Organizational Collective Intelligence with its antecedents and consequences for a maritime community

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Abstract

"Community" can be defined as a group of people or organizations that purposely share material wealth and property in some degree of common ownership and control . It can be said that to be an effective community, the members of community should develop the organizational collective intelligence which involves the capability of using the key components of community to collaborate in order to achieve goals in a complex environment. In this study, we aim to understand the importance of achieving an organizational intelligence-based maritime community.

1 Introduction

"Community" can be defined as a group of people or organizations that purposely share material wealth and property in some degree of common ownership and control. Another definition of community refers to a group of people with diverse characteristics who are linked by social ties, share common perspectives, and engage in joint action in geographical locations or settings. Consequently, organizing for a community generally involves being together for a purposeful collective effort for the enhancement of social conditions. These collective efforts constitute both learning to take each member's viewpoints, and integrating the reactions of others into their own activities. Joint actions, common perspectives and collectivism form an organizational archtitecture to allow people to create intellectual property and become the basic, but key, component of community.

To be an effective community, the members of the community should develop an organizational collective intelligence which involves the capability of using key components of community to collaborate in order to achieve goals in a complex environment. Accordingly, developing a new maritime community requires the integration of organizational collective intelligence.

Developing an effective maritime community depends on the ability to acquire several types of information and viewpoints, and to process and respond to them. Thus the maritime community should be evaluated from the perspective of three antecedents of organizational collective intelligence, which include the actions of acquiring, sharing and processing information, beliefs and viewpoints. These three antecedents are: The theory of the organization, the language of the organization, and the composition of the organization. Being a community is a process, therefore the output of the process for a maritime community – such as enhancing innovation and creativity in maritime community, and assuring maritime sustainability – involves the impacts of the antecedents of collective organizational intelligence.

In this study, we aim to understand the importance of achieving an organizational intelligence-based maritime community. We begin with a literature review for the general community, and organizational collective intelligence theories. Then a model is constructed for the maritime community. In the model, the antecedents of organizational collective intelligence is modified to a maritime organization. As a consequence of the model, we view the impact of the antecedents on the outputs of an effective maritime community such as innovation, creativity and sustainability in a maritime community.

2 Organizational Intelligence

Intelligence is an indispensable concept for the areas of psychology, organizational behavior, management and engineering (Dayan, 2003). Although there are a lot of definitions for intelligence, all of the theories agree that

intelligence is based on biology and is an improvable capability or potential. Studies about individual intelligence compose the bases of organizational intelligence (OI) literature. Research about organizational intelligence generally have been done through the definitions and perceptions of individual intelligence literature. When the organizational intelligence literature which is shown in Table 1.1 is evaluated, it is obvious that OI is also undertaken through both cognitive and physocometric perspectives.

Table 1.1. Organizational Intelligence Literature (Dayan, 2003)

AUTHORS	DEFINITIONS OF INTELLIGENCE
Greene (1966)	Processed information of interest to management about the present and future environment in which the business is operating.
Wilensky (1967)	The problem of gathering, processing, interpreting, and communicating the technical and political information needed in the decision-making process.
Gordon (1989)	The process of obtaining and analyzing publicly available data to develop the information necessary to serve as input to competitive strategy development.
Nevis et al. (1990)	Understanding organizations as learning systems and creative systems.
Halal et al. (1995)	A function of five cognitive subsystems: organizational structure, culture, stakeholder relationships, knowledge management, and strategic processes.
McMaster (1996)	The capacity for computation, which can be, applied to information that is externally gained or internally generated to meet survival challenges.
Glynn (1996)	The capabilities to process, interpret, encode, manipulate, and access information in a purposeful, goal-directed manner, so it can increase its adaptive potential in the environment in which it operates.
Liebowitz (2000)	The collective assemblage of all intelligence that contribute towards building a shared vision, renewal process, and direction for the entity.
Fleisher & Blenkhorn (2001)	The process by which organizations gather actionable information about competitors and the competitive environment and ideally apply it to their decision-making and planning processes in order to improve their performance.

From the cognitive perspective, intelligence is the capability of a system to transfer and acquire information from its internal and external environment.

Information is used for maintaining the stability, adaptation and enhancement of the system (Stalinski, 2004).

Furthermore intelligence refers to the computation capability that can be applied to the information. Computation capability is a system that involves the integration of the capabilities of receiving inputs from the external environment for capturing information, interpreting the information and converting the resulting interpretations to action (McMaster, 1996). Consequently, Organizational Intelligence should involve

- The capability to take signals from the external environment
- The capability to interpret the signals through various aims and internal structures
- The capability to create discrepancies from the inputs
- The capability to process and integrate the internal signals as the external signals.
- The capability to generate outputs and responding.

Information acquisition includes scanning information and reevaluating the signals from the primary and secondary information resources in the external environment (Dayan, 2003). Information distribution is sharing the information amongst the organization and transmitting the information to the related entities (Kohli & Jaworski, 1990; Beyer & Trice, 1982). Implementing the information is also another important issue in development of innovative processes, technology transferring and problem solving (Moorman, 1995; Lynn, 1998).

Nevertheless organizational intelligence is taken from the point of psychometric view. Gardner's multiple intelligence theory for individuals is integrated to organizations. Various resources of organizations provide various capabilities among organizations. These different capabilities have evolved as the kinds of intelligence. Halal (1998) specified that organizational intelligence could also be measured like individual intelligence, and matched the components of individual intelligence to organizational intelligence.

Albrecht (2003) defined organizational intelligence as the summation of all of the brain power in the organization. He emphasized that organizations could succeed in overcoming their weak points through improving their knowledge, capability and cultures. Osborn (1999) claimed that organizations should integrate their individual and collective intelligence to be healthy and functional entities. He suggested that organizational intelligence can be evaluated from the perspective of collective intelligence. In this context, the concept of collective intelligence emerges.

Collective intelligence (CI) is not a new concept. It is seen among evaluated groups in nature (Thorndike, 1911). As CI emerges in groups that have common aims or in groups that are coordinated around an object, it can be assessed from the aspects of the organizations that consist of the individuals who come together for a purpose. The broad definition of CI is the intelligence of

community. Community refers the systems that consist of more than one individual. Furthermore CI can be seen as *Holon*. In Greek, *Holon* means to be a whole while being a part of a whole. Thus CI is a *holon* because indvidiual intelligence is both a whole and a part of a collective system. Smith (1994) specified the CI as the capability of a group of individuals to complete a task as an organism that has a mind. He also emphasized that CI is essential for developing effective communities and collaborations.

Naturally many dependent variables of communities are necessary for the emergence of CI. Understanding these variables allows us to obtain the community system that will perform effectively with collaboration (Atlee, 2003).

3 Modeling Collective Organizational Intelligence for a maritime community

Organizational Intelligence literature evaluates information acquisition, sharing and distribution through the concept of intelligence (Dayan, 2003). In the studies of organizational intelligence, the structure (Delspande and Zaltman, 1982) and culture of the organization (Moorman, 1995) are introduced as the antecedents of OI, while organizational performance and the innovation process of the organization are presented as the consequents of OI.

By combining the literature about organizational collective intelligence, a model (shown in Figure 3.1) can be designed for organizational collective intelligence for the maritime community. In the model presented in this study, the theory of the maritime community, the composition of the desired community, and the communication of the community, are taken as the antecedents of the organizational collective intelligence of the maritime community. The consequents that will arise because of effective organizational intelligence are introduced as the innovation and creativity among maritime organizations, and enhancing sustainability by establishing maritime security and environmental protection more effectively.

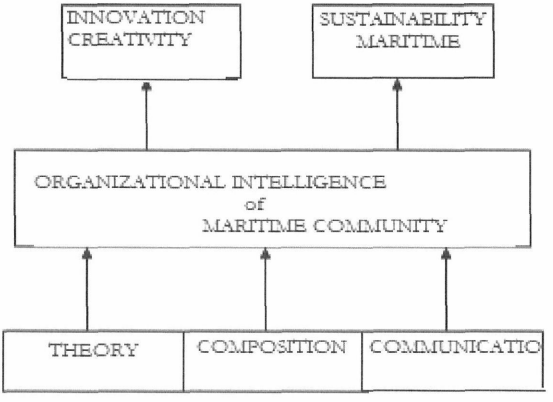

Figure 3.1. Model of Organizational Intelligence Antecedents and Consequents for the maritime community.

3.1 Theory of the maritime community

From the perspective of OCI, theory is the complementary statement that informs our perceptions, descriptions and judgments for our behaviors and activities (Mc Master, 1996). Namely, theory refers to developing cognitive models for our internal and external worlds.

Cognitive models are the mechanisms which provide explanations for the aim of systems, the functionality of the systems, and observed system conditions, while making forecasts (Rouse and Morris, 1986). Cognitive models are ordered knowledge structures that are used for communication with the environment. Furthermore, they are used for developing linkages between perceptions by creating expectations. They are also necessary to understand the basis of the performance of complex systems.

Gentler and Stevens (1983), and Rummelhart and Ortany (1977) analyzed cognitive models among the relationship of team members. Using this context, we can integrate the literature to the maritime community. Thus the maritime community should be shaped out of the cognitive models of the individuals of the commune. The structure of knowledge structure of the cognitive models can be specified by three models (Rouse et al., 1992; Canon-Bowers et al., 1993);

1- Instrumental Knowledge is related to the functionality, limitations, and operation procedures of resources and assets.
2- Task Knowledge is related to procedures of task knowledge, strategies and scenarios.

3- Group Knowledge is related to the role and responsibilities of teams, information resources, communication, interactions and the relationship between the members of the group. The capabilities of the members in the groups also should be known.

The Maritime community should be treated as teams. As cognitive models are related to the ordering and organization of the information of the maritime community, it is important to know who knows what in this community.

Klimoske and Mohammed (1994) noted that multi-cognitive models can be generated within team members. These multi-cognitive models involve common aims, common tasks, common operations and interactions. It is seen that teams that develop shared aims, tasks and operations are more successful than other teams (Klimoske and Mohammed, 1994). This means that shared cognitive models expose real expectations towards the members of the community and the external environment.

Since cognitive models involve describing and configuring the environment, they are important for the organizational collective intelligence of the community. High cognitive capability in an individual does not help us to see and understand all of the aspects of the environment (Wilson & Rutherford, 1989). Individual cognitive models give a person the required information. If this phenomenon spreads through the community members, each member can understand similar events and create similarities between the perceptions of other community members. Eventually explaining cognitive models will form the intelligence of the maritime community. As a result it can be said that:

The cognitive models will constitute the intelligence of the maritime community

The cognitive models will increase the effectiveness of the maritime community

3.2 Composition of the maritime community

Gardner (1983, 1999) explains the reason for the different capabilities of individuals with his multi-intelligence model. Integrating the multi-intelligence concept with the team work of a community exposes various operation styles, different core capabilities, and strategies in the community. Hoffman and Maier (1961) emphasized that heterogeneous task groups showed more successful results than homogenous groups. Furthermore it is also noted that when overcoming the challenges of the complex environments, diversifications should be obtained in the communities, so also in the maritime community. All in all,

Diversification in the community will constitute the organizational intelligence of the maritime community.

Diversification in the maritime community will positively affect the performance of the maritime community.

However, diversification should be taken with the identification of the aims. Fixing the aims of the community is important because ambiguity of tasks would yield a lot of different outputs. As a result, the determination of the performance assessment cannot be done effectively. Uncertainty in the tasks would also result in weak standards for operational procedures. Unfortunately, understanding the aims of groups are more difficult than the individual's aims. Weiryart and Weldon (1991) state that members of a group can develop different purposes while their group is focusing on their purposes. As a result the members of the maritime community can generate effective strategies (Hunter, 1996). Furthermore the feedback that is gained from the members of the community will improve adaptation, which is a key component of intelligence. Determination of the purposes of the community and getting the feedback from the strategies to achieve these aims provides for easy adaptation to different tasks.

3.3 Communication of the maritime community

In organizations, interaction and communication are necessary to provide linkages between members. The main purpose of communication is establishing coordination. Coordination is making decisions of the questions who-when-what, and to guarantee the achievement of the desired aims in a chaotic environment (Nevana, 1996). From the perspectives of communities, coordination can be developed with two concepts. These are synchronization and information flow.

Synchronization is required for the maritime community for continual and common tasks. The members of the community should do their tasks simultaneously. Accordingly, a common mind with a team spirit can be obtained through the community. As a result, the organizational intelligence of the community can be formed (Paolus, 2000) and

- Synchronization can develop organizational collective intelligence through the maritime community.

Communication of the community is also dependent on information flow. Information flow enhances the intelligence of the community by enhancing organizational learning (Glynn, 1996). Information flow is directly related to the usage of information and communication technologies. As one of the definitions of intelligence involves information processing, organizational intelligence in the maritime community will be more effective with the effective usage of information technologies.

4 The consequences of Collective Organizational Intelligence in the maritime community

4.1 Innovation and creativity

Thinking or ideas need intelligence (Gardner, 1983; Sternberg, 1985, Quinn, 1989). Gardner (1983) stated that creativity is a result of a combination of various intelligences. Consequently, based on individual intelligence, organizational intelligence has been evaluated with creativity. Creativity can be assessed through different perspectives. But the key point for the maritime community is probably the effect of creativity on innovation. As creativity can be defined as generating applicable new ideas, innovation can be taken as applications of creativity (Amobile, 1996; Kasof, 1995; West, 1990). Accordingly, organizational intelligence that will be created in the new maritime community will also trigger innovation and creativity in the maritime sector.

4.2. Sustainability

Sustainability can be defined as "the ability to meet today's global economic, environmental and social needs without compromising the opportunity of future generations to meet theirs" (Hamzah, 2006). For sustainability in the maritime sector, the following issues should be incorporated:

- strategic regional visions for connected regional marine systems;
- understanding the interdependence of various regional values and functions;
- formulation of long-term economic and ecological objectives, with concrete indicators;
- planning and investing directed at sustainable economic and ecological development;
- monitoring, evaluation and feedback according to established indicators.

Furthermore an integral system should be constructed by establishing integrated maritime programs and developing steering instruments. Hamzah (2007) also emphasized that for sustainable development in the maritime community, and in maritime activities, environmental and safety considerations should be taken such as:

- Management of estuaries
- All forms of pollution at ports
- Managing ecology and habitat
- Management of chemicals in or near water environments

- Oil discharge prevention and response
- Dredging and sediment removal including its disposal
- Management of ports and marinas and vessels
- Management of waste from vessels
- Loading and unloading of ships
- Ballast water and hull fouling and cleaning.
- Safety of ships and the people living around harbours
- Security of goods. Since 9/11, US Customs has insisted on security clearance and inspection of goods and vessels destined for US ports. The IMO has introduced security measures known as the International Ship and Port Facility Security (ISPS) Code for all ports, oil and gas terminals and merchant ships that engage in international trade.

When the above activities are analysed, it is obvious that the management of the organization of the maritime community is the main and common point for achieving sustainability. However, in some cases progress has been hampered because of difficulties in communication and coordination between parties. So the organizational intelligence that has been created among the maritime community can enhance sustainability by learning, creating, and providing coordination and communication effectively.

5 Conclusion

Organizational intelligence is greater than the sum of the knowledge of each individual in that organization. Organizational intelligence includes historical knowledge inherent in the organization and generative intelligence that results from collaboration between organizational members. To establish an effecitive maritime community, we should know that the sum of the all of the efforts are greater than the part which is the result of emergence of organizational collective intelligence through the community. In this way, the maritime community can behave with a team spirit. Accordingly, the maritime community should improve its intelligence to achieve its main purposes such as sustainability, which includes security, safety and environmental protection of the sea. By the context, Safety of Life at Sea (SOLAS) would shift to more common codes like Happiness of Life at Sea (HOLAS).

References

[1] Albrecht, Karl. The Power of Minds at Work: Organizational Intelligence in Action. New York: AMACOM, 2003.
[2] Amabile, T.M (1996). Creativity in context. Boulder , CO
[3] Atlee, T. (2003). The Tao of democracy using co-intelligence to create a world that works for all.

[4] Beyer, J. M., Trice, H. M. (1982). The utilizaiton process: a conceptual framework and sythesis of emprical findings., Administrative Science Quarterly, December, 591-622.
[5] Cannon-Bowers, J., and Salas, (1993). E. APA: Washington, DC; 61-87.
[6] Dayan, M. (2003)., New product team intelligence: ansequents and consequents, Doctoral Dissertation, Temple University.
[7] Deshpande., Zaltman (1982). Factors affecting the use of market reserach information: a path analysis., Journal of Marketing Research, February, 14-31.
[8] Gardner, H. (1983). Frames of mind:The theor y of multiple intelligences. New York: Basic Books.
[9] Glynn, M. A, (1996). Innovative geneous: a framework for relating individual and organizational intelligence to innovation., Academy of Management Review, 21,1081-1111.
[10] Halal, W. (1998). The Infinete resource: creating and leading the knowledge enterprise., Jossey-Bass.
[11] Hamzah, B.A. , Ports and Sustainable Development: Initial Thoughts, UNITAR
[12] Hunter, J. E. (1986). Cognitive ability, cognitive aptitudes, job knowledge, and job performance. Journal of Vocational Behavior, 29, 340-362.
[13] Jaworski, J. B., Ajay K. K. (1993). Market orientation: antecedents and consequenced, Journal of Marketing, 57, 43-70.
[14] Kasof, J. (1995). Social determinats of creativity: status expectationsand the evaluation of orginal products. Advances in group processes., 12, 167-220
[15] Klimoske, R., and Mohammed, S. (1994). Team mental model: Construct or metaphor?Journal of Management, 20, 403-437.
[16] Lynn, G.S, 1998. New Product Team Learning: developping and promoting your knowledge capital. California Management Review, 40, 73-94.
[17] McMaster M. D. (1996). The intelligence advantage: organizing for complexity, Newton. MA: Butterworth-Heinemann
[18] Moorman, C. (1995). Organziational market information procesess: culture antecedents and new product outcomes., Journal of Marketing Research, 32, 318-335.
[19] Paulus, P. B. (2000). Groups, teams and creativity: the creative potential of idea-generating groups. Applied Physcology: An International Review, 49 (2), 237-262.
[20] Quinn, J. (1992). Brain Intelligent Enterprise, The free press, NY
[21] Rouse, W.B., Cannon-Bowers, J.A., and Salas, E. (1992). The role of mental models in team performance in complex systems. IEEE Transactions on Systems, Man and Cybernetics. 22(6), 1296-1308
[22] Rouse, R., & Morris, N. M. (1986). On looking into the blackbox: prospects and limits in the search for mental models. Psychological Bulletin, 100, 349-363

[23] Rumelhart, D. E., & Ortony, A. (1977). The representation of knowledge in memory. In R.C. Anderson, R. J. Spiro, & W. E. Montague (Eds.), Schooling and the acquisition of knowledge (pp. 99-136). Hillsdale, NJ: Lawrence Erlbaum.
[24] Smith, J.B. (1994) . Collective intelligence in computer-based collaboration. Hillsdale, NJ: Lawrence Erlbaum.
[25] Sternberg, R. G. (1985)., Implicit theories of intelligence, creativity, and wisdom., Journal of Personality and Social Psychology, 49, 607-627
[26] West, M.A. (1990). The social pyschology of innovation in groups, MA, Westjale.
[27] Wilson, J. R., & Rutherford, A. (1989). Mental models: Theory and application in human factors. Human Factors, 31, 617-634.
[28] Thorndike, E.L (1911). Animal intelligence. New York: Macmillan