An Analysis of the Cypriot Maritime Cluster: Feedback from the Industry

Dr-Eng, Orestis Schinas, CEO, Transmart Consulting SA, Athens, Greece

Dr. Christis Charakis, Frederick Institute of Technology, Limassol, Cyprus

Dr Manolis Nikolaidis, Frederick Institute of Technology, Limassol, Cyprus

Abstract

Based on results of a research-project funded by the Cyprus Research Promotion Foundation under the title NAYTOTHORAX. This paper aims to present basic demographic, educational, professional and job-satisfaction information on the Cypriot Maritime Cluster.

The project-team has solicited information from the industry through questionnaires; major ship owning and ship-management companies, public entities, such as the Department of Mercantile Marine and the Port Authorities, have provided data. Directors and officers in the management of these public and private entities have responded to another set of questionnaires, in order to endow the project-team with a wider and more strategic approach.

The paper presents a statistical analysis, useful for the understanding of the Cypriot Maritime Cluster, based on established cluster-analysis approaches, as well as professional, training and educational characteristics of this market.

Keys: Cyprus, cluster analysis, human resources

Introduction

The importance of the Cypriot Flag is unquestionable in terms of registered GRT in the world commercial fleet. Cyprus as a EU-Member State has also adopted some stringent rules and regulations on safety, security and employment. The impacts of the latest developments are thoroughly analyzed in the related literature.

In contrast there is no clear picture of the Cypriot maritime cluster, its structure, its links and its dynamics. That is the gap, NAYTOTHORAX aims to bridge. The research project NAYTOTHORAX is funded by the Cypriot Research Promotion Foundation (www.research.org.cy) and aims, not only to identify the basic demographics and characteristics of the employees working in this field, but also to provide solid directions, towards a sustainable linkage of training, education and competitiveness of this sector.

Although the issue of human element is well discussed as regards safety onboard, accidents and similar aspects of shipping, very few if not any, are available in the scientific maritime economics literature. The issue of the 'quality of human element' and the competitiveness of a maritime cluster has not been discussed in quantitative terms. However, there is some information but not exactly of the quality and the quantity a researcher needs in the literature of maritime clusters.

The issue of maritime clusters is well discussed in the literature. Wijlnots et al (2003. pp 84-84) define clusters according to Porter, as vertical and horizontal networks of firms, in other words as a concentration of interconnected companies and institutions in a particular field. Moreover, this source provides also a classification of clusters as *regional innovation networks, regional innovation systems* and *learning regions.* This pioneering reference, focused mainly on technical and innovation issues of shipbuilding and shipping activities, as the countries under analysis were mainly Norway and the Netherlands. Another interesting reference, closer to the character of the Cypriot cluster, is the work of De Langen (2002 and 2004). De Langen uses the very same methodological tools for the analysis of a major seaport, in that case, Rotterdam, as it is easy to estimate agglomeration forces. Furthermore, the role of intermediaries is better understood, as facilitators along the logistics chain but also along a chain of business relations. Jenssen deals with the issue of innovation in the Norwegian shipping cluster (2003 and 2006).

The literature review would not be exhaustive at a satisfactory level for the needs of this work, if there was no mention of the work of Peters et al on the Dutch cluster (for example, 1999) as well as of the reports on the Finish, the Swedish, the German, the Dutch, the Norwegian and the Italian clusters.

Methodologically, the NAYTOTHORAX project-team has solicited data through questionnaires. Data provided mainly from public authorities, outline the Cypriot maritime business and are presented in the second section. The questionnaires and the feedback are presented in the next section and their aim was the mapping of the market. This paper concludes with a summary of remarks and conclusions of this research, currently still under progress.

At this point, it is important to acknowledge the contribution of many business decision-makers in the maritime cluster of Limassol as well as of officers of the Maritime Administration, especially Mr. Andreas Constantinou, for their support and their continuous feedback with data, information, comments and remarks. The interest of public authorities affirm the idea expressed in the literature, that clusters are of high political interest, and such an approach elicits the interest of policy-makers.

Cypriot Shipping Business Analysis

The Cypriot Registry has experienced recently a major change, as the number of ships registered has decreased, however improved in terms of quality. This was a positive impact on the full EU-Membership, granted to the Republic of Cyprus in 2004. European shipping has strengthened its relative importance, as close to 4% of the world's tonnage is registered under the Cypriot Flag. This development is rather encouraging for the registry, which consists mainly of bulk-carriers and tankers, of various ages and of an average capacity ranging between 4000 and 5000GRT. The following graphs and tables reflect developments of the Cypriot registry.

The decline in numbers is evident in the last years, according to the following graph (Figure 1). This is more or less the reflection of the accrued revenues by the State from the registry (Figure 2).
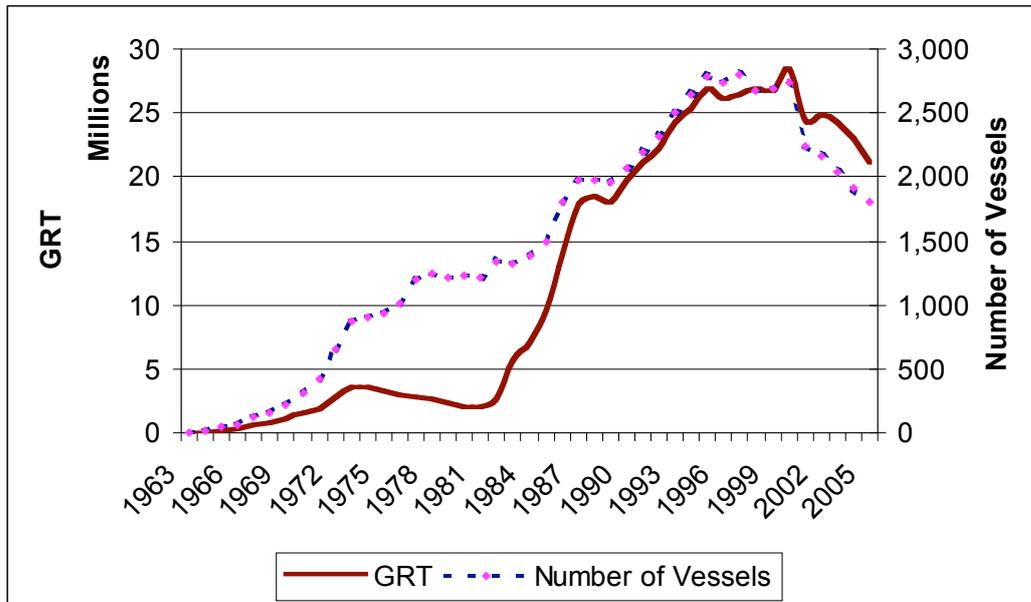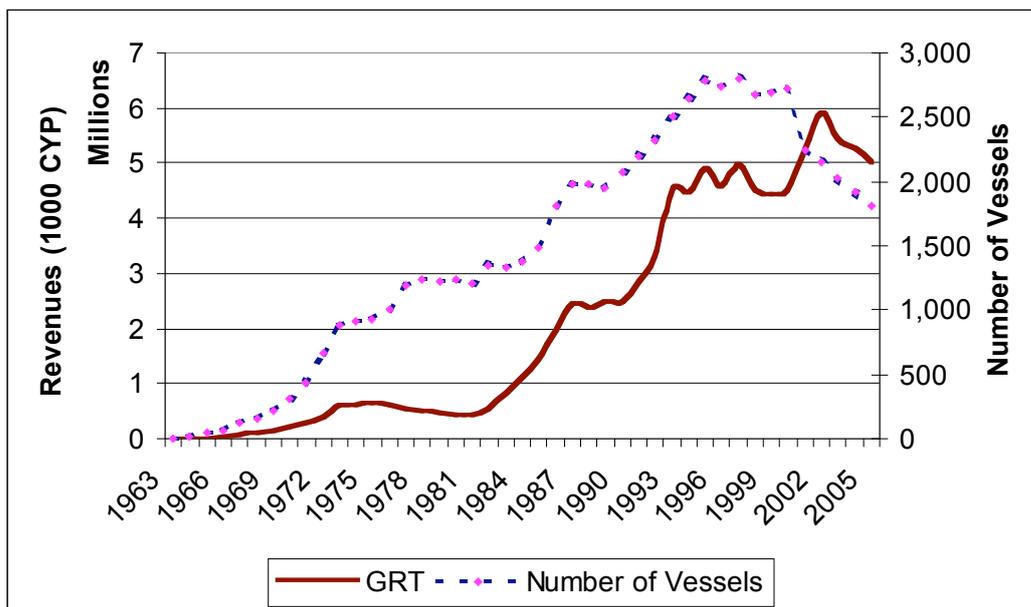

Figure 1: The Cypriot Registry of Shipping

Figure 2: Revenues accrued by the State from the Registry

The quality of the registry has been improved and this becomes evident through statistical data of the detentions of ships under the Cypriot Flag. The following tables provide data for the Paris MOU, Tokyo MOU and of the US Coast Guard (Table 1, Table 2 and Table 3).

Year	Inspections	Detentions	Detention Ratio	Av. Detention Ratio % for TOKYO MOU	± % for Cyprus ships
2001	693	45	6.49%	7.76%	-1.27%
2002	772	49	6.35%	6.67%	-0.32%
2003	738	52	7.05%	8.49%	-1.44%
2004	722	38	5.26%	6.51%	-1.25%
2005	575	21	3.65%	5.21%	-1.56%

**Table 1: Detention Data – Tokyo MOU (Source: Department of Mercantile Shipping)**

Year	Inspections	Detentions	Detention Ratio	Av. Detention Ratio % for PARIS MOU	± % for Cyprus ships
2001	1311	116	8.85%	9.09%	-0.24%
2002	1279	95	7.43%	7.98%	-0.55%
2003	1202	89	7.40%	7.05%	0.35%
2004	1050	60	5.71%	5.84%	-0.13%
2005	914	26	2.84%	4.67%	-1.83%

Table 2: Detention Data – Paris MOU (Source: Department of Mercantile Shipping)

Year	Inspections	Detentions	Detention Ratio	Av. Detention Ratio % for USGC	± % for Cyprus ships
2001	516	13	2.52%	2,21%	0.31%
2002	429	17	3.96%	2.52%	1.44%
2003	431	10	2.32%	1.99%	0.33%
2004	409	13	3.18%	2.43%	0.75%
2005	340	8	2.35%	1.61%	0.74%

Table 3: Detention Data - USGC (Source: Department of Mercantile Shipping)

Data from the above table confirm the qualitative improvement of the Cypriot Flag, suggesting decreasing deviations from international standards, thus achieving the 'quality shipping' goal.
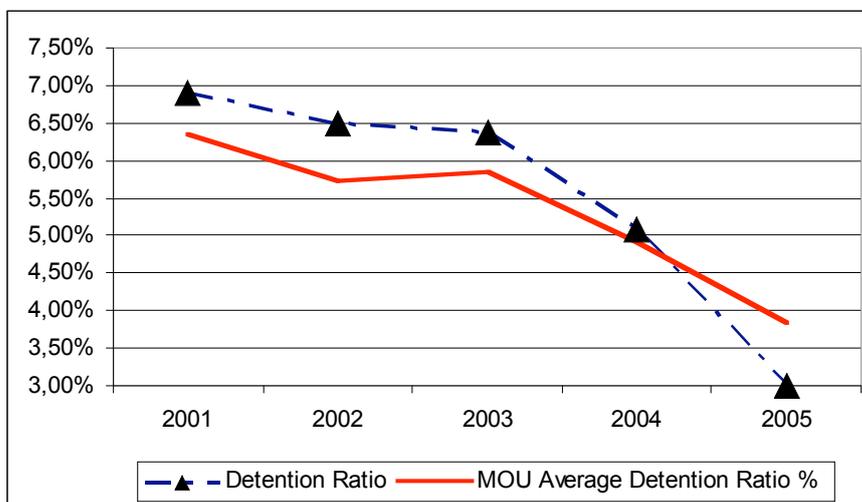
Figure 3: Detention Rate – Aggregate Figures

According to the Cypriot Shipping Council (2007, p.1) the improvement of the quality of the registry is a major political success that originally envisaged attracting shipping activity. However, the Cypriot registry ranks currently at the 10th position instead of the 4th; in other words, the qualitative improvement did not have positive impact on the number of registered ships as well as in the ship-owning and ship-managing community of Cyprus. In the same document, four reasons are identified for this negative impact:

1. Political Issues: the Turkish policy of banning Cypriot vessels servicing Turkish ports, affecting negatively short-sea shipping lines and coastal trading.

2. Taxation Issues.

3. Social Security Issues of European Nationals onboard Cypriot vessels.

4. Working License Procedures for non-EU nationals working for the shipping companies in Cyprus.

No further analysis is considered necessary within the framework of this work, yet some of the above issues are identically identified as problems in other clusters as well.

According to official data provided generously by the Department of the Mercantile Marine, 32 companies are involved in ship-management or ship-owning activities. These companies report 2185 vessels under management. Descriptive statistics are of little help: the minimum number of ships under management reported is 1, the maximum 701, the average is 68, the median 20 and the standard deviation is 138. Obviously the sample is heavily skewed.

A histogram with the reported number of ships under management is enlightening.
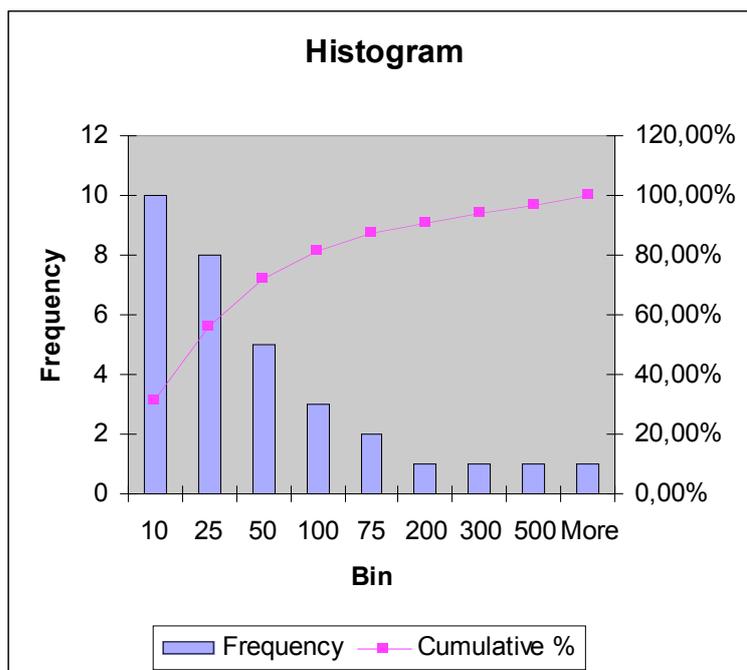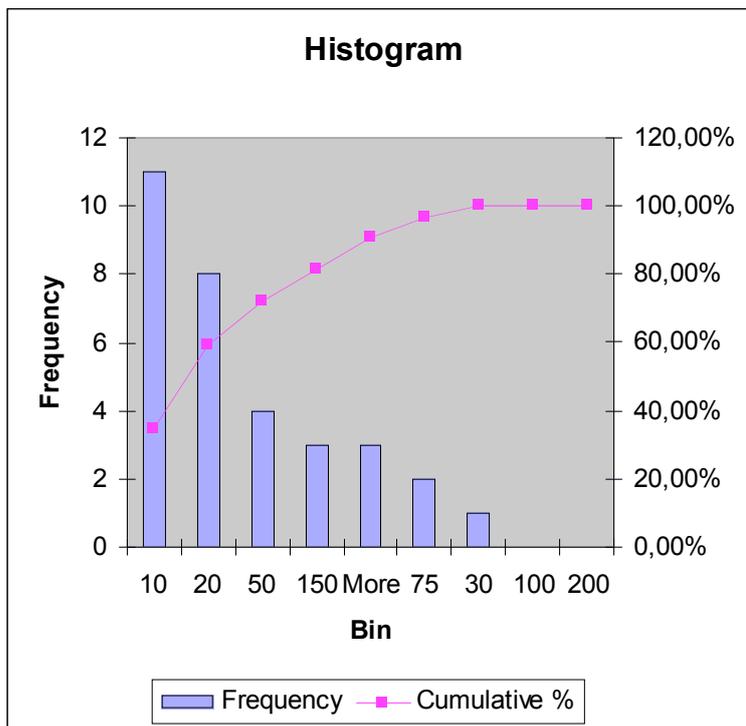

Figure 4: Number of Ships per Company – Histogram

Ten companies manage up to 10 vessels and eight companies manage up to 25 vessels. In terms of concentration analysis the following indices, are estimated:

- Dissimilarity Index   0.55320
- Gini's Concentration Ratio 0.02307
- HHI   0.15418

These indices are well discussed in the literature and widely used in market analyses. It is reminded, the HHI index reveals a monopoly when its value is close to 1 and a perfect dispersion when equal to $1/n$, where n is the size of the sample. In this case $1/n$ equals $1/32 = 0.03$. Obviously this index is not of great assistance, yet revealing a rather dispersed market as it is only 5 times larger than $1/32$ and 9 times lower than monopoly. The dissimilarity index and the Gini ratio suggest that the market is neither dissimilar nor absolutely concentrated, as the dissimilarity index is 0.55 and the Gini ratio suggests a uniform distribution.

A similar analysis for the reported employee number in theses companies yields that the total number employed is 1610, with a minimum reported of 4 persons and the maximum 248. An average of 50, a median of 16 and a standard deviation of 70 persons are estimated. The following histogram contains more information:


Figure 5: Number of Employees per Company - histogram

From the above graph, it is easily extracted that 26 companies employ up to 75 persons and represent almost 80% of the sample. A calculation of the similarity indices used above, yields:

- Dissimilarity Index   0.51646
- Gini's Concentration Ratio 0.05761
- HHI   0.09045

As HHI is only three times larger than $1/n$, it suggests that the market is less concentrated in terms of employment. The same conclusion is extracted from the other indices.

A single-parameter analysis is not really very helpful in understanding the maritime cluster of Cyprus. A statistical-cluster analysis enables our insight better; specifically an Euclidian hierarchical analysis over 'number of ships' and 'number of employees', suggests five distinct clusters:
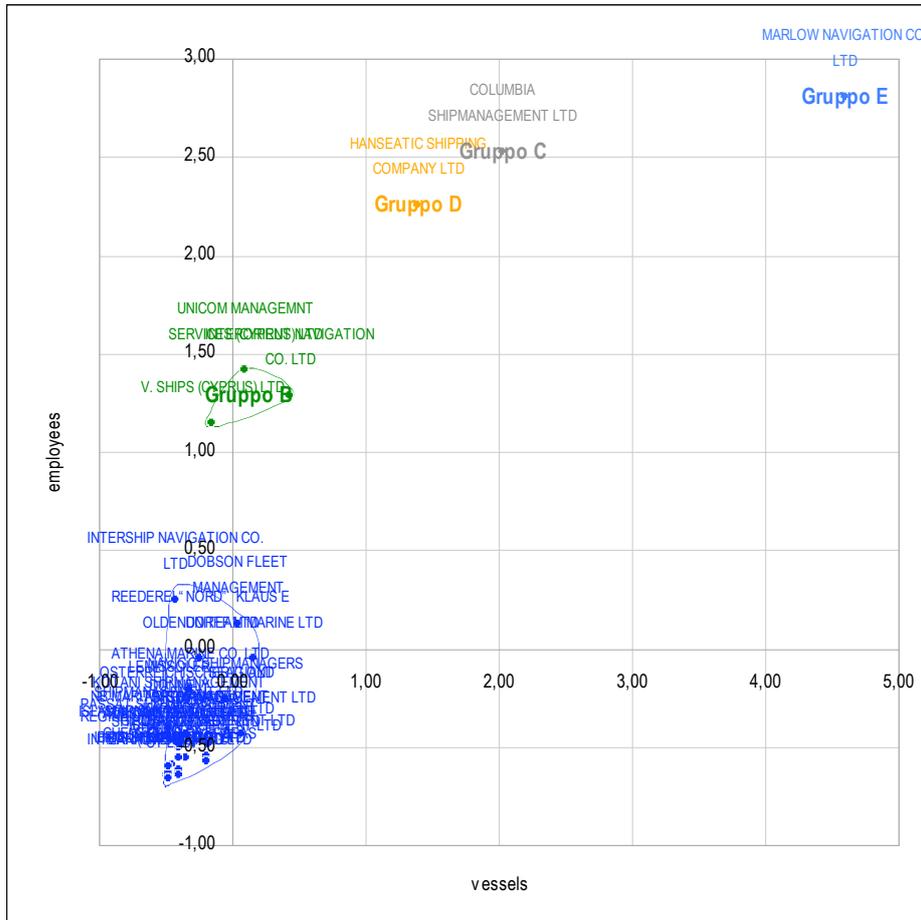

Figure 6: Cluster Analysis (Euclidian, Hierarchical) per number of vessels and employees

It becomes evident from the above graph that the distances between large ship-management companies, such as Marlow, Hanseatic and Columbia are very short, and practically they form an aggregated group. Companies in the second cluster manage a considerably higher number of ships than companies in group A. By applying the same criteria excluding the big companies mentioned above, then group A and B are clustered as following:
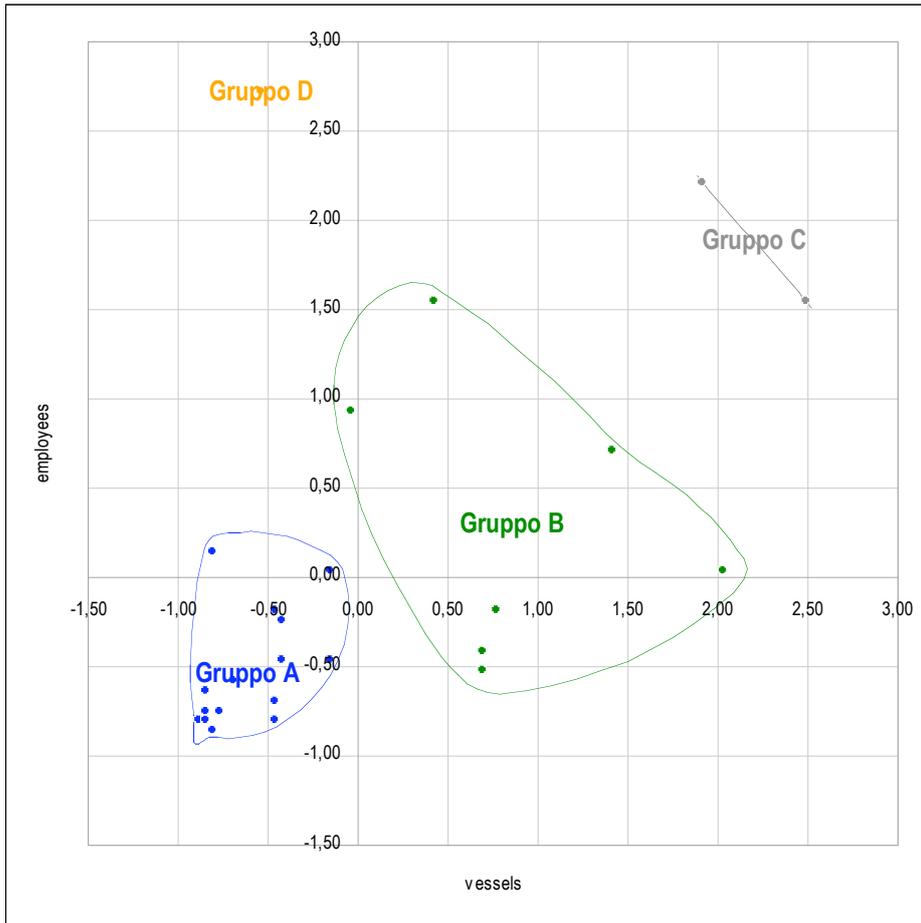
Figure 7: Cluster Analysis (excluding large companies)
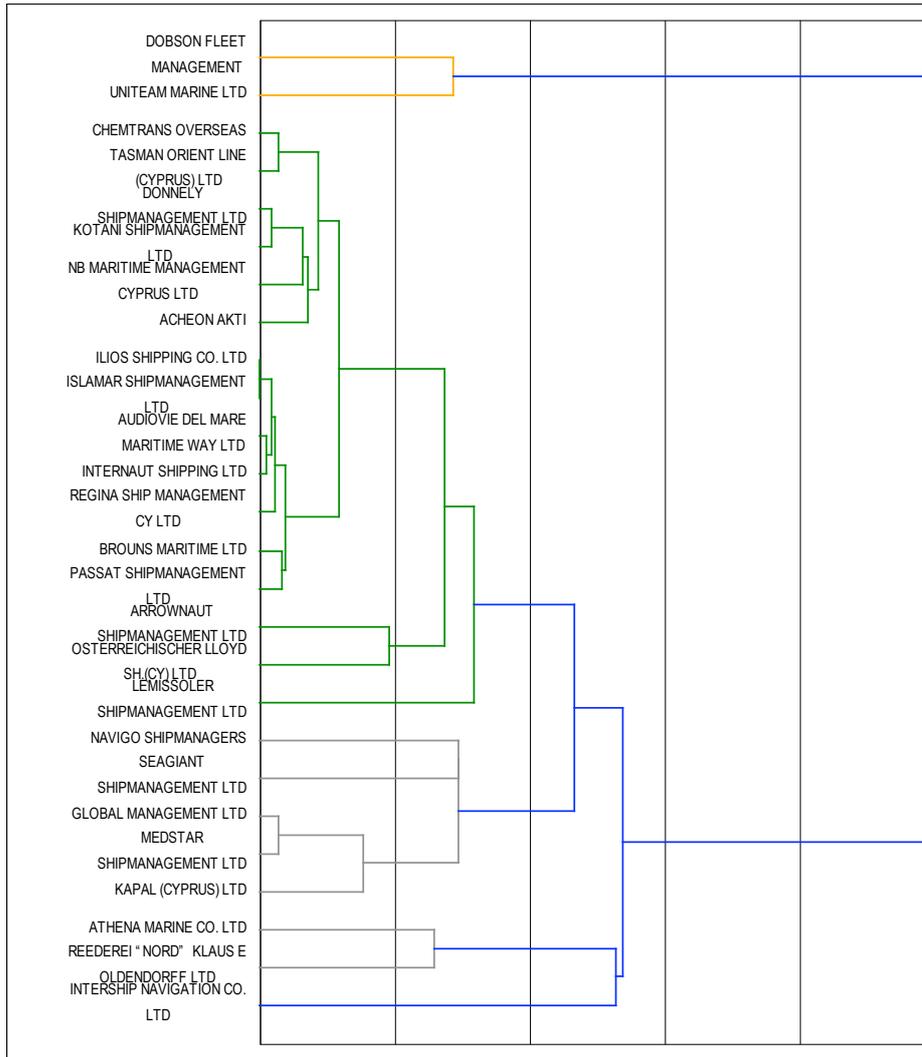
Figure 8: Tree analysis of the sample (excluding big companies)

The analysis of the cluster is still in progress, however, the following data have to be presented as well. According to official Cypriot sources, 1652 employees are working for ship management or ship-owning companies. Additionally, 656 employees are reported providing relevant to shipping services. A draft analysis yields:

Classification Societies	17	2.6%
IT – Communications – Marine Electronics	122	18.6%
Engineering & Technical Services	36	5.5%
Insurance Brokers & Services	36	5.5%
Paints – Supplies – Safety Equipment	55	8.4%
Bunkering	27	4.1%
Policy Related Bodies	3	0.5%
Agents – Brokers – Logistics (forwarders)	206	31.4%
Banks & Finance Services	45	6.9%
Ship Management	23	3.5%
Various	86	13.1%

At a final stage, the analysis will include in the future data about crews and officers, as well as some in depth information about employees ashore.

Questionnaires and Feedback

Following ordinary statistical methods for the analysis of questionnaires, four distinct categories of employees were identified and thoroughly analyzed:

- Executives of Public Sector (85 distributed questionnaires of 55 questions),

- Superior Executives of Public Sector (30 distributed questionnaires of 14 questions),

- Executives of Private Sector (120 distributed questionnaires of 75 questions)

- Superior Executives of Private Sector (25 distributed questionnaires of 14 questions).

The research effort was not limited in soliciting information through questionnaires, but also focus groups and interviews with senior executives in the private and public sector affirmed the direction of the analysis as well as supported the quantitative results with qualitative elements.

The questionnaires-analysis yielded significant results on the working environment in private and in public sector, as well as the degree of the employees' satisfaction at both wage and labour level.

The main concern of the research-team on the specific market was the relationship between the demand and the supply of executives in the private and public sector, aiming also towards a qualitative and quantitative update of the total Cypriot maritime cluster on relevant issues. The size of the sample is statistically adequate to yield conclusions for the whole cluster at the end of this research-effort.

Some of the results of the survey are presented below. As the research effort is not over yet, the presentation is limited to trustworthy outcomes up to the current stage of analysis.

A. Executives in the Public and Private Sectors

The very first outcome is that the executives in both private and public sectors, do not have statistically significant differences in *distribution per sex*; 100% and the 93% of their executives, respectively, is constituted by men. That is a demographic result of high importance for the equal employment opportunities of women in the industry.

Regarding *distribution per age*, it is observed that the administration of the public sector consisted of individuals between the age of 36-60, whereas that of the private sector consisted of individuals between the age of 31-65, a fact indicating the wider range of employees' ages in the administration of the private sector in comparison to that of the public one. More specifically, the age groups 31-35 and 61-65 years of age are absent in the administration of the public sector; a possible interpretation is the

indirect requirement of the public organizations through the competitive hiring procedure for experience and academic degrees. Furthermore, it seems that public servants leave office younger as they enjoy the right for an earlier retirement in comparison with private-sector employees.

Regarding the educational level of the executives. It is clear that there is a statistically significant difference between the private and public sector, as 42.85% of the public sector's senior administrative personnel does not possess a higher-education degree; in contrast only 7.1% has not concluded higher-education curriculum in the private sector. It is therefore understood that the educational level seems to be an important criterion for an individual to enter the private sector's administration, in contrast to the public one, where experience seems to be of equally importance. It was observed in the public sector that senior administration employees who have not acquired a university degree are minimum 51 years old. It is possible, that an academic degree was not necessary in order to enter into the Service in the past. Furthermore, in the public sector the percentage of employees with a post-graduate degree is 35.7%, while the corresponding percentage is 42.5% for the private sector.

More specifically, 87.5% of the public sector's executives with academic education have studied in Greece and Cyprus. Whereas, most executives in the private sector, a total of 82.1%, have studied in the United Kingdom and the United States.

Regarding the responses in the question *Professional Recognition – Title*, 29% of the public sector reports as professional title diplomas and certificates relevant to the naval profession – Master, Chief Mate and Chief Engineer, while titles such as Certified Accountants and Chartered Shipbrokers are totally absent, whereas the corresponding percentage of the private sector's administrative employees reaches 78% and refers to diplomas of Master, Chief Engineer, Chartered Broker, etc. in contrast to the public sector where professional specialization is absent.

The senior executives of the two sectors are also differentiated by their *involvement in the supervision of daily work*, as results from the senior executives' responses. In the private sector it is believed that seniors' involvement is excessive at a proportion of 87%, while in the case of the public sector only the 3.2% answers support the same. This result may be attributed to the hierarchical structure of the public sector as well as to the 'flat' and 'functional' organizational structures in private enterprises. The terms *involvement* and *supervision* yield a more vivid relation between top-, middle- and lower-level management.

Notably, 64.28% of the senior executives in the public sector believe that promotion and development opportunities are not provided on a merit-basis; the educational background should affect decisions more in the future than today. There is also discrimination in opportunities among employees with marine background and those who have not one, by 71.5%. It seems that public organizations tend to adopt merit-based procedures for development and promotion of staff, and the criterion of the educational background seems to become more important than it is in the private sector.

B. Administrative personnel in the Public and Private Sectors

The proportion of men and women in both sectors seems to be the same: 75% of the public sector's employees and the 73% of the private refer to men. This indicates a rather biased or traditional approach in both sectors.

Regarding *distribution per age*, it is observed that the private sector employees people ranging from 21-63 years of age, while the public sector is 21-60 years of age. For the latter, the age categories near to the bounds of this interval are under-represented, an indicator of the wider range of employees' ages of private sector – as happens to the executives. Moreover, the higher frequencies of the same sector are presented for the age groups 26-35 and 51-60 years of age (retirement age), while those of the private for the groups 31-35 and 36-40 years of age. In other words, the distribution per age of the private sector's employees covers a wider range and is mostly assembled to 'median' or 'middle' aged, but is not symmetric near the bounds being more receptive to youths.

Regarding the employees' distribution per educational level, the 28% of those of the public sector do not possess a higher-education degree, while the corresponding percentage of the private employees is negligible. Almost 44% of the public servants appear to have at least a post-graduate degree, while similar is the corresponding percentage for the private sector. Finally, the percentage of the employees with higher education that has made their studies abroad Greece or Cyprus is almost 68% for the public sector, while at about 59% for the private. Therefore it is concluded there is a difference between private and public sector employees on their educational background.

The employees' responses to the question *Professional Recognition – Title* indicate that in the public sector professional development through additional vocational training leading to professional diplomas or certificates is limited, as only a percentage of 7% has reported a relevant diploma or certificate. On the contrary, in the private sector 65% of the employees report having an additional certificate relevant to the maritime profession. This indicates that there is also a significant difference between private and public sector concerning the professional specialization. One should critically examine whether additional professional training and licensing is of direct interest to the Civil Service as well as necessary for the adequate fulfillment of the prescribed tasks per position in the public sector.

The employees' responses to the set of questions regarding *development prospects* are the same for the two sectors; the percentages of the positive answers are approximately 60%. Regarding the question on the *existence of discriminations,* concerning gender or educational-level related biases, significant differences are apparent, in the first case (gender discriminations) the negative answers' percentages are similar, 56% for the public and 59% for the private sector, and in the second (education discriminations), 72% for the public and 66% for the private sector.

Responses to the question on the *suitable exploitation of knowledge* vary considerably. The overwhelming percentage of 85% of the private employees answers positively to the question, while only 46% of those of the public did so. Similarly, in the question concerning the *volume of work assigned* the employees of the private sector answered that this is excessive with a percentage of 66%, while those of the

public do so at a proportion of 19%. The very significant differences in the answers of the two sectors' employees justify their differences in their very essence and justify the private sectors' biases for employees with advanced qualifications. Another difference is apparent in the responses regarding employees' satisfaction in the *working hours and salary*; 71% of the private sector reports satisfied with their working hours and 50% with their salary, while the corresponding percentages of the public sector are 97% and 75%.

In the public sector, 58% of the employees' reports *satisfaction on the upper management*, while for the private the corresponding proportion is 77%. This difference is statistically significant and is also an indicator of the differentiated criteria of the two sectors for the employees' promotion. As for the employees' views on the *promotion and salary increase criteria*, in the public sector they denote their merit-based ones at a proportion of 37%, while in the private sector at a proportion of 71%.

Employees' views about the *centralization and the bureaucracy*, as well as the *existence of 'out-of-the-box' actions* do not differentiate, as the majority answered positively to those questions. Similar, also, are the answers given to the questions concerning the *exploitation of human resources for the improvement of the organization's quality*, for both the private and public sector answer positively with a percentage of 57%. The similarly high percentage of negative answers probably indicates that not all employees participate equally in all processes of decision-making and production. This similarity of responses indicates that both sectors suffer from the same functional weaknesses.

Finally, employees of both sectors confirm the necessity of the training and its direct relation to the specific needs of each organization. As for the *main needs for specialized personnel*, they are considered by employees of both sectors to be relevant with technical subjects, to maritime policy and to environmental subjects, followed by ship equipment, personnel training and law.

Public sector's employees report as the *major deterrent factor for their training* the lack of interest as well as of motivation, in contrast to the employees in the private sector who report motivation and interest but lack of time. Surprisingly, training-fees are not considered as an obstacle. This difference indicates the significance of training and the perceived benefit for the employees of both sectors.

Regarding employment positions, the private sector seems to occupy more employees at the departments of Financing-Accounting and Crewing. More precisely, the private sections structure and allocation of employees is shown below (Figure 9):

PRIVATE SECTOR
Number of Employees per Department
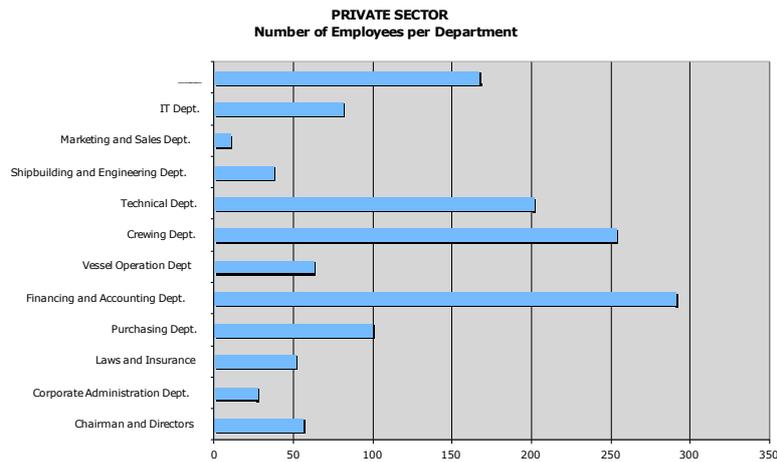
Figure 9: Allocation of employees per department in private entities

A major part of the research was devoted to the survey of allocation of employees in the private sector per department and per educational level. A special survey was conducted in one of the private enterprises that have participated in the original research (via the questionnaires and the focus groups). This special survey was aimed to record the allocation of employees in one randomly selected private enterprise. The critical factor taken into consideration was the hiring-year per employee; this factor allows estimations over the evolution of the enterprise's (annual) hire policies.

The methodology used was the correspondence analysis, which resulted in the following:

> ➢ There is statistically significant difference among the years of the enterprise's operation concerning the educational level of the employees hired, with a level of significance of 5% (p-value=0,019<0,05).

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	84,875	60	,019
Likelihood Ratio	93,554	60	,004
N of Valid Cases	275		

The correlation of the two variables is descending (Education Dependent: -0,164), meaning that in the flow of time the educational level of the personnel hired has

improved.

Directional Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Ordinal by Ordinal Somers' d	Symmetric	-,183	,045	-4,093	,000
	Year Dependent	-,208	,051	-4,093	,000
	Education Dependent	-,164	,040	-4,093	,000

[a.] Not assuming the null hypothesis.

[b.] Using the asymptotic standard error assuming the null hypothesis.

➢ There is statistically significant difference among the various departments of the employees' educational level, with a significance level of 5%(p-value=0,000<0,05), which means that different departments tend to hire personnel of different educational level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	309,487[a]	16	,000
Likelihood Ratio	57,522	16	,000
N of Valid Cases	276		

[a.] 15 cells (60,0%) have expected count less than 5. The minimum expected count is ,00.

The power of the correlation of those two variables is moderately high (Contingency Coefficient = 52,9%, Cramer's V Criterion = 72,7%), which means that the pre-knowledge of the department of employment of an individual may be an indicator of their educational level, able to reduce the error of its prediction at a level of 52.9% or 72.7%, as results of the two statistics.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Cramer's V	,529	,000
	Contingency Coefficient	,727	,000
N of Valid Cases		276	

The following bar chart (Figure 10) presents the educational level of the employees of the enterprise's departments:

Figure 10: Breakdown of Educational-level of employees per Department

Remarks and Conclusions

This is the very first research effort in mapping thoroughly the Cypriot maritime cluster. It is evident that the Cypriot maritime cluster is a dynamic and continuously evolving one. The interaction of companies and institutions is also apparent and maritime business is a vivid sector of economic activity.

The important issue at this time is not only the mapping of the cluster, but also the drafting of sound political goals and the employment of political means towards further development of this cluster. Cyprus faces a rather complicated political environment full of simultaneous opportunities and threats. One of the major challenges of the Cypriot policy-makers and definitely for the Cypriots, or Cyprus-based, business decision-makers, is the improvement of the level of employees. As maritime ventures and operations demand knowledgeable workers, the creation of human capital out of 'human resources' is the quest. In that direction, the NAYTOTHORAX research effort aims not only to map the cluster but also to suggest viable and feasible solutions towards these goals. Research is still in progress, and readers with special interest may find answers and responses by either directly contacting the authors or by monitoring this research.

Some interesting results of the research effort up to this point are the following:

1. The Cypriot registry has been considerably improved over the last years. Quality and competitive shipping seems an achievable goal for policy-makers; shipping companies seem to streamline efforts along with these policies. Decrease in figures and flagging-out expected a negative impact, but still Cyprus enjoys a top position in the world shipping.

2. Most of the companies are involved in ship-management; however many other companies offer services to ship-owning and ship-management communities. A

rather detailed analysis presented, yields the employment of 2300 persons. About 70% are directly employed by ship-management or owning companies. The market is lightly concentrated either in terms of tonnage or of number of employees. However, there are distinct tiers, especially between large ship-management entities and the rest of the companies.

3. The analysis of the questionnaires reveals interesting information, and the size of the sample suggests statistically, the ability to generalize, results for the cluster. Private and public entities have been under scrutiny; it is essential to include both sectors, as a cluster highlights interaction and the intertwined relations between public and private affairs. In any case, both sectors offer employment and potential employees stem out the very same educational and vocational system.

4. Employees' promotion criteria and procedures are different in the two sectors, as in the public sector working experience (or maturity) is more critical. Employees of the public sector are generally satisfied with their working conditions.

5. Professional specialization, as licensing or special training, is absent at the public sector, and the Administration demands less involvement in day-to-day operations from its executives. In contrast, the private sector's executives and employees report active (if not excessive) daily involvement in operations. Both sectors seem to suffer from the same operational weaknesses, such as bureaucracy and out-of-context actions.

6. Regarding the randomly selected private entity under analysis, it is concluded that the hiring policy shifted towards employees with strong academic background. It seems that hiring policies are evolving and employees with either marine professional background or academic degrees are preferred.

7. Crew Accounts and Crew Operations Department are staffed with more employees, whose educational level is higher than that of their colleagues in other departments. It was observed that those two departments engage a great number of graduates of University, College and High School, while the Crew Operations Department also tends to occupy graduates of the Marine Academy (having a Master License or a Deck Officer License).

Last but not least, the research team has to express sincere gratitude to the executives in the public and private sector for their continuous assistance and guidance.

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