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Evaluating Port Operation Managers' Competencies Related to the Port Environmental Sustainability Performance

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ABSTRACT

The competency characteristics of managers affect decisions that identifying the strategies in an organization. Similarly, the strategies for sustainability issues are also related to the managers' competency on sustainability. Thus, for better sustainability performance, the managers are expected to possess competencies in this direction. In this context, this study is aimed to evaluate the operations managers' competencies in terms of environmental sustainability in ports, which have huge effects on the physical and biological environment. For this purpose, one of the Multi-Criteria Decision Making (MCDM) methods, Analytic Network Process (ANP) was used to evaluate the priority weights of 15 competencies. Within a framework of container ports/terminals, the findings of this study show that "management skill", "emergency procedures", and "safety management" are the most primary competencies of port operations manager (POM) in terms of port environmental sustainability performance (PESP). The model used in this study can contribute to human resourcing and personnel training processes of ports.

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1 Introduction

Ports are places that play an important role in the economic development of a specific region or a country. This role of ports matches being an essential part of international cargo movement and trade. Besides contributing economically, ports also have activities closely related to the social and biological environment (Fossile & Gouvea Da Costa, 2017). Economical, social, and environmental issues should be handled in a balanced way, which was recognized as the three pillars of sustainability (Markley & Davis, 2007). "*For ports, sustainability means business strategies and activities that meet the current and future needs of the enterprise and its stakeholders, while protecting and sustaining human and natural resources*" (AAPA, 2007). Even though maritime transport is one of the most environmental-friendly ones of the current transport modes; considering the magnitude of the activities performed, it is understood that ports must attend importance to sustainability issues (Peris-Mora, Orejas, Subirats, Ibáñez, & Alvarez, 2005). As an increasingly developing industry to meet the demands of global trade, ports' activities occur serious concerns about hazardous or noxious substances, greenhouse effect, noise pollution, wastes, and energy consumption. Therefore, the importance attributed to environmental issues in ports are continuously increasing (Sislian, Jaegler, & Cariou, 2016), and this topic is gradually gain more interest by researchers (Acciaro et al., 2014; Antão et al., 2016; Darbra, Ronza, Stojanovic, Wooldridge, & Casal, 2005; Puig, Wooldridge, & Darbra, 2014).

Independently from the size, region and expertise, to perform various activities, ports need to be managed effectively (Burns, 2014). Nowadays, the foremost difficulty that management activities faced in the field of logistics and supply chain is the need for qualified managers (Thai, 2012). Effective management and positive organizational performance require competent managers. For a manager, being competent or as noun form "*competency*" means "*the characteristics that are causally related to effective*

Table 1 POM competencies related to PESP

Safety management	Decision making	Open-minded	Target-oriented	Teamwork ability and management
Security management	Regulations / procedures	Analytical thinking	Management skill	Field knowledge/ Expertise
Emergency practices	Problem solving	Action-oriented	Basic vocational knowledge	Delegating

Source: Tezcan and Kuleyin (2019)

and/or superior performance in job" (Boyatzis, 1982: 23). Usually, the organizational structure of a port consists of divisions connected to the Chief Executive Officer (CEO). These divisions are managed by managers like Chief Financial Officer (CFO), Chief Operations Officer (COO), Chief Technical Officer (CTO), etc. (Esmer & Karataş Çetin, 2016). Each division manager has to have the competency characteristics that are necessary for organizational performance. Organizational performance is vital for meeting the demands of a port's stakeholders. Satisfying stakeholders and reaching a considerable organizational performance requires handling the three dimensions of sustainability simultaneously (Dyllick & Hockerts, 2002).

Considering the environmental impacts of a port enterprise, the importance of the environmental performance dimension of sustainability stands out. In port management, it is thought that the operations division is the most intertwined one with environmental issues. A COO, generally named as Port Operations Manager (POM), needs engineering information about planning, logistics, transportation, environment, and industry, which are required to manage the port operations that are affecting human health and physical/biological environment. Therefore, this study focused on POM's competencies that are linked to Port's Environmental Sustainability Performance (PESP). This research aims to contribute to manager selection and training activities of a port administration by figuring out linked POM competencies to the PESP. While selecting POMs, focusing on mostly PESP related competencies could contribute to developing environmentally friendly ports. In this context, 15 POM competencies which have determined by a prior study of the authors (Tezcan & Kuleyin, 2019), were evaluated via Analytical Network Process (ANP).

2 Literature Review

2.1 Competency Studies

Competency studies in terms of manager characteristics started with Boyatzis's (1982) study. Following this, to identify manager competencies in general, many studies have been made (Chong, 2008; Fang, Chang, & Chen, 2010; McCredie & Shackleton, 2000; Quinn, Faerman, Thompson, & Macgrath, 1990; Viitala, 2005). Some researches searched the relation between managerial competencies and organizational performance (Sanyal & Guvenli, 2004; Wallick & Stager, 2002). There are a few studies evaluating manager competencies in the view of organizational sustainability performance or corporate sustainability (Fülöp, 2012; Wesselink, Blok, van Leur, Lans, & Dentoni, 2015).

There are quite scant researches regarding personnel/manager competencies in the port sector (Ahn & McLean, 2008; Thai, 2012; Thai, Yeo, & Pak, 2016). Lu, Shang, and Lin (2016) carried out a study approaching port sustainability performance from the perspective of port managers. A previous study (Tezcan & Kuleyin, 2019) of the authors of this study, made an effort to identify the port manager competencies in terms of ports' sustainability performance and reached 15 competency criteria (see Table 1). This study is complementary to that previous study, and it could fill the gap in the literature regarding which competencies really POMs need concerning an environmentally sustainable port.

2.2 Analytic Network Process (ANP)

ANP is one of the Multi-Criteria Decision Making (MCDM) methods. The ANP method was proposed by Saaty firstly in 1980, as a developed model for the Analytical Hierarchy Process (AHP). A hierarchical structure cannot be suitable for many decision problems, and the importance of ANP arises at this point (Gencer & Gürpinar, 2007). To build a model, ANP uses a network instead of hierarchy, and the term "*influence*" reflects the main perspective of ANP (Saaty, 1999).

Saaty (1999) built the ANP on the AHP, so it has some prominent advantages in general. The main advantage is, because of being a non-linear structure, a flexible network form that permits linking items without hierarchical concerns (see Figure 1). Hence, criteria and clusters of criteria can be in such network structure via inner or outer dependence and feedback (Saaty, 1999).

This kind of network allows prioritizing criteria and clusters of criteria via judging the influence of two criteria on a third criterion with respect to a standard (Saaty, 2004). This judgment process requires numerical pairwise comparisons of dependent criteria. Saaty (2008) proposes a fundamental scale for those judgments (see Table 2).

The Super Decisions (SD) software created by Saaty is the most commonly used analyzing program for ANP stud-

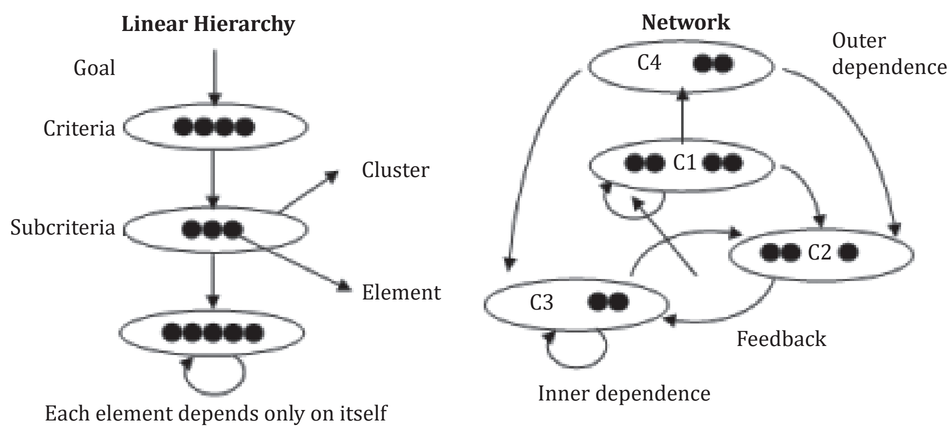

Figure 1 The Difference of Linear and Nonlinear Network Structure

Source: Saaty and Vargas (2006)

Table 2 Fundamental Scale Used for Pairwise Comparisons

1	Equal importance
3	Moderate importance of one over another
5	Strong or essential importance
7	Very strong or demonstrated importance
9	Extreme importance
2,4,6,8	Intermediate values
Use reciprocals for inverse comparisons	

Source: Saaty (2008)

ies. Ecnet software or mathematical models like Excel and Mathematica can also be used (Gencer & Gürpinar, 2007).

It is seen from the literature that the ANP method is used increasingly for decision making progresses in various researches. For instance; Niemira and Saaty (2004) used this method for financial crisis forecasting, Cheng and Li (2005) is for project selection, Jharkharia and Shankar (2007) is for logistics service provider selection, Gencer and Gürpinar (2007) is for supplier selection, Yüksel and Dagdeviren (2007) in SWOT analysis, Giannakis, Dubey, Vlachos, and Ju (2020) is for supplier sustainability performance evaluation, etc. ANP method usage in competency studies is scant; Brozova, Subrt, and Vorlickova (2009) used the method for determining a managerial competency model, Alexandra (2015) pursued a competency assessment process for IT professionals, Maaleki and Cyrus (2017) presented a competency model for construction managers.

3 Methodology and Application

Considering the complexity of interactions between the competencies evaluated, it was decided that a network structure could be more suitable than a hierarchy, and thus ANP method selected. The Super Decisions 3.2 software was used to analyze the ANP data. While performing this study, below mentioned steps were followed:

Step 1: Determining the decision problem

This study was planned on prioritizing the POM competencies related to the PESP. To do this, the decision problem is determined as "*evaluating the port operations manager competencies in terms of port environmental sustainability performance.*" The research was conducted within the field of container ports to eliminate the differences that may arise from the type of cargo.

Step 2: Selecting the competencies

The competencies that were evaluated in this study are those 15 that determined via a Delphi process in a previous study of the authors (Tezcan & Kuleyin, 2019). These competency criteria were distributed into four clusters according to Viitala's (2005) *'hierarchical model of management competencies'* (see Table 3).

Table 3 The POM Competencies Related to the PESP (Clustered)

Cluster	Competency criterion
Technical Competencies	Emergency practices (T1)
	Safety management (T2)
	Security management (T3)
	Regulations / procedures (T4)
	Basic vocational knowledge (T5)
Business Competencies	Field knowledge / expertise (B1)
	Open-minded (B2)
	Management skill (B3)
Information Management Competencies	Analytical thinking (IM1)
	Problem solving (IM2)
Leadership Competencies	Action-oriented (L1)
	Target-oriented (L2)
	Decision making (L3)
	Teamwork ability and management (L4)
	Delegating (L5)

Source: Authors

Step 3: Identifying the relationships and developing the network structure:

ANP is built on a network structure that is independent of a hierarchical frame (Saaty, 1999). This network structure is developed by revealing the relationship between criteria (Saaty, 2008). The relationship between competency criteria and the clusters were evaluated by an *influence analysis survey*. The survey was prepared to reveal the influence of each competency criterion on others. The survey was applied to three academicians who have expertise in port management. An *influence matrix* was obtained by the data gathered from the survey. Entering the matrix to the SD software formed the ANP network structure of the research.

Step 4: Performing the pairwise comparisons

The criteria that are found to be in a relationship together according to the network were compared to each other. The comparisons were questioned the importance level of two criteria relative to each other for another criterion through the 1-9 scale of Saaty (see Table 2), and. This was performed via a *"pairwise comparisons survey"* applied to six experts who are in charge of management in executive-level in five different container ports/terminals in Turkey (see Table 4).

There are different ways to reach a common idea about the opinions of the experts related to the pairwise comparisons: (i) consensus, (ii) voting or agreement, (iii) geometric mean, and (iv) separated models (Dyer & Forman, 1992). In this study, the geometric mean of expert answers was calculated. To make the analysis, this calculated means was coded into the SD software.

Step 5: Analyzing the data

Analyses start with forming the unweighted supermatrix. This is in a stochastic structure that shows a criterion's influence priority on another criterion in terms of a control criterion (Saaty, 2008). In the second stage, the weighted supermatrix is going to be reached by multiplying the unweighted supermatrix by the priority weights from the clusters (Gencer & Gürpinar, 2007). The weighted supermatrix shows the priority of criteria in a column

Table 4 The Experts that Performed the Pairwise Comparisons

Code	Position	Age	Experience in Maritime Field (Years)	Experience in Container Transportation (Years)
E1	Chief Executive Officer	53	28	19
E2	Chief Executive Officer	42	19	19
E3	Vice Chief Executive Officer	52	31	16
E4	Chief Operations & Finance Officer	47	27	13
E5	Chief Operations Officer	40	11	5
E6	Chief Operations Officer	48	22	22

Source: Authors

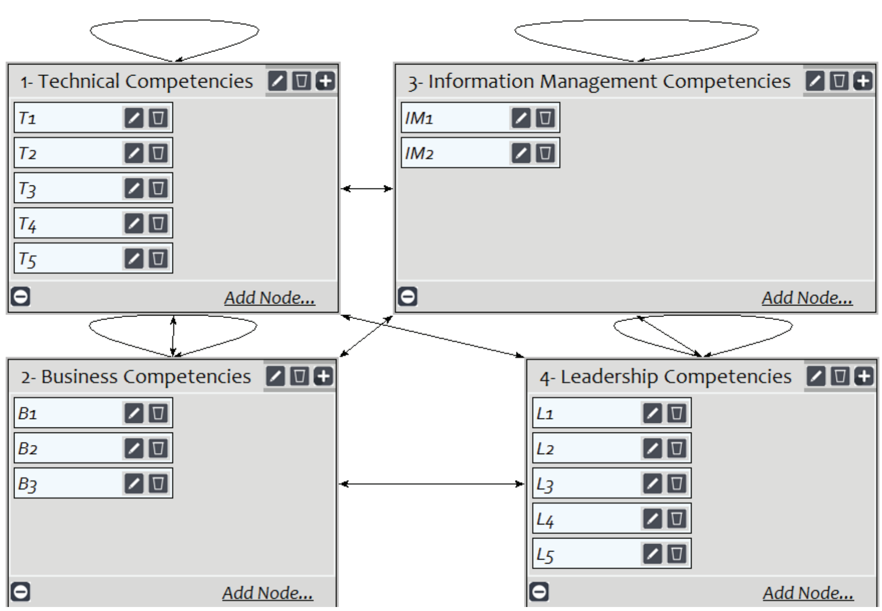

Figure 2 The ANP Model according to the SD

Source: Authors

for each criterion. The sum of each column equals to 1. The third and the last stage of the analyses is obtaining the limiting supermatrix. To reach the limiting supermatrix, unweighted supermatrix values are raised to limiting powers (Tzeng & Huang, 2016). SD software calculates unweighted supermatrix, weighted supermatrix and limiting supermatrix values at once.

Consistency is an important concept to be considered in decision problems. While answering pairwise comparisons, the decision-makers have to compare criteria consecutively, and this may cause inconsistency in given answers (Taylor, 2013). For the consistency of research, the consistency ratio is expected to be equal to or less than 0.1 (Saaty, 2008). This ratio is calculated by the SD software for each comparison.

4 Findings and Discussion

The answers to the influence analysis survey have been evaluated and the ANP model was formed in SD (see Figure 2). According to the model, all clusters have inner and outer dependence and there is feedback between clusters.

The SD automatically formed the pairwise comparisons according to the model. The experts have evaluated these pairwise comparisons via the pairwise comparisons survey. The geometric mean of each pairwise comparison according to the expert answers were coded to the SD again. Unweighted supermatrix (see Table 5), weighted supermatrix (see Table 6) and limiting matrix (see Table 7) values were calculated. All the consistency ratios of pairwise comparisons were found to be less than 0.1.

Table 5 Unweighted Supermatrix for Competency Evaluation by using ANP

		T1	T2	T3	T4	T5	B1	B2	B3	IM1	IM2	L1	L2	L3	L4	L5
T	**T1**	0.000	0.388	0.424	0.254	0.273	0.209	0.000	0.199	0.301	1.000	0.424	1.000	0.392	0.000	1.000
	T2	0.323	0.000	0.156	0.348	0.341	0.231	0.000	0.235	0.525	0.000	0.385	0.000	0.429	0.615	0.000
	T3	0.192	0.193	0.000	0.197	0.141	0.085	0.000	0.072	0.174	0.000	0.191	0.000	0.179	0.385	0.000
	T4	0.334	0.272	0.270	0.000	0.246	0.283	0.000	0.258	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	T5	0.152	0.147	0.150	0.201	0.000	0.192	0.000	0.236	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B	**B1**	0.407	0.455	0.574	0.336	0.412	0.000	0.000	0.602	0.000	0.000	0.000	0.000	0.000	0.000	0.351
	B2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.398	0.000	0.000	0.000	0.172	0.000	0.181	0.160
	B3	0.593	0.545	0.426	0.664	0.588	1.000	1.000	0.000	1.000	1.000	1.000	0.828	1.000	0.819	0.489
IM	**IM1**	0.000	0.654	0.000	1.000	0.000	0.561	0.000	0.556	0.000	1.000	0.294	1.000	0.573	0.000	0.567
	IM2	0.000	0.346	1.000	0.000	1.000	0.439	1.000	0.444	1.000	0.000	0.706	0.000	0.427	0.000	0.433
L	**L1**	0.000	0.000	0.333	0.281	0.000	0.222	0.000	0.265	0.134	0.127	0.000	0.140	0.548	0.000	0.214
	L2	0.000	0.000	0.000	0.269	0.000	0.307	0.301	0.385	0.203	0.109	0.129	0.000	0.452	0.000	0.285
	L3	0.291	0.000	0.000	0.199	0.000	0.471	0.222	0.350	0.290	0.476	0.490	0.615	0.000	0.313	0.501
	L4	0.371	1.000	0.468	0.000	0.000	0.000	0.263	0.000	0.213	0.169	0.225	0.000	0.000	0.000	0.000
	L5	0.338	0.000	0.199	0.252	0.000	0.000	0.213	0.000	0.161	0.119	0.156	0.245	0.000	0.688	0.000

Source: Authors

Table 6 Weighted Supermatrix for Competency Evaluation by using ANP

	T1	T2	T3	T4	T5	B1	B2	B3	IM1	IM2	L1	L2	L3	L4	L5
T1	0.000	0.203	0.222	0.133	0.168	0.112	0.000	0.107	0.091	0.303	0.122	0.287	0.112	0.000	0.287
T2	0.183	0.000	0.081	0.182	0.210	0.124	0.000	0.126	0.159	0.000	0.110	0.000	0.123	0.197	0.000
T3	0.108	0.101	0.000	0.103	0.087	0.046	0.000	0.039	0.053	0.000	0.055	0.000	0.051	0.123	0.000
T4	0.189	0.142	0.141	0.000	0.152	0.152	0.000	0.138	0.000	0.000	0.000	0.000	0.000	0.000	0.000
T5	0.086	0.077	0.079	0.105	0.000	0.103	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B1	0.111	0.115	0.145	0.085	0.122	0.000	0.000	0.116	0.000	0.000	0.000	0.000	0.000	0.000	0.074
B2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.077	0.000	0.000	0.000	0.036	0.000	0.042	0.033
B3	0.162	0.137	0.107	0.167	0.174	0.194	0.418	0.000	0.260	0.260	0.210	0.174	0.210	0.191	0.103
IM1	0.000	0.049	0.000	0.075	0.000	0.066	0.000	0.065	0.000	0.146	0.030	0.103	0.059	0.000	0.059
IM2	0.000	0.026	0.075	0.000	0.088	0.051	0.253	0.052	0.146	0.000	0.073	0.000	0.044	0.000	0.045
L1	0.000	0.000	0.050	0.042	0.000	0.034	0.000	0.040	0.039	0.037	0.000	0.056	0.219	0.000	0.085
L2	0.000	0.000	0.000	0.040	0.000	0.047	0.099	0.059	0.059	0.032	0.052	0.000	0.181	0.000	0.114
L3	0.047	0.000	0.000	0.030	0.000	0.072	0.073	0.053	0.084	0.138	0.196	0.246	0.000	0.139	0.201
L4	0.060	0.150	0.070	0.000	0.000	0.000	0.087	0.000	0.062	0.049	0.090	0.000	0.000	0.000	0.000
L5	0.055	0.000	0.030	0.038	0.000	0.000	0.070	0.000	0.047	0.035	0.062	0.098	0.000	0.307	0.000

Source: Authors

Table 7 Limiting Supermatrix for Competency Evaluation by using ANP

	T1	T2	T3	T4	T5	B1	B2	B3	IM1	IM2	L1	L2	L3	L4	L5
T1	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133	0.133
T2	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113	0.113
T3	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
T4	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091	0.091
T5	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061
B1	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072
B2	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
B3	0.151	0.151	0.151	0.151	0.151	0.151	0.151	0.151	0.151	0.151	0.151	0.151	0.151	0.151	0.151
IM1	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044
IM2	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042
L1	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038
L2	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039
L3	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
L4	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039
L5	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035

Source: Authors

The unweighted supermatrix indicates the cluster priority weights for each criterion. The sum of the priority weights about a criterion in a cluster equals 1. The values shown as '0.000' means that there is no relationship between intersecting criteria.

The weighted supermatrix indicates priority weights in a criteria-based way. Each column represents a criterion and the sum of a column is equals to 1. To point some high values, e.g.; the *B3 (management skill)* criterion is extremely prior (0.418) for the *B2 (open-minded)* criterion, *L5 (delegating)* criterion is highly prior (0.307) for the *L4 (teamwork ability and management)* criterion, *T1 (emergency procedures)* criterion is highly prior (0.303) for the *IM2 (problem-solving)* criterion.

The limiting supermatrix reveals the priority weights of POM competencies in terms of PESP. According to this, the priority rankings of competency criteria and cluster rankings are given in Table 8-9.

The most prior POM competency in terms of PESP has been found to be the *'management skill (B2)'* (0.151). *'Management skill'* competency has been discussed in many competency studies (Ahn & McLean, 2008; Fang et al., 2010; Shang & Yu, 2013; Thai, 2012). Fang et al. (2010), found the '*management skill*' as fourth prior competency in their study in relation to the healthcare managers. Considering prior studies and the findings of this study, it can be said that the management skill competency is more important for port management. Besides, the competencies *'emergency procedures (T1)'* (0.133) and *'safety management (T2)'* (0.113) placed second and third rankings in priority weight. These competencies differentiate port management from the other management fields. Finding high priority in terms of PESP of these two competencies, which include prevention and intervention methods for incidents against the environment, is considered significant.

Table 8 Priority Weight Rankings of POM Competencies in terms of PESP

Code	Competency Criterion	Weight
B3	Management skill	0.151
T1	Emergency procedures	0.133
T2	Safety management	0.113
T4	Regulations / procedures	0.091
B1	Field knowledge / expertise	0.072
L3	Decision making	0.062
T3	Security management	0.062
T5	Basic vocational knowledge	0.061
IM1	Analytical thinking	0.044
IM2	Problem solving	0.042
L4	Teamwork ability and management	0.039
L2	Target-oriented	0.039
L1	Action-oriented	0.038
L5	Delegating	0.035
B2	Open-minded	0.016
		1.000

Source: Authors

When focusing on the clusters, it is seen that the technical competencies found to be highly prior, and the priority of leadership competencies found to be lower relatively. This indicates the professional knowledge and ability are more important than having strong leadership characteristics in port management.

On cluster basis, the '*management skill*' competency differentiates from other competencies in business competencies cluster. This can be said also for '*decision making*' competency in leadership competencies cluster. The priority weights in the other two clusters are found to be relatively close together. The average priority weights of

Table 9 Priority Weight Rankings of Competency Clusters

Cluster	Code	Competency Criterion	Weight
Technical Competencies	T1	Emergency procedures	0.288
	T2	Safety management	0.246
	T4	Regulations / procedures	0.218
	T3	Security management	0.135
	T5	Basic vocational knowledge	0.112
			1.000
Business Competencies	B3	Management skill	0.633
	B1	Field knowledge / expertise	0.300
	B2	Open-minded	0.067
			1.000
Information Management Competencies	IM1	Analytical thinking	0.518
	IM2	Problem solving	0.482
			1.000
Leadership Competencies	L3	Decision making	0.293
	L4	Teamwork ability and management	0.181
	L1	Action-oriented	0.179
	L2	Target-oriented	0.178
	L5	Delegating	0.166
			1.000

Source: Authors

criteria in clusters are respectively as follows; *technical* 0.092, *business* 0.080, *information management* 0.043, and *leadership* 0.042. This ranking is exactly fit with the ranking in Viitala's (2005) model.

5 Conclusions

Ports are places that contain activities of intensive vehicle and ship traffic, and equipment usage. These activities cause significant energy consumption, and a considerable amount of wastes in solid, liquid and gas form. This reality forces port enterprises to consider environmental sustainability issues. Port enterprises have to push up environmental sustainability performance for the sustainability of the ecosystem, protecting the positive interaction with the social environment, sustaining economically, and corporate reputation.

The port activities that have environmental effects are mostly the responsibility of a POM. Thus, POM's are at the focal point of PESP. In this respect, POM's are expected to have competencies supporting PESP. In this study, it is aimed to determine the priority weights of POM competencies in terms of PESP. For this purpose, one of the MCDM methods, the ANP has been used.

As one of the pioneer studies evaluating manager competencies in the maritime field by an MCDM method, this paper shows that the managerial skill of a POM is vital for the PESP. This competency has also been found to be important in studies addressed ports or other management fields. This makes it a priority to have experience in lower management levels when hiring a POM, so port enterprises should take this into account. Additionally, technical and port-related competencies like emergency practices, safety management, etc. stand out. It indicates that a POM needs different specific competencies than the managers of other business fields have. This means the POMs should have had enough education in maritime training schools to gain those technical competencies and have enough field experience to intensify their knowledge with practical implementations. Considering the environmental sustainability performance of a port, and overall sustainability, these competencies should be taken into account while hiring a POM. POMs presently in charge could be developed via these competencies via in-service training.

A questionnaire that explores the priority competencies pointed out by the findings of this study could be created, and applied during a job interview. This can help select and hire the right POM for an environmentally sustainable port operation. Further studies investigating manager competencies in the maritime field from different perspectives could be useful. Competencies of managers in ports handling other types of cargoes or, competencies of different levels of managers could be analyzed.

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