, or are being developed. It is foreseeable that more new courses in the near future are expected to be developed by the changing needs of maritime technology. Diversification of courses is changing the traditional concept of maritime education, which used to focus on the education of ship officers.

3.2 Challenges for MET
3.2.1 Impact of the New STCW Convention

Background of the Revision

When the STCW/78 Convention entered into force on 28 April 1984, it was expected that its requirements would ensure the competence of masters, officers and ratings of all seagoing ships and their safe operation through efficient watchkeeping. As with all IMO Conventions it reflected the highest practicable standards which could be globally agreed at the time of its adoption. However, the STCW/78 has been regarded since its adoption as a compromise between those nations wanting very high standards and those countries concerned about their ability to implement such measures. Despite its broad global acceptance, it was realised in the late 1980s that
the convention was not achieving its purpose. In more recent years, three particular concerns about the existing Convention have been identified:

1) STCW/78 does not in fact contain precise standards of competence relating to the abilities needed to perform shipboard functions safely and effectively. Because the provisions of the existing convention have been open to different interpretation, they have failed to establish a uniform minimum level of competence internationally.

2) Neither the process by which countries have ratified the convention, nor the provisions of the convention itself, have been sufficient guarantees to ensure that STCW requirements have been implemented world-wide or sufficiently enforced. Consequently, there has been a loss of confidence in the reliability of STCW certificates issued by certain governments as an indicator of seafarers’ competence.

3) The existing Convention is written in terms of conventional shipboard work organisation based on traditional divisions between the deck and engine departments. It has therefore failed to accommodate modern developments in training and shipboard organisation. This has already proved too restrictive, limiting the potential career development of seafarers and preventing any safety-enhancing redistribution of workload on board during intensive working periods. In short, the existing Convention lacks the flexibility to meet the industry’s anticipated needs in the 21st century.

Following a series of high profile maritime casualties, which drew additional attention to concerns about general levels of crew competence, the IMO Secretary-General initiated a fast-track revision of the Convention. In July 1995, this accelerated revision process was finalised with the adoption of a package of radical amendments to the STCW Convention at an IMO Diplomatic Conference. The main aims of the revision were:

- To transfer all detailed technical requirements to an associated Code;
• To clarify the skills and competence required;
• To require administrations to maintain direct control over and endorse the qualifications of those masters, officers and radio personnel they authorise to serve on their ships;
• To make Parties to the Convention accountable to each other, through IMO, for their proper implementation of the Convention and the quality of their training and certification activities;
• To have the amendments enter into force for all Parties to the Convention with the least possible delay.

(Stan Morrison, 1995)

Impact on Maritime Institutions

Obviously, the radical changes made in the revised STCW Convention will bring about a tremendous impact on the parties to the Convention once it enters into force on Feb 1, 1997. To effectively implement the revised Convention, preparation work and actions must be taken by governments, maritime institutions, shipowners, as well as shipping companies. As far as the maritime institutions are concerned, the impact of the revised Convention on the activities of maritime institutions is mainly in the following aspects:

• Focus on Competence

Although most of the knowledge requirements necessary for deck officers, engineering officers, and radio officers remain unchanged, the revised Convention now focuses more than ever before on the competence necessary to perform the functions concerned. All existing courses and training materials must therefore be reviewed to ensure that training outcomes are linked to the competence specified under the Convention and require the correct and intelligent application of all associated knowledge, proficiency, and skills.
• **Quality Standard**

All training and assessment of seafarers must be administered, supervised and monitored; trainers and assessors must be appropriately qualified, in accordance with the requirements of regulation A-I/6. Quality standards must be applied to all training and assessment activities in accordance with the provisions of regulation I/8 and Code A-I/8. An independent evaluation of the quality standards and the activities they cover must be conducted at intervals of not more than five years. In this context, the national academic standard organisation or committee should beforehand establish quality standards well suitable for application to the maritime education activities.

• **Professionalism and Safety Culture**

Every opportunity should be taken to strengthen the professionalism of all seafarers and to encourage the development of a strong safety culture on board ships of all types, particularly those which carry passengers or carry hazardous cargoes. Short courses and seminars to enhance the knowledge and motivation of serving seafarers should be developed by maritime institutions in consultation with the maritime administration and the shipping industry.

• **Reports on MET Institutions to IMO**

Before 1 August 1998, each party must communicate the information required by regulation I/7 and Code A-I/7 to the Secretary-General of IMO. Information regarding MET institutions, such as a statement of the education, training, examination, competency assessment and certification policies adopted, a summary of the courses, training programmes, examinations and assessments, etc., constitute major components of the report. In addition, the results of each evaluation carried out pursuant to regulation I/8, paragraph 2 within six months of its completion should also be reported. The report should describe the terms of reference of the evaluators, their qualifications and experience, the date and scope of the evaluation, the deficiencies found and the correction measures recommended and carried out.
Alternative Certificates

The revised Convention permits a party nation to issue certificates to seafarers using alternative arrangements not based solely on conventional divisions between Deck and Engine department. Alternative certificates can only, of course, be issued to candidates who meet all the requirements of the revised Convention. Even if alternative certification is not going to be introduced by the party or parties concerned in the near future, there is merit in taking the opportunity to redistribute course content so that courses are aligned with the functions identified in the revised Convention. Noticeably, alternative certification may require redevelopment of curricula in many countries including China.

Other Aspects

As in all international conventions or treaties, the standards prescribed by the STCW Convention are minimum. STCW standards of competence should thus form the core curricula of all maritime institutions and constitute the basis for evaluating and approving training provisions for masters, officers, ratings and other personnel who are to serve on seagoing ships. Attention should be paid to aspects like: Radar and ARPA training by simulator will become mandatory; use of simulators in other areas will be encouraged, but simulator performance standards must be complied with the relevant requirements. In addition, there will also be increased requirements for revalidation, refresher and updating training.

3.2.2 Impact of the ISM Code

Background of the ISM Code

Safer Shipping and Cleaner Ocean, this slogan has been disseminated throughout the maritime world by IMO since its foundation and has become the well-known spirit of IMO. After having recognised the potential damages, which may occur through substandard ships, following a number of marine casualties in recent years and major environmental damages, IMO adopted the ISM Code in Nov. 1993. This Code created a world-wide standardisation of safety management and is aimed at
improving the general safety standards of ships, thus to ensure safety at sea, prevention of human injury or loss of life, and avoidance of damage to the environment, in particular to the marine environment and to property. It is due to become mandatory for most vessels by June 1998.

The ISM Code demands an initial assessment and ongoing annual assessments of the shore-based organisation of a shipping company and the ships of the fleet. The fundamental requirement of the Code is that a safety management system be in place in the shipping company. This should include the following:

- a safety and environmental protection policy
- instructions and procedures to ensure safe operation and protection of the environment
- defined levels of authority and lines of communication between and amongst shore and shipboard personnel
- procedures for reporting accidents and non-conformities
- procedures to prepare for and respond to emergency situations
- procedures for internal audits and management reviews

To put it simply, the ISM Code is an internationally recognised standard for the safe management and operation of ships and for pollution prevention.

Impact on Maritime Education and Training

The ISM Code in itself would no doubt have a direct impact on the operation and management of a shipping company. Nevertheless, it seems that it has nothing to do with maritime education. It really has, however, much to do with maritime education for the sake of dissemination of the ISM Code, specialised training and education for senior managers and ISM Code auditors, as well as some legal implications of the ISM Code.

- Dissemination of the ISM Code

According to Dr. H.G. Payer (1995), Executive Board Member of Germanischer Lloyd (GL), "The philosophy behind the Code is to eliminate as far as possible
uncertainties about responsibilities, the flow of information and communication, and to set clear procedures for action in case of an emergency." Unfortunately, this philosophy is not well understood and accepted by the people concerned. Some of them still believe that the ISM Code is a bureaucratic decision causing extra documentation, more paperwork, and yet another survey with which to contend (Lloyd’s List, Nov. 21 1995). Obviously, the implementation of the ISM Code in such a large maritime country as China is certainly difficult, since there are hundreds of shipping companies and nearly 2,000 vessels (over 300 grt) there. If the people involved do not realise the benefits and the legality of ISM Code, but regard it as bureaucracy, it is almost impossible to implement ISM Code effectively. Nevertheless, the ISM Code is coming and failure to comply could result in ships being unable to trade. This is a fact the shipping industry has to face. Maritime institutions should thus take the responsibilities for the dissemination of the ISM Code in China.

A company with an ISM certificate achieved through proper preparation of procedures and religious commitment to the implementation of the system, according to J. Vaidyanathan (1995), the Senior Technical Manager of ETA ship Management, is bound to benefit in terms of

1. selection of properly trained personnel
2. improvement in the safety management skills of the personnel
3. a culture that promotes awareness as regards to safety and environmental protection
4. increase in operational efficiency, optimise performance and minimise delays and other costs
5. reduction in likelihood of accidents, insurance claims and in turn reduction in insurance premium rates

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Training for ISM Auditors and Senior Managers

Section 13 of the ISM Code states that certification is the responsibility of the flag administration. Many administrations, however, have not yet confirmed who will get to administer the Code. It has been assumed that classification societies would be entrusted with this task. The major concern is, nevertheless, that there is a severe shortage of experienced and knowledgeable auditors to undertake this mammoth task of certification.

Maritime institutions should thus take the responsibilities for the training and education of those auditors who undertake verification of compliance with the requirements of the ISM Code, and those senior managers in shipping companies who take all duties and responsibilities imposed by the ISM Code. With respect to the education for the personnel performing the ISM Code verification, the IACS Procedural Guidelines issued by IMO on its MSC66/INF.3 has specified the standards of competence for the above personnel as follows:

1) These personnel shall have as a minimum the qualification from a tertiary institution recognised by the administration or by the IACS Member Society with a relevant field of engineering or physical science (minimum two years programme), or qualification from a marine or nautical institution and relevant seagoing experience as a certified ship officer.

2) These personnel shall have undergone theoretical training in accordance with ISO 10011-1.1991(E) or equivalent national standard to cover at least such aspects as: audit techniques of examining, questioning, evaluating and reporting; knowledge and understanding of the ISM Code; mandatory rules and regulations; technical or operational aspects of safety management; and procedures relevant to the certification process.

Recognising the importance of having a common approach for ISM Code certification, IACS has established a IACS Model Course for training ISM Code
The course is structured to include all the elements that are necessary to comply with IMO resolution A.739(18). For this purpose, the IACS Model Course is subdivided into the following five modules:

- **Module 1** basic knowledge of quality management system criteria
- **Module 2** knowledge and understanding of the ISM Code
- **Module 3** outline of mandatory rules, regulations and applicable codes, guidelines and standards
- **Module 4** basic knowledge of shipping and shipboard operations, including technical and operational aspects of marine safety management
- **Module 5** procedures and instructions for planning and performing verification of compliance with the ISM Code

In this context, new courses could be developed in maritime institutions to meet the training needs created by the effective implementation of the ISM Code.

### 3.2.3 Impact of the Maritime Market

“China could replace the Philippines as the world’s largest supplier of seafarers in the foreseeable future.” This prediction, which was reported in *The Sea* published by The Missions to Seamen, came from Wallem Group chief executive H. Gilbert (1996) in the Manila Conference.

“With their (Chinese seafarers) competence not in question, the Chinese may begin to look more attractive as the new regulations begin to bite, particularly when their costs are considered by the shipowner.” (Andrew Guest, 1996)

Having noticed those predictions, some Chinese Maritime educationalists would probably be complacent. However, if noticing the wording *Could* and *May* in the above reports, nothing can be complacent. They are merely predictions, not reality that has come true. To materialise those predictions, much work needs to be done, particularly in improvement of quality. As A. Guest (1996) wrote in the same article:
China has been often quoted as the next great source of labour for shipping and likely to replace the Philippines, but has yet to prove itself in any significant way.

Here the significant way implies the concern with the further improvement of quality.

The updated version BIMCO/ISF-1995 Manpower Report, which is an update of the 1990 study into manpower carried out by the BIMCO and ISF, indicates only a slight shortage (4.4%) for officers, and an overall excess for ratings. This result seems to be unexpected, because many people including the report writers themselves once believed there could be at least a 10% of shortage of officers by 1995 when they issued the first Manpower Report in 1990. In fact, however, “Based on anecdotal evidence over the last five years, it has been obvious for some time the real problem has been one of quality, not quantity.” (Andrew Guest, 1995)

This conclusion could also be applicable to the current situation in China, which seems to be facing options between quantity and quality. In the past few years, the number of enrolments in Chinese maritime institutions has been expanding rapidly because the authority relevant over-estimated the shortage of ship officers. According to Harry Gilbert (1996), however, the real picture is that there are around 330,000 Chinese seafarers, among which 60,000 are ship officers. Some 10% (30,000) of these seafarers are working on foreign-flag ships, among which 10,000 are ship officers.

On the other hand, the number of ships (over 300grt) of the national merchant fleet by Dec. 1995 were 1,847. Even if a high wastage rate is taken into consideration, the stock of seafarers is large enough in the short term to man the national fleet and to supply the international crew market.

The facts mentioned above once again provides with the evidence that quality but not quantity issue is a challenge for Chinese maritime education.

At the end of the BIMCO/ISF-95 Report, the writer summarised the following main conclusions for the future of the maritime industry over next the 5-10 years, which
could be a guideline or reference for policy-makers concerning maritime education
and training:

- The balance of supply and demand is likely to tighten as far as officers are
  concerned;
- Greater difficulties are anticipated in the availability and recruitment of senior
  officers from the western European nations;
- Training levels will need to be maintained at high levels to prevent a worsening
  of the current position;
- Wastage problems are an important issue;
- Quality of the available supply of seafarers is also likely to remain a major
  concern.

From the above conclusions, considering the reality of the existing number of
seafarers in China, it is evident that quality is the only choice at present. As the
author emphasised in the previous section, quality should be put on the top agenda in
maritime education.

In addition, the development of maritime technology, such as automation,
computerisation, containerisation and trade globalism, necessitate an increasing need
for a variety of specialised maritime personnel ashore, not solely ship officers on
board. Shipping managers, port operators, shipping brokers, insurers, and surveyors
are becoming indispensable personnel in the modern maritime industry. To meet the
needs of the maritime market, curriculum and courses should be revised continuously
and new courses could be developed if necessary.

3.3 Potential of Development

3.3.1 Post-graduate Education

Post-graduate education has increasingly played an important role in Chinese higher
education. It has become an indispensable part of the higher education. Many
universities have been authorised by the State Education Commission to award Master’s Degrees and Doctor’s Degrees.

The post-graduate education in the maritime universities started in 1979. Although only Master’s Degrees have been available so far, the post-graduate education itself has contributed a lot to the maritime industry and higher maritime education, particularly scientific research on maritime technology. Nevertheless, the potential of development for the post-graduate education in terms of its level and size can still be found.

Table 3.1 shows the number of Master’s Degrees awarded in the recent five years by Shanghai Maritime University.

Table 3.1  Master’s Degrees Awarded by SMU

<table>
<thead>
<tr>
<th>course /year</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipping Economics</td>
<td>8</td>
<td>1</td>
<td>9</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Economics &amp; Maritime Law</td>
<td>10</td>
<td>13</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Theory &amp; Practice of Translation</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Engineering Mechanics</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Marine Engineering</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Computer Technology &amp; Application</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Ship Automation</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Navigational Technology</td>
<td>8</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Shipping Management</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>47</td>
<td>35</td>
<td>37</td>
<td>31</td>
<td>53</td>
</tr>
</tbody>
</table>

Table 3.1 shows that the number of post-graduates is fairly small, if compared with that of undergraduates and its overall size of the university, which is producing nearly 1,000 graduates yearly (see section 2.3). The reason behind this is that the university has been in shortage of human resources supporting large size post-graduate education and also lack of necessary laboratories and facilities for scientific research, which is one of the major compulsory requirements for post-graduates pursuing Master’s Degrees, particularly for MSc Degrees. Another reason is that the university itself lacked autonomy in deciding the size of enrolment due to tight
control by the relevant education authority. As a result, the number of post-graduates of the maritime institutions has remained at a relatively low level.

In view of social mobility and stratification, however, post-graduate education is becoming popular among undergraduates, maritime personnel in shipping companies, as well as those ship officers who are intending to leave sea for land-based jobs. They are willing to study post-graduate courses for the sake of their career development, although the admission examination for post-graduate courses has been really stringent and the ratio of enrolment has been fairly low.

On the other hand, in view of the maritime university itself, post-graduate education could push the education standards in terms of academic level onto a higher step. In this connection, the potential for expansion and the drive for development of the post-graduate education in the maritime universities are evident as long as the resource problem can be solved.

3.3.2 Multi-purpose Courses

It is well known that dual-purpose courses and bivalent programmes or polyvalent programmes in ship officer training have been prevailing in some developed countries due to high Manning cost for ships. However, as many other developing countries, dual-purpose courses and bivalent programmes or polyvalent programmes are still not available in the Chinese maritime universities. The major reason is that the Manning cost in China does not take, compared with that of developed countries, a considerable part (5%~10%) in the total operation cost for ship owners. It is thus unnecessary in the short term to run dual-purpose courses or polyvalent programmes in Chinese maritime universities, if reducing Manning costs takes first priority.

However, in consideration of the high qualifications of the graduates and their social mobility, multi-purpose courses in various specialities, not just in ship officer’s training, may become necessary in the future. For instance, students who major in Marine Engineering could compulsorily or optionally study subjects like Maritime Law and Shipping Management. Such cross-studies in different subjects can not only
broaden the views of the students, thus improving their qualifications, but also provide the graduates with more opportunities for career development and professional adaptability.

In fact, the difficulties facing Chinese maritime universities in recent years in recruiting candidate ship officers have something to do with lack of social mobility for the graduates, which has resulted in lowering the quality of freshmen. To attract candidates with high quality, much attention should be paid to the issue of social mobility. Multi-purpose courses may be one of the several measures to be taken to solve this problem.

3.3.3 The Upgrading of Educational Standards

With the rapid development of maritime technology, as the author mentioned in section 3.1, there has recently been an irreversible world-wide tendency towards diversification in maritime education. Obviously, maritime education today is no longer constrained to the training of ship officers. For a comprehensive maritime university like DMU or SMU where the diversification of courses has been put into practice for years, the upgrading of educational standards should take first priority in the future developments. In addition to the wide coverage of diversified courses, post-graduate education including PhD degree courses, should be developed, improved or extended.

However, except for DMU, PhD courses in major maritime institutions have not yet been approved by the State Education Committee due to the shortage of necessary equipment and human resources. In this case, MSc degree courses should firstly be improved and extended, particularly in terms of course depth. On the basis of the successful running of Master's degree courses, the maritime higher institutions should be authorised to run PhD course and offer PhD degree, thus to raise educational standards in terms of academical level. Much work should be done, if PhD courses are to be approved by the State Education Commission.
4.1 Quality Assurance in General Context

Before the author attempts to develop the Quality Assurance Mechanism adapted to the maritime education system, it is essential to understand basic concepts about quality and quality assurance in the industrial context.

4.1.1 Quality

There are many definitions for quality which have been defined earlier by various writers. Here is a selection:

- Fitness for use. (Juran, J.M., 1974)
- Conformance to requirements. (Crosby, P.B., 1979)
- The degree to which product characteristics conform to the requirements placed upon that product, including reliability, maintainability, and safety. (QS_NORM Draft of Swiss Standard Association, 1981)
- The degree to which a product or service is fit for the specified use. (Seghezzi, H.D., 1981)

The International Standard Organisation definition of Quality is given in its document ISO8402 Quality vocabulary. ISO 8402 precisely defines Quality as follows:

The totality of features and characteristics of a product or service that bear upon its ability to satisfy stated or implied needs.
As a matter of fact, these five definitions can be considered almost the same as they are complementary, because each of them emphasises a particular point which is only implicit in the others.

4.1.2 Quality Assurance

Similarly as the definition of quality, the technical language of quality assurance with its terms and concepts is not standardised. Here are two examples for the definitions of quality assurance, which reflect the concepts of quality assurance.

- A planned and systematic pattern of all means and actions designed to provide adequate confidence that items or services meet contractual and jurisdictional requirements and will perform satisfactorily in service. Quality Assurance includes Quality Control.
- All those planned or systematic actions necessary to provide adequate confidence that a product or service will satisfy given needs.

The following viewpoints provide in detail concepts of quality assurance that consider together all the efforts that go into production or provision of quality items. (Madhav N. Sinha, 1985)

- Quality Assurance, as an act by the producer means promise, conformance with quality specification, and to meet other understood requirements.
- Quality Assurance means to create confidence not only in the integrity of the product and service, but between producer and consumer.
- Quality Assurance means that the producer takes every measure to ensure positive quality for the physical as well as non-physical characteristics attached to its products and services.
- Quality Assurance means care in the design, production, and service of a product.

Obviously, quality assurance is the most desired goal in quality management. Quality assurance usually requires documented evidence for respective procedures and
measures in production, for overall attainment of quality. Moreover, quality assurance does not end with management that contracts with the consumer. Rather, it is an ongoing commitment that requires concern from everyone involved: staff, suppliers, governments and consumers. In a generalised context, quality assurance is a comprehensive management responsibility, which involves both planning and control. It should be borne in mind that all these concepts mentioned above about quality assurance in the industrial context are applicable in maritime education.

4.2 Importance of Quality Assurance in Maritime Education

The importance of quality assurance in maritime education is analysed in the following aspects.

4.2.1 Difficulties in Assessment of Educational Quality

It is obvious that both quality and quality assurance establish consumer satisfaction and confidence. Without good quality, future business of the company will soon be undermined. Doubtlessly, it is strongly believed today that the quality of the product of a company means, to some extent, the life of a company.

Unfortunately, with regard to maritime education, the quality problem has not been paid as much attention as it should have been. One of the reason is that education quality is not as easily assessed as industrial products, especially maritime education quality. The quality standards of a product, such as reliability, durability, safety, etc., are easily set up and therefore its quality is easily assessed. However, what on earth is the maritime education quality? Is it enough to assess only the quality of graduates who are regarded as the output of maritime education? How can maritime education quality be effectively assessed? The answers are not so easy to find. As Mr. Gareth Williams and Mrs. Cari Lord (1990) stated:

but higher education is not an easy activity to evaluate. Outputs and processes are many and complex. There is no simple relationship between inputs and outputs and it is subject to many random influences.
In addition, the requirements for marine officers have been changed from traditional knowledge-oriented to competency-oriented in the new STCW/95 Convention. This remarkable change makes the assessment of maritime education more complicated, since it is easier to evaluate the knowledge than to evaluate competency.

In this context, there has to be such a quality assurance mechanism, i.e., to take every possible measure to ensure maritime education quality throughout the whole educational process, thus to create confidence between MET institutions and the shipping industry.

4.2.2 Requirements of the STCW Convention

As mentioned in 3.2.1, the new STCW Convention, for the first time, put forward the regulation regarding Quality Standard and Quality Assurance. A serious problem in maritime institutions is that a quality assurance mechanism must be set up in order to meet the requirements of the newly revised STCW Convention, no matter how difficult practically the evaluation of the education quality is. If the quality assurance mechanism, which is considered as an assurance of the maritime education quality, is not established by Feb 1, 1997, the certificates issued by the party are likely to be rejected by IMO and other signature parties to the STCW Convention. It could mean that these maritime institutions that do not have a quality assurance mechanism in place would be superseded.

4.2.3 Competition for the Labour Market

In recent years, with the steady increase of the world merchant fleet, the shortage of ship officers is becoming evident. It will be a tendency that most shipowners are willing to employ crew from developing countries due to lower labour prices. The competition between developing countries which are capable of supplying crew to the international maritime labour market for the market share will be fierce.

China is among those countries who have great potential to be crew supplier. It is no doubt that China is competitive at present in the international labour market in view
of labour price. Paradoxically, the competitiveness will depend to a large extent upon the quality of crew, not upon labour price in the future market.

In this regard, a quality assurance mechanism should be set up in the maritime education system as early as possible, not only for the sake of meeting new STCW Convention requirements in the short term, but also for the sake of strengthening the competitiveness in the international maritime labour market in the long run.

4.2.4 Safety Shipping

Unlike the defect goods, which perhaps impair individual consumers only, the products of maritime institutions, i.e. graduates or seafarers, and their quality as well, will have direct impact on safer shipping. Even minor errors made by those unqualified seafarers could bring about catastrophic results, such as marine pollution, human injuries and loss of lives. Marine accident investigations show that 80% of all marine accidents in the past few years were caused by human errors. This remarkable figure has, more or less, an ironical meaning for all those who are responsible for maritime education.

If a Quality Assurance Mechanism had been established and implemented in every maritime institution or maritime training school throughout the world, and if every seafarer on board ships had been well-trained in maritime institutions which had taken education quality as their top priority in maritime education, the number of maritime accidents would have been much fewer.

Therefore, it is foreseeable that quality assured education and training for safer shipping has large potential for great payoff in saving lives, reducing injuries, avoiding pollution, and protecting the economic investments in ships and cargoes.

Actually, Mr. L.A. Colucciello(1988) stated as early as in 1988 the importance of quality in maritime education in his papers at the Fifth International Conference on Maritime Education and Training:
One of the most effective means for preventing accidents caused by human error and for improving marine safety world-wide lies in the development and implementation of improved training.

Clearly, improved training here means implicitly quality assured training or education. It is worth emphasising again that the effective way to achieve quality assured education is through establishment and implementation of a quality assurance mechanism within any maritime education system.

4.3 Major Factors Affecting Maritime Education Quality

It is necessary to find the major factors that would affect maritime education quality in order to establish a Quality Assurance Mechanism in the maritime education system. Before discussing these factors the author attempts to give the readers the definition of Maritime Education Quality, which, from the stand point of the outcome of maritime education, should be

The knowledge and skills of the graduates obtained in maritime institutions; as well as their ability and suitability to a particular maritime job.

In this context, the process of education or training of students has a similarity with that of goods production in the factory. That is the reason why the Quality Assurance concept in industry could be applied to maritime education. However, it would be more complicated and more difficult in practical application, because the education process involves more random factors.

In general, there are three major aspects in terms of human factors that affect the maritime education quality. They are, from the bottom to the top by a hierarchy (see Fig.4.1), students, teaching staff as well as administration.

![Figure 4.1 Hierarchy of Factors](image)
They are subdivided into the following aspects:

**STUDENTS**
- Admission
- Motivation
- Learning Method
- Theory Learning
- Practice (sea-going)
- Exam

**TEACHING STAFF**
- Qualification
- Methodology
- Evaluation

**ADMINISTRATION**
- Objective & Planning
- Curriculum
- Resource Allocation
- Assessment

4.3.1. Students

Students are the object of education. The objectives of maritime higher education are to educate students, enabling them to acquire knowledge, skills, ability, and suitability necessary for being senior maritime personnel, such as surveyors, brokers, port operators, teachers, maritime administrators as well as ship officers. Some educationalists may compare the education process of students to that of goods production. It is to some extent right. However, it should be borne in mind that the students are human beings, not really goods. The education of students involves various aspects, such as psychology, ethics, management, knowledge and
methodology. It is necessary to pay a great deal of attention to the following elements with respect to the students.

1) Admission

As that the poor quality of raw material would ultimately deteriorate the quality of the product, the quality of candidate students would inevitably affect the quality of graduates. Evidently the qualification requirements of admission to maritime universities for candidates should be up to a specified standard. The traditional way to meet the minimum requirements for admission is through stringent entrance examination. It has proved by experience an effective means to ensure education quality at first stage. Unfortunately, there has been a world-wide tendency for entrance examinations to be phased out in many universities, due to fierce competition between universities to attract candidate students.

2) Motivation

Psychologically, motivation is an impetus to make people act. It denotes the factors and processes that impel people to action or inaction. As Raymond J. Wlodkowski (1985) stated:

Most psychologists concerned with learning and education use the word motivation to describe those processes that can (a) arouse and instigate behaviour, (b) give direction or purpose to behaviour, (c) continue to allow behaviour to persist, and (d) lead to choosing or preferring a particular behaviour.

In the educational process, motivations of learning for students are fairly important because students would lose impetus to learn without motivation. It is almost certainly the case that many students fail to fulfil their potential ability due to lack of motives. The barrier to progress in most cases of students' performance is often psychological. "The psychological barrier is largely determined by a student's own expectations of the standards he will reach" (Don Davies, 1986).
Theoretically, motivation starts with needs. In addition to the primary needs, such as food, drink and shelter, the advanced needs for students are the expectations on the future job, desires for money, social status and self-realisation, which are primarily the motives of learning for students. It is therefore a major concern with respect to students. Understandably, only when students have got motivation for learning, it is then possible for them to bend their minds to speciality learning.

3) Learning Method

In general, the performance of students seems to be proportional to the time they spent on learning on the condition that they have the same teacher and the same Intelligence Quotient. But that is not always the case. Unexpectedly, a few students who spent less time on learning have better performance than those who spent more time on it. The reason behind this paradox lies in learning method.

In their authoritative text book Theories of Learning, Hilgard and Bower (1975) present a list of principles drawn from learning theory that is considered to be potentially useful in practice. These principles are (1) principles emphasised within stimulus-response or behaviourist theory, (2) principles emphasised within cognitive theory, and (3) principles which stem from theories of motivation, personality and social psychology.

Fundamentally, these principles are not mutually exclusive. Rather, they are practically being used in combination, whether they have been fully understood or not. Fortunately, the importance of learning theories and learning methods has been increasingly recognised by teachers and students. From the author's personal experience, learning methods in practice could encompass understanding of knowledge, reading skills, processing of information, self-confidence, allocation of time, compromise between work and rest, etc. It is worth mentioning that there is not a single generalised learning method that is suitable to every student.

4) Theory Learning

With the rapid development of modern science and technology, ships with their machinery are becoming more and more sophisticated. The traditional way, which
used to be skill-oriented training for crew or cadets, could no longer satisfy the training standards required by these sophisticated modern ships. In addition to the basic skills necessary for ship officers, theory learning is also indispensable. That is to say, ship officers have to learn not only how to operate a ship, but also why operating a ship in this way, not that way.

However, most students or candidate ship officers in maritime institutions would rather learn skills than theory, since theory learning seems to be more tedious and monotonous than skill learning. However, theory learning is so essential nowadays in modern ships that nobody could master the skills without theories. For instance, to operate a highly automated ship skilfully, a ship officer must have knowledge regarding theories of automation. Theory could underlie and improve relative skills. What is more important, theory could help ship officers accurately analysing, locating machinery failures in case of emergency, which has proved crucial for the safety of shipping.

To improve the quality of ship officers, a great deal of attention should be paid to theory learning in maritime higher institutions, although the new STCW Convention emphasises the competency of crew, but not knowledge. Precisely speaking, the competency should be interpreted as a combination of knowledge or theories and skills. As the yearly report (1994/1995) of ISF (International Shipping Federation) stated:

This (change made in the revised STCW Convention) will not eliminate the need for the acquisition of the necessary academic knowledge which puts pressure on the traditional arrangement.

5) Practice

Unlike the general higher education institutions, which mainly focus on theoretical learning and knowledge acquisition, the practical skills of students in maritime institutions account a considerable part in measuring their ability or quality. What is more important, the revised STCW Convention has set forth higher standards of skill requirements on maritime education and training, because the means of assessment
has been amended so significantly that it will be based on a demonstration of actual proficiency in a particular task where possible. This drastic change, which, in other words, turns from the past knowledge-oriented training to the present competency-oriented one, indicates that new STCW Convention emphasises more skill requirements than before. It is therefore necessary for students to improve their practical skills through all means, such as more laboratory work, simulator training, as well as sea-going service.

6) Examination

Traditionally, examinations have been the major means for evaluating students. It is indeed indispensable to ensure education quality. With regard to the content of examinations, there must be a minimum standard by which the teaching objectives are to be fulfilled in a particular course. Moreover, for the purpose of improving later-on learning and teaching and thus improving education quality, it is necessary to analyse the exam results by both students and teachers. Unfortunately, this is not always the case in many maritime institutions. Rather, the examination has become a mere formality for sake of examination itself, not for ensuring quality of education. In this connection, attention should be paid to the examinations on the part of teaching staff. The examinations should play an important role as it should have been in ensuring education quality. Furthermore, it is also necessary to take various forms of examinations, such as written, oral or practical ones, as well as demonstration on simulators or computers, in order to suit the characteristics of maritime education.

4.3.2 Teaching Staff

To simplify the problem, teachers in the educational process can be compared to the employees who make goods on the production line. It is thus believed that the teachers’ qualification, knowledge, personality, behaviour, attitude, as well as teaching methodology could have direct impact on the education quality. Needless to say, the qualities of teachers determine, to a large extent, the education quality. Much attention should therefore be paid on part of teachers in the following aspects:
1) Qualification of Teaching Staff

Doubtlessly, the qualifications of teaching staff are extremely important in ensuring teaching effectiveness and thus ensuring education quality. For general universities in China, it is common that many academic teaching staff are recruited from graduates or postgraduates of teacher training colleges. They are supposed to have systematically learned about education psychology, education theory, pedagogics as well as knowledge in a particular speciality. These teachers can fulfill the qualification requirements and standards specified by general universities, because they have been well educated and trained in teacher training colleges.

However, the situations of the Chinese maritime universities are quite different. Generally, there are two cases with regard to qualifications of teaching staff. One is that some lecturers are former ship officers who have no experience of pedagogics and academia. The other is that some lecturers come from conventional teacher training colleges who have no sea-going experience or maritime background. The serious problem facing maritime universities is that both groups of these lecturers can not be considered as qualified lecturers according to the new STCW Convention, particularly those involved in the ship officers' training. (STCW/95, A-1/6, A-1/8)

The teaching staff involved in maritime education should be required to have both maritime background and pedagogics, as well as academia. Particularly, the teaching staff or instructors in ship officers' education or training must be required to have both sea-going experience and pedagogics at the same time. In addition, it is also necessary for the teaching staff in maritime institutions to be trained periodically in order to keep their knowledge and qualifications updated. This is of great significance nowadays due to the rapid development of science and maritime technology.

2) Methodology

With regard to the methodology in teaching, it has been a contentious issue. Many lecturers believe that effective teaching is an indeterminate phenomenon, because learning is ultimately the students' own business and responsibility. It is to some
extent true, because there is indeed no such a best way of teaching which is applicable to every student. It is however stupid to carry this truism beyond its proper boundary and to suggest that there are no better or worse ways of teaching, and no general attributes that distinguish good teaching from bad. Paul Ramsden (1992) stated that:

Good teaching encourages high quality student learning. It discourages the superficial approaches to learning represented by 'imitation subjects' and energetically encourages active engagement with subject content. This kind of teaching does not allow students to evade understanding, but neither does it bludgeon them into memorising; it helps them respectfully towards seeing the word in a different way.

It is certain that following teaching ideas regarding methodology from the individual lecturer's point of view, are considered as characteristics of good teaching.

- **Teaching Plan and Control**

  Paul Ramsden (1992) described the education process as follows:

  All education may be seen to proceed in a triple cycle of growth, from a stage of absorbing, discursive, romantic discovery, through a stage of precision to a stage of generalisation and application, where again initiative and enquiry dominate.

  The teacher's task is to recognise these equal claims of freedom and discipline, and their cyclical ordering, without overemphasising one or the other; to create a system in dynamic equilibrium. To achieve this objective, the teaching process for a teacher should start with a teaching plan. Teachers should make out detailed teaching plan beforehand, by which teaching aims, goals, and objectives of a particular subject are to be stated; text books, teaching materials are to be listed; and allocations of time in different sections are to be arranged.

  With a detailed teaching plan, teachers could then focus on key concepts rather than on covering the ground and thus control the teaching process systematically, and
finally achieve the teaching objective in a planned time period. Moreover, in the view of students, the teaching plan shows clear goals of learning tasks and thus fosters the sense of students’ control by themselves over learning and interest in the subject matter. This has been proved important in improving education quality.

- **Interest and Explanation**
  The top priority of good teaching is firstly clear explanation and provoking of students’ interest. When the students’ interest is aroused in something, they surely enjoy working hard at it. They would feel that they could in some way own it and use it to make sense of the world around them. In this case, they would be more likely to focus on the subject matter itself rather than the institutional context surrounding it, and this is even more likely if an explanation is added as to why the particular method or fact that has to be learned will be useful in the future.

- **Appropriate Assessment and Feedback**
  Here the assessment refers to evaluation of students. Undoubtedly, appropriate assessment of student is essential in good teaching. Setting appropriate assessment tasks, however, is obviously a difficult technique for teachers. It implies questioning in a way which demands evidence of understanding, the use of various techniques for demonstrating what students have learned, and avoiding any means that require students of rote-learning. After assessment, it is equally essential to give really helpful feedback on assessed work. The feedback could help students clearly know their weaknesses and strengths in an assessed subject and thus benefit their later-on learning.

3) **Evaluation**

The main purposes of evaluation of teaching staff are: (a) to understand the effect of teaching, (b) to improve teachers’ skills and knowledge on teaching, (c) to use the information for the basis of promotion of teaching staff, and (d) to improve education quality.

The evaluation of teaching staff may be conducted by administrators, colleagues, students or teaching staff themselves. Theoretically, most of educationists realise the
significance of evaluating teaching staff in improving teaching quality. Some of them even think the self-evaluation of teaching staff should be one of the key elements in the quality assurance mechanism. In practice, however, evaluation of teaching staff does not go well in ensuring education quality, because of the difficulty and complexity of the evaluation itself. Typically, self-evaluation of teaching staff is so difficult that it is almost not feasible in practice.

Nevertheless, emphasising the qualifications of teaching staff and instructors in maritime institutions, the newly revised STCW convention will force everybody who is concerned with education quality to pay attention to the evaluation issue on consideration of its legal status or practical requirements.

4.3.3 Administrators

Like the managing director in a company who takes charges of managerial work such as making policies, setting market strategies, planning, budgeting, etc., administrators in a university should be accountable for policy, strategy, academic administration, organisation, as well as education quality. Nobody would be suspicious of responsibilities of administrators for things like policy and strategy indeed.

With respect to education quality, however, some administrators would argue that it should be the teaching staff’s business. They are totally wrong, since education quality is not equivalent to teaching quality. It is a narrow viewpoint to regard education quality as teaching quality. The latter should only be one of the components of education quality. Actually, as a general concept, education quality consists in policy, strategy and academic administration, all of which may include education objectives, standards, future strategy of development, scientific research and so on. It is certain that good policy, strategy and good administration are prerequisites to ensure education quality. In this connection, administrators should pay considerable attention to the following aspects:
1) Objective and Planning

As any other activities, every university or college should have definite objectives and planning in order to achieve the goals effectively and efficiently. This is fairly important especially for maritime institutions. This is because, firstly, a mandatory regulation required by the new STCW Convention:

Each party shall ensure that the education and training objectives and related standards of competence to be achieved are clearly defined and identify the levels of knowledge, understanding and skills appropriate to the examinations and assessments required under the convention. The objectives and related quality standards may be specified separately for different courses and training programmes and shall cover the administration of the certification system. (STCW, 1995, section A-I/8)

Secondly, the rapid changing shipping industry creates needs for not only setting specific objectives, but also correcting and upgrading the objectives constantly. Differing from objectives, which are mainly related to what to be achieved in education, planning is concrete measures regarding how to achieve and what to be done in the future. Without realistic objectives and good planning laid down by administrators, it is almost impossible to perform teaching activities well on the right track.

2) Curriculum

There are many contentious definitions regarding curriculum. The common element of almost all usage of the term, however, is agreement that curriculum has to do with planning the activities of students. As David Pratt (1980) defined in his works Curriculum: “A curriculum is an organised set of formal educational and/ or training intentions”.

Curriculum, typically in practice, as a main part of written education planning laid down by administrators, provides lists of courses or subjects for different specialities that may cover a wide range of fields for the needs of the maritime industry, allocations of learning hours, as well as teaching objectives to be achieved. To
achieve the defined education objectives, the administrators should make a rational curriculum on basis of job needs for corresponding specialities. Moreover, constant rationalisation and development of curriculum should be carried out periodically to meet the rapid changing needs created by the development of maritime technology. This is of great significance to upgrade education standards and keep abreast with the maritime industry.

3) Resource Allocation

Resource scarcity is almost a common problem in all universities. It is therefore a critical issue facing administrators in maritime institutions to reasonably allocate limited financial resources. Obviously, to ensure educational quality, it is necessary to upgrade or renew teaching facilities and accessories; it is also necessary to increase bonus or salary for teaching staff whose performance is excellent to encourage or motivate them; and so on. All this could cost money. Which one takes priority? What is the basis of resource allocation? or, how to allocate reasonably? All these questions are indeed difficult to answer. They are, however, beyond the coverage of this dissertation. What the author would like to reiterate here is that reasonable allocation of financial resources would have direct or indirect impact on education quality.

4) Assessment

Here assessment refers to the performance evaluation of administrators. This is an area which is likely to be ignored.

When talking about education quality and quality assurance, many educationists and administrators within institutions would insist that the evaluation of both teaching staff and students should be indispensable. With respect to evaluation of their own performance, however, few of them are aware of it. In fact, the performance of administrators, particularly those who are in charge of policy-making and decision-making, such as president and deans, has significant impact on education quality. These top administrators, like top managers in a company, may give directions to their faculties or teaching staff on what to do and sometimes even how to do it. Yet
they may decide what objectives to be achieved and what educational standards to be reached in the short term or in the long run. All these things really have a lot to do with educational quality.

After having realised the importance of administrators' performance, it is then understandable that performance evaluation of administrators themselves is as significant as evaluation of teaching staff and students. Clearly, three important reasons to evaluate administrators can be foreseeable: (a) to improve administrators' performance; (b) to provide a rational and impartial basis for policy-making or decision-making; and (c) to meet the growing demand on more accountability and quality assurance in maritime institutions.

4.4 Quality Assurance Mechanism

Having analysed in the previous sections the quality assurance in the industry context and main factors that have direct impact on educational quality, the author can now come to the theme of this dissertation, that is, how to set up or develop a quality assurance mechanism which is adapted to maritime education.

As mentioned in the previous sections, quality assurance is a collective term for planned, formalised activities intended to provide confidence that the product or service will meet the required quality levels. In addition to in-process activities, quality assurance includes a series of activities external to the process, such as activities undertaken to determine customer needs. If maritime education is considered as a production or as a service, depending upon the standpoint, it would be safe to say that the quality assurance concept stemming from industry should be applicable to maritime education.

To make it understandable for the readers, the author starts with Deming(1982) Cycle to describe the quality assurance mechanism. In essence, Deming Cycle is the crux of ISO standards, under which any activities involved in production or services have to be conducted according to the Cycle: (Fig.4.2)
Essentially, the quality assurance mechanism in maritime education could also be based on the above Deming Cycle. In the following sections, the author intends to describe in detail how the Cycle would be adapted to maritime education.

4.4.1. Planning

Planning is always located at the very beginning in the quality assurance mechanism. In the previous section 4.3.3 the importance of planning in quality assurance has been emphasised. However, the succeeding question is what to be planned, and where to start. The author intends to give a general description in this section.

Generally speaking, with emphasis on the outcomes of the education and training process, the quality assurance process should begin with an institutional or programmatic self-study: a comprehensive effort to evaluate achievement of the stated policy, aims and objectives through application of quality management and operational control functions.

The intention of such self-study is to enable institutions to assure themselves in the first instance that the intended quality standards are being achieved at all levels of the training activities - focusing on those aspects of the functions and activities which impinge on the quality of what is provided (D. Waters & P. Muirhead, 1995)
Quality management is concerned in detail with the way these functions are managed, organised, undertaken and evaluated in order to ensure education quality and the achievement of their identified objectives. As a result, which is based on the initial self-study on quality management, the planning should include, together with the original ones, the following necessary items:

1) lines of responsibility for quality and integrity and for the internal approval and conduct of programmes, including functions of academic committees
2) development of learning and performance objectives, based on job analysis as appropriate
3) policies and procedures for student admission, evaluation and progression, including criteria for examinations and skill acquisition testing
4) development of curriculum, based on need analysis of the maritime industry
5) availability and allocation of resources, including human, financial and physical resources for sustaining and improving programs and instruction
6) availability of correction action, based on self-study on quality management
7) selection and approval of teaching staff, examiners and assessors, including qualifications and experience criteria
8) provision for staff development

4.4.2. Audit and Evaluation

As a reliable way to check the educational process, audit and evaluation constitute key parts in the quality assurance mechanism.

Audit

The purpose of the independent quality audit is to provide an independent assessment of the effectiveness of the quality standard arrangements at all levels. The audit is carried out by specialists from an academic accreditation council, which should be independent of the MET system. The specialists who are selected according to the nature of the programme may assess the institution training unit or programme in light of the self-study and its own judgements and perspectives.
A typical audit of a major institution would involve a visit of about one week by several auditors, depending upon the size of the institution and programmes. Auditors may be expected to bring to their work extensive knowledge of quality assurance practice in education and training and be aware of the strengths and weaknesses to be encountered within the system. The auditors will be provided with terms of reference by the body on whose behalf the audit is being carried out. The audit visit will be preceded by a scrutiny of the briefing documentation supplied by the institution under audit and followed by the preparation of a report, which should be discussed in the first instance with the institution. (IMO, STW 26/4/Add.4, 1994)

The type of briefing materials which institutions submit to the external auditors may vary according to the scope of the audit. The purpose of these briefing materials is to ensure that the audit teams could get a clear picture of the quality standard systems in operation. The detailed briefing materials list required by the audit should include the following items:

1) the institution’s formal statement of its aims, objectives, mission, policies, purposes etc.
2) a statement of academic and training strategies, including those applying to assessments for competency standards which are recognised by the maritime administration
3) a description of the institution’s management and organisational structure, including an organisation chart and the composition and functions of committees
4) copies of curriculum, course plans, and prospectus
5) staff and student information, especially numbers of staff and trainees, student entry qualifications
6) a description of the training facilities and equipment
7) any documentation relating to current or recent evaluation or approval of programmes
8) any current documents describing policies and practices, particularly those illustrating the institution’s quality assurance action, or providing an understanding of its quality assurance mechanism

(IMO, STW 26/4/Add.4)

Prior to the audit visit the auditors should spend two or three weeks scrutinising the proposal and the briefing materials supplied by the institution under audit. In order to examine some parts of the system in depth, as well as the whole broadly, sampling techniques should be employed. The audit visit should proceed in such a systematic way that functions and activities regarding the quality assurance mechanism must be checked item by item. It would include interview discussions with administrators and with members of staff and students within the institution. The external audit report should give a full, accurate and fair description of the institution’s quality standard structures and mechanisms. In doing so it should draw attention to any examples of particularly good practice that the audit team has encountered, and which might be recommended to others, as well as any evidence of defective or inadequate systems.

The typical report format will be introduced in 4.4.3 Feedback.

Evaluation

Differing from the audit, which is essentially the third party review conducted independently by external specialists, the evaluation could, however, take various forms at different levels in a more detailed and specific way. Moreover, it is carried out more frequently and periodically than the audit.

The conventional evaluation has been a narrowly defined context, which mainly focuses on the evaluation of students’ performance. As a main part of the quality assurance mechanism, however, the evaluation should be considered a systematic framework in a broad concept. By different levels, it should include:

- evaluation of administrators’ performance within maritime institution as well as its policy, aims, and objectives regarding quality and training standards
- evaluation of teachers’ performance, including their qualifications, methodology and teaching effectiveness
evaluation of students, including their knowledge, skills and competency required by the STCW Convention

By different specific content, it should include
- curriculum evaluation
- course evaluation
- subject evaluation

By different standpoints, it could essentially be divided into two types only:
- external evaluation
- internal evaluation

The external evaluation should be conducted by the superior of the institution, which in most countries is the Ministry of Communications and peers from sister institutions. The criteria and process of the external evaluation should be set out by the Ministry of Communications and be harmonised within the maritime education system. The external evaluation should mainly focus on the evaluation of administrators and teaching staff as well as the curriculum. It could be conducted every two years.

The internal evaluation should focus on the evaluation of teaching staff, students, as well as curriculum, course and subject evaluation. They are carried out within the institutions by administrators, teaching staff, as well as students themselves. The criteria and process should be set out by administrators in the institutions and be approved by the superiors of the institutions. More frequently than external evaluation, internal evaluations should be conducted every year.

Fig. 4.3 Framework of Internal and External Evaluation
Fig. 4.3 shows the framework of external and internal evaluation, from which an overlap between the external and internal evaluation can be seen. It is by no means a waste of time and resources, but an emphasis on the importance of teaching staff in the quality assurance mechanism. Actually, the teaching staff play such an important role that they are, on the one hand, employees of the top administrator; on the other hand, they are directors of students. They must not only be accountable to students, but also be responsible for the administrators. The education quality depends to a large extent upon the teaching staff in the institutions.

Both external and internal evaluation can be viewed as an integral self-evaluation mechanism at the standpoint of the maritime education system. It would form the basis for the independent external quality audit, which is conducted by the tertiary unit independent of the MET system. At the end of evaluation, the evaluators should issue an evaluation result report for the purpose of subsequent feedback.

4.4.3. Feedback and Correction
After finishing a quality audit and evaluation, the subsequent step in the quality assurance mechanism is the feedback of the audit report and/or evaluation result to those who are concerned with quality management and assurance. These personnel who are involved in the quality assurance mechanism, and who are of course concerned with the quality management, would include IMO officials, the supervisors of maritime institutions, the administrators within maritime institutions, as well as teaching staff.

Depending upon the feedback report, the decision-makers who in most cases are administrators of maritime institutions should determine what correction actions need to be done for improvement and assurance of educational quality. Feedback and correction are thus indispensable steps for an integral quality assurance mechanism.
Feedback

The purpose of feedback is to give the personnel involved in the quality assurance mechanism an understanding of strengths and weaknesses in quality management and thus form the basis of realistic policy-making or decision-making. It also forms the basis of correction actions to be done. The content of feedback reports may vary from types and objects of evaluations, depending on internal or external evaluation, or independent external audit; evaluation of students or teaching staff or administrators. Yet the feedback point may vary from different levels of evaluations. As an example of feedback information, a typical report of external independent audit would cover the following aspects:

1) brief background information about the maritime institution, its type, size, academic, training, and environmental characteristics;

2) a description of the audit procedures used;

3) a description of the institution’s formally stated aims, objectives, mission, purposes, etc., together with any specific strategic policies regarding quality and training standards;

4) a summary of formal procedures adopted by the institution in the area of functions and activities regarding the quality assurance mechanism;

5) a comment on the extent to which the institution’s academic and training activities is underpinned by an active, effective and pervasive commitment to fulfilling its stated aims and objectives in matters of quality and standards of vocational education and maritime competency;

6) a comment on the extent to which the relevant programmes, examinations and assessments comply with the requirements of the STCW Convention;

7) recommendations for improvement of quality assurance structures and mechanism.

(IMO, STW26/4/Add.4)
This report should be used for the superiors of maritime institutions as first hand information reflecting the education quality and quality management in the maritime institution. It should form the basis of related decision-making, such as policy review, resource allocation, as well as planning for corrective action.

Together with the internal and external evaluation report, it also forms the basis of quality assurance report to IMO required by the STCW Convention. This report should preferably be prepared in four copies: one is to be submitted to IMO, one to the Ministry of Communications (the superior of the maritime institution); another one is to be kept for the top administrator of the institution under audit, and the last one could be circulated among teaching staff within the institution.

**Correction**

The corrective action is critically important for the improvement and assurance of quality. Decision-makers at all levels should make out planning for corrective action in those areas where evident deficiencies or weaknesses in the quality management exist and take immediate corrective action to eliminate these deficiencies or weaknesses. It is also necessary to carry out periodically job need analysis based on the feedback of the shipping industry in order that timely policy review, correction of educational aims and objectives, as well as curriculum development could be conducted correspondingly to meet the changing shipping industry and maritime technology.

Generally speaking, the implementation of corrective action begins with the identification of quality-related problems based on the audit report and evaluation result. It involves taking every possible measure to eliminate or minimise the recurrence of the problem and to eliminate the causes of an existing nonconformity and deficiencies related to quality assurance. The corrective action could be proceeded in the following way:
1) Assignment of responsibility
The responsibility and authority for conducting corrective action should be defined as part of the quality assurance mechanism. The co-ordination, recording and monitoring of corrective action related to all aspects of the quality system should be assigned within the maritime institution.

2) Investigation of possible cause
The significance of factors affecting educational quality should be evaluated and emphasised in terms of its potential impact on education quality and the quality assurance mechanism. The relationship of cause and effect should be determined, with all potential causes considered. In the analysis of a quality-related problem, the root causes should be determined before corrective action is planned. Consideration should be given to establish a file listing nonconformity to help identify those problems having a common source.

3) Elimination of causes
Appropriate measures should be timely taken to eliminate or minimise the causes of existing or potential deficiencies and nonconformity. Sufficient controls of processes and procedures should be implemented to avoid recurrence of the quality problem. When the corrective action is implemented, its effect should be monitored and timely feedback should be given to the personnel concerned in order to ensure that desired objectives could be achieved.

4.4.4. Documentation
The final important part of the quality assurance mechanism is the documentation of all quality-related aspects. The maritime institutions should establish and maintain documented procedures to control all documents and data related to quality management within the institutions. The major document should cover the following aspects, which constitute the integral quality assurance mechanism:

1) Institutional Planning, including
- the education aims and objectives, mission statement;
• objectives and related quality standards for different courses and training programmes;
• outline of curriculum for different courses;
• formal procedures related to quality management;
• specific strategic policy regarding quality management;
• organisational structure, functions and responsibilities,

2) Audit and Evaluation, including
• briefing materials related external audit;
• policies and procedures related internal evaluation at different levels;
• internal evaluation result,

3) Feedback and Correction, including
• external audit report and external evaluation result;
• need analysis report based on audit report, evaluation result, as well as feedback from the shipping industry;
• corrective action plan;
• monitoring record of corrective action.

All the above documents should be reviewed and approved for adequacy by authorised personnel prior to issue. A master list or equivalent document control procedure identifying the current revision status of documents should be established and be readily available to preclude the use of invalid and/or obsolete documents. This control would ensure that

1) the pertinent issues of appropriate documents are available at all locations where operations essential to the effective functioning of the quality system are performed;
2) invalid and/or obsolete documents are promptly removed from all points of issue or use;
3) any obsolete documents retained for legal and/or knowledge-preservation purposes are suitably identified.
Changes to documents should be reviewed and approved by the same organisation that conducted the original review and approval, unless specifically designated otherwise. The designated organisation should have access to related background information upon which to base their review and approval. The nature of the change should be identified in the document or the appropriate attachments, where practicable.
CHAPTER 5
APPLICATION AND DEVELOPMENT OF QUALITY ASSURANCE

The Quality Assurance Mechanism which is generally applicable to any kind of maritime institutions has been presented in the previous chapter. The real situations of maritime institutions, however, may vary from country to country, or from one institution to the other in the same country. It is thus necessary to analyse the real situations within institutions in order that the quality assurance mechanism can be implemented effectively and efficiently.

In this chapter the author intends to introduce the application and development of the quality assurance mechanism in Chinese maritime institutions based on the analysis in previous chapters of the strengths and weaknesses in Chinese maritime education.

5.1 Lines of Organisational Responsibilities

As the author mentioned in chapter 2, the organisational structure and lines of responsibilities within the MET system and the maritime institutions as well are not satisfactory. If the quality assurance mechanism is to be implemented effectively and efficiently, the rationalisation of the organisation structure and its lines of responsibilities should be given first priority. The following questions should be given clear answers when possible:

Who takes charge of conducting the independent external audit?
Who is responsible for the evaluation composed of external and internal ones?
Who makes and revises the maritime education policy?
Who sets up the criteria of assessments? and
What are the criteria for various assessments?

5.1.1. Organisational Structure of the Chinese Maritime Education System

Fig. 5-1 shows in brief the organisation structure of the Chinese maritime education system. Traditionally, the maritime institutions in China are under double supervision of the State Education Commission and the Ministry of Communications. It really does not matter for the implementation of the quality assurance mechanism. Rather, it would benefit to some extent the assurance of education quality. For example, the qualifications of candidate students for the admission to the maritime institutions are assured through the strict National Examination mentioned in 2.4, which is held under the auspices of the State Education Commission. However, a matter of concern is that the lines of responsibilities among organisations and divisions are unclear because of many reasons. Assignment or delegation of responsibilities within the maritime education system should thus be done in order to co-ordinate well among different levels and different divisions.
5.1.2. Assignment of Organisational Responsibilities

Obviously, it is of critical significance for the implementation of the quality assurance mechanism to assign or delegate specific responsibilities or functions to different sectors at all levels of the organisation within the maritime education system.

1) Role of the Ministry of Communications & the State Education Commission

The Ministry of Communications and the State Education Commission would firstly ensure that the education and training objectives as well as related standards of competence to be achieved are clearly defined according to the STCW Convention and the relevant national legislation on higher education. The maritime education policy, strategic plan, as well as development goals should at least satisfy the training standards required by the STCW Convention and at the same time satisfy the minimum standards required by the legislation of the Chinese higher education. In addition, the Ministry of Communications and the State Education Commission should ensure the following:

- An Academic Accreditation Council needs to be established, which is co-operatively composed of the academical authorities selected by the State Education Commission, maritime specialists selected by the Ministry of Communications, maritime experts from shipping companies, as well as professors or the maritime academic authorities from the maritime institutions.

- The Academic Accreditation Council is to be accountable to the independent external audit, which constitutes the major part of the quality assurance mechanism. Yet the council is to assist the Ministry of Communications to carry out every two years the external evaluation of the maritime institutions, which, together with the internal evaluation, constitute an integral self-evaluation system in the quality assurance mechanism.
- The Ministry of Communications is responsible for reporting to IMO about matters regarding training policy, policy review, quality audit of the quality assurance mechanism, as well as any documentation of the maritime education system. The Ministry of Communications is also responsible for the co-ordination with the State Education Commission.

- On basis of the external quality audit report, self-evaluation results, feedback from the shipping industry, as well as the requirements arising from the revised convention and/or the national legislation, the Ministry of Communications should takes charge of corrective action planning, policy review and overall resource allocation among institutions, academies and training schools.

- The structures of the Independent External Audit and the External Evaluation need to be well organised.

Fig. 5.2 shows the proposed structure of independent external audit.
Fig. 5.3 shows the proposed structure of external evaluation.

2) **Responsibilities of the President**

In accordance with the education and training objectives and related standards of competence that are necessarily required by the STCW Convention and defined by the Ministry of Communications, the president or top administrators at an institutional level of the maritime institution should ensure that

- the institution’s formal aims, objectives, mission, purpose as well as any specific strategic policies regarding quality and training standards are to be clearly stated, in consideration of the characteristics, strength, potential and size of the institution;
- lines of responsibility for quality and integrity and for the internal approval and conduct of programs, as well as functions of academic committees are to be clearly defined;
design, evaluation and development of curriculum are to be conducted, based on needs assessment of the shipping industry;

- policies and procedures for student admission, assessment and progression are to be laid down;

- internal evaluation is to be carried out under supervision of the president, especially the evaluation of deans is to be conducted by the president himself or top administrators at an institutional level; (see Fig. 5-4 Structure of Internal Evaluation)

- correction plan or/and action is to be conducted under supervision of the president, based on the internal evaluation;

- policies for selection and approval of teaching staff, examiners, assessors as well as their qualifications and experience criteria are to be laid down; and

- there must be a designated person at an institutional level to be in charge of documentation and all documents related to quality management are to be signed by the president.

3) Responsibilities of the Deans

According to the institutional education policy and its formal aims and objectives, the deans at department levels should ensure that

- specific aims, objectives and related quality standards are to be clearly specified separately for different courses and training programmes, levels of knowledge, understanding and skills appropriate to the examinations and assessments are to be identified;

- course design, evaluation and development are to be carried out based on needs analysis;

- the dean is responsible for the evaluation of teaching staff in his department, which constitutes a part of the internal evaluation. The result of the evaluation should be documented and reported to the president or top administrators at an institution level; (see Fig. 5-4 Structure of Internal Evaluation)
• teaching staff's training, development or promotion should be taken care of where possible on basis of the evaluation results.

4) Responsibilities of the Teaching Staff
The teaching staff, as emphasised in the previous section, play such an important role that they on the one hand are like directing managers of students; on the other hand they are employees of deans or president of the institution. They are the only personnel who are really involved themselves in concrete teaching activities. Without exaggeration, the assurance of education quality depends to a large extent upon teaching staff: their qualifications, background knowledge, skills, experience as well as their sense of responsibility. In this context, every teacher should ensure that

• a detailed teaching plan, which includes specific aims and objectives for a particular subject, a syllabus for the subject, time allocation for different sections, as well as a list of text books and reference materials to be used, must be made out beforehand and submitted to the dean for approval;

• the subject evaluation is to be conducted annually and the subject revision to be conducted when necessary. Evaluation report should be documented and submitted to the dean. Revision plan, if available, should also be submitted to the dean for approval;

• the evaluation of students' performance regarding their knowledge and skills in a particular subject should be carried out and monitored properly, which constitutes a part of the internal evaluation. The result of the evaluation should also be documented and submitted to the dean; (see Fig.5-4 Structure of Internal Evaluation)

• the evaluation of the dean by the president is to be assisted by the teaching staff if possible, and the evaluation report on his own perspective should be submitted to the president.
5.2 Evaluation

As discussed in the earlier section, the evaluation itself, both external and internal, constitutes a key part in the quality assurance mechanism. But what are the criteria for a particular evaluation? and How should the evaluation be conducted? These are crucial questions concerned in the implementation of the quality assurance mechanism. In this section the possible solutions to these problems are presented.
5.2.1 Evaluation Criteria for Administrators

In any maritime institutions the administrative positions are diverse. In the interest of clarity and brevity, the evaluation criteria for the deans, who play supporting roles in administrative and academic management within institutions, will be focused on hereinafter. It should be evident, however, that the principles of criteria setting are applicable to all administrators at any level.

Peter Seldin (1988) presents a lengthy list of criteria for administrative evaluation. They are:

1) underlying Traits and Interest
2) general Quality and Dimensions of performance
3) Interpersonal Relationship
4) Leadership
5) Professional Interest
6) Commitment to institution

Practically, the evaluation criteria for the deans, who serve as mid-level administrators in the institution, should focus on the following aspects:

1) Planning and Decision Making ability, including:
   - setting specific aims and objectives clearly and realistically
   - making decisions effectively
   - adapting changing situations
2) Supervisory Ability, including:
   - delegating responsibilities properly
   - understanding faculty members
   - supervising work of faculty members
3) Communicative Skills, including:
   - communicating well with faculty members
   - making clear reports to the president
   - interacting with faculty members in a professional manner
4) Co-ordination Ability, including:
   - consulting with faculty members
   - promoting good public relations
   - creating an atmosphere beneficial to high faculty performance

5) Originality, including:
   - making innovative recommendations to the president
   - advocating affirmative action
   - showing drive and energy in reform

6) Efficiency
   - tackling problems decisively
   - getting things done efficiently and effectively
   - taking corrective actions without delay

5.2.2 Evaluation Criteria for Teaching Staff

The evaluation of teaching staff has been a controversial issue. Few educationists are suspicious of the importance of the evaluation of teaching staff. However, the problem is that who actually is in the most appropriate position to produce objective and meaningful evaluations on them? Clearly, the criteria may vary from evaluator to evaluator due to different standpoints and concerns.

Theoretically, the evaluation of teaching staff could be done by three levels: their supervisors, colleagues and the students. In the author's personal experience, the evaluation by colleagues could raise some problems. Because such evaluation is unlikely to be reliable unless colleagues have many opportunities to see each other teaching in the classroom. Moreover, teaching staff with different subjects and different value systems may find it difficult to fairly evaluate each other's work. This is the major reason why the author suggested in the earlier section that the evaluation of teaching staff should be done by the dean who is the supervisor of them and the students who are the object of their teaching activities.

1) Criteria from the dean's viewpoint
The evaluation criteria for teaching staff from the dean’s viewpoint are mainly concerned with the following aspects:

- academic qualifications and shipping experience
- sense of responsibility
- well and detailed teaching planning
- methodology in the teaching process
- timely information feedback to the supervisor
- ability and achievement in scientific research

2) Criteria from students’ viewpoints

The evaluation criteria for teaching staff from students’ viewpoints may mainly focus on the effectiveness of teaching. John A. Centra (1979), in his authoritative works Determining Faculty Effectiveness, pointed out the characteristics of effective teaching. They are:

- Communication Skills—clearly interprets abstract ideas and theories
- Favourable Attitudes towards students
- Knowledge of subject
- Good Organisation of subject matter and course
- Enthusiasm about subject
- Fairness in examinations and grading
- Willingness to experiment—flexible
- Encouragement of students to think for themselves
- Interesting Lecturer—good speaking ability

These items have been used as the major criteria of evaluation which is conducted by students on the teaching effectiveness of teachers in the student rating forms. Nevertheless, the use of such student rating forms has been contentious issue. As Mr. Ruth Beard and James Hartley (1984) stated:

The main debate about student ratings, of course, concerns itself with the validity and reliability of such ratings. The questions at issue are questions like:
• Are ratings of effectiveness related to academic performance?
• What factors affect students’ appreciation of teaching?
• Are the ratings consistent between groups?
• Can student ratings detect changes in teacher performance?

Despite some strong opposition on part of the teaching staff to incorporating student ratings in teachers’ evaluation, the student rating forms could provide valuable reference about teaching effectiveness of the teachers for the administrators who are concerned with educational quality.

5.2.3 Evaluation Criteria for Students
Depending upon the type of evaluation, which could either be the comprehensive ability and/or competence evaluation in terms of external audit, or a particular subject evaluation in terms of internal evaluation, the criteria may vary from course to course, and from external auditors to internal evaluators. Taking the marine engineering course as an example, the author would like to put forward the criteria of comprehensive competency evaluation for marine engineering students. Such criteria could, in principle, be generalised to any other courses or a particular subject in the maritime institution. It should be borne in mind that the competency means sound theory plus practical skills. In this regard, the main evaluation criteria in terms of external audit for marine engineering students could be focused on the following aspects:

• sound theoretical foundation
• comprehensive theoretical knowledge
• analytical and reasoning ability
• suitability or adaptability to the civil engineering field
• originality or creativity in a particular subject
• intellectual potential for further education or career development
In addition, the following aspects are also significant for students who are to serve as marine officers on board ship:

- the ability of planning and preparation of operation suitable to the power installation and requirements of the voyage
- the skills of operating, monitoring and maintaining the power installation and associated equipment
- the skills of dealing with emergencies
- the ability of leadership
- the safety consciousness

5.2.4 Evaluation Instruments

There are many evaluation instruments to be employed in both internal and external evaluations at all levels in the maritime education system, namely:

- Examination
- Performance Records
- Questionnaires
- Interview
- Presentation and Oral Debate

Practically, any evaluation can be conducted in way of the combination of two or more instruments listed above depending upon the type of evaluation. For instance, the evaluation of students can be carried out by means of examination, presentation and oral debate, as well as performance records; the evaluation of teachers can be conducted by way of presentation and oral debate, interviews, as well as questionnaires collected from students; and the evaluation of administrators can be done by questionnaires collected from their subordinates, and interviews as well.

Examination

The examination has been the conventional instrument of evaluating students. It is indeed an indispensable means for testing the knowledge, skills or ability of students. Nevertheless, attention should be paid to the diversification of the examination's
types. Types such as criterion-referenced tests, performance tests, objective tests, etc. should be used in order to suit the characteristics of maritime education. These examinations can be conducted in forms of closed-book and open-book, essay examinations, laboratory skill tests, as well as simulator operation tests.

**Performance Records**

Performance records, as a part of documentation in the quality assurance mechanism, are a formal document relating to the performance of personnel at all levels, including students, teaching staff, as well as administrators. Performance records would enable evaluators to determine the performance of personnel under evaluation. They are usually used as an auxiliary means of evaluation.

**Questionnaires**

This is probably the most commonly used instrument of evaluation. The questionnaires may take a variety of types, such as open-ended questions, checklists, Yes-No questions, multiple-choice, as well as attitude survey question with ratings. They are usually designed by evaluators and collected back from participants who are usually subordinates of the personnel in being evaluated. They can be used to obtain subjective information about participants' feelings, or opinions to the personnel in being evaluated.

**Interview**

It is a useful instrument in evaluation, although it is time consuming work. Interviews are usually conducted by the supervisors of personnel in being evaluated. It can secure valuable information, which might not be available by other instruments or may be difficult to obtain through other instruments.

**Presentation and/or Oral Debate**

It is also a useful and effective instrument in the evaluation of any personnel. The evaluators can obtain firsthand information about the expressive ability, reasoning and analysis skills, as well as the mentality of the personnel being evaluated through presentation and oral debate. The topic of the presentation or oral debate can be designated by the evaluators, if necessary and possible.
5.3 Qualification Requirements for Personnel Concerned

5.3.1 Requirements for Auditors

Considering the significance of auditors for the quality assurance mechanism, the BSI Quality Management Handbook, Part 1, (1995) set forth the qualification criteria for quality system auditors. The qualification criteria mainly cover the requirements on auditors of their education, training, experience, personal attributes, management capabilities, maintenance of competence, as well as selection of lead auditor.

In accordance with the reality and characteristics of the maritime education in China, the qualification requirements for auditors, which would also be requirements for candidates of the so-called Academic Accreditation Council, can be presented as the following:

1) Auditor candidates should have professor title or equivalence and both teaching experience and maritime industry experience.

2) Auditor candidates should have undergone necessary training to ensure their competence in the skills required for carrying out audits and for managing audits. Training in the following areas should be regarded as particularly relevant:
   - knowledge and understanding of the standards against which quality audits may be performed
   - evaluation techniques of examining, interviews, and reporting
   - additional skills required for managing an audit, such as planning, organising, communicating and directing

3) In terms of personal attributes, the auditor candidates should be open-minded and mature; possess sound judgement, analytical skills and tenacity; have the ability to perceive situations in a realistic way, to understand complex operations from a board perspective, and to understand the role of individual unit within the overall organisation. The auditor should be able to apply these attributes in order to
   - obtain and assess objective evidence fairly
   - remain true to the purpose of the audit without fear or favour
• evaluate constantly the effects of audit observations and personal interactions during an audit
• treat the personnel concerned in a way that will best achieve the audit purpose
• perform the audit process without deviating due to distractions
• commit full attention and support to the audit process
• react effectively in stressful situations
• arrive at generally acceptable conclusions based on audit observations
• remain true to a conclusion despite pressure to change that is not based on evidence.

4) Auditors should maintain their competence by

• ensuring that their knowledge of quality system standards and requirements is updated
• ensuring that their knowledge of auditing procedures and methods is updated
• participating in refresher training where necessary

5.3.2 Requirements for Teaching Staff

Undoubtedly, the qualifications of teaching staff are of critical importance in education. Maritime education is, of course, without exception. In late December 1995, the Code for Teachers Qualification was issued by the Chinese State Council and will soon be implemented nation-wide. (People's Daily, 28 Dec. 1995) This Code provides a sound legal basis for the setting-up of teachers' qualification requirements in the maritime institutions. Considering the characteristics of maritime education and qualification requirements for instructors and assessors under the new STCW Convention, the qualification requirements for teaching staff in maritime institutions are presented in the following aspects:

• candidates should at least obtain Masters Degree in a particular speciality or course
• candidates should at least have two years' experience in the shipping industry
• candidates cannot obtain teacher's certificate until passing through stringent examination or equivalent evaluation conducted by the Academic Accreditation Council. The validation of the certificate should be carried out through periodical evaluation. The term of validity of certificate should be correspondent to the external independent audit period (i.e. 5 years)

• Teaching staff should be periodically trained to ensure that their knowledge and skills in their individual speciality are updated

• Teaching staff should be periodically instructed to ensure that their teaching methodology, knowledge and understanding of assessment criteria for students are updated

• Teaching staff who undertake ship officers' training should be periodically involved in the maritime industry. They should preferably work on board ship for 6 months every 5 years if possible

5.4 Other Considerations in Preparation for the QA Mechanism

5.4.1 Informational Sources

Without exaggeration, the twenty-first century will be the century of information. A library should and has to be the information centre in a maritime institution. However, the libraries in Chinese maritime institutions are not well functioning as they should have been.

The libraries in Chinese maritime institutions have been facing a common problem of not being able to provide students and teachers with enough informational sources that they need, because of severe shortage of financial resources. As the author described in section 2.5, the budget tightness has resulted in a series of problems in the library, such as lacking subscription fees for periodicals, books, as well as proceedings related to the international maritime conferences; lacking funds to update the informational sources, e.g. video tapes, films, slides, CD-ROM; shortage of money to establish a computerised management system, which is essential for the library to operate efficiently. If these problems persist, the library is likely to be a
latent threat to maritime education quality in terms of both teaching and learning. They will ultimately have an adverse effect on the quality assurance mechanism.

In this context, there is much work to be done on part of the administration in the maritime institutions. The following work can be done as the first stage to improve the performance of the library.

1) An Interlibrary Loan System among local public libraries and the libraries of maritime institutions should be established by means of local computer network available. It would make up the shortage of informational sources and reduce expenditure on subscription for common books. The libraries in the maritime institutions should expend their limited money mainly on purchasing books, periodicals related to maritime affairs. Common informational sources could be available through access to local public libraries within the interlibrary loan system. The interlibrary loan system has been proven in some developed countries to be a cost-effective way in increasing the informational sources and saving money.

2) An Informational Data-Base regarding IMO documentation, conference proceedings, convention revisions and circulars should be established in the computer centre of the library. The above data-base should be updated periodically.

3) A Computer Searching System should be set up as soon as possible.

4) Access to the Internet should be gained when possible.

5.4.2 Communications

Communications have always been crucial matters in any organisation. Without exception, communication links are necessary in preparation for implementing a quality assurance mechanism. The communication links at all levels, such as links between one maritime institution and another, between maritime institutions and ship-owners, between institutions and shipyards, between institution and IMO, between maritime institutions and scientific research institutes, should be established and well organised.
1) Communication links between institutions

Communication links between institutions could encompass many ways, such as academic communication and collaboration, visiting scholar exchange, mutual quality supervision. All these activities could contribute to improving educational quality. In addition, close communication links between institutions could be beneficial to both sides in sharing the latest information regarding maritime affairs. Further, on the basis of close links between institutions, networking, where maritime institutions may be linked in some way for their mutual benefit, could be gradually established within the maritime education system. The concept of networking has become increasingly important in recent years. Grouping of institutions could give member institutions more opportunity of co-operation in many areas. It also provides the possibility for harmonisation of education objectives, quality standards, evaluation criteria, and etc. Yet it is possible to run training courses in a more cost-effective and efficient way.

2) Communication links between the institution and the shipping industry

The main purpose of maritime education is to provide the shipping industry with qualified personnel. Maritime science and technology nowadays are developing so rapidly that qualified personnel today would probably become unqualified tomorrow. It is thus necessary for maritime institutions to keep their eyes staring at the shipping industry.

Communication links between maritime institutions and shipyards, links between institutions and classification societies, links between institutions and scientific research institutes, as well as links between institutions and shipowners should be established. Experts and technicians from shipyards or scientific research institutes can be invited periodically to hold seminars and lectures in the institutions. The latest development regarding the maritime technology can be comprehensively and intensively introduced in these seminars and lectures.

In addition, opinions from shipowners with respect to their expectation and assessment of maritime personnel, as well as maritime job needs, should be
periodically collected by the administrators in the institutions. Such information is a valuable reference to the policy-making, curriculum design and course development for the administrators in the institutions.

3) Communication between the institution and IMO

In order to set up an IMO information data-base mentioned before, direct communication links between the institution and IMO should be established to avoid deficiency or distortion of IMO information due to bureaucracy and red-tape. In addition, direct communication link with IMO could facilitate co-operation between IMO and the institution. The experts from IMO could be invited to give directions and recommendations on the institutional policy-making regarding quality management, or to supervise the implementation of the quality assurance mechanism. Such direct communication with IMO could also provide the institution with more opportunity to know what is happening in the maritime field.

5.4.3 Scientific Research

Scientific research work has taken a considerable proportion in teachers' educational activities in Chinese maritime institutions. For the sake of their position promotion, career development, as well as increase of salaries and bonus, academic teaching staff in most cases have to undertake a great deal of scientific research work at the same time as they are teaching.

In this context, some administrators who are involved in quality management would argue that scientific research work could conflict with teaching activities because it could draw too much of the teachers' attention and could in turn affect the teaching quality. A controversial point is that they see only the negative side of research work. However, scientific research could, from the standpoint of its positive side, greatly contribute to the educational quality. Jean-Marie Archambault (1989), described the importance of scientific research in university as following:

Research takes place on the frontiers of knowledge and yields innovations which shape our science and culture. Research is also of socio-economic
importance. Another no less important ramification couples research with university life. The fact that it takes place in the university produces obligations towards the university structure: to give support to institutional growth sectors, to renew teaching content, to breathe new life into graduate studies, to fuel the teaching body and to provide intellectual fresh air.

In view of the author's personal experience, scientific research in a university could be the best way to make teaching staff keep abreast with the development of science and technology in their particular fields, and keep their knowledge updated. This, which was stated in the previous section, is of critical importance in the assurance of educational quality. In this context, when making institutional policies, the administrators should pay considerable attention to the research work. The following considerations should be taken into account:

1) There should be a stronger and clearer link between research work and resource allocation; The allocation of resources should be based on evaluation results of previous research work.

2) There should be a clear policy for stimulating and initiating new research in the circumstances of financial austerity.

3) Certain important new areas in the maritime field, such as pollution prevention, energy saving, and safety of ship structure, should be identified for research work.

4) The evaluation criteria of research work should mainly focus on

- the number of scientific papers published
- the number of research items undertaken
- output and impact of research work
- relevance to teaching subject or speciality
- cost and benefit
5) There should be a reasonable proportion between scientific work and teaching activities for academic teaching staff. Teaching staff who teach subjects in basic science should be encouraged to undertake more scientific research work.

6) Scientific research performance of teaching staff should be clearly indicated as a major part of the evaluation of the teaching staff.
6.1 Conclusions

In response to the booming national economy and the changing maritime industry, the size of Chinese maritime institutions has expanded dramatically in the past decade. The over-expansion has inevitably raised concerns over the quality issue. Meanwhile, the STCW/95 Convention, for the first time, put forward the regulations regarding Quality Standards and Quality Assurance. The Quality Assurance Mechanism within the Chinese MET system is therefore indispensable. The quality of maritime education in terms of its outcome should really be a matter of the utmost concern, rather than the quantity of graduates, which seems to be in shortage at present due to the constantly expanding maritime market.

Based on the investigation and analysis on the external and internal environment of the Chinese MET system, taking into consideration the characteristics of maritime education, this dissertation presents the Quality Assurance Mechanism by means of Deming Cycle.

Deming Cycle has been regarded as the crux of ISO standards, under which any activities involved in production or services have to be conducted according to the Cycle:
Essentially, the Quality Assurance Mechanism in the MET system can be based on Deming Cycle. The contents, coverage and functions of the mechanism are of course quite different from those in the industrial context, in particular:

1. **Role of the Maritime Administration**

The essential steps to take to ensure the good quality of an operation on part of the Maritime Administration are to

- establish clear policies and standards governing staff quality and the conduct of the activities;
- adopt realistic and properly funded implementation and control measures which give practical effect to these policies and standards in order to allow the established objectives (i.e. STCW/95 Convention requirements) to be achieved;
- develop and introduce procedures which allow the performance and results of these activities to be monitored and checked to ensure that established objectives are being achieved; and
- ensure that all staff concerned participate fully in the development and establishment of the quality system and are kept fully informed at all times.

In this regard, a single government department or agency must be made responsible for administering the STCW/95 Convention and must be given the necessary regulatory and administrative authority to ensure that all government departments and agencies, education and training institutions, shipowners, shipping companies and seafarers within the party's jurisdiction give full and complete effect to the revised convention.

2. **Responsibilities of the Maritime Institutions**

With emphasis on the outcomes of the maritime education and training process, the establishment and maintaining of the Quality Assurance System within the maritime institution should start with an institutional or programmatic self-evaluation: a comprehensive effort to evaluate achievement of the stated policy, aims and
objectives through application of quality management and operational control functions.

The quality management is concerned in detail with the way these functions are managed, organised, undertaken and evaluated in order to ensure educational quality and the achievement of their identified objectives. In this context, based on the initial self-evaluation on quality management, the elements in the Quality Assurance Mechanism within the institution should at least include the following necessary items:

- the institution’s formal statement of its aims, objectives, missions and policies
- lines of responsibility for quality and integrity and for the internal approval and conduct of programs, including functions of academic committees
- development plan of learning and performance objectives, based on job analysis as appropriate
- policies and procedures for student admission, evaluation and progression, including criteria for examinations and skill acquisition testing
- development plan of curriculum, based on need assessment of the maritime industry
- availability and allocation of resources, including human, financial and physical, for sustaining and improving programs and instruction
- quality standards and plans for periodic independent audit
- availability of correction action, based on self-evaluation and independent audit
- selection, approval and appointment of teaching staff, examiners and assessors, including qualifications and experience criteria
- staff appraisal and provision for staff development

In introducing and implementing the Quality Assurance Mechanism, the following areas need to be paid considerable attention:

- quality system coverage regarding academic and administrative structures
- quality control functions regarding teaching, learning and evaluation
- internal self-evaluation and independent external audit regarding methods, process and framework

The introduced Quality Assurance Mechanism is generally applicable to any kind of maritime institutions. The real situation of the maritime institutions, however, may vary from country to country, or from one institution to another in the same country. Based on the analysis of the strengths and weaknesses in current Chinese maritime education, the following areas particularly need to be paid attention in the development and application of the Quality Assurance Mechanism in the Chinese MET institutions:

- Lines of Organisational Responsibilities
- Evaluation Criteria and Instruments regarding administrators, teaching staff and students
- Qualification Requirements for the personnel concerned
- Informational Sources
- Communication Linkages
- Scientific Research

6.2 Recommendations

Based on the previous analysis in section 2.5 on the weaknesses in Chinese maritime education, recommendations for the establishment of the Quality Assurance Mechanism in Chinese maritime education are presented below:

- Organisational structure within the institution needs to be streamlined in order to simplify administration.
- Lines of responsibilities for quality and integrity and for the internal approval and conduct of programs, including functions of the academic committee, should be clearly defined and be reflected in official documentation.
- The institution's formal statement of its aims, objectives, missions and policies regarding quality standards should be established and be reflected in official documentation.
- The evaluation criteria, instruments, and procedures regarding administrators, teaching staff, as well as students need to be set up and officially documented.
- An Academic Accreditation Council, co-operatively composed of the academic authorities selected by the State Education Commission, maritime specialists selected by the Ministry of Communications, maritime experts from shipping companies, as well as professors or the maritime academic authorities from the maritime institutions, needs to be established, which is mainly to be accountable for the independent external audit.
- The role and responsibilities of the Academic Council within the institution need to be strengthened by means of creating a Quality Standard Committee of the Council, which is to be composed of a cross representation of teaching staff, acting as an internal evaluation mechanism for quality standards. Its role is to approve courses, documentation of course development or schemes, assessment system, qualifications and experience of teaching staff.
- On the basis of the external quality audit report, evaluation results, as well as feedback from the shipping industry, the corrective planning or actions on part of the administration need to be timely taken in those areas where evident deficiencies or weaknesses in the quality management exist.
- Policies encouraging strong links between evaluation result and resource allocation should be established in the current situation of financial austerity.
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